Michael Gane

# Forest Strategy

## *Strategic Management and Sustainable Development for the Forest Sector*

Springer

Forest Strategy

# Forest Strategy

*Strategic Management and Sustainable Development for the Forest Sector*

*By*

Michael Gane

Springer

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 978-1-4020-5964-3 (HB)
ISBN 978-1-4020-5965-0 (e-book)

Published by Springer,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

*www.springer.com*

*Printed on acid-free paper*

# CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

## LIST OF BOXES

# ACKNOWLEDGEMENTS

Thanks are due to many friends and associates who have stimulated and encouraged me over a number of years to put forward the ideas in this book. Particular assistance and helpful criticism was unstintingly given by Alf Leslie. Mike Arnold and Bob Plumptre contributed to parts of earlier drafts. In Cyprus, where some of the strategic ideas in Part II were tested during preparation of the National Forest Plan, the practical help provided by Alex Christodoulou, Chief Conservator of Forests, staff of the Forest Department and consultants to the project is gratefully acknowledged. The support of Manuel Paveri at FAO and Professor Jeff Burley at Oxford has been invaluable. Responsibility for all misunderstandings and faults remains with the author.

# FOREST STRATEGY

*Strategic Management and Sustainable Development for the Forest Sector*

## SYNOPSIS

This book deals with the application of strategic management principles to sustainable development for the forest sector. It contains an introductory chapter followed by two parts: Part I (consisting of 6 chapters) explaining the Forest Sector and Part II (3 chapters) dealing with Strategy. It is global in scope, while focussing on the sector at national level.

The Introduction presents strategy as a concept which bridges the gap between aims and their achievement. It is evident that misuse and destruction of the world's forest resources is having a serious impact. Forest strategy, viewed as a process, is related to the global development issues evident in forestry and conservation. Policy failure, which is widespread, can be attributed partly to neglect of appropriate strategic methods in natural resource management.

Part I describes the forest sector, its composition and the way that it functions. The forest sector concept is explored in chap. 2; the sector is defined in broad terms as the economic, social and cultural contribution to life and human welfare derived from forests and forest-based activities. It has three components: resources, activities and outputs, which are described in detail in chaps. 3, 4, and 5. Chapter 6 covers the human aspects of the sector, describing it as a loose association of all those who depend on forest resources. A holistic approach is essential and chap. 7 deals with the sector as a dynamic, open system. This analysis treats the sector as a unit, providing insights into it structure and operations, and breaks new ground.

Part II examines the strategy concept and its application to the forest sector. Strategic ideas, drawn from military/diplomatic, business management and public policy sources, are considered in chap. 8. These different perspectives portray strategy in three ways (as a grand design, guidance for decision making and a route for development). They lead to the formulation of forest strategy as part of a cyclical process which connects analysis with the choice of aims and subsequent action to implement those aims. Chapter 9 deals with the application of strategic methods to stages in the strategy process. It covers various analytical methods (such as SWOT), scenario preparation, imperatives (e.g. sustainability, equity, participation), choice of objectives and national forest programme preparation. The final chapter, entitled 'strategy in action', considers various practical problems, such as public

value assessment, leadership, direction and control of sectoral affairs, in a national setting and from an international point of view; these issues must be tackled to enable strategies to work. Strategic concepts have not previously been applied to the forest sector in this manner and many aspects of the methodology represent new thinking which is relevant to the advancement of forest science and development worldwide.

The book draws on a wide range of sources and is backed by an extensive bibliography, with recommendations for further reading. Diagrams and tables support the text. Summaries of each chapter are provided.

CHAPTER 1

# GENERAL INTRODUCTION: STRATEGY FOR DEVELOPMENT

As the title of this book indicates, it is concerned with two things: forests and strategy. Its purpose is to investigate ideas about both subjects and to study the implications of applying the strategy concept to the development of the forest sector. The forest sector consists of forest resources plus all the varied activities dependent on them and on which they depend. Strategy is (or should be) focussed on ways of getting the right things done; forest strategy aims at getting the right things done in the forest sector.

The subtitle of the book is *strategic management and sustainable development for the forest sector*. Strategy formulation and implementation is (or should be) regarded as an ongoing process; hence the use of the term 'strategic management'. 'Sustainable development' refers to the need to be able to continue to meet the requirements of society for goods and services of all kinds in future years; it is the antithesis of short term satisfaction at the expense of long term welfare. The 'forest sector' distinguishes the forest-dependent portion of economic and social activity from all the rest of the activities that go on in the world, treating the sector as a recognisable unit within a wider national and international setting. Strategic management provides the means for achieving sustainable development when applied to the forest sector.

This theme is examined in detail throughout the following pages. Part I of the book considers the meaning and significance of the forest sector concept; it describes its composition, characteristics and the way it works. Successive chapters view the sector from different standpoints and describe the interdependencies which hold it together. The strategy concept is examined in Part II, first by reviewing the various sources of strategic ideas and then by considering how they can be applied to the situation in the forest sector. Strategy in action involves the use of various techniques and procedures to make the difficult choices that arise when attempting to direct the development of the forest sector; these methods are described and their usefulness evaluated.

The sources of information that have been drawn on for this study are eclectic. Readers trained in a particular discipline, such as forestry or ecology, may find

some of the ideas unfamiliar. For this reason care has been taken to explain the terms used in a way that does not assume prior knowledge; this has been done for the sake of clarity although it risks boring those who have already been exposed to other disciplines. The administrators and managers who deal with forest sector affairs are becoming more diverse, their backgrounds and experience are more varied than formerly, although forestry professionals still predominate. Within the forestry profession there is often a greater amount of specialization by students during their training than there used to be; they need to expand their horizons as they progress in their careers. Older practitioners could use a text that enables them to update their skills.

The standpoint from which the book has been written is practical. It is concerned with how best to promote forest sector development, mainly from a national standpoint. To achieve this it is necessary to understand the complexities of the forest sector and the principles on which its development should be based. There have been manifest failures, particularly in a number of tropical and subtropical countries, which have resulted in forest resources being destroyed or degraded, leading to criticism and consternation amongst people who fear its effects on the global environment. International opinion in knowledgeable quarters has described the situation as a crisis. What is less obvious but more damaging in the long run is the apparent inability in many countries to administer the forest sector effectively; such shortcomings reflect failures at both political and managerial levels. Indecisiveness and poor management deprive individuals and communities of many of the benefits that the forest sector can confer. The present generation is deprived of worthwhile improvements in its standard of living, while future generations lose opportunities to enjoy the goods and services that the sector is capable of supplying. Consequently the significance of the forest sector tends to be underestimated in the eyes of the general public. We should ask why the management of the forest sector is failing and what can be done about it. The analysis that is presented in the following pages is an attempt to diagnose the causes and suggest an approach which might lead to solutions to the problem.

The answers appear to depend on changes in attitude in two important respects. First, the forest sector must be viewed as a whole instead of piecemeal; second, the key role of strategic management in the development process needs to be recognised and put into practice. It is vital to adopt a holistic approach and to work out strategies for developing the sector which are based on the expected outcomes of alternative courses of action rather than stipulating in advance a set of forest policy aims, with little regard to how they might be implemented. It might be said of a strategy, 'by its fruits shall ye know it', whereas forest policies, too often, consist of pious aspirations unsupported by the means to carry them out.

Part I reveals why the forest sector must be treated holistically. The resources, activities and outputs of the sector are interconnected in space and over time. Similarly, the sector is made up of numerous organizations and interest groups which interact with each other. Thus a seed sown or a seedling planted will grow eventually into a tree, which may be felled, transported to a sawmill and cut into

timber; the timber is likely to be used for building construction or find its way as furniture to an end user. A series of transformations is involved, first in the forest of which the tree is a part and later in the industries which use timber and distribute wood products. While the tree increases its biomass, it will capture atmospheric carbon, interact with other organisms in the ecosystem, affect the quality of the forest as a water catchment and marginally alter the landscape. The output of wood that the tree supplies is connected to consumers through the manufacturing chain. Similarly, outputs of services from the forest, such as climate amelioration and biodiversity, provide public benefits. Judgements about what to do with a forest (what to plant, whether to cut and how to alter its structure etc.) should consider all the downstream consequences and not ignore what may appear to be side effects which alter the quality of peoples' lives indirectly. Viewed from the other end, changes in public needs and tastes have important repercussions on the activities, employment and investment that takes place in the sector, and are transmitted back, in one way or another, to influence the composition of the forest. It is necessary to treat the forest sector as a system and consider how interventions at one point will be transmitted to affect the rest, either now or in the future. Decision making based on partial analysis is likely to be misleading.

The complexity of the forest sector causes problems for decision makers. Part II explores these in the context of strategic management. Strategy bridges the gap between aims and their achievement; it is necessary to choose attainable aims and then seek to implement them. By working out the probable consequences of strategic options it is possible to choose between them in a rational manner. However, the forest sector is a constantly changing, dynamic system which is open to outside influences. Consequently, the expected results of decisions are unlikely to materialize in exactly the way envisaged and strategic aims need to be reviewed and adjusted as time goes by. The process is surrounded by uncertainty and is evolutionary. Therefore, it also seems rational to allow for unexpected events by providing flexibility so that the strategy process becomes responsive to change and allows for readjustment as it continues. Forest sector development can be compared to a journey along a path that alters, towards a destination that is never quite reached.

## 1.1 PARADOX AND POLICY

This paradoxical situation appears to be the source of many of the policy failures that are now evident. It is certain that forest sector development can only be guided if the direction in which it is to be steered has been mapped out; equally certain is the inevitability of unexpected events occuring along the way which may frustrate even the best of development plans. The forest resources on which development is based may be destroyed by fires or a hurricane, a trade embargo may put a forest industry out of business, national forest programmes may prove disappointing because they fail to attract the financial resources that are necessary to carry them out and forest projects may prove to be technically unworkable. These dangers,

and many others, can disrupt progress. A strategic approach offers a way of coping with such eventualities by including formal procedures for monitoring, revision and readjustment at all levels.

How to deal with such paradoxes is a widespread problem outside the forest sector. Referring to signs of a general breakdown of organized management and control in society, Charles Handy has pointed out the inevitability of paradox as a feature of life. He identifies nine principal paradoxes which create turbulence in our lives, ranging from intelligence to justice. He points out that we need to accept paradox as a first step towards living with it and managing it. In his view, in order to make sense of the future we need a new perspective on life, its purpose and responsibilities. He suggests that we need to build on three senses: a sense of *continuity*, a sense of *connection* and a sense of *direction*. "Without these senses we feel disoriented, adrift and rudderless"[1]. The author is a well-known writer on business and organizational matters and his books are directed at managers of all descriptions, including those who work in the forest sector. His ideas are obviously relevant to the way the forest sector should be managed; continuity is important in dealing with forest ecosystems to allow for their perpetuation, connections between the various activities and people in the sector enable them to communicate and induce a feeling of coherence, while direction gives all its organizations and individuals a common purpose. Strategic management of the forest sector should address all three.

Other causes of policy failure have been identified. The discrepancy between aims and their successful implementation is often blamed on 'lack of political commitment' or put down to regional, ethnic, cultural, social or even religious factors. One might argue that these should have been forseen when the policy was drawn up; alternatively they might be classed as unexpected events with which the policy was incapable of dealing. Either way, a strategic approach as described in Part II would enable the problem to be identified and an appropriate response arranged. The emphasis when forest policies are prepared has usually been on their objectives rather than the means of carrying them out. That there has been a lack of attention in practice to what are called 'policy tools' has been pointed out[2]; since these determine the courses of action to be followed in order to implement the policy, they should be at the centre of the policy-making process. Good intentions do not lead automatically to successful results. A strategic approach, on the other hand, focusses on the connection between aims and the achievement of results.

Policy failures are evident in many countries. Too often, national forest policies and plans have failed to produce the results that were hoped for, forest resources continue to be destroyed or degraded in spite of all the attention that is supposedly paid to sustainability, and the numbers of endangered plants and animals in forest ecosystems throughout the world are still being depleted. Taken together, these problems constitute a policy failure of global proportions. Consequently, there have been calls for international action which have become progressively louder and more urgent. They resulted in the Earth Summit at Rio in 1992 and, more recently,

the World Commission on Forests and Sustainable Development was set up to consider what should be done. Seen at this level, policy failures become global issues and a subject for diplomacy.

## 1.2 GLOBAL ISSUES

The World Commission believes that "the world's forests are being cut and burnt at such a rapid rate that if action is not taken soon, we risk undermining their vital function in maintaining a habitable planet. Already, forest losses are contributing to the extinction of plants and animals, increased flooding and disruption of climate patterns. In many parts of the world, forest decline adds to people's social and economic distress." The Commission has expressed the view that "we are faced with a forest crisis"[3]. Their Report makes important recommendations about what should be done, calling for international leadership and political action.

The solutions advocated by the Commission, as listed in Box 1.1, are plausible, given their underlying assumptions. However, general exhortations of this kind have not been very successful up to now in persuading nations and the international community to change their ways. There are serious difficulties to be overcome at international, country and local level before these recommendations can be achieved. Conflicting interests are at stake which must be reconciled. Many of these are based on wider concerns than fears about the future of the forests. For example, decisive action at international level is not possible without collective agreements by governments. These may infringe what countries regard as their

**Box 1.1 Recommendations for addressing the forest crisis**

The conclusion of the World Commission is that "we must urgently choose a path that respects the ecological value of forests while recognising their role in social and economic development". The key recommendations in their Report include:

- the global nature of the forest crisis requires decisive international leadership and action;
- governments must ensure that the public interest prevails over private interests;
- prices and policies that truly reflect all benefits provided by forests are needed to change wasteful production and consumption patterns;
- protection of the remaining primary forests requires that future demand for wood products must be met through plantation and secondary forests;
- community involvement in decision-making is essential for sustainable management of forests.

Source: *Our Forests, Our Future*. Report of the World Commission on Forests and Sustainable Development.

sovereign right to do what they please with their forests. However, rights should go with responsibilities to the global community; countries are responsible for the consequences of their actions if these are detrimental to the rights of other nations.

There are serious political difficulties at international level which prevent decisive action being taken, even though the global nature of the crisis is undeniable. Humphreys has described them in relation to the issues raised by tropical deforestation[4]. He identifies three dimensions of the problem: causal, institutional and proprietorial. The causes can only be tackled if all the actors with a stake in forest use, including transnational corporations (TNCs) and non-governmental organizations (NGOs) as well as the governments, join together in a coordinated response. He points out that forest conservation cannot be achieved on the ground without the effective participation of indigenous people, villagers and local community groups. Institutions and political structures need to be devised to integrate the views of local people, at the lowest level of international society, with government departments, TNCs and UN agencies at the highest level. Controversially, he asks who 'owns' or has a legitimate stake in the world's forests: are they a national resource or should they be treated as global commons? These three dimensions are interlinked.

The World Commission's recommendations involve action at various levels. The issues may be global but the solutions are not. Decisions about the rights and responsibilities of citizens and the 'public interest' are national not international matters. Government action on policies and prices requires implementation and support at lower levels. For example, moves to protect primary forests and meet future demands for wood products by establishing compensatory plantations cannot be successful without official backing and much activity on the ground. International encouragement, supplemented by offers of assistance, may assist national and local initiatives, but success depends on coordinated action taken by governments with community involvement in local decisions which affect their interests. A multi-level response is required.

However vociferous the protests about unsustainable forest exploitation and destruction, international intervention to impose solutions on national governments that fail to look after their forests is unlikely to be acceptable; nor is it practicable. They may be cajoled but not forced. It is important for countries to accept their share of global responsibility and devise their own remedies which are suited to local conditions. For this they may secure the backing of international organizations and other nations willing and able to provide appropriate assistance. International cooperation can help, but the only feasible way of tackling these global issues is through national action and countries' own efforts. Success depends on mobilizing the resources that are available to the forest sector and securing the participation of organizations and individuals within it. Sector level coordination of locally based projects and operations is necessary within a generally acceptable institutional framework. Therefore attention should be focussed on the preparation and implementation of sector strategies and national forest programmes. International activities should be directed towards their support.

There are other global-scale influences, not directly addressed by the World Commission, that are having an impact on the forest sector and call for a strategic response. The advent of the new millenium marks a time of unprecedented change. We face the spread of the global economy, the impact of a technological revolution in the provision of information and communications, and the effects of environmental deterioration on the welfare of communities. These three major influences are unavoidable, ubiquitous and unsettling in their consequences. Somewhat perversely, they also add to the divisions in society because their effects vary from place to place according to local geographical, economic and social conditions. Not all nations are able to benefit equally from growth of the world economy, some regions are better able to make use of information technology than others, and climate change affects different regions and their populations in different ways. Adaptability and enterprise are at a premium and the ability to successfully manage the situations that these changes create is assuming unprecedented importance. No part of the economy or section of society is immune from their effects, least of all the range of activities associated with forests, the industries and rural communities dependent on them.

Managers have to cope with the upheaval and uncertainty that these global influences bring. Adjustments in the forest sector include greater openness to trade in forest products and less scope for protection of domestic producers. Working practices in forests and forest-based industries require reappraisal to make use of the fast moving technological innovations in data handling and availability. Much more attention than in the past is being paid to forest resources from the point of view of their effects on climate, biodiversity and the conservation of fauna, flora and landscapes; the social consequences of environmental deterioration are coming under scrutiny. Those who live, work and derive their living from forests, directly or indirectly, are being subjected to unaccustomed changes which are occuring at unprecedented rates. The task of dealing with the problems created by these changes presents a severe test of managerial competence. A strategic response that provides flexibility and allows for uncertainty has become essential.

Even without the challenges created by these worldwide trends, those responsible for forestry affairs have been put under severe strain. The traditional concerns of the forestry profession, which have revolved around timber supply, are being superseded by multipurpose management of forest resources which calls for much broader expertise and training. In developing countries, particularly in the tropics where rapid population growth continues, forest resources are being depleted and this is causing international concern. The pressure on land for subsistence agriculture is the main reason for the substantial shrinkage in forest area that has occurred, but the quality of the remaining forests has also been affected by unrestricted cutting and grazing to meet villagers basic needs and, in many places, by inadequately controlled commercial exploitation. The extent of the forest resources in temperate regions remains more or less constant overall, but this apparent stability conceals local variations and some serious qualitative deterioration due to pollution and mismanagement. Forest administrators are having to contend with increasing

pressure exerted by external interests, while attempting to meet the demand for more goods and services of all kinds from a shrinking resource base. Their ability to meet the needs of the communities they serve is being undermined and too often their efforts to remedy the situation have been ineffectual. Their predicament shows up major shortcomings in the way that forest policies are decided and forest resources are administered. A new strategic perspective is necessary to cope with this unsatisfactory situation.

## 1.3 CONSERVATION AND DEVELOPMENT

The forest crisis has its origins in a wider failure of conservation. Forest ecosystems are not being adequately safeguarded or sustainably managed to continue to provide the wide range of environmental benefits that society expects. Public concern is mainly concentrated on the effects of forest destruction on life support systems, climate change, loss of biodiversity, water supplies and landscape. The fears are mainly for the services and intangible benefits that forests provide, rather than the timber supplies or other material goods derived from them. Timber production is frequently portrayed as inimical to conservation even though the world would find it difficult to live without forest products.

Comparable concerns are evident about other types of ecosystem which are not dominated by trees. The conservation of natural resources generally is suffering from policy failure at international, national and local level. Wildlife conservation has not, so far, prevented species becoming endangered or extinct at human hands and conservation of the marine environment has not stopped overfishing or dumping. The conservation movement has been active in drawing attention to the problems and proposing solutions at international level, but results have fallen short of expectations; unfortunately, conservationists have been no more successful professionally than foresters in achieving their aims. As with forestry, good intentions have not led to remedial action where it is needed within countries and the same strategic principles need to be applied.

Conservation, as a concept, has evolved from simple preservation to more complex ideas about the way that natural resources should be used as shown in Fig. 1.1. Starting with protection of areas of land and water in their natural state, as with national parks in the USA which were first set up to safeguard outstanding scenic features such as the Yosemite Valley and the Sierra redwoods[5], it developed in the early part of the twentieth century into a creed based on 'wise use' of natural resources[6]. This implied a rate of use which did not exceed the ability of the resource to replenish itself, as enshrined in the sustained yield principle adopted by foresters to ensure a continuous output of timber. In the last quarter of the century the conservation concept was extended further, as shown in Box 1.2, and now covers the equitable sharing of benefits derived from the resources, in the present and in the future[7].

This wider interpretation is similar to the definition of sustainable development adopted by the World Commission on Environment and Development in 1987[8],

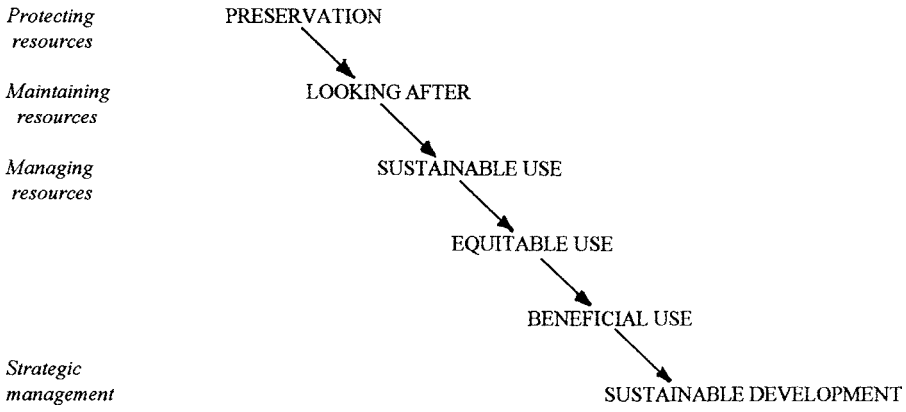


*Figure 1.1* Evolution of the conservation concept

**Box 1.2 Definition of conservation**

'the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment. Living resource conservation is specifically concerned with plants, animals and microorganisms, and with those non-living elements of the environment on which they depend.'

Source: *World Conservation Strategy*, 1980.

i.e. "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Protecting the interests of future generations (intergenerational equity) is usually combined with providing for the present needs of the least advantaged in society (intragenerational equity); both forms of equity are regarded as components of sustainable development[9]. Equitable use of resources, based on fair shares for the users, leads on to beneficial use designed to provide the greatest possible satisfaction for the beneficiaries. This is also the aim of sustainable development. Thus conservation merges with sustainable development.

Society benefits from the existence of natural resources and the way they are utilized. The transition from protection to sustainable development reveals a shift in emphasis from concern for the forests to concern for people. Conservation is focussed on resources and the way they are managed, whereas sustainable development is oriented towards the recipients of the outputs of goods and services that the resources provide. They represent different aspects of the same spectrum

of ideas. The final step in the transition is supplied by the word 'development', which adds a dynamic dimension to the concept. It implies that the flow of benefits derived from the resources is expected to increase and provide greater satisfaction, higher living standards and environmental improvements in future years.

Some people still regard conservation as protection of the *status quo*. This view is not tenable. Forest resources cannot be preserved untouched; they exist naturally in a state of flux due to climate change and the endless interactions between species and their habitats. Ecosystems will not remain exactly as they are now even if human intrusion and interference are prevented. There is widespread evidence of historical change in the extent, distribution and composition of forest resources. Nor is it reasonable try to keep humans out. Resources should be managed to provide a sustained flow of outputs of all kinds (tangible and intantangible), for the benefit of all sections of the community. Some benefits derived from forests are attributable to conservation of the flora and fauna, and some to preservation of areas as 'wilderness'. However, other areas may be used to grow timber and, in many cases, outputs are combined under the mantle of multiple use.

Viewed from the perspective of receivers, a country's resources should be managed to make the maximum possible contribution to the nation's economic growth and the welfare of its citizens, both now and in future. Changes in peoples' tastes and improvements in technology may affect the composition of the output mix over time. Global influences also have an impact on what happens in the forest sector. Managers seeking to promote sustainable development must cope with the consequences of change and unexpected events which affect both the forests and the people that use them. Uncertainty is unavoidable and unpredictable, and flexibility to respond appropriately is essential. A strategic approach is required. Instead of conservation based on resource management it is necessary to move to sustainable development based on strategic management of the forest sector. It might be said that strategic management represents the new face of conservation. This transition requires a new managerial perspective.

## 1.4 THE STRATEGY PROCESS

Strategic management is a continuous process. In relation to the forest sector, it defines the aims and guides the action to be taken in pursuit of development objectives. As the process deals with the sector holistically, it covers all aspects of the sector and is mainly carried out at country level. It takes place within the context of national institutions, customary social behaviour and prevailing economic conditions, but is influenced to some extent by events and opinions at international level and also by tactical and operational considerations that reflect the realities of the situation on the ground, which are transmitted upwards. The setting within which the process occurs affects both the choice of aims and the type of action contained in the strategy; conversely, decisions taken as the result of the strategy process determine both the subsidiary objectives and the means of attaining them

that constitute local level development. Strategic management does not take place in a vacuum and drives forward changes and development at all levels.

The decisions that are taken during the strategy process lead to interventions in the system. These are intended to promote sector development. We might ask, why intervene? Surely, environmental changes and market forces will occur anyway and these will stimulate sectoral development without extra help. Perhaps deliberate intervention is unnecessary and the forest sector will progress faster if it is left alone. This point of view is not supported by popular opinion or economic rationality. Public protest of some sort, low key or vociferous, is likely if the sector fails to produce the goods and services expected of it, or if those dependent on it appear to have suffered unfair treatment. As many of the outputs derived from the sector are unpriced and difficult to value, their equitable distribution, particularly between generations, is unlikely to occur by chance. Intervention of some sort is both necessary and expected. Therefore governments have a duty to step in to promote sector development by initiating and facilitating strategic management.

It is more useful to consider what the object of intervention should be and how best to interpret development aims in a national and local context. The general objective is clearly to 'make people better off', both as individuals and in society as a whole. Strategic management should deliver economic improvements for the people whose livelihoods depend on the forest sector and for the nation. It should also lead to better surroundings for them to live in and contribute to their social, cultural and aesthetic welfare. What is often referred to as the 'public good' has many dimensions. Strategic management is multi-purpose management and involves difficult choices between outputs that are not directly comparable. It is necessary to balance the composition of the output mix and also decide how this balance may change in later years.

It is the function of the strategy process to interpret this general objective in ways that correspond to the particular situations found in different countries. Each country or state needs to have a national strategy for forest sector development, which is suited to the type of resources and conditions found there. The general objective is betterment, but the range of activities and mixture of outputs that best meets this aim varies from place to place. Different countries require different treatment and strategic objectives; thus one may concentrate on expanding its timber-based exports (as in Fiji), while another may adopt a strategy based on ecotourism (e.g. Cyprus). It is also true that the process by which objectives are identified and selected should be adapted to the prevailing social system and customs. The procedures followed where most of the forest is owned and managed by the state, for example are unlikely to be the same as those where private landowners control much of the resource or shifting cultivation by tribal people is widespread.

In all countries, an essential feature of strategic management is the attempt to reconcile resource limitations with the desires of the community for outputs derived from the forest sector. The capacity of forest resources to supply the mixture of goods and services that society wants is finite, whereas the needs and aspirations of society are only held in check by the spending power of individuals and

governments. It is possible, over time, to increase capacity by means of investments which raise the productivity ceiling; similarly, requirements are likely to increase in most countries as incomes and populations rise. Reconciliation is therefore a dynamic balance which aims to match changes in supply to changes in the amounts that are sought. Each type of output has its own balance; thus the potential of a county's forests to produce timber or supply water should correspond to the nation's timber or water requirements. Output balances may be influenced by prices, by competitive spending on other goods and services and by the proportional relationships that govern outputs in joint supply situations. Successful reconciliation depends on the validity of forecasts of output flows under different assumptions about the future and on difficult value judgements about the relative values (or utility) of different types of output.

Making people better off depends partly on providing more of the outputs people want and partly on achieving the mixture of outputs that the community prefers. Strategic management should facilitate interventions that are designed to enable the forest sector to satisfy both requirements. It is therefore forward thinking, anticipating future changes and requirements so far as this is possible, rather than backward looking or reactionary. However, expectations are seldom fullfilled in their entirety so that the amount of social betterment actually achieved is likely to fall short, even with the most carefully prepared strategy. The behaviour of complex systems such as the forest sector is difficult to predict. Therefore, forecasts need to be adjusted periodically and strategic decisions revised. In fact, forest sector development should be viewed as a series of approximations and the development path that is followed is likely to meander under the influence of unexpected events. Hence, the development paradox previously described.

In spite of these difficulties, strategic management is still worth while. It may only offer imperfect, second best solutions, but does provide a sense of direction on which interventions can be based. The approach is rational and positive, which seems preferable to leaving it all to chance. The alternative is likely to be reactive behaviour by those in charge of forest sector affairs, who respond to whatever situation is perceived as most threatening or whichever pressure group has the most influence. Aimlessness and the absence of a strategy are harmful because they lead to piecemeal instead of holistic treatment of the sector and deal with short term issues rather than long term sustainability. It is also likely to be unfair and divisive; the weaker groups in society tend to suffer most. The level of social satisfaction is likely to be lower without strategic management than where the strategy process is well organised and effective.

It is evident that the strategic management process should be initiated at national level and that collaboration is necessary between the organizations and groups that comprise the sector. Oversight and control of the process is therefore a government responsibility, although strategy implementation devolves onto all those taking part in its activities. The sector is a conglomerate of diverse interests, which tend to pull in different directions, although there are benefits for all in pursuing a common purpose. The strategy process should foster unity through participation in its stages;

all the participants are entitled to a say in decisions about the objectives to be pursued and to share in the resulting benefits. A prosperous forest sector increases the wellbeing of its members while, at the same time, generating outputs which confer benefits on society as a whole.

Strategic management, as applied to the forest sector, is therefore a joint venture. The process has three steps which are repeated at intervals: analysis, aims and action. *Analysis* covers review of the situation and identification of possible courses of action, choice of *aims* should be based on their likely consequences and lead to decisions about which route development should follow, and *action* deals with implementation of the chosen aims, including the means that are used. The process involves cooperation to consider objectives and select the best way forward and, subsequently, participation by all the organizations involved in the programme to carry out the necessary work on the ground. First comes formulation of an agreed strategy for sector development, then preparation of a national forest programme to implement the strategy. The programme, consisting of subprogrammes and projects, spells out the action to be taken in particular forest areas and the types of activity that are required. It should also include schedules and targets, which specify what is expected of the organizations or groups carrying out the work. The strategy process should connect general aims and aspirations at the national level to specific activities in forests and factories. The programme needs to be monitored to keep it on track and be sufficiently flexible to enable it to be adjusted or adapted to cope with unexpected events. The process is cyclical so that national objectives can be reviewed at intervals of, say, five to ten years.

This brief description of the strategy process summarizes its functions. Strategy is often distinguished from tactics and operations, which refer to the levels at which decisions are taken and the scope of the responsibilities of the managers who take them. As applied to the forest sector, strategy is primarily a national function, whereas tactics are subnational and relate to the control of projects and other components of the national forest programme; the operational level deals with day-to-day management. These levels are interdependent and it is essential that they be coordinated for the sector to develop in the way intended. Much of the uncertainty with which the strategy process has to deal arises at tactical and operational levels.

A major source of uncertainty relates to difficulties with programme and project funding. This can lead to delays and sometimes cancellations which may undermine the strategy. The problem of securing the necessary financial resources creates another paradox: budgets are derived from programmes, while programmes depend on budgets that can seldom be guaranteed in advance. Although a settled programme is highly desirable and much easier to carry out, this ideal situation is scarcely ever achieved in practice. Sufficient flexibility must therefore be built into the content and timing of programmes to overcome this chicken and egg type of problem.

Fig. 1.2 shows how strategic management is applied to the forest sector. The resources, activities, outputs, organizations and institutions which comprise the sector are brought together by treating it as a system. Strategy evolves as the result


*Figure 1.2* Contributions to forest sector strategic management

of a three-stage, repetitive process, which consists of analysis, aims and action. The strategy process, when applied to the sector system, leads to forest sector strategic management.

The arrangement of parts and chapters that make up this book follows the sequence in the diagram. In Part I, the forest sector is described from all aspects and its characteristics as a dynamic, open system are examined. The relevance of strategic ideas, drawn from various sources, to the special problems of the forest sector are considered in Part II; this section includes explanation and discussion of the methods that are available for promoting sector development through the strategy process.

The general introduction, which has been presented in this chapter, might be called the 'what', the 'why' and the 'wherefore' of the book. It describes what the book contains and why it was written, together with a justification of its purpose and its style. It focusses on the role of strategy in forest sector development. This sets the scene for the rational approach to change and development that is advocated and urgently needed to overcome the policy failures now attracting international attention. It puts forward the case for a significant shift in managerial attitudes and the adoption of new techniques by those responsible for administering the forest sector. This is most important at national level where strategic concerns are

concentrated. Forest administrators should take on a new role and become agents of change; their proper function is to 'make things happen'.

The book proposes changes in sector organization and institutions, partly derived from other fields and partly from what is already regarded as 'best' practice in the forestry field. The strategy process provides the means by which the sector can be guided, stimulated and controlled in the interests of its members and society. Improvements in sectoral performance depend on basing strategic choices on a comprehensive view of development and encouraging joint action by the sector's assorted organizations and interests. A positive approach to uncertainty and the dilemmas that it causes is a necessary ingredient of success. The following pages attempt to show how forest sector strategic management can become more efficient and effective; they are intended as a guidebook for forest administrators and a text for students who expect to move into positions of responsibility connected with the forest sector in future.

## SUMMARY

- *Forest Strategy* is about the application of strategic ideas to the forest sector. The book has two parts: Part I considers the meaning and significance of the forest sector concept, describing its composition, characteristics and the way it works; Part II reviews strategic ideas drawn from various sources and considers strategy formulation and the range of aids to decision making that are available for guiding forest sector development.
- The forest sector must be treated as a whole. Its resources, activities and outputs are interconnected in space and time; it is made up of numerous organizations and interest groups which interact with one another. A series of transformations link the forests to consumers and the general public. It is necessary to view the sector as an open system and consider how interventions at one point will be transmitted to other parts. Decision making based on partial analysis is liable to be misleading.
- Strategy bridges the gap between aims and their achievement; it is necessary to choose attainable aims and then seek to implement them. Strategic management is a continous process, which is affected by the complexity of the forest sector and influenced by uncertainty. Flexibility is essential.
- Policy failures are evident in many countries and the cause of widespread international concern. A forest crisis has been identified, which is marked by forest destruction, the extinction of plants and animals in forest ecosystems and disruption of climate patterns. A new strategic perspective is necessary to cope with this situation.
- The forest crisis has its origins in a wider failure of conservation. The conservation concept has evolved from preservation into sustainable development. Forest management based on resource protection needs to be replaced by strategic management aimed at 'making people better off'. Strategic management represents the new face of conservation.

- Strategic management requires leadership which is mainly the responsibility of governments. Its general purpose of promoting sustainable development and public welfare needs to be interpreted in a national context, to suit the resources and conditions in each country. This is achieved by preparing a forest sector strategy and implementing it by means of a national forest programme. The strategy process (based on analysis, aims and action) is cyclical and evolutionary.

## SOURCES

1 Charles Handy. *The Empty Raincoat*. Hutchinson, London (1994).
2 Maurizio Merlo and Manuel Paveri. Formation and implementation of forest policies: a focus on the policy tools mix. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, October, 1997, volume 5, pages 233–254.
3 Emil Salim and Ola Ulsten, Co-chairmen. *Our Forests, Our Future*. Report of the World Commission on Forests and Sustainable Development. Cambridge University Press (1999).
4 David Humphreys. *Forest Politics*. Earthscan, London (1996), Chapter 1.
5 Alfred Runte. *National Parks: the American Experience*. University of Nebraska Press (1979).
6 Gifford Pinchot. *Breaking New Ground*. Harcourt, Brace & Co, New York (1947).
7 *World Conservation Strategy* prepared by International Union for Conservation of Nature and Natural Resources (IUCN), with advice, cooperation and financial assistance from United Nations Environment Programme (UNEP) and World Wildlife Fund (WWF), in collaboration with Food & Agriculture Organization of the United Nations (FAO) and United Nations Educational, Scientific and Cultural Organization (UNESCO), 1980.
8 World Commission on Environment and Development. *Our Common Future*. Oxford University Press (1987).
9 David Pearce, Anil Markandya and Edward B. Barbier. *Blueprint for a Green Economy*. Earthscan, London (1989).

PART I

# THE FOREST SECTOR

# INTRODUCTION TO PART I

Activities can be analysed and studied at various levels of aggregation. One approach is national; everything is lumped together and the behaviour of a country as a whole is observed. An alternative approach is to examine the way that individuals behave and individual enterprises perform. Economists traditionally work at both these levels. They distinguish macroeconomics from microeconomics and have developed different theoretical concepts to suit each approach. However, there is also a third, rather neglected, level that lies in between. It might be called mesoeconomics. This deals with the behaviour of particular industries or sectors of economic activity. In Part I of this book the sector approach is developed by applying it to the group of varied activities that is based on forest resources. This portion of the national economy is conveniently called the *forest sector*.

The forest sector is a broad-based concept. Its scope embraces scientific, technical, economic, social and cultural features, which interact with each other in many possible ways. The complex behaviour of the sector is determined partly by its scientific and technical characteristics — rates of tree growth, ecosystem responses, population dynamics and the like — and partly by the actions of people and organisations involved in sectoral activities, including the owners, workers and managers of forests and forest industries. The way that the sector responds to change and the direction that its future development will follow, are influenced by human values, preferences and aims. These interact with the ecological and physical realities of the sector.

In this book the behaviour of the forest sector is viewed from a human standpoint; the perspective is anthropocentric. This stance is appropriate when the resources, activities and outputs, which make up the sector, are being studied from the point of view of a strategist who is responsible for its management and future development, as is the case here.

Part I contains six chapters, each of which looks at the sector in a different way:-

**Chapter 2** outlines *the forest sector concept*, defines it, and provides a general description of its composition; the dynamic interactions which are a feature of its behaviour, the role of people in sectoral activities and the need to adopt a holistic approach.

**Chapter 3** examines the sector as a collection of *resources*, and examines their distribution, allocation and renewal.

**Chapter 4** considers the sector as a set of related *activities* which link the forest to the outputs it generates.

**Chapter 5** describes the sector as a provider of tangible and intangible *outputs*.

**Chapter 6** views the sector from the standpoint of the people involved and examines its *organisations and institutions*.

**Chapter 7** treats *the forest sector as a system*, enabling its behaviour to be explored using simulation models and its development promoted.

CHAPTER 2

# THE FOREST SECTOR CONCEPT

Forests and the activities associated with them are commonly referred to as the *forest sector*. The name is convenient and its meaning is often thought to be self-evident, but those who use it seldom explain what they have in mind. Therefore the purpose of this chapter is to look more carefully at the forest sector as a concept, define it and describe its distinctive features. It is a distinct entity with easily recognisable characteristics. An understanding of these is required for its management and future development. The sector includes forests and all the people who, in one way or another, depend on them; it also covers their relationships. An overview is provided of its scope, composition and functions, indicating the important features which distinguish it from other sectors. A holistic approach is adopted to allow for the dynamic interactions that take place within it. The sector as a whole amounts to more than the sum of its parts.

The forest sector concept is all-embracing. Globally, it covers all types of forest and woody vegetation, from rain forest in the tropics to boreal coniferous ecosystems, and includes all manner of human activities based on forest resources. Sector activities range from large scale forest industries, which manufacture timber, panels, paper and other mass-produced goods to meet the needs of consumers in home and foreign markets, to the small-scale collection and processing of forest products for domestic and local use. Service activities which aim to satisfy social, cultural and environmental needs are also included. Outputs from the sector are very diverse and comprise intangible benefits, such as scenery and biodiversity, in addition to the wide range of goods derived from forests and trees. From a human point of view the sector is a collection of groups, organisations and institutions, with interests ranging from the conservation and exploitation of the forests to the processing and distribution of the goods and services obtained from them. The sector's contribution to social and economic welfare is heterogeneous.

The forest sectors of districts, countries and regions are more restricted in scope; each contains an assortment of resources, activities and outputs drawn from the range of different types existing in the world. The forest sector of a particular area or zone is specific to that location and consists of the actual forests and the particular activities and outputs that occur there. The forest sector of each place is

therefore distinctive and different from other places. Some countries have large and important forest sectors, while in others the sector is insignificant.

The general description of the forest sector, which is presented in this chapter, applies at all levels. It is arranged in five sections. First, the sector is defined and its main features are identified. In the second section its composition is described; the sector is divided into three parts: *resources*, *activities* and *outputs*. These components interact with each other and respond to external stimuli from other sectors, as described in the third section. The fourth section deals with the role of people in the sector. Finally, the way in which the sector concept is applied to actual situations and the real world is considered in the fifth section.

## 2.1 WHAT IS THE FOREST SECTOR?

A *sector* is a convenient portion or section of something, like a slice cut from a cake as shown in Fig. 2.1. However, it is not cut at random; each sector has particular features which distinguish it from other sectors. Economists have found the sector idea useful. They divide the national economy into sectors, which describe the nature of the economic activities carried out by different groups of people or types of organisation and separate government activities from those of private persons (see Box 2.1). The national economy is also subdivided according to the contributions derived from various sources, such as manufacturing or financial services, or produced by industries such as agriculture, mining or fisheries. These industrial sectors are based on particular natural resources, for example mining activities depend on mineral resources and fisheries on water resources. Similarly, the forest sector includes all the activities based on forest resources.

**Box 2.1 Definition of 'sector'**

"**Sector** a part of the economy that has certain common characteristics which enable it to be separated from other parts of the economy for analytical or policy purposes. A broad division may be made, for example between economic activities undertaken by the state (the PUBLIC SECTOR) and those that are undertaken by private individuals and businesses (the PRIVATE SECTOR)".

Source: Pass, C., Lowes, B. and Davies, L. (1993). *Collins Dictionary of Economics*. 2nd. edition.

The section of the national economy concerned with forests and the goods and services that forests supply, is the *forest sector*. It embraces everything to do with forests and woody vegetation from the seedling to the consumer. The sector is characterised by its dependence on forest resources. These provide the

The size of the 'slice' indicates the importance of the sector. Total production from the sector amounts to as much as about 20 percent of GDF in a few countries, although the average is only about 2 percent but GDP excludes non-marketed services, so the relative size of the sector may be many times greater.


*Figure 2.1* The forest sector

foundation for a wide range of activities that include the management of the resources themselves and the subsequent harvesting, processing, distribution and trade activities which utilize inputs derived from the forest. Forest sector activities provide outputs in the form of tangible and intangible benefits in response to the requirements and aspirations of society, locally and nationally.

The sector idea, derived from economics, can be enlarged to include other perspectives. From an economic standpoint the forest sector creates utility and wealth; from a social and cultural point of view it contributes to the structure, way of life and ethos of the community. It gives rise to a variety of organisations and institutions, and is a source of aesthetic, educational, historical and religious values. Therefore, the forest sector can be defined in broad terms to include **the economic, social and cultural contribution to life and human welfare which is derived from forests and forest-based activities**.

This comprehensive definition takes account of all aspects of the sector's contribution to local, national and international development. Other, more limited, interpretations are sometimes used (see Box 2.2). In institutional terms, the range of activities administered by the government ministry responsible for forestry matters has sometimes been called the forest sector, thereby demeaning the role of private firms and voluntary agencies. Parts of the sector may be excluded, such as the contribution derived from informal activities which are not recorded in national accounts. The danger is that an incomplete specification of the sector can easily lead to oversights and analytical errors and thus to mismanagement.

Change is a feature of the forest sector; it continually evolves and develops or regresses. Forest resources are subject to natural processes of biological growth and ecological succession, intervention by humans may affect their size and quality, and their capacity to satisfy local and national requirements may diminish or expand with time. The range and variety of sector activities alters in response to the

**Box 2.2 Different interpretations of the forest sector**

"The forest sector self-evidently covers those activities based upon the forest, and the goods and services provided by the forest. But this gives considerable leeway for differences in interpretation. Some sector analyses are confined to all wood-based activities, others encompass only forestry activities, excluding the forest industries. Where the latter are included in the sector there is considerable room for choice as to which of the wood-using industries to include. In many instances forest sector analysis should also include consideration of non-wood products and services of the forests, including soil and water protection, recreation, amenity and wildlife.

There is in fact no standard uniform classification of the sector — and no need for one. The sector should be defined to meet the purposes of the particular analytical exercise, including all those activities that have a significant bearing on the situation to be diagnosed. If the purpose is for a national planning exercise encompassing all sectors, then the boundaries of the forest sector will of course be affected by what is to be included or excluded from the other sectors."

Source: FAO (1974). *An Introduction to Planning Forestry Development*, page 23.

availability of supplies of raw materials from the forest and stimuli from end-users' market demands. Outputs from the sector vary with shifts in consumer preference and population growth. A change in one place affects the rest of the sector because its parts are interdependent. The sector adjusts and adapts, expands or contracts, alters in composition and may even suffer economic or environmental collapse. The forest sector is a dynamic entity.

The forest sector is a portion of the national economy and its boundaries are demarcated by its relationships with other sectors, such as agriculture, energy or construction. Often, sectors overlap, as with agroforestry in which forestry and agriculture share the use of land. In other cases, parts of the forest sector are also included in other sectors, as for example, forest industries, which form one group of industries within the wider sectoral classification of manufacturing industry as a whole. How sectors are delineated is a matter of convenience[1] and depends on the purpose of the analysis which is being undertaken. Double counting must be avoided if the aim is to examine the relative importance of different sectors in the national economy (e.g. contributions to the gross domestic product for national statistics), but is irrelevant for in-depth studies of particular sectors. The concept of the forest sector as a dynamic entity dependent on forest resources, which is presented in this chapter, depends on a comprehensive definition. A broad perspective is essential in order to allow for the sector's internal interactions and to lay a proper foundation for subsequent discussion of strategy formulation and policy analysis.

## 2.2 COMPOSITION

The forest sector concept provides a useful general framework for explanation and analysis — it presents a conceptual model of the way the sector works. The sector is made up of resources, activities and outputs. These three components interact with one another (see Fig. 2.2) and transformations take place during which resources are converted by activities into outputs; additional inputs may come from outside. Value is added by these transformations, so that the forest sector creates wealth in response to human needs and contributes to economic growth. More generally, economic, social and environmental outputs from the sector influence the course of a nation's development and the welfare of its people.

*Forest sector resources* include the whole range of resources available in the sector, not forgetting the factors of production used in processing, distribution and trade activities. They fall into three groups: natural, human and capital. *Natural resources* comprise land, water, soils and air, the ecosystems which they support and the minerals which lie underground. Forests are included in this category and are by far the most important of the natural resources utilised by the forest sector. Other natural resources utilized for sectoral activities include water and a small amount of land occupied by forest industries. *Human resources* include relatively small numbers of forest dwellers and other people dependent on the forest for their livelihoods, such as shifting cultivators; many more people are employed in forestry and forest industries. *Capital resources* are made up of the physical assets obtained by investment in the sector (buildings, factories, machinery, tools etc.) and also human capital derived from skills, education and training. Human resources and capital resources tend to be concentrated in the industrial parts of the sector.

*Forest resources* are the natural resources associated with forest land and trees. They include forests and woody vegetation both in their wild state and when modified or managed by man. They form a wide spectrum of vegetative types, from closed forest (i.e. land entirely covered by trees), through woodland and scrub, to parkland and isolated trees. Man-made forests and plantations are included, and also trees which form the forestry component of mixed land use systems such as agroforestry. Forest resources are distinguished by the presence of trees, but they also comprise the land, soils, water and local climate which support tree growth and all the other living things that are associated with trees. Kimmins (see Box 2.3) has aptly described forests as landscapes[2].

*Forest sector activities* include all the activities based on forest resources. They fall into two groups. The first is forest oriented and includes what are generally called *forestry* activities. It covers all the work that is directly associated with the


*Figure 2.2* Components of the forest sector and their interactions

**Box 2.3 Forests as landscape**

"A forest is defined as an ecosystem dominated by trees. But the forest is no more the trees than the farm is the cabbages or cows. Ultimately a forest is a landscape that has the soil, climate and set of organisms that make up what we think of as a forest."

"Forestry has been defined as the art, science and practice of managing forested landscapes to provide a sustained production of a variety of goods and services for society. In concept, forestry is definitely people-oriented."

Source: Kimmins (1992). *Balancing Act: Environmental Issues in Forestry*, pages 27 and 48.

conservation and management of trees, forests and forest land. The regulation of tree felling and extraction operations is also a forest management activity. The second group consists of activities which utilize outputs from the forests. These outputs generate sequences of operations which connect the forests to the end users of forest products. Harvesting leads to processing, processing is followed by distribution and trade as shown in Fig. 2.3. Forest sector activities are also directed at the delivery of services and intangible outputs from the forest.

The object of these activities is to provide *forest sector outputs* of various kinds in response to the needs of consumers. The sector produces a wide range of goods and services ranging from food to fuel and wood to wilderness. Some outputs, such as beautiful scenery or biodiversity, provide intangible benefits which, nevertheless, meet the needs of the community. Tangible outputs include wood and non-wood items with market values. Some come straight from the forest and are used in unprocessed form to satisfy local requirements for food, fuel and shelter. Other forest outputs provide raw materials for processing and manufacturing (e.g. logs and pulpwood) or are used by other sectors (e.g. water for hydroelectric power

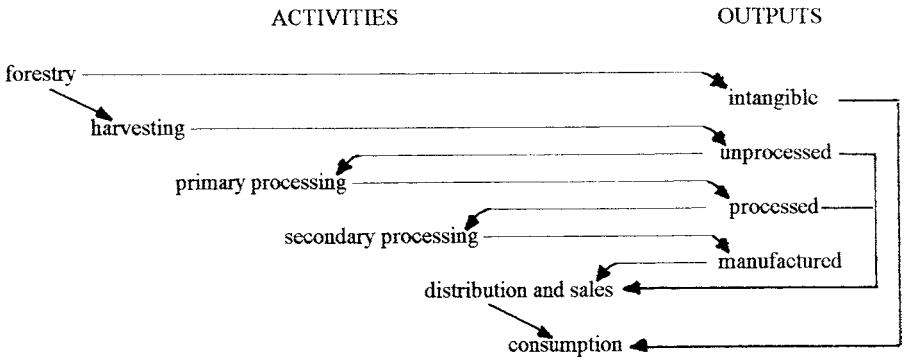


*Figure 2.3* Forest sector activities and outputs

generation). Within the forest sector, there may be one or more stages of processing before eventual distribution for use elsewhere in the country or abroad. Each stage provides outputs, some of which become inputs to the next stage, before they finally reach consumers.

## 2.3 INTERACTIONS AND INFLUENCES

The three components of the forest sector interact with one another. The sequences of operations or processing chains, which link forest resources to sectoral outputs, depend on these interactions. They work in both directions — backwards and forwards. The nature of the resources affects the sort of activities that take place and the kinds of goods and services produced; in the reverse direction, consumer demand for goods and services influences sectoral activities and the way that the resources are managed.

Looking forwards, forests and woody vegetation generate a succession of activities, including the management of forest land and forest crops, the harvesting of those crops, and the subsequent processing, distribution and trade in wood and non-wood forest products. Improvement in the productivity of forest resources leads to more raw material to harvest and process, and, in turn, to an increase in the amount available for consumers. The effects of these interactions may, of course, be extended in both space and time. For example, more trees planted in one district now can lead to an increase in harvesting activities in later years and more logs for sawmills situated elsewhere in the country. Similarly, forest management aimed at preserving biodiversity in one area of forest may confer global benefits.

In the reverse direction, the requirements of end users are transmitted backwards along the distribution and processing chain until they reach the forest in the form of derived demand. Sector activities are influenced by demand at all stages along the chain. Thus an increase in paper consumption may lead to working an extra shift in some paper mills or more investment in paper-making machinery. It may also increase the demand for wood pulp and lead to a rise in pulp production. In turn, this may lead to greater use of sawmill residues or waste paper, or be transmitted into requests for more pulpwood and a higher rate of felling in the forest. Similarly, consumers' requests for intangible outputs influence the flow of funds to forest managers and the nature of their activities.

The size of the forest sector and the amount of activity that takes place in it depend on two internal factors: the capacity of the forest resources to supply outputs of different kinds, including environmental benefits, and the strength of end user's demands for tangible and intangible outputs. The sector is driven from both ends — resource 'push' and consumer 'pull'. These opposing forces interact and are reconciled with each other by the scale and nature of the activities that are generated in between.

Forest sector behaviour is controlled by the responses to changes in supply and demand. These changes may be either actual or anticipated. An actual change in market behaviour, such as an increase in the use of newsprint, can lead directly

to increased production, subject to the constraints imposed by the availability of pulpwood and the capacity of existing pulp and paper mills. It can also result in investment to increase their capacity. An anticipated change, which is expected at some time in the future, perhaps due to rising population and incomes, may also cause increased investment and production. Whether the anticipated change in demand in due course turns into an actual change will, of course, depend on circumstances at that time, but the expectation is enough to affect sectoral behaviour. In fact, because of the long delays associated with the growth of forest crops, forest sector development is dependent to a large extent on present expectations of future events.

These interactions connect different parts of the sector — they are *internal interactions*. The behaviour of the sector is also affected by *external influences*, either from other sectors, or due to national action, or resulting from international activities. Other rural sectors impinge on the forest sector, particularly agriculture which is the most important alternative use for forest land. Changes in farming practices, productivity and subsidies are having profound effects on forest resources in many places and much deforestation in developing countries is caused by agricultural clearing. Forest sector outputs are utilised by other sectors, such as food processing, and changes in their requirements may affect the level of activity in forest industries. The forest sector is also affected by national events; thus the level of demand for forest products tends to be cyclical, following general fluctuations in industrial activity and trade. International action, affecting trade and aid, and global concerns about tropical deforestation and biodiversity also influence the forest sector, either directly or indirectly. The sector is linked to activities in other sectors, to national prosperity and stability, and to the economic, political and environmental state of the world. There are influences at all levels from which it cannot be isolated. As Fig. 2.4 shows, the forest sector is not an independent entity and displays 'open' system characteristics.

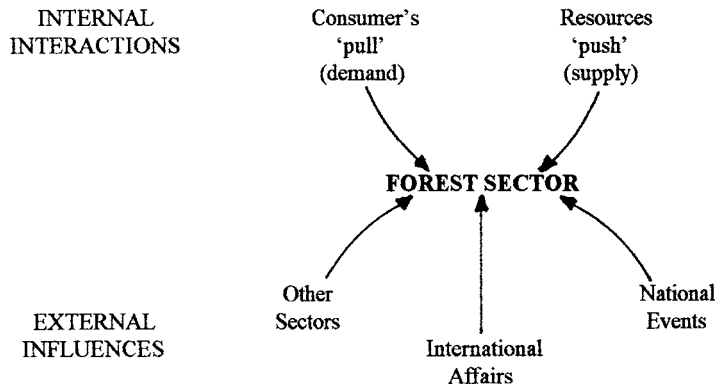


*Figure 2.4* Internal interactions and external influences on the forest sector

## 2.4 THE ROLE OF PEOPLE IN THE SECTOR

Another way of looking at the forest sector is from the perspective of the people involved and the way that they are organized. The sector can be regarded as a loose association of all those who depend in one way or another on forest resources. Sectoral activities are undertaken by people, either as individuals or in groups. Some control, manage or work in the forests, or grow trees alongside agricultural crops; they are involved directly with forest ecosystems and woody vegetation. Others depend indirectly on outputs from the forest through their participation in harvesting, processing, manufacturing and the distribution of forest products. At every stage people interact within the sector and with others outside, giving form, direction and purpose to the wide range of sectoral activities.

People have a dual role: they are both producers and consumers of forest products. As producers, their activities provide goods and services from the forest and influence the flow of intangible outputs such as carbon sequestration. They are responsible for forest harvesting activities and the provision of raw materials for primary processing; their productive contribution extends into secondary manufacturing, distribution and trade. As consumers, people are the recipients of these goods and services, and benefit from them. The production costs of those that can be profitably bought and sold are recouped from their prices; others, which cannot be traded, are financed through taxes or by charitable subscriptions. Either way, in the long run, consumers must pay for the outputs they receive or face losing the benefits of output flows which are unsustainable. Consumer demand influences what is produced and changing consumer preferences lead to changes in the balance of productive activities.

In their role as producers, people contribute to the sector in various ways and benefit from it in other ways. They provide the work force, the managers, the directors and the owners of private enterprises; they are also employed as civil servants in the government ministries and departments concerned with the forest sector. The sector contains landowners and timber growers, users of forest land with rights established by custom or law, shifting cultivators, collectors of forest produce (such as resin tappers), loggers and transporters, suppliers of herbal medicines, sawmillers, manufacturers of plywoood and panels, pulp and paper producers, furniture makers, housebuilders, timber merchants and exporters, and many others. A wide range of knowledge and experience is necessary for these varied activities and the expertise and skills of staff and labour are essential ingredients in the productive processes that take place. The forest sector cannot function without an assortment of human resources and its future development depends on renewing and extending their capacity. As beneficiaries, those engaged in sector activities receive employment, incomes, profits, training and other advantages. For some the forest sector provides a way of life, for others it offers social, cultural and recreational facilities.

The sector is made up of a variety of functional units. People join together in groups of various kinds which undertake sectoral activities. They range from small, dispersed family units to large, highly organised industrial corporations.

Typically, peasant farmers practising agroforestry are widely scattered, while large-scale manufacturing processes, such as pulp and paper making, are concentrated in particular locations in a few countries. Some groups are loose associations of people with a common interest, such as landowners associations, or cooperatives formed to market the output of small-scale producers like handcraft makers. Other groups are more tightly organised in order to perform complex functions which depend on technical expertise and effective coordination, as with state forestry departments and companies in the private sector. Generally, national forests are managed by government agencies, while industrial and commercial activities are undertaken by firms. Some of these groups and organisations operate entirely within the forest sector, while others straddle its boundary and are also active in other sectors. Which organisations are included and which are excluded is to some extent a matter of judgement and convenience.

The various kinds of organisations that make up the sector represent a wide range of interests. Non-government organisations (NGOs) are voluntary groups formed for such purposes as upholding the rights of indigenous people, or protecting special forest areas and ecosystems, or representing peoples' concerns about issues such as tropical deforestation and sustainability. Similarly, forest sector workers may join trade unions and manufacturers combine to form trade associations in order to strengthen their bargaining position through joint action. Companies engaged in manufacturing and trade are commercially motivated, seeking to fulfil the ambitions of their managers, provide employment for their workers and make profits for their shareholders. International corporations have interests in world trade in forest products and international agencies, such as the Food and Agriculture Organization of the United Nations (FAO), are concerned with a whole range of matters affecting world forestry from the collection of statistics to measuring and monitoring global forest resources.

This diversity of organisations and interests encourages divergent tendencies; the sector does not behave as a single, tightly organised, cohesive unit. It is best described as a conglomerate or loose association of organizations with a common interest. Nevertheless, the interactions between its parts and the existence of an institutional infrastructure are unifying influences. The institutions create a framework that serves various functions, including law and regulation, policy and planning, financial arrangements, education and the provision of information, conflict resolution and leadership. The actual institutional arrangements and their effectiveness vary from country to country, according to the characteristics of the sector and the system of administration. It is desirable to foster a sense of unity because member organizations have a common interest in collaborating to promote sector growth and sustainable development from which all can benefit.

## 2.5 APPLICATION OF THE SECTOR CONCEPT

As a concept, the forest sector is comprehensive in scope, but unrelated to either particular places and circumstances or to specific problems and types of analysis. A wide range of forest resources, activities and outputs exists throughout the world.

Different forest types, processing industries and patterns of consumption occur in each country. The sector concept covers the whole range and serves to define a general outline for study and analysis; it provides a description of the possibilities and potential for development of the sector.

The three-part sectoral composition of resources, activities and outputs, which the concept embraces, must be applied to actual situations to be useful in practice. This involves selecting those parts of the conceptual framework which are appropriate. A description of the forest sector in a country should contain an account of the types of forest resources, activities and outputs found there, an explanation of the way that they interact with each other and with other sectors. The description should also cover the organisations and institutions of the sector, the roles they play and contributions they make. The sector's actual composition is specific to each country and the stage of development that it has reached; it also reflects external influences. The development opportunities open to the country at any particular time consist of a few possibilities drawn from the wide range contained in the framework.

It is important to distinguish between the forest sector as a concept and as a description applicable to the real world. The concept does not exist anywhere except in the imagination, but is a helpful idea because it is comprehensive and provides a standard with which to analyse and compare the actual situation in different countries. Forest sector descriptions draw on relevant parts of the concept to fit real situations in particular places. If the descriptions are drawn up without reference to the concept there is always a danger that some parts or some interactions will be overlooked, or others included which should not be.

Similarly, a more restrictive definition of the forest sector, i.e. a more limited concept, is likely to lead in practice to omissions from the analysis of actual forest situations. Some of the early sector studies undertaken by FAO under the Tropical Forestry Action Plan were defective for this reason[3]; they ignored environmental aspects or excluded forest industries. The scope of the concept should not be altered — it is important to maintain a broad sectoral perspective — but the way it is applied can, if necessary, be restricted to match the problem being studied. A full sector study may not be needed to answer a specific question in a particular place, the analysis can concentrate on the aspects that are relevant, but it is not acceptable to redefine the sector in order to narrow the analysis.

It is helpful to view the sector holistically, as a complex entity, by regarding it as a *system*. A systems approach stresses the interconnections between different parts of the sector and the need to treat it as a single unit. In each country or region, the sector forms a dynamic system which depicts its composition, interactions and organizational structure. A change in one part may produce other changes elsewhere and affect the rest of the system, often in unexpected ways. This approach treats the sector as a matrix of activities which interact in space and time. It enables the behaviour of the system to be analysed and studied with the aid of simulation models in a computer. Models can reveal what is likely to happen under various assumptions about future events and changing conditions. They can be used to construct scenarios showing what the sector might look like if a particular course

of action is chosen. Development of the sector can then be steered in the direction likely to bring the greatest advantage to the people who are directly dependent on forest resources and, more generally, to increase the flow of benefits for society as a whole.

The sector concept therefore provides a comprehensive means of describing forest resources and the range of activities and outputs dependent on them. It stresses the diverse interrelationships which are a feature of sectoral behaviour and indicates how the processes of change at work inside and outside the sector are likely to influence the flows of benefits that the sector provides. Treating the sector as a system provides a powerful analytical tool for formulating development strategies and preparing detailed programmes to implement them; this approach helps to turn good intentions into reality. In theory and in practice, the forest sector concept offers advantages to managers in their search for better understanding and wiser courses of action in matters relating to forest resources and the contribution they make to a sustainable environment.

## SUMMARY

- The forest sector is defined in broad terms as the economic, social and cultural contribution to life and human welfare derived from forests and forest-based activities.
- The sector should be treated holistically. It has three components: resources, activities and outputs.
- These components interact with each other in response to the capacity of the forest to supply outputs and the demand from consumers for those outputs. The sector is also subject to external influences at three levels: activities in other sectors, the behaviour of the national economy and international events.
- Viewed from a human standpoint, the sector is a loose association of all those who depend on, or who are concerned with forest resources. Sectoral activities are undertaken by individuals and organisations, including private companies, government departments and NGOs.
- The forest sector concept provides a comprehensive general framework for study and analysis; relevant parts of this framework are used to describe the actual forest sector in particular places. Treating the sector as a system enables its behaviour to be studied and its development guided in the direction that society prefers.

## SOURCES

1 FAO. *An Introduction to Planning Forestry Development*. Paper Ref. FAO/SWE/TF 118, FAO, Rome (1974).
2 Hammish Kimmins. *Balancing Act: Environmental Issues in Forestry*. UBC Press, Vancouver (1992).
3 FAO. *Tropical Forestry Action Plan: Report of the Independent Review*. FAO, Kuala Lumpur, Malaysia (1990).

CHAPTER 3

# RESOURCES

Resources provide the means which enable the forest sector to function; they are the assets of the sector which are available to support its activities and produce its outputs. Their usefulness makes them valuable. They provide the inputs to the productive processes which take place in the sector. In relation to a particular region or country, the availability of resources limits the sector's development and determines its importance compared with other sectors. Some resources, such as forests, are linked to particular locations. To the extent that resources cannot easily be moved, differences in the resource endowments of countries are significant.

It is usual to divide resources into three types: natural, human and capital. All three are essential to the activities of the sector and contribute to its productivity and development. A country that is well-endowed with forest does not necessarily have a well-developed forest sector; it may lack the human and capital resources that are needed to complement the wealth of the forest. Conversely, some countries without any forests of their own have built up a significant forest sector based on imported raw materials.

Forest sector resources should be distinguished from forest resources. The former include the resources of all three types available in the sector, whereas the latter are the natural resources contained in the forest itself — forest land, soils, trees, vegetation, ecosystems etc. Most of the sector's natural resources are concentrated in the forest and are site-specific. Forest resources underpin the sector and are the source of all its activities and outputs. They provide the raw material from which processed outputs are derived and support the sector's contribution to environmental stability and human welfare.

Except for the small amount of land used by forest industries, the sector's natural resources are all located in forest areas or in woodlots and scattered trees on agricultural land. Some of the sector's human resources are also forest-based, but most are employed by the industries that utilise outputs from the forest, such as sawmilling and furniture manufacture, and in the sale and distribution of forest products after processing. Capital assets, in the form of buildings, machinery and equipment, also tend to be concentrated at the industrial end of the output chain.

Forest resources are tied to the land they occupy; they cannot be moved from place to place or redeployed. Human and capital resources, within limits, are more

mobile. People, machines and equipment, even buildings, can be shifted to new sites and additional expertise or capital can be acquired from outside the forest sector. Therefore, forest resources are less flexible than the other types of resources and their geographical distribution has a greater influence on the way the sector develops in particular countries.

The ability of the sector to supply a wide variety of outputs depends partly on the nature and extent of its resources and partly on the way that resource inputs are combined. All three types of input are necessary for the sector to function effectively, but there are many possible ways of allocating the available resources to different uses in accordance with their relative scarcity or abundance. To some extent, one type of resource can be substituted for another. Countries which are well-endowed with forests tend to use forest land and forest products more freely than countries which lack forest resources. Some countries, such as India, have ample labour and tend to adopt labour-intensive methods of production, while others, as in western Europe, choose capital-intensive technology in their forest industries.

With time, changes occur and the structure of the sector may alter. Forests may be destroyed to make way for agriculture, new industries may start up, new markets may be developed and different techniques and methods may be introduced. The development path of the forest sector in a country depends partly on the resources that the country possesses and partly on the way that the available resources are allocated. There is also a third influence: renewal or sustainability. The nation's resources may be depleted or built up, both in quantity and quality. Forest resources may be exploited and not replaced, leaving less for future years. Failure to maintain the productive potential of the existing capital and human resources, or allowing them to degrade, reduces the potential for future development. Adequate provision for the renewal of resources is essential. The sector's activities cannot be sustained without attention to resource renewal, otherwise, in time, the sector will inevitably decline instead of progressing.

These three influences on development — the *endowment, allocation* and *renewal* of resources — determine the path of future change in the forest sector. Viewed positively, more resources, better allocated, with due attention paid to their replacement, will result in sectoral growth, which is likely to increase the sector's contibution to national welfare; from a negative point of view, fewer resources, wastefully allocated, with no concern for their depreciation and sustainability, lead to contraction and a diminishing role for the sector. Development, in a positive sense, is not inevitable. Unfortunately there are many countries where the forest sector has slipped back through neglect and mismanagement of its resources. Negative development is regression. Whether the forest sector in a particular country regresses or progresses depends on the choices that are made by those responsible for its management and, more generally, by those in control of rural affairs and the direction of the national economy.

Positive development is obviously a desirable national aim. It goes without saying that a country's people and government should seek the best or, at least, a satisfactory use of its resources. Resource endowment, allocation and renewal,

and their interactions with each other, should therefore be examined in more detail. These topics are addressed in the following three sections of this chapter.

## 3.1 ENDOWMENT

Resource endowment describes the present stock of different types of resources and their condition. It refers to their quantity and quality in relation to the way they are used. Natural resources, labour and capital are described by economists as 'factors of production'; their availability determines the amount of goods and services that can be produced. In general, (other things remaining the same) the more of a particular type of resource that is available for use by the forest sector, the greater the output that is likely to result. Better quality resources — more fertile soils, a better trained workforce and more efficient machines — also enable outputs to be increased.

The forest sector is endowed with natural resources, which attract human and capital resources. A country starts with an area of forest land, which may be diminished or increased, and a population which tends to expand, at least in the early stages of development; as development proceeds, the stock of capital resources, consisting of man-made assets and the money to buy them, are gradually built up. Within limits set by market capacity, additions to the quantity of these resources will add to tangible and intangible sector outputs. A larger work force in the forest makes it possible to grow more timber or provide better facilities for forest recreation; extra sawmill employees might be used to speed up production or work another shift. Generally, the same work force using more capital in the form of machines and equipment enables output to be increased, as for example using powersaws instead of handsaws for felling. Similarly, the procurement of additional productive forest land is likely to lead to a larger annual harvest in future years and may also enhance environmental benefits based on the forest's role as a refuge for wildlife or a 'sink' for atmospheric carbon.

The quality of resources can be improved in a variety of ways, which usually involve investment. Outlays of time, effort and money are necessary to increase the capacity of resources to supply more output and greater benefits per hectare, per worker or per unit of capital. Soil improvement practices, tree breeding and genetic improvement, training to provide the workforce with new skills, research to improve techniques and develop new products, improvements in the design of machines and manufacturing processes — these are all examples of the way resource quality can be enhanced.

Knowledge about resource endowment in the forest sector is uneven. Because forest resources underpin all sector activities and their presence distinguishes the sector, attention tends to be focussed on them; their richness, variety and availability attract more attention than the people and capital employed in sector activities. This relative neglect of human and capital resources can be explained to some extent by their greater mobility compared with natural resources. The supply of forest resources, which are land based, is limited and inflexible whereas human and capital resources can be augmented from outside the sector. However, the importance of

having a skilled workforce and sufficient capital should not be overlooked. The sector cannot function without them and any assessment of sector potential should embrace the availability and quality of all three resource types.

Most of the information that is available relates to the distribution of forest resources. Published statistics show the areas of forest in each country, much less is known about their composition and quality. The human and capital resources of the sector are inadequately recorded and have been little researched; data from a few places have been published from time to time, but estimates for successive years, which would show changes over time or trends in resource use, appear to be almost non-existent.

## Forest Resources

Some natural resources, such as land, are supposedly finite; the possibility of adding extra hectares to the global stock of land is limited to relatively small areas reclaimed from the sea. The land area of the world, estimated at 13,067 million ha, is accurately known, but, within that total, estimates of the areas of forest and wooded land are less sure and liable to alter with land use changes.

The area classified as forest varies widely, depending on how forests are defined and how they are measured. If only 'closed forest', i.e. land entirely covered by trees, is included, the area classed as forest will be smaller than if open woodland or scattered trees are also regarded as forest land. Mather[1] lists different estimates of the global forest area ranging between about 3,000 and 6,000 million ha, and attributes most of this variation to different definitions. FAO's best estimate[2], based on its 2005 Global Forest Resources Assessment, gives 3,952 million hectares (30.3 % of the land area) as the total area of forest and also a larger area of 5,328 million hectares, representing the total forest plus other wooded land. The definitions used for this assessment are shown in Box 3.1.

The 2005 assessment is the most comprehensive and reliable general guide to the state of the world's forest resources that is available. It includes 229 countries and is based on information supplied by countries and survey data, combined with monitoring using remote sensing techniques. Therefore the reliability of the figures varies somewhat from country to country. It displays the area of forest by country and region, and also shows growing stock and biomass. At the time of the assessment, 30.3 percent of the land area of the world was covered by forest, with a further 10.5 percent classed as 'other wooded land'. The forest area amounted to approximately 0.6 ha per head of population.

Estimates are provided of the rate of net annual deforestation since 1990. Destruction of the world's forest resources is a cause for concern. The global rate of loss remains alarmingly high, although it declined slightly from 8.9 million ha annually in the decade 1990–2000 to 7.3 million ha during the period 2000–2005. Brazil (−3.1 million ha) followed by Indonesia (−1.9 million ha) recorded the greatest losses. These figures do not include estimates of degradation, which only affect the quality of the forest, not its area.

**Box 3.1 Definitions used for the 2005 Global Forest Resources Assessment**

**Forest**— Land spanning more than 0.5 hectares with trees higher than 5 m and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban use.

Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 metres (m) in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 percent and a tree height of 5 m are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.

Includes: areas with bamboos and palms provided that height and canopy criteria are met; forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest; windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 ha and width of more than 20 m; plantations primarily for forestry or protective purposes, such as rubber-wood plantations and cork oak stands.

Excludes: tree stands in agricultural production systems. The term also excludes trees in urban parks and gardens.

**Other wooded land** — land not classified as forest, spanning more than 0.5 hectares; with trees higher than 5 m and a canopy cover of 5–10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban use.

Source: FAO. *Global Forest Resources Assessment* 2005, Annex 2.

The 2005 assessment is the latest in a series, published by FAO, which started in 1945; assessments have been carried out at 5 to 10 year intervals since then. It provides more information than before and is intended to contribute data relevant to the application of sustainable forest management. It covers seven thematic elements:

1. Extent of forest resources
2. Biological diversity
3. Forest health and vitality
4. Productive functions of forest resources
5. Protective functions of forest resources
6. Socio-economic functions
7. Legal, policy and institutional framework

Earlier assessments are not directly comparable as they focussed on other issues and the definitions on which estimates were based were slightly different. Thus

the 1990 assessment[3] included a special study of the long term changes in tropical countries and, in some respects was more informative because it distinguished 'developed' from 'developing' countries. In the latest assessment, estimates of the volume of growing stock are provided for countries, but not by regions or the whole world; the global volume per ha is put at 110 $m^3$. Similarly, the biomass stock is given by countries only.

The 1990 assessment covered 179 countries and showed the total forest & other wooded land divided in the ratio 2:3 between the developed countries, (approximately 2,060 million ha) and the developing countries, (3,060 million ha). In the developed countries the decrease in the forest area was estimated at 0.08 million ha or 0.01 percent per year, compared with an annual loss of 13.1 million ha or 0.43 percent in the developing countries. Both these deforestation rates were *net* figures; 16.3 million ha were deforested annually, mostly in the tropics, but 3.2 million ha of forest plantations were added, and 2.1 million ha of forest were degraded, mainly by shifting cultivation, and transferred to the 'other wooded lands' category. The total volume of growing stock was estimated at 384 billion cubic metres over bark, corresponding to an average of 114 $m^3$/ha and the total above-ground biomass was estimated at about 440 billion oven-dry tonnes. Three-quarters of the biomass was said to be in the developing countries, due to the higher density of wood and larger proportion of branchwood in tropical forests.

The 1990 assessment included a special study of long term area changes in the tropics over the 30 years 1960–1990. The loss of forest cover during this period was estimated at 450 million ha. Demographic changes were said to be the prime cause, followed by other factors such as economic growth and government policy. Over these three decades, the population of the developing countries roughly doubled in number from 2 to 4 billion. Since 1990, according to the latest assessment, the deforestation rate has declined, but still remains high.

Global statistics can be misleading as Table 3.1 reveals. They disguise large variations between regions and countries. Thus, the percentage of the total land area classed as forest for Europe is twice as high as the proportion in Africa. Finland, Japan and Brazil are all well endowed countries (74%, 68% and 57% respectively), whereas the United Kingdom, which in the past also had extensive forests, now has less than 12 percent — about one third of the average for European countries. Some countries are poorly endowed for climatic reasons, such as Syria (2.5% of forest) where much of the land is semi-desert. A few countries have practically no forests at all, e.g. Tonga and Singapore, because all the available land has been taken for agriculture or industrial development. The area of forest and other wooded land in a country is, at best, only an indicator — it is a mere pointer to the potential of the forest sector, which may or may not be realized in practice. It shows the extent of its forest resources, but tells us nothing about their quality or productivity or biodiversity, and very little about the way they are being managed or their contribution to national development and welfare.

In relation to population, the forest resources of countries also differ widely. Finland has more than 4 ha of forest and Canada nearly 10 ha per head, compared

*Table 3.1* Forest resources of selected countries and regions

| Country or Region | Forest | | | | | | Other wooded land *1000 ha* |
|---|---|---|---|---|---|---|---|
| | Area *1000 ha* | % of total land area | Annual change rate % 2000–2005 | Per capita *ha* | Growing stock | | |
| | | | | | *million m 3* | *$m^3$ per ha* | |
| Finland | 22 500 | 73.9 | n.s | 4.31 | 2 148 | 96 | 802 |
| United Kingdom | 2 845 | 11.8 | +0.4 | 0.05 | 340 | 120 | 20 |
| France | 15 554 | 28.3 | +0.3 | 0.26 | 2 465 | 158 | 1 708 |
| Spain | 17 915 | 35.9 | +1.7 | 0.43 | 888 | 50 | 10 299 |
| **Europe** | **1 001 394** | **44**.3 | **+0.1** | **1.38** | | **102** | **100 925** |
| Canada | 310 134 | 33.6 | 0 | 9.72 | 32 983 | 106 | 91 951 |
| USA | 303 089 | 33.1 | +0.1 | 1.03 | 35 118 | 116 | – |
| **North America** | **677 464** | **32**.7 | **n.s** | **1.58** | | **111** | **111 866** |
| Australia | 163 678 | 21.3 | −0.1 | 8.14 | – | – | 421 590 |
| Japan | 24 868 | 68.2 | n.s | 0.19 | 4 249 | 171 | – |
| New Zealand | 8 309 | 31.0 | +0.2 | 2.05 | – | – | 2 557 |
| **Oceania** | **206 254** | **24**.3 | **−0.2** | **6.3** | | **36** | **429 908** |
| Senegal | 8 673 | 45.0 | −0.5 | 0.83 | 324 | 37 | 5 001 |
| Kenya | 3 522 | 6.2 | −0.3 | 0.11 | 281 | 80 | 34 920 |
| Nigeria | 11 089 | 12.2 | −3.3 | 0.08 | 1 386 | 125 | 5 495 |
| South Africa | 9 203 | 7.6 | 0 | 0.20 | 635 | 69 | 21 409 |
| **Africa** | **635 412** | **21**.4 | **−0.6** | **0.73** | | **102** | **406 100** |
| Bangladesh | 871 | 6.7 | −0.3 | 0.01 | 30 | 34 | 58 |
| India | 67 701 | 22.8 | n.s | 0.06 | 4 698 | 69 | 4 110 |
| China | 197 290 | 21.2 | +2.2 | 0.15 | 13 255 | 67 | 87 615 |
| Indonesia | 88 495 | 48.8 | −2.0 | 0.41 | 5 216 | 59 | – |
| **Asia/Pacific** | **571 577** | **18**.5 | **+0.2** | **0.15** | | **82** | **191 291** |
| Brazil | 477 698 | 57.2 | −0.6 | 2.67 | 81 239 | 170 | – |
| Chile | 16 121 | 21.5 | +0.4 | 1.01 | 1 882 | 117 | 13 241 |
| **South America** | **831 540** | **47**.7 | **−0.5** | **2.28** | | **155** | **129 410** |
| **TOTAL WORLD** | **3 952 025** | **30**.3 | **−0.2** | **0.62** | | **110** | **1 375 829** |

FAO. *Global Forest Resources Assessment, 2005*.

with only 0.2 ha per head in Japan.The United Kingdom population density (247 inhabitants per $km^2$) is much lower than the density in Japan (350 inhabitants per $km^2$), but the amount of forest per head in the latter country compares favourably with the United Kingdom with only 0.05 ha per head. Generally, the developed countries as a group have more forest per head of population — more than twice as much in 1990 — compared with the developing countries with only about 0.5 ha per head.

A full appreciation of the variety and richness of a country's forest resources requires detailed information, using a wide range of criteria. Forests may be species rich or species poor; one or more ecosystems may be represented; they may provide livelihoods for many or few people, and raw material for large-scale or small industries. The uses to which forests are put differ from place to place and a range of wood and non-wood outputs may be produced, upon which the value of the resource depends. Suitable indices of biodiversity, landscape value etc. need to be developed and a wider range of statistics assembled by individual countries and by FAO before it becomes possible to build up comprehensive profiles to describe the forest resource base in each country.

As a factual starting point for measuring future forest sector change and development, the FAO assessments are useful. They record the state of the resources at a given date — their distribution, composition and condition at that time. This is dependent partly on geographical factors, i.e. on a country's climate, topography, geology and soils, which may be more or less favourable for tree growth, and partly on the changes which occurred in the past, caused by forest clearing and other forms of human interference with the forests in their pristine state. Geography and history combine to explain the present state of the resource in each country.

Depending on what exists now, there may be significant opportunities for national betterment through conservation and management or costly remedial action may be required to halt further environmental decline. Resource management and development lead to modification and change. Whatever course of action is chosen, future assessments will portray a new disposition of forest resources, due to the resulting alterations in their distribution, composition and condition.

Problems arising from uninhibited use of forest resources are not new, although they have become a focus for environmental concern. Mather refers to the idea that "in many parts of the world a sequential pattern of use of the forest resource can be demonstrated". Initially the forest is seen as almost unlimited, with little danger of exhaustion and little need for conservation; a reduction in forest area may even be welcomed to make way for agricultural expansion. As destruction progresses, calls for conservation start to be heard, which, as they become stronger, may lead to government action and legislation to protect the remaining forest. The forest area is stabilised. Finally, attempts may be made to re-create forest resources by planting trees and allowing marginal agricultural land to revert to forest. Different parts of the world have reached different stages in the progression. Woodland in Britain contracted for centuries until there was a turn-round after World War I and subsequent expansion through afforestation, which has continued to the present day.

How far the depletion phase has been allowed to go in other countries depends on circumstances; it reached a climax in the nineteenth century in the Mediterranean region where all but a tiny fraction of the original forest was destroyed, whereas in North America, although the reaction came later, extensive forest areas have been preserved.

Mather also compares the changes in the way that forest resources have been used with the evolution of agriculture in Box 3.2. The unrestricted cutting, grazing and cultivation of the forest, which leads to resource depletion and instability, is equivalent to the hunting/gathering phase; the transition to settled agriculture corresponds with stabilisation of the forest resource base.

**Box 3.2 The analogy with hunting/gathering and agriculture**

"Initially, utilisation of the forest resource resembles hunting or gathering rather than farming. It involves the direct use of an ecological resource with little or no management or manipulation. Only later is management applied, and later still trees are grown under conditions as 'artificial' as those under which crops such as wheat or rice are produced. Again the model is perhaps not simple or linear: there may be deviations and reversals. Nevertheless, the transition from hunting/gathering to farming the forest has been made in many parts of the world, although in many others it has still to begin."

Source: Mather (1990), page 31

These historical and geographical factors do not fully account for the variations in the present forest extent in different countries. Rapid population growth linked with poverty in the developing countries is having a significant destructive effect on the forests. These factors combine to produce environmental deterioration in rural areas, as Leonard[4] explains: growing populations continuously subdivide a land resource whose potential to yield food, fodder and fuel is relatively fixed, and the world's poorest people are increasingly being driven to occupy and exploit more and more marginal lands such as tropical forests and other ecologically sensitive areas. The forests that remain are subjected to ever greater pressure to satisfy the requirements of an increasing number of people and the expansion that is taking place in the global economy.

The deforestation, which accompanied land use changes in the past, not only diminished the forest resource base but also reduced the forest sector's share of total land resources. Forest land was, in effect, reallocated to other uses. In some cases the outcome was the result of deliberate decisions by governments — the consequence of land use policy and legislation which gave priority to agricultural settlement. In other cases a new distributional pattern arose by default because landowners and private interests were able to do whatever they wanted, without restrictions, and forests were destroyed for the sake of short-term gain. The process

continues and some developing countries now, whatever their official policies may say, are being overwhelmed by the growing masses of poor people encroaching on the forests for subsistence agriculture; their governments are unable to stop the involuntary land use changes that are occurring.

## Human and Capital Resources

It is evident that previous land allocation patterns have affected present forest resource endowment. For the most part the trend has been negative; forest land has been taken and converted to other uses, so that the total area of forest has shrunk. This process is continuing in developing countries. The tendency for forest resources to diminish contrasts with the sector's human and capital resources, which have generally increased in availability. More people now derive their livelihoods from forest sector activities than was the case in the pre-industrial past and the amount of capital employed in the sector has greatly expanded. Increased industrial production and extension of the processing chain have led to a larger work force and more complex processing methods, while the forest resource base, which supports sectoral development, has declined in size.

Detailed information about the forest sector's human and capital resources is hard to come by. Unfortunately, there is no comprehensive statistical coverage of them. The 2005 FAO assessment includes a table of forestry (not forest sector) employment for some countries. The national statistics published by most countries usually include estimates of employment, but these tend to combine forestry workers with those in agriculture and seldom divide industrial employment into its sectoral components. The forest sector is not recognised as a distinct unit by government statistical services; therefore they do not provide employment information which relates to it. Even less is recorded about the capital employed in the forest sector. Governments seldom attempt to estimate the total value of capital assets used either by particular industries or nationally; it is too difficult an undertaking. Generally, they are less concerned with the stock of wealth in the form of physical assets than with additions to the stock represented by the flow of investment. As a component of gross domestic product, total investment is shown, but it is not disaggregated in a way that reveals forest sector capital formation as a separate item. Therefore, the only accessable sources of data on human and capital resources in the forest sector are a few special studies undertaken from time to time, for various purposes, in particular countries.

The limited amount of published data that is available should be interpreted with caution. Just as forest area statistics form the basis for assessments of forest resource capacity and potential, employment statistics are only a starting point for measuring human resources. They exclude some groups of people who depend on the forest sector for their livelihoods, such as shifting cultivators or owners of forest land. Industrial employment figures often cover only establishments above a certain size, leaving out workers in small enterprises, so that total sector employment is liable to be understated. The way that part-time, seasonal and casual labour are

counted is not always consistent or clearly stated. Even if the estimates of employee numbers are reliable, they do not reveal the quality of the workforce — they give no indication, for example of the skills available for sector activities, the kind of work involved or productivity levels.

Some examples of forest sector employment from countries which are well-endowed with forest resources are given in Box 3.3. Although it is unwise to draw general conclusions from them, they indicate that the sector accounts for some 3 to 7 percent of total employment in those countries.The studies relate to different years and different stages of development, so are not comparable. In other countries, with less forest, the proportion of the working population employed in the forest sector is likely to be less than 3 percent.

Similar care is necessary with information about capital resources and investment. The scope of the data is not always clear. The forest sector is seldom defined and parts may be excluded (e.g. secondary wood manufacturing or processing of

**Box 3.3 Employment in the forest sector**

**Malaysia**: "About 100,000 people are directly employed in the forest and forest-based industries, less than 3 percent of the total labour force in Malaysia. Despite the low rate of direct aggregate participation, forestry employment had a rapid growth rate of about 46 percent in the five years between 1972 and 1976. If figures of sectors dependent on forests are included, e.g. transport, trade and construction, the contribution is even higher. About three-quarters of the total employed are concentrated in Peninsular Malaysia and 60 percent of these are found in sawmills and plywood-veneer mills."

Source: Kumar (1986), page 154.

**Chile**: "The forest industry in Chile in 1981 employed 67,358 people, representing about 3 percent of the active population of the country, of which 6,523 worked in industrial centres, 2,682 were employed in services, such as transport, and 58,153 in forest activities.

Source: Solbrig (ed) (1984).

**Canada**: "In the past few years, the forest sector in Canada has installed new processing equipment and adopted less labour-intensive technologies. As a result, employment opportunities for lower-skilled workers have declined, while the demand for higher-skilled workers has increased. The overall employment level rose from 311,000 direct jobs in 1993, to 339,000 jobs in 1994. There were substantial increases in the logging industry and forestry services. Forest-sector employment now accounts for 1 job in every 15 in Canada."

Source: Natural Resources Canada (1995).

non-wood products), so that information from one country may not be comparable with that from others. Investment may be 'gross' or 'net'; either including provision for the replacement of worn out buildings, machines and equipment, or showing only additions to the value of existing assets after allowances for depreciation have been deducted. Investment may also include or exclude stock changes. Stocks of unprocessed wood inputs and manufactured outputs alter from year to year, and adjustment for these inventory fluctuations, which are often substantial, is not always included in the statistics.

The examples in Box 3.4 illustrate some of these difficulties. In particular, the Malaysian study refers to land but does not include fixed assets used for forest

**Box 3.4 Capital and investment in the forest sector**

**Malaysia**: Fixed Assets of Wood-based Industries in 1972 (M$'000)

| | *Land* | *Buildings* | *Transport* | *Machinery* | *Total* |
|---|---|---|---|---|---|
| Logging | 116 | 1,613 | 25,575 | 8,331 | 35,635 |
| Sawmills | 11,729 | 26,048 | 21,065 | 20,061 | 78,903 |
| Plywood & Veneer | 6,173 | 21,374 | 7,908 | 61,117 | 96,572 |
| Total | 18,018 | 49,035 | 54,548 | 89,509 | 211,110 |

Source: FAO. *Global Forest Resources Assessment, 2005*.

**Chile**: "In 1970 the total investment in the forest industry in Chile was US$ 275.6 million, of which US$177.6 correspond to industrial plant and US$ 98 million to forest plantations."

Source: Solbrig (ed) (1984).

**Canada**: "In 1993, capital and repair expenditures decreased slightly, reflecting the continuing low profitability of pulp and paper companies in particular. Capital expenditure by the forest industry is cyclical. Expenditures were up slightly for both the logging and wood industries sectors.

Additions to capacity were substantially lower in 1993, compared with the boom that occurred between 1988 and 1991. Most of the expenditures were to finalize projects initiated in earlier years.

| | *billion* | *annual % change* | |
|---|---|---|---|
| *1993* | *Can $* | *1 year* | *10 years* |
| Paper & allied industries | 3.9 | −10.5 | +10.0 | |
| Wood industries | 1.5 | | +25.6 | +10.5 |
| Logging industry | 0.4 | | +19.2 | +0.1 |
| Total expenditures | 5.8 | | −1.7 | +8.3 |

Source: Natural Resources Canada (1995).

management activities, whereas the cost of forest plantations is regarded as part of forest industry investment in Chile.

Studies of this kind do not show the relative position of the forest sector in the economy with regard to capital. Some idea can be gleaned from employment statistics of the forest sector's importance as a provider and employer of human resources, but little can be inferred from the available data about the sector's share of the national capital endowment. It should also be noted that employment and investment in forest industries can fall as well as rise from year to year, even though sector output continues to expand in the long run. Cyclical variations in the demand for forest products cause employment fluctuations and affect investment. The introduction of labour-saving methods of production normally involves investment and leads to fewer employees.

The examples also raise important questions about the nature of capital resources and investment. Resources are 'factors of production' — they provide inputs for the productive activities that take place in the forest sector. The size and quality of a country's resource base, i.e. the national factor endowment, limits the quantity of goods and services that can be produced. Capital resources, viewed from this standpoint, consist of physical assets such as buildings, machines and equipment and the stock of these items in the forest sector represents the capital that is available for its use. Land is not part of this capital endowment (although the Malaysian example groups them together); it is a basic component of natural resources and should not be classed as capital. The availability in the forest sector of all three types (natural, human and capital), at any time, limits its productive capacity. As time passes, the capacity of the sector can be raised by increasing the quantity and improving the quality of resources of each type.

Investment enables the supply of resources available to the sector to be increased and improved. It involves expenditure which is intended to enable the forest sector to produce more in the future. The money may be used to build new mills or factories or buy additional capital goods, such as machines or vehicles, which add to the sector's capital resources. Alternatively, investment expenditure may be used to improve the quality of human resources by training or add to the productive capacity of forest resources by purchasing more land, creating plantations or undertaking silvicultural research. Investment can be applied to all types of resources, not solely to physical capital. Confusion can arise because all forms of investment are often referred to as 'capital expenditure', including those directed at human and natural resources. Investment is often described as 'capital formation' and economists define 'capital' as the contribution to productive activity made by investment.

Some of the difficulties that arise due to different interpretations of the meaning of capital can be avoided by distinguishing money from the goods that money buys. Benham, in his classic texbook[5], describes the capital of a community as "all its physical assets or possessions measured at a given moment of time". The value of this capital stock, and subsequent additions to it, is also referred to as capital. The word 'capital'is used in two senses: capital funds and capital goods. In its money form, capital is mobile and can be easily moved to wherever extra investment is

needed; in its physical form, after it has been invested, capital is relatively immobile and is only released slowly through the income that is generated by the flow of outputs produced as a consequence of the investment. Throughout their working life, factories, machines and equipment produce cash flows, some of which can be saved and used for investment elsewhere.

There are also other difficulties as shown in Box 3.5. Benham's interpretation of capital includes circulating capital and therefore covers stock changes in forest industries; it might easily be extended to include the 'growing stock' of standing trees in the forest. To bring his ideas up to date, however, 'human' capital needs to be added to 'real' capital and the capital concept should be further enlarged to cover investments in natural resources. In the forest sector, in addition to the capital invested in physical assets and people, we can also distinguish 'forest' capital, based on investments in forest crops, such as timber plantations, and improvements in the capacity of forests to provide tangible and intangible outputs of all kinds.

**Box 3.5 Benham's categories of 'real' capital**

"We have, then, five categories of 'real' capital (as distinct from paper titles, which are capital to an individual or a firm) between which it may be necessary for some purposes to try to distinguish. They are: fixed capital used in industry and trade; land; circulating capital used in industry and trade; durable consumers' goods in the hands of consumers; other consumers' goods in the hands of consumers. I have argued that from the standpoint of the community as a whole there is no need to draw a line, which in border-line cases would be very difficult to draw, between these different categories, and that we can include them all because they all contribute, in one way or another, to future output and the future satisfaction of wants."

Source: Benham (1955), pages 138–9.

The economist's idea of capital is based on an important distinction between saving and consumption. It involves delays and waiting for benefits which are expected at a later date. By definition, the part of the national output which is not consumed or used up, is saved or invested and contributes to future output. Capital, in all its various forms, is the result of accumulated savings/investment; some capital accumulates in the form of capital goods and contributes to the nation's stock of capital resources, some is used to increase the potential of human resources so that they can contribute more in the future, and some is directed to natural resources to increase their future output. Our present stock of capital has been built up from the output of former years; it is output that has has not yet been used up, scrapped or consumed.

The generation of capital through the accumulation of savings/investment is the result of human economic activities. From a resources point of view, these do not

provide a sufficient explanation of the way that productive potential is built up. Forests in their original state, without any interference or modification by people, are the result of natural growth processes; they possess a productive potential that has accrued naturally as species multiplied and trees grew in size. Forest resources, which are being managed, benefit in two ways: from additions to the growing stock due to nature and an accumulation of capital due to investment. The present stock of forest resources is derived from both natural and human sources, and their interactions with each other as shown in Fig. 3.1. Similarly, human resources do not derive their potential solely from investment. The numbers of people have risen due to population expansion, while their capacity to contribute to society has increased through education, training and research. Only the resources of capital goods depend entirely on savings/investment.

Finance to undertake forest sector investment may be generated internally, within the sector, or externally from savings elsewhere. Sector profits or savings may be sufficient for its requirements, but often need to augmented. In some countries with substantial forest resources, the flow in the past was in the opposite direction and surpluses from forest exploitation were invested in other sectors. The ability of the national economy to generate funds for investment depends on the proportion of the national income that is saved rather than consumed. Subject to this general limitation, the amount of investment in the forest sector is determined by the attractiveness of opportunities there compared with other sectors. Development of the sector may be inhibited by shortage of funds or a dearth of suitable projects. However, domestic financial constraints may be loosened by overseas investment or foreign aid. Whatever the source of investment funds, they need to be matched to real resources in the form of land, labour and capital goods. Land must be acquired,

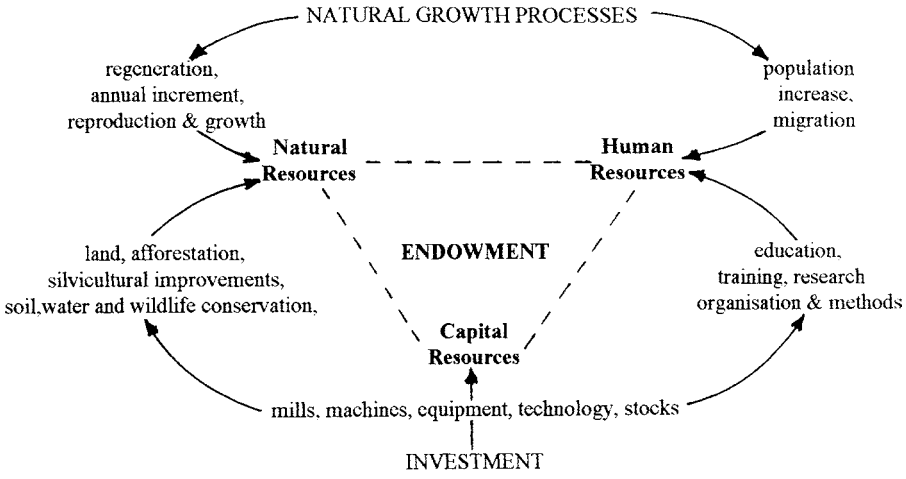


*Figure 3.1* Additions to forest sector resource endowment

workers employed, machines and equipment obtained; the cost of these additions to forest sector capacity represents the value of the investment.

Additions to the resource endowment of the sector, which are brought about by investment, are affected by the availability and mobility of resources. Natural resources are fixed geographically, whereas human and capital resources can be shifted from sector to sector. Nationally, the total amount of land is limited and additions to the forest area depend on reallocation from other uses; such changes of use are frequently beset with practical difficulties. Generally, the forest sector's natural resource endowment is most easily increased by improving the quality rather than the size of forest resources. The number employed in the sector can be supplemented by recruiting workers from other sectors provided the inducements offered are adequate, although unwillingness to move away from their homes may reduce the numbers available. Alternatively, the sector's existing work force can be retrained and redeployed, or made more efficient by providing better organisation and equipment. Capital resources such as sawmills and pulpmills cannot easily be moved and they continue to operate at their old locations, provided they remain profitable, until the machines and equipment wear out; upgrading and productivity improvements at existing plants are usual, however. Such restrictions do not apply to new capital resources which can be located wherever is most convenient.

Capital formation is facilitated by resource mobility and the forest sector would develop much more slowly if human and capital resources could not be moved. Investment provides flexibility both inside the sector and for interchanges with other sectors. It also enables adjustments to be made over time. The share of national saving/investment that was taken by the sector in the past affects its present productive capacity. The balance between natural, human and capital resources that exists now in the sector, is the result of previous investment choices. In fact, the quantity and quality of resources of all kinds that is available for forest sector activities is a legacy of the past; the sector's present resource endowment has been shaped by its history.

Looking to the future, through investment, additional resources can be brought into the forest sector. Growth of the national economy may provide new capital and population growth adds to the available work force. Sector resources can be supplemented by reallocation from other sectors, or by bringing into use land, labour and capital that is at present underutilized or unemployed. How a country chooses to use the resources of all kinds that it has available to it at a given time predetermines the resources that will be available in future and the development path that the sector will follow.

## 3.2 ALLOCATION

The resource endowment of the nation consists of factors of production which are used for different purposes. Allocation describes the way they are distributed between sectors throughout the national economy and their patterns of use within

sectors. The three types of resources — natural, human and capital — can be combined in a variety of ways, in different proportions, and to some extent different kinds of resources can be substituted for one another. The forest sector receives a share of the total of each type available to the nation. Within the sector, resources are applied in appropriate combinations to forestry activities and along the processing chain to produce various outputs.

Allocation depends on resource mobility. Only resources that are free to move or are capable of being used in a different way can be allocated. Much of the present endowment is committed to existing uses and cannot easily be reallocated, at least in the short term. Forest land that is inaccessible or too steep to cultivate cannot be converted to agriculture, labour is more mobile but may need to be rehoused or retrained, and capital, once invested, does not become available for reinvestment until existing assets are sold or written off at the end of their useful lives. Allocation is easiest with additional resources, which result from extra investment generated by savings and economic expansion. This can be used to build new mills and factories at any suitable site, or to acquire machinery, vehicles and equipment for any purpose. Investment in human resources, through education and training, widens employment opportunities for new recruits to the work force and assists transferability. Forest resources can be supplemented by investment in plantations, forest infrastructure and conservation facilities. Generally, resource mobility is greatest in a growing economy, when it is easiest to improve resource allocation by taking advantage of alternative investment opportunities.

Allocation involves choices or decisions; there are alternative ways of using the same resources and, by one means or another, selections must be made. Choices may be *deliberate*, rational and calculated, or *involuntary*, when the resulting allocation pattern comes about through habit, tradition, drift, inertia, reluctance to intervene or inability to alter the course of events. Policy, politics and prejudice all contribute to resource allocation and it is little wonder that the present pattern of resource use is often unsatisfactory and offers ample scope for improvement. The pattern may be economically *inefficient*, in the sense that a different distribution of resources would lead to a larger total output or utility, or *ineffective* because the way of using the resources that has been chosen for some reason fails to achieve the desired results. It may also be *inequitable*, because it benefits some sections of the community or one generation more than other sections or generations.

Where are the choices made and who makes them? We can distinguish several levels at which allocation takes place. The two most easily recognisable levels are concerned with the distribution of resources within countries and the way they are used within sectors:-

- at *national* level the resources available to the nation are divided between sectors. Each sector receives a share which corresponds to its contribution to national output and perceived needs; a portion of the total is allocated to the forest sector. Countries develop distinctive patterns of resource allocation, partly based on their natural advantages, partly as the result of government policies and intervention, but mainly due to the interplay of activities and market forces that takes place

between sectors.The pattern in each country alters as its economy develops and new investment takes place. Over time, two sorts of change occur: first, the balance between natural, human and capital resources may be adjusted in response to alterations in their relative abundance and value, and second, there may be shifts in the relative importance or weight attached to particular sectors. The forest sector's share may increase or decrease, according to circumstances, as the allocative pattern evolves.

- *sector* level allocation refers to the distribution of resources within sectors; the resources available to the forest sector are shared amongst its various activities. The choices of the various organisations and interests that constitute the sector determine its internal pattern of resource allocation. Some forest sector resources are controlled by the government, others are in the hands of private corporations and individuals. The former are divided between various programmes and projects in accordance with budgetary allocations, while the latter, which are guided by market forces, are distributed among enterprises. Government influence is strong in many countries, where the state directly controls the management of large areas of forest land and determines the nature of the its output. Adjustments to the pattern take place continually as the sector develops.

Changes in resource allocation at national level affect the pattern of resource allocation at sector level; the higher level influences what happens at the lower level. These levels are interdependent and, in fact, form part of a complete hierarchy consisting of six levels as shown in Fig. 3.2.

In addition to the national and sectoral levels already identified, resource allocation takes place at global level and, within sectors, at three subsidiary levels, which roughly correspond with the strategic, tactical and operational decisions made by governments and private corporations:-

- The world's total resources are distributed, largely as a result of geographical and historical accident, among countries according to their area, population and

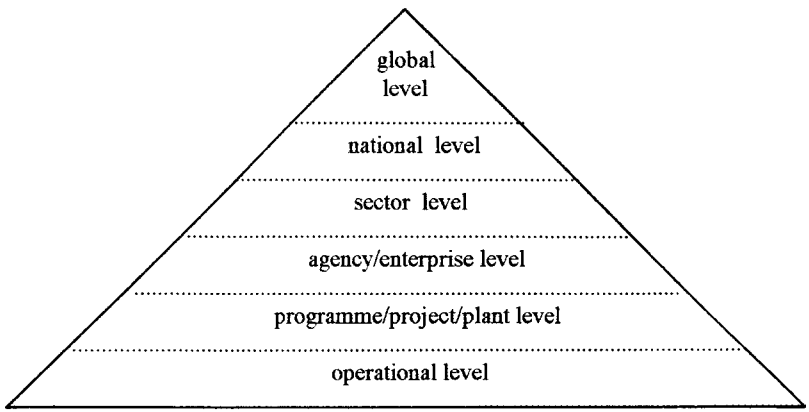


*Figure 3.2* Levels of resource allocation

accumulated capital. Each country has a share of *global* resources, some of which may be transferred to other countries. It is possible to augment a nation's resources by allocation decisions taken at global level, as with international aid and investment flows. Some of these flows are directed towards the forest sector. Countries also affect the patterns of resource allocation in other countries in a more subtle way by means of tariffs and trade restrictions.

- Within sectors, resource allocation takes place at the *agency/enterprise* level. Ministries, departments and other agencies of the government, by means of their budgets, share out their resources among branches, divisions, programmes and projects in order to carry out the functions for which they are responsible. Private enterprises similarly distribute their resources to mills, factories and other subsidiaries. Choices in the way resources are employed at this level depend on agency and enterprise strategies; this is the level mainly responsible for strategy formulation and strategic management.
- The *programme/project/plant* level deals with the allocative choices made within each government or enterprise sub unit. In the forest sector, government activities are frequently decentralized to regions or administered by means of programmes lasting several years (e.g. watershed rehabilitation) and projects in particular places (e.g. a community forestry scheme). Similarly, many decisions of companies (such as production levels) are made at plant or factory level.These choices are tactical and are expected to conform with the strategic framework of resource allocation set at agency/enterprise level.
- The lowest level in the hierarchy deals with allocation at the *operational* level. The choices are made by units with day-to-day responsibilities in the forests or the workplace and concern the means by which tactical plans are implemented. Their impact on resources is generally short-term and local.

The levels in the hierarchy interact with each other. The choices made at each level restrict the range of choices lower down. Each level receives a portion of the total resources available to the level above. Allocation at global level affects the resource endowments of each country; national level allocations decide each sector's share of resources; at sector level resources are distributed to agencies and enterprises, and so on, down to the local choices made at operational level. A decision at the top filters down and is felt directly or indirectly at the bottom. In the reverse direction, lower level decisions commit resources to particular uses and may limit the range of possibilities for decision makers at higher levels. The interactions work in both directions.

The kinds of interactions that occur are often far reaching. Policy choices at national level, which affect the distribution of resources between sectors, also influence their availability and allocation within sectors. National policy strongly influences the use of land, for example and thereby restricts the development possibilities open to forest sector agencies. As Box 3.6 shows, governments have promoted the conversion of indigenous forest to permanent agricultural crops in Malaysia[6], induced population migration in Indonesia[7] and provided tax incentives which were detrimental to the forests in Brazil[8]. In each case, although the objectives

**Box 3.6 Effects of government policies on forest resources**

**Malaysia**: as part of the land development programme, a large area of natural forest has been converted into plantations of rubber, oil palm, cocoa and coconut. During 1981–85 some 417,000 ha of new land were planted, 69 percent with oil palm, 23 percent with rubber and 4 percent with cocoa. Further large areas were scheduled for conversion under the Fifth and subsequent Malaysia plans.

Source: FAO. *Report of the Mission to Malaysia on the Tropical Forestry Action Plan, 1986*.

**Indonesia**: almost two thirds of the country's 147million people live on the three heavily populated islands of Java, Madura and Bali, with a land area of only 13.9 million ha and a population density of 10.6 persons per ha.The 'Outer Islands' of Kalimantan, Sumatra and Irian Jaya have an area of 144 million ha and are lightly populated — East Kalimantan has only 0.05 persons per ha and large areas covered with tropical rain forest. Indonesia has had a Transmigration Programme for a number of years to transfer people from the densely to the lightly populated areas, which involved considerable clearance of forest. The Programme aimed to resettle 500,000 families between 1978–1983 and 750,000 families during the period 1983–88. It was estimated that about 300,000 ha would be cleared annually during the latter five year period, 80 percent of which would be in primary or relatively old growth forest.

Source: Ross (1985).

**Brazil**: "Public policies affect individual land use decisions and frequently play a pivotal role in promoting tropical forest conversion. For example a single Brazilean policy — promoting the development of the Amazon region through a program of corporate tax incentives favouring commercial beef producers — was responsible for an estimated 30 percent of the total forest area converted in Brazilean Amazonia by 1983. All told, cattle ranching in the region was responsible for about 60 percent of the 148,000 square kilometers of Amazon forest area converted, whereas small farmers participating in government resettlement schemes accounted for only about 11 per cent of the total reported conversion by 1983."

Source: Browder (1989), page 113.

of government policy were quite different, land was reallocated for use by the agricultural sector and the forest sector's resource base was seriously affected, thus diminishing its future productive potential.

Some countries, which are well-endowed with forest resources, such as Ghana, Ivory Coast and Indonesia, have tried to promote development by stimulating forest processing, as described in Box 3.7. Attempts have been made to discourage log

**Box 3.7 Incentives for forest industry development**

"....to stimulate investment in processing capacity that would create employment and value-added in wood industries, log-exporting countries have banned log exports, reduced or waived export taxes on processed wood, and offered substantial investment incentives to forest product industries. Ghana used four different measures in the attempt to stimulate investment in domestic processing industries: log export bans were enacted (but mostly evaded); plywood and other wood products were exempted from export taxes (which were far less onerous than the currency overvaluation); long-term loans for sawmills and plymills were granted at zero or negative real interest rates; and finally, a 50-percent rebate on income tax liabilities was given to firms that exported more than 25 percent of output. By 1982, these policies had created a domestic industry comprising 95 sawmills, 10 veneer and plywood plants, and 30 wood-processing plants."

"Similarly, in the Ivory Coast generous incentives were given for creation of wood processing capacity. Firms making approved investments can write off half the costs against income tax liabilities and are eligible for income tax holidays for seven to eleven years on subsequent profits. These incentives, in addition to the large reductions in export taxes on exports of processed wood, explain the creation of a sizable but inefficient processing industry."

"Such industrial incentives can increase local employment, but often do so at a heavy cost in lost government revenues and faster deforestation. In Ghana, Ivory Coast and Indonesia, many of the mills established in response to these inducements have been small and inefficient. Conversion rates of logs into sawn lumber and plywood have been only about two thirds of industry standards. Shifting to domestic processing in technically inefficient mills means that considerably more logs must be harvested to meet any level of demand, disturbing much larger forest areas through selective cutting."

"The Indonesian case illustrates the fiscal costs and risks to the forests that ambitious forest-based industrialization entails. To encourage local processing, the government raised the log export tax rate to 20 percent in 1978, exempting most sawn timber and all plywood. Mills were also exempted from income taxes for five or six years. Since these tax holidays were combined with unlimited loss-carryover provisions, concessionaires were frequently able to extend the holiday by declaring (unaudited) losses during the five-year holiday provision, or by simply arguing before sympathetic tax officials that the holidays were intended to apply for five years after the start of profitable operations. With these incentives and the impending ban on log exports, the number of operating or planned sawmills and plymills jumped from 16 in 1977 to 182 in 1983."

Source: Reppetto (1988), pages 23–25.

exports and to offer incentives to attract new investment into wood industries. These measures have led to the creation of sizeable industries. They affect resource allocation at both the national and the sectoral level by diverting resources from other sectors, thus increasing the forest sector's share, while at the same time altering the balance of resource use within the sector. The incentives favour some activities and types of processing more than others. Such interventions in the allocative process may have achieved their aim, but have also been criticised because the industries, which were set up, were inefficient.

These examples illustrate the complexity of the interactions between levels. Preferential treatment given to part of one sector — such as the part of the forest sector concerned with wood processing in the countries above — caused extra resources to be diverted to it from elsewhere. Other sectors had to forego the use of additional government tax revenues so that the forest sector might benefit. The justification for their sacrifice was the expectation that an enlarged forest sector would contribute more to national output, employment and welfare in future years. However, as Reppeto[9] points out, the costs (in export taxes and other revenue foregone) entailed by the switch from log exports to (inefficient) domestic processing was more than the extra value that was generated in the countries he studied. The mills, run by private companies, were profitable because of the incentives but the national economy paid the price for this, at least in the short term. Furthermore, there was a serious risk that the log supply needed to keep the additional mills working would lead to overcutting and unsustainable harvesting rates in the forest. Consequently, a different part of the forest sector was likely to be disadvantaged. Government interventions which alter resource allocation need to be very carefully analysed to discover and evaluate their full effects. Even their measurable impacts are sometimes difficult to foresee and not always beneficial. Besides these, there may be other effects on the supply of public goods, such as loss of biodiversity, which although intangible are not necessarily insignificant.

## 3.3 RENEWAL

Resources are so named on account of their usefulness and value. As Rees[10] puts it, "resources are defined by man, not nature". The natural environment consists of physical entities — they are 'things' which only become resources if they acquire utility. Mere existence is not enough; if they have no conceivable use and are not valued by humans, they are not classed as resources. Natural resources require knowledge and skills for their extraction and utilization, and there must also be a demand for the materials and other outputs produced. Forest resources provide goods and services which benefit the community. Similarly, people become human resources and capital items are transformed into capital resources when they are used for productive purposes.

Resources are utilized to provide a continuing stream of tangible and intangible benefits. This stream may increase or decline over time, or even cease altogether. The future flow of benefits from a resource depends on its nature and, in the case

of those resources which are capable of renewal, on the capacity of the resource to renew itself. The renewal process in forest resources depends partly on the natural growth and reproduction which take place in all ecosystems, partly on the physical characteristics of the environment and partly on the way that the resources are managed. Human resources are renewed in number by the reproductive capacity of the population and migration from elsewhere, and in quality by the provision of education and training. The continued productivity of capital resources depends on the replacement of assets as they wear out and the introduction of changes in technology which maintain efficiency.

When natural resources are used, the possibility arises that they are also being consumed or used up. They may cease to be capable of providing a flow of outputs. Some resources, such as minerals, are inert and exist in fixed quantities; they are described as *non-renewable* or 'stock' resources. These are distinguished from *renewable* or 'flow' resources, which continue to provide utility and value, and are not necessarily depleted by exploitation. Although resources are commonly divided into these two types, it is more useful to classify them in a range, as shown in Table 3.2. At one end are those resources which take millions of years to form and cannot be replaced; at the other extreme are those which are continuously renewed and need not run out provided that they are used at a rate which matches their renewal.

Forest resources are an intermediate type; they can behave as either stocks or flows, depending on the way they are used. Rees calls them *critical zone* resources. These can be exploited to exhaustion if their rate of use exceeds their rate of natural replenishment. At some point — the critical zone — the depletion process can go beyond the capacity of the resource to renew itself. Then, even when all exploitation ceases, recovery becomes impossible. Thus plants and animal populations may become too sparse to reproduce themselves, and land overuse may lead to soil erosion, degradation and desertification.

Mather[11] prefers to describe forest resources as *potentially renewable*. This draws attention to the fact that, too often in the past, there was a tendency to treat them as though they would last forever and to 'mine' them, forgetting that their survival

*Table 3.2* A classification of natural resources.

| STOCK | | | FLOW | |
|---|---|---|---|---|
| Consumed by use | Theoretically recoverable | Recyclable | Critical zone | Non-critical zone |
| Oil | All elemental minerals | Metallic minerals | Fish | Solar energy |
| Gas | | | Forests | Tides |
| Coal | | | Animals | Wind |
| | | | Soil | Waves |
| | | | Water in aquifers | Water |
| | | | | Air |

Source: Rees (1990)

is not automatic. Unfortunately, the need to ensure their renewal is still frequently ignored or overlooked, as is evident from the widespread destruction of forests in many parts of the world. Mather also points out that a resource may shrink or deteriorate because of external factors unconnected with its current use. Forest land may be lost through conversion to agricultural purposes or be damaged by pollution. The level or intensity of forest exploitation is not the only factor to be considered and the renewal of forest resources depends, first and foremost, on having a secure land base, with adequate protection from outside influences.

The classification in Table 3.2 and Mather's comments highlight a feature of forest resources which has wider significance. They are suppliers of raw materials. Throughout this chapter, the role of resources as factors of production has been emphasized. The activities which are carried on in the forest sector depend on resource inputs, in order to provide the wide variety of outputs which the community uses and values. The contribution to production obtained from capital and human resources is rather different from that provided by most natural resources however. Fixed capital contributes to manufacturing or processing activities, but is not itself shaped or transformed during the productive process and does not become physically part of the output; similarly, human resources are responsible for the shaping and transforming, but are not themselves converted or destroyed in the process. Natural resources also provide inputs to the productive process, but usually in the form of raw materials which are incorporated in the eventual output, even though they may be considerably modified during the course of manufacture. The difference is that raw material inputs come only from natural resources, not from capital and human resources.

**Box 3.8 The principle of sustainable yield**

"Wood is not only versatile; it is also a renewable resource. It is something which we can have, if we go about it the right way, as far in the future as we wish. Many European and North American forests are primarily managed for wood production, and the key principle is that yield should be at least maintained. This principle of 'sustainable yield' was only established after a hard battle at the end of the last century. In establishing it, foresters won the first battle in the twentieth-century conservation movement. Because the factory and the product are identical, care must be taken that trees are not felled at a time and in a way which lowers the capacity of the forest to go on producing wood (and providing its other services). Forestry science has now advanced to the point where it is known how to do this for nearly all temperate zone forests. This does not mean that all such forests *are* properly managed. But mismanagement arises more from confused ideas about the purposes for which the forests should be managed than from ignorance about how to manage."

Source: Westoby (1989), page 33.

Forest resources provide wood and non-wood raw materials for forest sector activities. These raw materials flow into the processing chains which link the resource to the final consumers of outputs from the forest. In relation to wood processing, forests are regarded as resources because they are the source of raw materials for primary processing plants such as sawmills. The forests and the trees in them can be bought and sold, and have utility and value. They represent valuable stocks of wood for processing, which have been built up by growth and regeneration in past years. Mature standing trees are the result of a protracted process of wood production and a forest can be regarded as a wood factory. The growing stock in the forest accrues annually as the trees grow and, in a sense, the forest represents both the product and the production line. The productive capacity of the forest is set by the growth rates of the trees, the density of the crop and the fertility of the site. The way the forest is managed has a strong influence on its productivity and the flow of wood obtained when the trees are harvested. Somewhat confusingly, this output flow, in the form of logs, poles or pulpwood, is also often referred to as a resource.

It is important to maintain the output flow so that processing activities can continue and consumers' requirements can be met in the future. Concern to provide an uninterrupted supply of raw material from the forest underlies the principle of sustained yield, as developed by foresters during the eighteenth and nineteenth centuries (see Box 3.8). The ability of the forest to provide a continuous flow of raw materials depends on the rate of renewal of the resource and the rate of harvesting. In some cases, harvesting is necessary for regeneration to take place. In the long run, removals from the forest should be matched by new growth and the rate of harvesting should not exceed the capacity of the resource to replace what is taken away. The growing stock acts as a buffer between the new growth and the removals as shown in Fig. 3.3. This buffer enables depletion to exceed removals for a short period, by reducing the growing stock, but if too many trees are felled, the annual growth of the remaining trees may be insufficient to maintain the renewal rate at its previous level, thus reducing the sustainable yield from the forest.

Forest resources are described as potentially renewable because they are capable of replenishing themselves in this manner, within biological limits and given appropriate management. If the forest is mismanaged by allowing excessive harvesting, at some stage, depletion of the growing stock will reach the point where renewal is undermined and the output flow ceases to be sustainable. Eventually, further exploitation will become uneconomic or impracticable. As with trees grown for

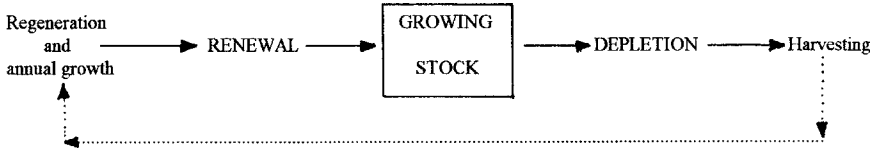


*Figure 3.3* Renewal and depletion of forest resources

timber, so also with other plants and animals; their populations represent stocks, which are renewed by reproduction and depleted by hunting or collecting for food, sport or other purposes. The flora and fauna of the forest — the part of the resource which is living — is composed of potentially renewable resources.

As well as raw materials, forests provide services and intangible outputs, such as recreational opportunities and biodiversity. The existence of the forest may be enough to ensure that these benefit flows continue, although not necessarily without changes in their quality and quantity. As with timber production, the way the forest is managed is important. Thus, visiting a forest provides people with a recreational experience, but the areas that are accessable and the kind of recreational facilities that are offered determine the quality of the experience. Similarly, the variety of species of wildlife that a visitor may come across depends on how the forest ecosystem is managed; species diversity often depends on maintaining glades and forest margins so that they provide suitable conditions for herbs, insects and birds to flourish.

Forests are composite resources. They consist of several, associated components which provide a mixture of outputs, some in the form of raw materials and some as services or benefits to the community. From the point of view of resource renewal, the components behave differently. Some are stocks, like forest land, which exists in fixed amount at any given time, although the area of forest may be added to if extra land is taken from alternative uses. The land itself is not reduced in size or consumed when trees are grown on it, although its fertility may decline with bad management. Others, like the trees and wildlife, are renewable resources — part stock and part flow — which can be managed by controlling their rate of exploitation within safe limits to provide a sustained flow of outputs. There are also pure flow components, such as carbon sequestration, which provides an uninterrupted supply of benefits so long as the forest is not destroyed, although the amount of carbon dioxide removed from the atmosphere can be altered by way the vegetation is managed. These variations in behaviour make it necessary to disaggregate the various components of forest resources when analysing their renewal and sustainability. Often components interact with one another, so that having more of one means having less of others. Each component requires individual consideration and successful resource management depends on finding ways of safeguarding the renewal of as many constituents as possible, while sustaining their outputs in the desired proportions.

Forests in their natural state are complex ecosystems consisting of many interdependent plant and animal species. Forest soils contain vast numbers of invertebrates and fungi on which the health and resilience of the ecosystem depends. Above ground, climatic variations affect both species distribution and population numbers; the flora and fauna form a changing patchwork. In their pristine state, it is often assumed that forests exist in a state of dynamic equilibrium — decay is balanced by new growth, the available nutrients and energy are recycled, and species diversity does not decline. The stocks and flows in the system will be maintained, although they may fluctuate from year to year. However, dynamic equilibrium, at least in

this simplistic form, is seldom found in actual forests, even though they appear to be free of human interference. Ecological processes are subtler and more complicated than that; some species only reproduce themselves infrequently in response to exceptional events such as fires. Nevertheless, the idea of an equilibrium is valid and useful because it stresses the natural tendency of forests to renew themselves and to absorb the shock of disturbances, provided these are not so severe as to overwhelm the system.

Human interference or, in rare cases, a natural disaster such as an earthquake, will disturb the equilibrium. Low levels of intervention, such as felling occasional trees or light grazing by domestic animals, allow the system to adjust to change without significant alteration in composition and diversity. The forest ecosystem will continue to exist and generally retain its renewable characteristics. More serious interventions cause ecosystem changes that may be long-lasting or even permanent. For example, selective logging in mixed forest, which leaves unmarketable timber species behind, is liable to upset the species balance and impoverish the forest resource for many years to come. Logging may also destroy the habitat of endangered species and, in extreme cases, may lead to their extinction.

Managing the natural forest as a timber crop combines intensive harvesting of the valuable species with silvicultural operations to assist regeneration. This is likely to disturb the ecosystem and may reduce biodiversity, but so long as the rate of removal does not exceed the rate of replacement, the crop can be considered to be sustainably managed. However, the beneficial consequences of obtaining a regular supply of logs should be weighed against a possible loss of diversity; some sacrifice of non-timber benefits may be involved. In many cases the extent of the loss may be considered acceptable, perhaps because other unexploited forest areas contain similar ecosystems. Nevertheless, sustained yield management for timber should not be confused with managing the forest as a renewable resource. It is necessary to consider the renewal of each type of output separately. Different parts of the forest may be managed in different ways so that each part contributes to the renewal of the whole resource. Over the entire forest area it may be possible to achieve a satisfactory balance of outputs which is sustainable.

The most drastic intervention occurs when particular species are grown as plantation crops, usually as even-aged monocultures. Man-made forests amount to a new form of land use, which involves concentrating the full productive potential of the site onto the selected species at the expense of the other constituents of the ecosystem. If this involves replacing a low output system by a more valuable tree crop, as occurs with the afforestation of degraded grassland, the change is likely to be considered advantageous. However, if the site supports a rich, existing ecosystem, such as tropical high forest, which is destroyed by clearing prior to planting, the sacrifice is questionable. Such changes are irreversible and should not be undertaken without a full understanding of their consequences. Even if the plantations are sustainable and the previous natural ecosystem was so neglected that it was not capable of renewing itself, this does not necessarily justify the conversion. The species and habitat losses should be examined carefully to see how they might

be ameliorated or made good elsewhere. The renewal of each component should be considered separately, with a wider perspective than merely the area which is to be converted into plantations.

The growth of agroforestry poses other resource renewal problems. In developing countries, where rural households have traditionally depended on common property resources to supply some complementary inputs to the agricultural system, off-farm tree resources are being degraded and are disappearing. Farmers are tending to meet their needs for some items of food, fuel and fodder, by protecting, planting and managing appropriate tree species on their own land. There is a shift from public to private tree resources. Trees can be used on farms in a variety of ways in response to the demands of other farm activities and crops, as shown in Box 3.9. As agricultural land use intensifies, the organisation and sophistication of tree

**Box 3.9 Patterns of planted trees on farms**

- **Trees on non-arable or fallow land**. This type of lower intensity management of naturally regenerated trees is likely to occur in more extensive farming and grazing systems.
- **Trees grown in homestead areas**. This often emerges even when there is still plentiful tree cover, to introduce fruit and other valued species. Where protection against livestock or burning is difficult, the homestead area can be the only niche where trees can be grown.
- **Trees growing along boundaries and in other interstitial sites**. Found where trees need to be separated from crops in areas of intensive land use, or where trees are the dominant means of boundary demarcation, or where lines of trees serve a protective purpose (e.g. windbreaks and contour planting).
- **Intercropping on arable land**. Generally takes the form of trees scattered, or in clumps or rows (alley-cropping), as part of sometimes complex agricultural crop production. Occurs where trees provide benefits to agricultural crops through shade, shelter or soil improvement, or intercropping is mutually beneficial to both trees and crops because of shared water, soil, nutrient, and light resources. In its most highly developed forms, as in multi-storied multiple species *home gardens*, tree/crop mixtures can represent important components of the overall farm system.
- **Monocropping on arable land** (farm woodlots). This is usually associated with the growing of trees to produce cash crops, such as poles, pulpwood, bark or for fruits such as cashew nuts, and is most commonly found in the more advanced market-oriented agricultural areas. Tree crops are also employed as a low cost means of using poor sites, or to maintain land as extensively managed fallow.

Source: Arnold (1997), page 8.

management strategies is also likely to increase. Trees become an integral part of the farm production process and their renewal is linked to the renewal and sustainability of the whole farming system[12].

In practice, renewal of forest resources is a matter of management. It depends on careful analysis of the kinds of output or benefits that are derived from each area of forest and the probable consequences of human interference. It involves understanding what combinations of outputs are technically possible and choosing the most appropriate combination. Different combinations, derived from different parts of the forest or trees outside the forest, are necessary to ensure the complete renewal of all components. A broad perspective is needed, so that forest resources are managed on a sectoral rather than a local basis, with each part of the forest estate contributing in a balanced way to the general renewal and sustainability of the sector as a whole.

At the start of this section, it was pointed out that the renewal of resources is not only concerned with maintaining the flow of outputs from forest resources. The human and capital resources used throughout the forest sector are also renewable and, like forest resources, their renewal depends on the way they are managed. A continuous flow of capital and human inputs is needed to sustain forest sector activities and to provide for their future development; the flow will dwindle if there is no provision for renewal. The quality and quantity of the human contribution depends on maintaining the numbers, skills and quality of the people in the work force. Capital renewal is achieved by means of depreciation provisions and setting aside a portion of the incomes received so that the capital stock remains intact.

Human resources consist of people who apply their knowledge and skills to sectoral activities. Renewal depends on maintaining both their numbers and their quality. Adequate levels of remuneration and reward are necessary to retain people in the sector. It is also necessary to ensure that the work force has an intake of recruits which balances retirement and other losses after allowance has been made for changes in productivity. The quality of the employees needs to be sustained or improved by education and training. It may be possible for the same work to be done with smaller numbers in future if their productivity is increased. This may be achieved by improving their skills or providing them with more or better capital resources to work with. The introduction of technological improvements will only increase output if they can be used effectively. Human resource renewal is therefore linked with investment in the forest sector and depends on continuity in the flow of capital resources to keep the work force employed.

The renewal of capital resources is achieved by allowing for the run down of physical capital that occurs while it is being used. Capital goods, such as buildings, machinery, vehicles and equipment gradually wear out and lose their utility; these assets have a limited life and need to be replaced at intervals. If they are not renewed, their productivity will decline and their maintenance costs are likely to increase. Some items are likely to be superseded by improvements in design or technology. In other cases new methods of production can lead to obsolescence,

such as the replacement of mechanical sawmilling by electrically driven machines. Financial provision to meet the cost of renewal is usually made by spreading the cost of each capital item over the number of years of its expected useful life. Each year an appropriate amount is set aside to allow for depreciation so that money is available, as needed, for reinvestment. In practice, the replacement items are often improvements on those used previously so that output per £ or per $ invested tends to increase. Investments in research may also lead to increased efficiency in the use of both capital and labour.

The forest sector can continue to provide benefit flows only if all its resources are renewed in an appropriate manner. Provision for renewal is not just a matter for foresters. Natural, human and capital resources are to some extent interdependent so that renewing one type affects the others. In all cases resource management is necessary, with adequate attention to renewal, so that the sector's capacity to maintain the flow of outputs of all kinds, both tangible and intangible, can be sustained.

## SUMMARY

- Resources are factors of production. They provide the inputs to the productive processes which take place in the forest sector, and their availability limits the sector's development.
- Three types of resources are distinguished: *natural, human* and *capital*. All three are essential to forest sector activities and contribute to the flow of tangible and intangible outputs in the sector.
- Forest resources are the natural resources contained in the forest itself, including forest land, soils, trees, vegetation, wildlife, ecosystems etc. They underpin the sector and are the source of all its activities and outputs. They supply raw materials for industrial processing and provide a wide range of other welfare and environmental benefits.
- The capacity of the forest sector to provide outputs of all kinds is determined by the nature and extent of its resources. Development of the sector is influenced by three factors: resource *endowment, allocation* and *renewal*.
- Resource endowment describes the present availability of different resource types with respect to both their quantity and quality. Forest resources are land-based and limited in extent, whereas human and capital resources are more mobile and can be more easily augmented from outside the sector.
- FAO's 2005 Global Forest Resources Assessment is the most comprehensive and reliable guide to the state of the world's forest resources that is available. 30.3 percent of the world's land area is classed as forest with a further 10.5 percent of 'other wooded land'. The total area of both is divided in the ratio 2:3 between developed and developing countries. The endowment of individual countries varies widely and deforestation has proceeded much further in some countries than in others.

- Historically, the area of forest resources has declined while the sector's human and capital resources have generally increased; more people now derive their livelihoods from forest sector activities than in the past and the amount of capital employed has greatly expanded due to industrialisation. However, there is no detailed statistical coverage of sector resources, comparable to the forest assessments produced at 10 year intervals by FAO.
- Investment involves expenditure intended to enable the forest sector to produce more in future. It is often referred to as 'capital formation' although it applies to forest and human resources as well as capital assets. Additions to the resource endowment of the forest sector are derived partly from investment and partly from natural processes of growth and reproduction.
- Allocation describes the way resources are distributed between sectors and their patterns of use within the forest sector. Resources can be combined in many ways. Allocation is based on choices, which take place at six levels and form a hierarchy, ranging from the global to the operational level. Levels interact with one another and choices made at one level restrict the choices further down.
- Forest sector activities cannot be sustained without provision for resource renewal. The future flow of tangible and intangible benefits from the sector's resources depends on maintaining their productive potential. Forests are composite resources, which provide a mixture of outputs, including raw materials for processing and a range of community services/benefits. They are described as 'potentially renewable' resources, which are capable of replenishing themselves within biological limits, provided the growing stock is not depleted by excessive harvesting. Human resources are renewed by recruitment, migration, education and training. Capital resources depend on the replacement of assets as they wear out by making adequate provision for their depreciation.

## FURTHER READING

Alexander Mather has provided a comprehensive review of the forest resources of the world and the dangers to them in *Global Forest Resources*, published in 1990 by Belhaven Press.

International reviews of the world's forest resources have been carried out every 10 years by the UN Food & Agriculture Organization. The most recent is available in the *Global Forest Resources Assessment 2005*, Forestry Paper 147. It was preceeded by *Forest Resources Assessment: Global Synthesis*, Forestry Paper 124, published in 1995.

*Natural Resources: Allocation, Economics and Policy* by Rees discusses the general characteristics of natural resources, including forests.

The unfortunate effects of some government policies on forests, particularly in the tropics, are examined critically by Repetto in *The Forest for the Trees? Government Policies and the Misuse of Forest Resources*, World Resources Institute, 1988.

## SOURCES


1 Alexander Mather. *Global Forest Resources*. Belhaven Press, London (1990), Chapter 4.
2 FAO. *Global Forest Resources Assessment 2005*. Forestry Paper 147. Food & Agriculture Organization of the United Nations, Rome (2005).
3 FAO. *Forest Resources Assessment 1990: Global Synthesis*. Forestry Paper 124. Food & Agriculture Organization of the United Nations, Rome (1995).
4 H. Jeffrey Leonard, *Environment and the Poor: Development Strategies for a Common Agenda*. Transaction Books, New Brunswick, USA and Oxford, UK (1989).
5 Frederic Benham, *Economics: a General Introduction*. 5th edition, Pitman & Sons, London (1955).
6 FAO. *Report of the Mission to Malaysia on the Tropical Forestry Action Plan, November, 1986*. Food & Agriculture Organization of the United Nations, Rome (1987).
7 M.S. Ross. The Development and Current Status of Land Clearing for Transmigration in Indonesia. *Journal of World Forest Resource Management*, **1** (2), 163–176, 1985.
8 John O. Browder. Development Alternatives for Tropical Rain Forests. Chapter 3 in Leonard, H. Jeffrey and contributors, *Environment and the Poor: Development Strategies for a Common Agenda*. Transaction Books: New Brunswick, USA and Oxford, UK (1989).
9 Robert Repetto. *The Forest for the Trees? Government Policies and the Misuse of Forest Resources*. World Resources Institute, Washington (1988).
10 J.A. Rees. *Natural Resources: Allocation, Economics and Policy*. 2nd. ed. Routledge, London (1990).
11 Alexander Mather, op cit, page 4.
12 J.E. Michael Arnold. Framing the Issues. Part I in *Farms, Trees and Farmers*. Edited by J.E.Michael Arnold and Peter A. Dewees. Earthscan, London (1997).

CHAPTER 4

# ACTIVITIES

Resources, which were discussed in the previous chapter, provide the inputs for forest sector activities. In turn, these activities give rise to outputs, which are the subject of the next chapter. The purpose of this chapter is to describe the range of activities that take place and examine their characteristics. The activities are very varied. They create incomes, employment and trade, and contribute to the welfare of the community at global as well as national level. Over time, the activities alter and the balance between them changes as the sector develops.

Some forest sector activities are forest-based and are concerned directly with the protection and management of forest resources; others are focussed on the transformation and movement of forest products, after they leave the forests, en route to consumers. The first group — the *forestry* activities — are 'supply' oriented. The forests are the source of tangible and intangible output and benefit flows. Forest management activities are broadly aimed at maintaining these flows, to both consumers in particular and society in general, in the short and the long term. The second group consists of *industrial* activities which are 'demand' or consumer oriented. They aim to satisfy the needs of end-users by converting raw materials from the forest into more valuable or useful commodities and distributing them to the places where they are required.

Forestry activities serve two purposes: conservation and production. The conservation function is concerned with protecting forest resources and safeguarding their capacity to provide future output flows. Conservation provides a variety of intangible benefits which accrue directly to particular groups of people or the community-at-large, as e.g. the conservation of habitat for endangered species, which preserves biodiversity for everyone. The activities aimed at production provide tangible outputs, some of which are used in their natural state and pass directly to consumers, while others form the raw material inputs which support the sector's industrial activities. The direct outputs include poles, fuelwood, game animals, fruits, fungi, etc, which are taken, mainly by people living near the forests, for domestic use; the industrial inputs must be processed to varying degrees before being sold to consumers within the country or for export. Forest management is therefore concerned with multiple outputs, the problems of joint production, and the resolution of conflicting requirements.

The size and economic importance of the two groups of activities is very unequal. Forestry activities tend to be widely spread and their impact is less obvious. Industrial activities are more concentrated and account for most of the sector's contribution to gross national product (GNP), a large proportion of the employment generated and nearly all the trade in forest products. They are mostly based on wood and nearly all the available statistics refer to wood products; FAOs 'forest product' statistics in fact refer to timber. A comprehensive view of the sector is obtained by dividing it into parts or *subsectors*, based on the different kinds of activity concerned with wood production. Other types of product do not involve all subsectors and service outputs accrue directly to consumers.

The first section of this chapter provides a classification of forest sector activities, based on division into six subsectors. Each subsector performs a distinctive function and interacts with other subsectors. Using this scheme, the contributions to value added, employment, capital formation and foreign trade, that are generated by the sector, are described and discussed in subsequent sections.

## 4.1 SUBSECTORS

Six distinct types of activity take place in the forest sector. These were recognised and described in a classic study by Dwight Hair of the economic importance of timber in the United States, which was published in 1963[1]. However, the types he distinguished are not peculiar to that country or applicable only to timber-based activities; they can be easily adapted to provide a convenient framework for general use. Hair's classification has been modified to derive the following breakdown of the forest sector into six subsectors:-

1. **Forest management** — all activities concerned with protecting, conserving and managing forest resources.
2. **Harvesting** — felling, cutting, gathering, collecting, removing and transporting wood and other forest products from the forest to local delivery points.
3. **Primary processing** — the conversion of wood and other forest products from their natural state into basic manufactured products, such as lumber, veneers, boards, pulp & paper, turpentine, rosin and essential oils.
4. **Secondary manufacturing** — the reprocessing and further manufacture of outputs from primary processing to produce finished goods, such as furniture, containers and paper products.
5. **Construction** — the use and fabrication of timber and other forest products for buildings and other fixed structures.
6. **Distribution and trade** — the transportation, handling, marketing and trade in timber and other forest products at all stages after harvesting.

These subsectors represent stages in the flow of production, which extends from the seedling to the consumer. The subsectors follow in succession, although some kinds of product do not need to pass through all the stages. Sawn timber illustrates the sequence. It begins in the forest with the regeneration and growth of trees to maturity; this stage, which may take many years, is part of the forest management

subsector. The next stage — the harvesting subsector — includes felling the trees, extracting the logs and transporting them to convenient collecting points, ready for sawmilling. The primary processing stage then takes over and the logs are cut up to produce lumber. Some of the mill output is sold to the secondary manufacturing subsector, perhaps for joinery, the remainder going to the construction subsector, say for roofing timber or shuttering. The activities involved in selling, handling and transporting the sawn timber, form part of the distribution and trade subsector.

The whole sequence of subsectors is not required in other cases as Fig. 4.1 makes clear. For example, poles, firewood and bamboo are used directly by consumers, without any processing. Similarly, some sawn timber and plywood passes straight from the mill to end users, avoiding secondary manufacturing. Many non-wood commodities, such as grasses, game meat, flowers and fruit, are taken for local sale or domestic use by people living in the vicinity of the forest; little processing is involved. However, other non-wood forest products, including gums, resins and some medicinal plants do entail factory extraction, distillation or purification before sale. Each type of output follows a different succession of subsector activities, which is more complete for some outputs than others. Nevertheless, all the activities which take place in the forest sector, can be assigned to one or other of the subsectors. The classification is all-inclusive.

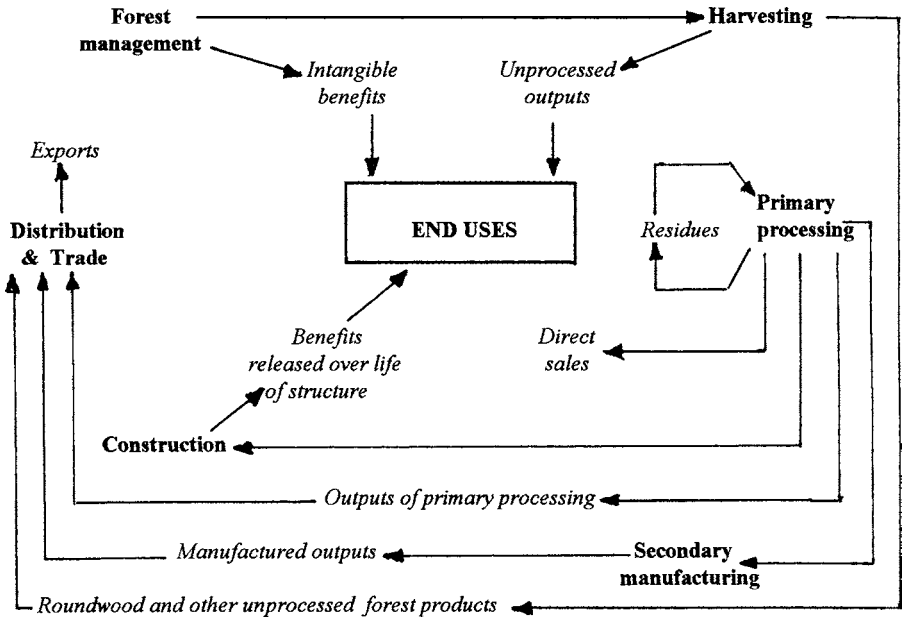


*Figure 4.1* Subsector output flows

The sequence of subsectors follows the direction of flow of raw materials and outputs from subsector to subsector. During their progression along the processing chain, there is a reduction in bulk or weight. When logs are sawn or peeled, or sawn timber is machined, some of the wood is removed; part is unusable and goes to waste, the rest is sold or recycled as a by-product. In some cases, residues are passed directly to consumers, as with sawmill offcuts used for domestic fuel; other residues, such as the cores of peeled logs, may be utilised to produce sawn timber or woodchips for the manufacture of particle board or paper. Most of the raw material used by the primary processing subsector comes from harvesting, but some is derived from other processing activities which take place in the same subsector.

This classification into six subsectors has the advantage of being comprehensive, but the disadvantage of including some activities which overlap with other industries or sectors. The first three subsectors are obviously forest-based. Forest management and harvesting take place in the forest. Primary processing depends on raw materials obtained from forest resources and provides outputs which are generally described as 'forest products'. The difficulty comes with the secondary manufacturing and construction subsectors. These absorb large quantities of forest products, but also utilise products from other industries. For example, wood and wood panels are used in furniture manufacture, but metal items, plastics and textiles are also important furniture inputs; similarly, cement and bricks are essential building materials — they are even required for the foundations of wooden houses — and some forms of construction rely more for strength and durability on metal components than wood. A significant proportion of the output of both of these subsectors is not attributable to forest products, does not depend on forest resources, and therefore, should not be included in the output of the forest sector.

The parts of the forest sector which are wholly dependent on the forest, i.e. the first three subsectors, support a variety of activities which are also wholly dependent on forest resources. Secondary manufacturing and construction are partially dependent on forest products and these subsectors may include activities which use only small amounts of wood or other products derived from forest resources, compared with the larger quantities of inputs drawn from outside the forest sector. In some cases, when the forest-based input is relatively small, it becomes difficult to say precisely which activities should be included in these subsectors and exactly where the boundaries of the sector should be drawn. Therefore, to some extent, the sector's size and limits are a matter of judgement. However, in practice, if forest products are significant inputs, the secondary manufacturing activities which use them should be recognised as forest sector activities.

Table 4.1 indicates the wide variety of activities found in the forest sector. Some forest management activities are supportive and protective. They are concerned with the continued existence of forest ecosystems in the face of threats from agricultural settlement, fires, excessive grazing and unrestrained cutting. Other forestry activities provide tangible outputs and are aimed at production. Harvesting and the subsectors which follow, contain activities which are related to their outputs.

*Table 4.1* Forest sector activities

| Subsectors | Activities |
|---|---|
| Forest management | protection of forest land and ecosystems |
| | construction and maintenance of forest roads |
| | regeneration, cultural operations and tending of forest crops |
| | inventory, yield regulation and control of harvesting |
| | agroforestry and community forestry |
| | watershed management and soil conservation |
| | maintenance of landscape features and scenery |
| | wildlife and game management |
| | habitat and species conservation |
| | recreation management and tourism promotion |
| | safeguarding the basic needs of forest dwellers and rural populations |
| Harvesting | timber felling and crosscutting |
| | extraction of logs and other roundwood from forest to roadside |
| | collection and removal of leaves, flowers, fruit, and other non-wood products |
| | hunting or collecting animals, birds and insects |
| | transport of forest products to mills or other local delivery points |
| | extraction of water and minerals |
| Primary processing | preparation and treatment of poles and posts |
| | preparation of bamboos, canes and fibres |
| | production of woodchips |
| | sawmilling |
| | veneer, plywood and blockboard production |
| | manufacture of particle board, fibreboard and other board products |
| | manufacture of matches |
| | pulp and paper production |
| | processing of gums and resins |
| | extraction of essential oils |
| | preparation of drugs and medicinal products |
| Secondary manufacturing | machining, drying and further treatment of sawn timber |
| | joinery |
| | wood turning |
| | furniture manufacture |
| | paper and paperboard manufacture |
| | further processing of non-wood products |
| Construction | prefabricated timber housing |
| | building construction |
| | timber engineering |
| Distribution & trade | marketing of forest products |
| | storage and stock control |
| | transport of timber and other forest products |
| | merchandising and retailing |
| | importing, exporting and shipping |
| | international trade activities |

Different processing and manufacturing methods, using different technologies, are used to produce different types of output. Thus, sawmilling requires machines and a workforce with the skills needed to cut up logs to produce sawn timber, plywood manufacture depends on 'slicing' or 'peeling' logs by rotating them against a knife and paper production is based on converting logs into woodchips and pulp by mechanical or chemical methods. Similarly, secondary manufacturing and construction activities are associated with the methods used. The kinds of activities involved in the distribution and trade subsector, such as marketing and transport, are generally comparable to those in other industries. They are functional, but differ in detail according to the nature of the product.

The list in Table 4.1 is intended show the range and diversity of the activities which take place in the forest sector, not to provide a comprehensive classification. Attempts at classification would require revision to keep up to date with changes in production methods and technology. Furthermore, each country displays a different assortment of activities — it has a distinctive forest sector profile of its own — which evolves year by year, as new industries start up, extra capital is made available and end users' requirements change.

As Box 4.1 illustrates, the very varied nature of these activities offers scope for specialisation by those who carry them out. A different person, agency or corporation, with appropriate expertise, frequently undertakes each stage, although some large corporations exhibit vertical integration and directly control all stages from the forest to the consumer. Except for these, the work in each subsector is done by different organizations, passing the output from one to the next, along the processing chain. As the output changes hands, ownership of the product is transferred from firm to firm. These transactions form the links in the chain and the value of the output exchanged at each stage builds up progressively as value is added to the product.

Sometimes individual enterprises or agencies undertake a range of activities which straddle subsectors. Thus government forest departments in some countries (e.g. India) not only manage forest resources but also undertake timber harvesting, and there are corporations (such as Weyerhauser) which control both forest resources and forest industries. The division into subsectors does not always correspond with the functions performed by organisations, although large-scale forest resources tend to be owned and managed by governments, while private sector companies concentrate on the processing and commercial activities associated with particular forest products.

Forest management activities involve distant time horizons because of the long periods required for growing trees to maturity — timber rotations in temperate zones frequently extend to 80 or 100 years. This is much longer than the time span required for industrial activities. Most harvesting is completed in days or possibly weeks; primary processing operations take a similar length of time. Investments in processing, such as sawmills or pulp and paper plants, usually have an economic life of no more than 20 years. Generally, the shorter perspectives of the industrial subsectors are better suited to a private enterprise approach.

**Box 4.1 The history of a window frame**

Six stages are involved, corresponding to the six subsectors, with six different types of organisation contributing to the process, as shown below. The forest owner is concerned with growing the timber crop from which the window frame is derived; at maturity, the trees are felled, the resulting logs are extracted from the forest and transported to mill by a logging contractor; there the sawmiller takes over and converts the round logs to sawn boards and scantlings; the rough timber then passes to a joinery manufacturer for resawing, machining and assembly into the finished window frame; the builders merchant holds the frame in stock in his warehouse before selling and delivering it to the building site; finally the window is installed in the completed house, which becomes the property of the new houseowner.

| | | |
|---|---|---|
| Forest management | *forest owner* | seedling ---------> mature tree |
| Harvesting | *logging contractor* | standing timber --> roundwood at mill |
| Primary processing | *sawmiller* | log ----------> lumber |
| Secondary manufacturing | *joinery manufacturer* | rough timber -------> finished frame |
| Distribution & trade | *builders merchant* | factory ----------> warehouse |
| Construction house. | *housing company* | building site ------> completed house |

## 4.2 VALUE ADDED

Value is added to forest products as they move along the chain from forest to consumer. Seedlings cost a few cents, but grow into mature trees worth many dollars. The price of a standing tree (i.e. its 'stumpage' value) is much less than the value of the logs obtained from it. Sawn timber is worth several times the cost of the logs from which it was cut. The amounts paid for forest products of all descriptions, compared with the cost of the raw materials used to produce them, become progressively larger as additional value is generated by the activities in each subsector.

At each stage, raw materials and other inputs are used up and outputs are produced. There is a difference between the cost of the inputs and the value of the outputs; this difference is known to economists as *value added* (see Box 4.2). The total of the extra value generated by each of the activities in a subsector represents the value added by that subsector. Similarly, the sum of the additional value from all six subsectors amounts to the value added by the forest sector as a whole. This represents the contribution of the sector to the total annual output of the nation, i.e. the portion of the gross domestic product (GDP) that is derived from forest sector activities.

**Box 4.2 Definition of value added**

**"Value added** — the difference between the value of a firm's (or industry's) *output* (i.e. the total revenues received from selling that output) and the cost of the *inputs* of raw materials, components or services bought in to produce that output. 'Value added' is the value that a firm adds to its bought-in materials and services through its own production and marketing efforts within the firm."

Source: *Collins Dictionary of Economics*, 2nd. edition, 1993.

Value can be taken away instead of being added if the cost of the inputs exceeds the value of the output; value added can be negative as well as positive. This arises if operations are notprofitable or only become profitable because the prices paid for inputs or received for the output are distorted and do not reflect their true economic value. This situation may arise when governments intervene in markets or provide subsidies to promote particular activities. The attempts to encourage domestic processing of timber and discourage log exports in West Africa and Indonesia, which were referred to in the previous chapter, provide examples of resource misallocation with detrimental consequences for the forest sector in the countries concerned. Inefficient industries can, too easily, become a drain on the GDP.

The subsectors provide two kinds of output: intermediate and final. Intermediate outputs provide the raw materials used for further processing inside the forest sector, while final outputs are those products which are sold to end users or exported to other countries. Intermediate outputs form part of the inputs to other subsectors and are therefore excluded when subsector value added is calculated. Only the final outputs are included in the value added for the whole forest sector.

The forest sector value added is made up of the sum of all of its final outputs, after deducting the cost of raw materials and the value of any inputs that are obtained from other sectors . It is necessary to deduct the inputs from other sectors because they represent part of the output (and value added) attributable to those sectors and would therefore involve double counting if they were also included in the forest sector's output. For example, the cost of diesel fuel for logging vehicles, resins for bonding plywood and upholstery materials for furniture are all deductible items, which are the products of other sectors.

Another way to look at value added is the way that it is spent; it represents the amount available for payment of wages and salaries, interest, profits, taxes and depreciation. The forest sector contributes to the national output and also to the total income of the nation. Foreign transactions apart, output and income at national level are different sides of the same coin; the income is used to purchase the output. The value added by forest sector activities (after allowance has been made for depreciation and stock changes) indicates the contribution of the sector to the total income of the nation. At subsector and enterprise level, value added can be broken

down to show the amounts spent on payments to staff and labour, and the level of profits, as illustrated for logging activities in Trinidad in Box 4.3.

Value added calculations for the forest management subsector face a special difficulty. If the product approach is followed:-

> Value added = value of wood and non-wood forest outputs — cost of goods & services from other sectors.

The difficulty is that the value of the forestry output (and any surplus or profit) is not the result of only one years growth. In the case of timber, the value of standing trees at maturity has been built up, year by year, over a long period. It is unreasonable to attribute the whole of this accumulated value to the GDP of one particular year. A better measure of the output of the subsector would be the value of the annual increment, i.e. the additional value generated by new growth. However, this may not match the amount felled. The value of the output actually

**Box 4.3 Harvesting in Trinidad**

Logging in Trinidad in the 1960s was carried out entirely by numerous small-scale operators working on short-term licences. After felling, logs were usually crosscut and frequently roughly squared before extraction by bull or tractor to roadside, where they were sold to sawmillers who undertook their own transport to mill. Most of the work in the forest was subcontracted to others who were paid according to the task performed instead of daily wages. The value added by harvesting operations was estimated from a sample of more than 200 licences, taken in 1964, which showed the following average costs and returns (in West Indian cents per cubic foot of timber):-

| | | |
|---|---|---|
| **Sale value of timber per cubic foot at roadside** | | **76 cents (100%)** |
| Royalty paid to Forest Department (stumpage) | | 9 cents (11.7%) |
| Value added | | 67 cents (88.3%) |
| made up as follows:- | | |
| Wages paid to employees | | 5 cents (6.5%) |
| Payments to sub-contractors | | 31 cents (40.6%) |
| felling, cross cutting & squaring | 8 cents (11.1%) | |
| loading | 2 cents (2.1%) | |
| extraction | 21 cents (27.4%) | |
| Licensees surplus | | 31 cents (41.2%) |
| licensees labour and animals | 8 cents (10.0%) | |
| profit | 23 cents (31.1%) | |

Source: Gane (1966).

**Box 4.4 The treatment of natural resources in national accounts**

".....there is a dangerous asymmetry today in the way we measure, and hence, the way we think about, the value of natural resources. Man-made assets — buildings and equipment, for example, — are valued as productive capital, and are written off against the value of production as they depreciate. This recognizes that a consumption level maintained by drawing down the stock of capital exceeds the sustainable level of income. Natural resource assets are not so valued, and their loss entails no debit charge against current income that would account for the decrease in potential future production. A country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers, and hunt its wildlife to extinction, but measured income would not be affected as these assets disappeared. Ironically, low-income countries, which are typically most dependent on natural resources for employment, revenues, and foreign exchange earnings are instructed to use a system for national accounting and macroeconomic analysis that almost completely ignores their principal assets."

Source: Repetto et al. (1989).

removed from the forest in any year may be more, or less, than the value of the new growth; it depends on circumstances and the decisions of forest managers. Only if the rate of removal matches the rate of replacement, does the output approach give a fair measure of the value added by forest management activities.

This difficulty can be avoided if the value of the output is adjusted to allow for changes in the value of the growing stock from year to year. However, this does not conform with the model system of national accounts published by the United Nations[2] and, consequently, it has not been customary practice to include forest inventory changes when national accounts are prepared. The problems associated with defining and valuing forest output were recognised some years ago by forest economists, including Kunnas[3]. More recently, the shortcomings of the present system of national accounts have attracted wider attention; the forest sector is not the only one affected when changes in the value of natural resource assets are omitted. Repetto et al. (see Box 4.4) have pointed out the serious consequences of treating natural resources as 'gifts of nature' and not allowing for either their depreciation as they are used up or their appreciation as they grow. This study[4], undertaken by the World Resources Institute, proposes a system of natural resource accounting, which is designed to correct the estimates of net national product and national income in national accounts. FAO has recommended a system of satellite accounts which would achieve the same purpose[5].

Corrections to the national accounts to allow for growing stock changes have been attempted in a number of countries with significant forest resources. In some cases this has been in response to the destruction of forest and other natural resource assets, which is taking place in some tropical countries such as Indonesia. The

recorded forest output in those countries overstates the sector's contribution to the national product unless an appropriate correction is made. While the GDP in Indonesia increased at 7.1 percent between 1971 and 1984, the true rate of growth of output, after accounting for consumption of natural capital, was only 4 percent according to the World Resources Institute study. In other countries the reverse occurs — the contribution to GDP is liable to be understated if new growth exceeds removals. This is the situation in Scandinavia, where the quantity of timber felled has been less than the volume increment over a number of years. It is also occuring in a few countries, such as New Zealand and Chile, where the forest sector is expanding due to rapid afforestation. New Zealand has adopted a system of forest resource accounting which indicates that changes in the value of the growing stock averaged about 1½ percent of GDP during 1989–93[6] (see Box 4.5).

**Box 4.5 Allowance for forest stock changes in New Zealand**

"In New Zealand, the rapid expansion of the exotic plantation estate from the 1960s was such that in 1978 it was decided to expand the coverage of the System of National Accounts (NZSNA) to incorporate the changes to the forest estate. Changes to the plantation estate have since been captured in the national accounts, along with changes to the livestock base in the agriculture sector. Based on these accounts, changes to the value of the plantation stock have contributed, on average, around 1.5 percent of total GDP over recent years. Changes to the value of the plantation stock have also made up about 25 percent of the total contribution of the forest sector to GDP."

National Accounts Data ($ million)

| Year | Change in value of forestry stock | Contribution to GDP[1] Forestry & logging | Forest Sector[2] | GDP | Increase in forestry stocks as a % of GDP |
|---|---|---|---|---|---|
| 1989 | 1092 | 1442 | 3884 | 66403 | 1.64 |
| 1990 | 1084 | 1538 | 4201 | 71435 | 1.52 |
| 1991 | 1075 | 1564 | 4244 | 73601 | 1.46 |
| 1992 | 1083 | - | - | 73378 | 1.48 |
| 1993 | 1165 | - | - | 77067 | 1.51 |

Notes: 1. Value added including changes in the value of stocks.
2. Includes Forestry & logging, manufacture of wood and paper products.

Source: Bigsby (1995).

National account adjustments have been taken further in Norway by attempting to include non-market goods and services[7]. The growing stock is increasing and

this is beneficial because it also involves additional carbon sequestration for which the forest acts as a 'sink'. It is argued that the resulting reduction in atmospheric carbon dioxide is equivalent to a reduction in the use of fossil fuels; this was valued by using the tax on petroleum fuel related to $CO_2$ emissions. The effect of this adjustment appears to be substantial: on timber sales of 3,371 million kroner in 1990, allowing for net growth of the forest stock added 522 million kroner (15%) and $CO_2$ fixation increased the value added by 1,925 million kroner (57%). The size of the increase depends on the method of valuation, however, and the adjustment might have been either larger or smaller than the estimate given if some other basis had been used. It is also worth noting that in other countries, where net losses in the growing stock are occuring, the value added should be reduced to compensate for the extra $CO_2$ released into the atmosphere. Adjustments to the accounts to allow for carbon sequestration in the forest, which are based on changes in the growing stock, do not tell the whole story, however. They assume that $CO_2$ is released as soon as the trees are felled, whereas if timber is removed from the forest and converted to sawn timber or other durable forms such as plywood, the release of the $CO_2$ contained in the processed wood will be delayed, often by many years.

These adjustments only apply to the value added by the forest management subsector. They are not applicable to the other subsectors concerned with harvesting, processing and subsequent activities, for which the value added calculations include adjustments for changes in stocks of wood products. As no adjustments for stock changes in the forest are made in most countries, statistics of the value added by forestry activities are liable to be misleading and less informative than the contributions recorded by other subsectors. However, the overall effect of such errors is less serious than might be thought. The value added by forest management is usually relatively small compared with the amounts generated by forest industries and, in relation to the contribution to GDP of the forest sector as a whole, the share provided by forestry activities is not very significant.

Perhaps the most striking feature of the value added by forest sector activities is the way that it builds up as forest products pass along the processing chain. Hair's groundbreaking study of timber-based activities in the USA illustrated this, as shown in Box 4.6. The forest management contribution was not adjusted for growing stock changes, but, even if it had been, the later stages would still have contributed far more than the subsectors at the start of the progression. A small amount of extra output from the forest leads to sequential value increases which multiply the economic impact many times before it reaches the consumer end of the chain.

Follow up studies in the USA[8] (USDA 1980 and 1982) shows that the forest sector's contribution to the national economy has altered over time and appears to be declining; the relative amounts coming from each of the subsectors is also changing. The value added attributed to timber increased from about $25 billion in 1958 to $48.5 billion in 1972. However, this increase was insufficient to keep pace with national economic growth over the same period, with the result that the timber-based contribution, as a proportion of GNP, declined from 5.6 to 4.1 percent; $1 out of every $18 of GNP came from timber in 1958, compared with $1 out of

**Box 4.6 Value added attributed to timber in the USA, 1958**

"The sum of the values added in all kinds of timber-based economic activities amounted to about $25 billion in 1958. This represented 5.6 percent of the Nation's gross national product — the market value of all goods and services produced. This means that about $1 out of every $18 of gross national product originated in some kind of timber-based economic activity.

Of the total value added attributed to timber in 1958 about 4 percent was added in forest management. An additional 6 percent was added in harvesting, 16 percent in primary manufacturing, 22 percent in secondary manufacturing, 31 percent in construction, and 21 percent in transportation and marketing.

Looked at another way these data show that in 1958 timber increased in value nearly 25 times between the stump and delivery of finished products to final consumers. On the average, to each $1 worth of stumpage cut another $1.50 was added in harvesting, $3.85 in primary manufacturing, $5.45 in secondary manufacturing, $7.60 in construction, and $5.35 in transportation and marketing."

Source: Hair (1963), page 5.

every $24 in 1972. The build up of value along the processing chain was also less pronounced. In 1958 timber increased in value nearly 25 times between the stump and delivery of the finished product to consumers, whereas the multiple had fallen to about 17 by 1972.

Although evidence is hard to come by because few comparable investigations have been carried out elsewhere, there is no reason to think that the progressive build up in value added in the USA is exceptional. A study of the forest sector in Trinidad[9] showed that in 1963, of the total value added by the first three subsectors (i.e. forest management, harvesting and primary processing), 8 percent came from forestry activities, 43 percent from harvesting and 49 percent from primary processing. In New Zealand, according to Bigsby, forest management + logging combined to provide 37 percent of the sector's adjusted contribution to GDP during 1989–1991. The build up is a general phenomenon, although the subsector percentages vary from country to country, depending on their particular circumstances.

Differences in the distribution of subsector activities between countries are inevitable, due to variations in their resource endowments and the stage of development reached. The nature of the forest affects the activities and the outputs. Countries such as Malaysia and Indonesia, which are rich in tropical rainforest, obtain a particular range of outputs from their forests and support forms of harvesting, processing and manufacturing which are adapted to that range and the prevailing climatic conditions. The balance of subsector activities in those countries is likely to be different to that found in countries with cooler or drier climates,

where the range of forest outputs is more resticted, and different technologies and working methods are used. Distinctive variations between countries also arise due to economic and social factors, such as population density, income per head, opportunities for trade with other countries, government regulation and the nature of the political system. These factors affect all aspects of national life and influence the path of forest sector development. As development proceeds, the processing chain tends to lengthen and the relative sizes of the subsector contributions alter; processing activities expand, manufacturing increases and a wider range of products is distributed to consumers.

The total value added in the forest sector, which depends on the size and range of subsector activities, varies from country to country. The sector's contribution, as a proportion of GDP, also varies between countries. Unfortunately, comparative data are not available. The few country analyses that have been published refer to different years and differ in scope. They provide few clues about the significance of the factors likely to influence sector size and importance. No general conclusions can be drawn about the sector's rate of growth or whether the relative size of its contribution to GDP is likely to expand or contract over time. It is obvious that during the course of development, the sector increases in size as more forest products are manufactured and the output flows become larger in quantity and value. What is lacking are insights into the necessary conditions for sector growth and the ways in which it can be promoted and sustained where this is desirable.

There is a dearth of information about the forest sector's role and economic contribution in different countries. In lieu of comparative value added statistics, the only surrogate that is available is provided by the figures of gross output of forest products published by FAO[10]. Although somewhat outdated, Table 4.2 gives an indication of the significance of the economic contribution resulting from forest sector activities. Usually, the value added by forest sector activities is less than the gross output, the difference being due to an unknown amount for goods and services purchased from elsewhere. However, the FAO figures exclude the economic contributions coming from secondary manufacturing, construction, distribution and trade; the omission of these subsectors is likely to affect the developing less than the developed nations. It is also possible that natural resource accounting and environmental adjustments, as described previously, would affect the positions of some countries in the table of comparative statistics.

The value of the world output of forest products in 1993 amounted to about 2 percent of the global GDP, according to the FAO statistics. Forest production in the developing countries accounted for about 3 percent, compared with 1 percent of GDP in the developed countries.This indicates the developing countries' greater dependency on primary production compared with the developed countries, where processing and manufacturing chains tend to be longer. Within both groups there are wide variations as can be seen in Table 4.2, although some care is necessary in interpreting them due to uneven reliability of the statistics. Some developed countries, which possess substantial forest resources, depend quite heavily on forest products, e.g. Finland (10%), Canada (6%) and New Zealand (6%); the value

*Table 4.2* Forest sector production and trade in selected countries, 1993

| Country or Region | Production *million $* | % of GDP | Imports *million $* | Exports *million $* | % of Trade | Consumption *million $* |
|---|---|---|---|---|---|---|
| Finland | 9 230 | 10 | 475 | 7 411 | 32 | 2 294 |
| United Kingdom | 4 055 | 0 | 8 192 | 1 932 | 1 | 10 315 |
| Germany | 14 481 | 1 | 9 502 | 5 751 | 2 | 18 232 |
| Spain | 3 658 | 1 | 2 479 | 1 032 | 2 | 5 106 |
| **Europe** | **75 235** | **1** | **47 141** | **41 427** | **3** | **80 950** |
| **Former USSR** | **18 443** | ~ | **124** | **2 061** | ~ | **16 506** |
| Canada | 30 655 | 6 | 2 082 | 19 295 | 13 | 13 442 |
| USA | 93 189 | 2 | 16 873 | 13 401 | 3 | 96 661 |
| **North/Central America** | **129 240** | **3** | **20 923** | **33 018** | **5** | **117 145** |
| Brazil | 17 437 | 5 | 308 | 1 995 | 5 | 15 751 |
| Chile | 2 742 | 4 | 152 | 1 134 | 12 | 1 760 |
| Guyana | 6 | 1 | 2 | 6 | 1 | 2 |
| **South America** | **25 421** | **3** | **1 639** | **3 532** | **4** | **23 528** |
| Bangladesh | 1 424 | 4 | 26 | 0 | 0 | 1 450 |
| India | 16 543 | 4 | 262 | 17 | 0 | 16 788 |
| Nepal | 957 | 20 | 1 | 0 | 0 | 958 |
| China | 34 659 | 2 | 4 648 | 1 121 | 1 | 38 186 |
| Indonesia | 13 519 | 6 | 556 | 5 158 | 14 | 8 917 |
| Japan | 21 828 | 1 | 16 767 | 1 684 | 0 | 36 912 |
| **Asia** | **111 899** | **3** | **33 701** | **15 203** | **2** | **130 396** |
| Australia | 3 065 | 1 | 1 216 | 468 | 1 | 3 813 |
| New Zealand | 2 194 | 6 | 273 | 1 310 | 12 | 1 158 |
| Papua New Guinea | 460 | 8 | 5 | 464 | 19 | 1 |
| **Oceania** | **5 814** | **2** | **1 541** | **2 350** | **4** | **5 005** |
| Senegal | 188 | 3 | 13 | 0 | 0 | 201 |
| Kenya | 1 729 | 11 | 15 | 1 | 0 | 1 744 |
| Nigeria | 5 281 | 4 | 77 | 20 | 0 | 5 337 |
| South Africa | 2 079 | 2 | 327 | 566 | 2 | 1 840 |
| Zaire | 1 788 | 20 | 5 | 50 | 15 | 1 743 |
| **Africa** | **25 276** | **3** | **1 672** | **2 027** | **2** | **24 921** |
| **All Developed Countries** | **246 834** | **1** | **85 325** | **80 232** | **3** | **251 926** |
| **All Developing Countries** | **144 493** | **3** | **21 417** | **19 386** | **3** | **146 524** |
| **WORLD** | **391 327** | **2** | **106 742** | **99618** | **3** | **146 524** |

Source: FAO. *Forestry Statistics Today for Tomorrow*: 1945–1993…..2010

of forest production was only about 1 percent of GDP in other industrialized countries, including Germany and Japan. Amongst the developing nations, some of the poorest countries rely on their forests for fuel, as in Nepal (20%), while others with substantial forest resources, such as Zaire (20%), Papua New Guinea (8%) and Indonesia (6%), are exploiting them to generate trade.

Without comparative statistics of the forest sector's contribution to national product in different countries, which are repeated at intervals to show changes in

the value added, it is very difficult to draw general conclusions about its growth and development. The sector may grow faster or slower than the rest of the economy and its performance in relation to the growth and development of other sectors may also change. The value added by the forest sector obviously increases as its activities expand and national development proceeds, but how best to influence the growth process, ensure that it is sustainable and obtain the greatest national advantage from it, are questions that cannot at present be answered satisfactorily. Scarce resources, combined in various ways, can significantly alter the contributions generated in different parts of the sector. Historical studies of forest sector development, based on the structural and economic changes taking place, are necessary before any general conclusions can be drawn about the mechanisms involved.

## 4.3 EMPLOYMENT

Forest sector activities contribute value to the total production of the nation; part of that value added consists of payments made to human resources in the form of wages and salaries. When value is added, employment is also generated. The amount of employment — the number of jobs — depends on the scale of the activities and also on their nature. Some activities in the forest sector are highly labour intensive, including many forest management operations, while others are described as capital intensive and employ a few skilled workers to control very expensive plant and machinery, as with pulp and paper manufacture.

Like value added, employment in the forest sector tends to expand with movement along the processing chain. Hare's study for 1958 showed the relatively small contribution provided by forest management in the USA — only 3 percent of the total employment attributed to timber; for every person employed in forest management, 10 more were employed in logging and primary processing and 30 more in the subsequent subsectors. Evidence for other years in the USA (see Box 4.7) and from other countries supports this general pattern, although the percentages obviously vary according to local circumstances and the stage of development reached.

Historically, the share of total employment that is attributable to the forest sector has tended to decline through time. Forests are now relatively less important as a source of industrial raw materials than in the past and the use of wood for industrial and domestic fuel has been largely superseded by other forms of energy in most developed countries. At the same time, labour productivity has improved and forest operations have become more mechanised. Mather[11] cites the example of Canada, where almost half the adult male population was involved in the timber and lumber industry in the late nineteenth century, while only 7 percent of the labour force is forest-dependent now. In Sweden, forest sector employment reached a peak at the end of the 1930s, since when it has declined at a rate of about 2 percent per annum. In the USA, the employment attributed to timber fell from 5.6 percent of total employment in 1954 to 4.5 percent in 1963 and 4.0 percent in 1972.

Forest resources were often used recklessly in the early stages of development, particularly in countries where they appeared to be unlimited as in North America.

**Box 4.7 Employment attributed to timber in the USA, 1972**

"Employment (full-time equivalent) in all timber-based economic activities amounted to 3.3 million people in 1972. This represented about 4 percent of the total civilian employment in the United States in 1972 and means that about 1 out of every 25 persons employed was engaged in some type of timber-based economic activity. In 1963, the employment attributed to timber was 3.1 million, about 4.5 percent of total civilian employment.

Some 4 percent of the employment attributed to timber was in timber management, an additional 6 percent in harvesting, 13 percent in primary manufacturing, 27 percent in secondary manufacturing, 24 percent in construction, and 26 percent in transportation and marketing. These data on employment attributed to timber show that for each worker employed in forest management and harvesting, four were employed in primary and secondary manufacturing and five in construction, and transportation and marketing."

Source: USDA (1980), page 27.

Large tracts were cleared to make way for farms and the residual forests were mined rather than managed. As areas were worked out, logging and sawmilling operations were forced to move on and the labour force, housed in camps, migrated to fresh sites. This transient pattern of natural forest exploitation is being repeated today in many developing countries, where 'cut and run' logging is prevalent[12]. So long as the resource lasts, employment continues at an inflated and unsustainable level; when the saleable timber has been worked out, most of the labour force is paid off or relocated. Forest sector development which is based on unsustainable rates of resource utilisation, is liable to destabilize forest-dependent rural communities. In these circumstances the forest sector creates employment, but it is not necessarily permanent employment.

When sustained yield management is introduced, the flow of output from the forest is likely to be reduced, which at first leads to job losses in rural areas although it may help to stabilize employment levels later on. It may not always be welcomed by the local communities who are hardest hit and special measures to soften the social impact may be desirable. In some respects the introduction of yield restrictions in forests is comparable with stopping the overexploitation of fisheries resources when boats have to be laid up and fishermen are thrown out of work. If time is allowed for adjustment by progressively reducing the rate of felling (or the size of the catch) over several years, new employment opportunities can be created and the work force can be retrained. It is preferable to anticipate the conversion to sustainable rates of exploitation rather than wait until the damage to the resources becomes critical or even irreversible. Forests are generally more flexible than fisheries because it is often possible to create new forestry employment by investing in silvicultural operations which increase the productivity of existing

resources, establishing plantations or diversifying the range of outputs/benefits that the forests provide. There are many opportunities for creating employment in the forest sector which can be used to allay fears of job insecurity.

Instability is also caused by fluctuations in the demand for forest products, which lead to corresponding variations in forest sector activity. Even though population growth and rising incomes per head lead to ever larger requirements for forest products, the upward trend in demand is not constant; it tends to be cyclical with periods of rapid increase followed by downswings, as countries experience alternate periods of economic expansion and recession. These fluctuations, which originate in the global economy, affect forest sector employment nationally and the numbers working in harvesting, processing, manufacturing and construction at regional and local level. Their consequences are felt most in places where the economy is poorly diversified and there are few opportunities for alternative employment. Their impact is greatest in rural areas and developing countries.

In the past, the cyclical movements in economic activity were more pronounced, there were long periods of depression, and special measures were taken to relieve widespread unemployment, poverty and social distress. During the 'Great Depression' of the late 1920s and early 1930s, forestry programmes were used to provide relief work in a number of countries. Roads, firebreaks, towers, picnic facilities and similar capital improvements were constructed in the USA[13]. Reforestation was carried out in Britain and in New Zealand (see Box 4.8) extensive areas were planted with exotic conifers which became the basis for a further wave of planting and large-scale forest industry development after 1960[14].

**Box 4.8 Afforestation in New Zealand**

"Most of the forest areas were established during one of two boom periods; the late 1920s and early 1930s and from the late 1960s onwards. The first planting boom extended 12 years, and comprised a variety of species, notably Corsican pine, ponderosa pine, lodgepole pine, Douglas fir and radiata pine. The bulk of these older plantings occured in the central North Island and were initiated by Government as part of depression relief-work schemes, in response to the perceived possibility of timber shortages and as a means of using cobalt-deficient, pumice scrublands."

Source: Valentine (1993).

After the Second World War, attention turned to efforts to raise living standards in the 'underdeveloped' countries. The potential of the forest sector for generating jobs and income in these countries was recognised as Box 4.9 shows and attempts were made to exploit it, though not always with the hoped for results. Nevertheless, employment creation remains a national policy aim in many places and

**Box 4.9 Labour absorption by the forest sector**

"Forestry and forest industries provide many opportunities of absorbing under- and unemployed labour. Even in the developed countries almost all operations in the forest are carried out by manual labour. Afforestation, thinning, pruning, nursery work and some aspects of insect and fire control, for instance, do not lend themselves readily to mechanisation: these operations are mechanised but rarely, and only in those countries where labour is extremely scarce and expensive.The same is true for many aspects of forest exploitation — save in those instances where large log sizes compel mechanization. What should be emphasized here, however, is that limited or negligible mechanization should not imply primitive methods of work. In all these phases there is ample scope for spectacular increases in productivity by the provision of suitable transport and simple, well-adapted tools."

Source: Westoby (1987), pages 51–52.

the mobilization of underutilized labour resources is often seen as a development priority. It is generally believed that the forest sector can make a worthwhile contribution to the achievement of this aim[15] although estimates have sometimes been over-inflated as Box 4.11 shows.

The numbers employed in the forest sector depend on the level of activity. Employment tends to increase as the sector expands, other things being equal. The greater the flow of forest products from subsector to subsector, the higher the level of activity and the larger the workforce required. If there are deficiencies on the supply side or fluctuations in demand, the growth tendency may be checked in the way previously described, but the underlying upward secular trend continues, based on long term increases in the consumption of forest products by the general population. However, this trend is offset by an opposing downward tendency: employment tends to be reduced by technological progress and improvements in labour productivity. When fewer people are required to produce the same output, the growth of employment is held back. Which influence is strongest depends on circumstances and the balance between the tendencies may alter with time. Future employment expectations should be treated with caution; they have sometimes been inflated because changes in technology and productivity were overlooked.

## 4.4 CAPITAL FORMATION

Forest sector activities generate incomes and employment; they also contribute to the formation of additional capital resources, which increase the sector's capacity to provide future output, incomes and jobs. Most of the present income flows, which accrue to organisations and employees, are used up during production or consumed to meet day-to-day needs, but a smaller amount is saved and invested

**Box 4.10 Overestimates of employment opportunities**

".....there appears to be a widespread tendency to overestimate the number of jobs that forestry and forest-products industries can provide. Employment potential is frequently an important element in forest policies or in justifying individual projects, and exaggerated or over-optimistic estimates have often been made. For example, it was forecast in the early 1970s that employment in forestry and wood industry in Australia would rise substantially: in fact it has declined. In Scotland the chief minister in promoting a programme of forest expansion in the 1940s looked forward to a day when forestry would employ as many workers as agriculture and coal mining (around 15,000). In fact it now employs little more than 10,000,"

Source: Mather (1990), page 278.

to meet future requirements. This contributes to capital formation within the sector and may in some circumstances provide capital for other sectors, thereby adding to total national investment.

Some problems with the definition of capital in relation to resources were described in the last chapter. Two kinds of capital were distinguished: capital funds and capital goods. Our concern here is with the accumulation (or run down) of capital as a store of value. Activities in the forest sector enable its resource endowment to be built up by additions to the value of the natural, human and capital resources that are present. Capital funds provide a mechanism for mobility which enables investment (or disinvestment) to take place where it is required. Capital goods refers to the physical assets, such as factories and equipment, which are acquired as a result of investment. However, investment may also affect the sector's natural and human resources.

According to Clayton & Radcliffe, the word *capital* refers to human generated wealth, including both the goods that society produces and the tokens of value, such as money, that society uses to transfer wealth[16]. They separate *artificial* capital, which is used for the goods and services that society produces, from *natural* capital, which refers to those features of nature that are directly or indirectly utilised or are potentially utilisable in human, social and economic systems. Both kinds of capital are present in the forest sector, but natural capital is mainly found in the forest management subsector whereas artificial capital is spread throughout all subsectors. The natural capital of the forests, consisting of the trees, plants, wildlife and other living organisms that have acquired value because of their utility to man, may conveniently be called *forest capital*. This classification is useful because it points out that the value of natural capital results from its utility; therefore its value may alter if people are prepared to pay more (or less) for it, regardless of any investment that may take place in the forests. However, the terminology is somewhat misleading because managed natural forests and plantations are artificially created by society.

Forest capital is therefore a hybrid, partly formed by nature and partly as a result of investment by society.

The artificial capital that is used during manufacturing and distribution consists of buildings, machines, vehicles, equipment and other artifacts; less tangible features of the productive process, such as the capacity to provide services and a specialized knowledge base are also included. Some artificial capital is employed in forest management activities, but most is to be found in the industrial subsectors concerned with handling and processing the raw material outputs obtained from the forest. The most important factor which controls capital formation in these subsectors is therefore the capacity to cope with the quantity of material passing through them in response to market demand from consumers — an increase in the required 'throughput' will lead to extra capital formation, once the existing capacity is fully utilised. Thus, global consumption of paper and paperboard averaged 25 kg per head in 1960, rising to 38 kg in 1984 and 44 kg by 1995[17]; world capacity for manufacture of these products amounted to 220 million metric tons in 1985 and is expected to rise to 337 million metric tons by the year 2000[18].

Capital formation also occurs in response to changes in technology. This involves the substitution of less expensive or relatively abundant resources for more expensive or scarce resources, as for example the introduction of labour saving equipment in forestry and harvesting, and the replacement of circular saws by bandsaws to improve sawmill recovery rates. New technologies can create entire new industries, cause old products to be replaced by new ones, create new inputs or increase the productivity of old ones, and otherwise affect the processes by which goods and services are produced, distributed and consumed[19]. This is illustrated by the development of new board products, such as medium density fibreboard (MDF). Generally it is very difficult to identify and separate capital formation caused by the need to increase capacity from that due to technological change; often investments are undertaken with both objectives in mind and statistics do not distinguish between them.

Artificial capital is continually created by investment and used up through wear and tear. The investment may be provided from income and savings generated within the forest sector or new investment may come from outside. It is the normal practice of business enterprises to reflect the run down of capital assets by allowing for depreciation in their accounts; they are guided by the principle of keeping capital intact and make provision for the replacement of fixed assets at the end of their useful life. However, in practice, the replacements are seldom identical to the old assets and the opportunity is taken to re-equip with up-to-date machinery and the latest technology. Assets may even be written off ahead of time if the pace of change is rapid and they become technically obsolete; investment in new production methods then becomes essential to remain competitive. The forest sector's endowment with artificial capital resources is renewed and updated by this turnover of assets. Without the turnover, the sector's activities would soon cease to be sustainable. Therefore, it is necessary to maintain an investment flow which is at least equal to the rate of depreciation. The long-term survival of the sector depends

on preserving a balance between capital formation and capital depletion. Sector expansion and development involves additions to the stock of artificial capital.

There is a significant difference between the types of capital: artificial capital depreciates in use and gradually runs down in value unless provision is made for its replacement, whereas forest capital is capable of self-renewal through regeneration and growth. Left to themselves, trees do not depreciate or wear out; usually their value appreciates as they get older until they become over-mature. Capital formation takes place through the biological process of tree growth. Trees increase in size, year by year, until physical growth slows down and eventually ceases in old age. Their value for timber also tends to increase with size, because large logs usually fetch a higher price per $m^3$ than small ones — sawmill wastage is lower and timber quality is higher. Ecosystem enrichment may also occur because older tree communities tend to support a greater diversity of associated species than is found among seedlings and saplings.

Forest crops consisting of trees of similar age, increase in volume and value as they grow; forest capital in the form of standing timber accumulates until the trees are felled. The longer that even-aged crops (such as plantations) are left to grow, i.e. the greater the rotation, the more the value of the growing stock, although the rate of capital accumulation slows down in later life. The capital value of uneven-aged crops (as in natural forest) depends on the distribution of size classes of the trees, but also tends to increase as the trees get older; a given area of forest may support a larger or smaller growing stock, depending on the species present, their growth rates and the way the crop is managed. Whether the crop is even- or uneven-aged, the amount of the growing stock and therefore the capital value of the forest depends on the age of the trees and is influenced by the management regime.

Management for sustained yield depends on maintaining a balanced succession of age classes, leading up to the oldest, and harvesting the age classes in turn. Within limits, the capital value of the forest can be altered by adjusting felling rates and changing the rotation or felling cycle while still preserving the continuity of the output flow. Longer rotations generally support a higher capital value per ha than shorter rotations and forest capital can be built up by slowing down the rate of felling and removal; conversely, a higher removal rate tends to reduce forest capital. The principle of maintaining capital intact, which applies to artificial capital, involving the preservation of a balance between the depletion and renewal of assets, is also applicable to forest capital. Normally, the rate at which forest products are removed should match the rate at which they are replaced by new growth. This *growing stock balance* is a useful indicator of sustainability. However, it is not an infallible guide because a management regime, which involves felling large, slow-growing, overmature trees in order to replace them with a young, quick-growing crop, may sometimes justify harvesting at a faster rate. It may also conceal ecological deterioration or other adverse environmental effects which alter the capital value of the forest.

If the balance is upset by excessive rates of exploitation, future productivity may be undermined. In extreme cases the forest resource may be degraded by

uncontrolled cutting and grazing or destroyed by forest clearance. The capacity of the forest to sustain the output flows to other subsectors will then be affected and the flows may even cease altogether. This will have a knock-on effect on the ability of the forest industries to continue to generate income, savings and investment. In the long run, the viability of the whole forest sector depends on the way the forests are managed; sustainable forestry is a prerequisite for a sustainable sector. If the forest capital is dissipated, the sector's capacity to replace its artificial capital will also eventually come to an end; both forms of capital are interdependent.

Historically, in several countries, the exploitation of untapped forest resources in their natural state has contributed to capital formation outside the sector and accelerated national development. In the USA and Canada, during the second half of the nineteenth and the first part of the twentieth century, their rich forest endowments were used to generate other forms of capital for the advancement of agriculture, mining, the construction industry, communications and manufacturing[20] (see Box 4.11). Rostow records the substantial increases in savings and investment rates that marked the 'take-off' stage in national economic development in these and other countries[21]. Profits from timber were ploughed back to create productive capacity in other sectors, often indirectly through the medium of foreign trade; timber contributed to a rapid rise in exports, which was used to finance imports of capital equipment and service the foreign debt. Wealth flowed out of the forest sector, pushing up investment and stimulating rapid growth.

**Box 4.11 Transformation of forest capital in the USA**

"The USA's deforestation was not a deliberate strategy to produce national wealth, but was an inevitable consequence of making room for agricultural expansion. Stocks of timber were converted into liquid capital, yielding arable land beneath them as an even greater source of national wealth. Previously unproductive forest assets produced an injection of housing materials, railroad ties, mine timbers, and other products for industry and household consumption. The newly converted lands under agriculture provided an increased flow of food products for both subsistence and market sales, helping propel the countries industrial urbanization. Forest conversion financed much of the USA's early economic development".

Source: Laarman & Sedjo (1992), pages 106–7.

Although forest resources were liquidated to provide funds for non-forest purposes in the past, present-day repetition of the process is subject to severe criticism and countries where it is being allowed to happen, even on a limited scale, face the prospect of international disapproval. Forests, after unrestricted exploitation, cannot continue to yield a steady flow of outputs for processing and consumption or the same range of intangible benefits for the community; the consequences

are obviously unsustainable and it is no longer acceptable to generate capital for development in such a destructive way. Those countries, particularly in the tropics, which continue to deplete the capital stock locked up in their forests for short-term commercial gain, would benefit if they adopted sustainable resource management practices. They would avoid much of the outcry from conservation activists but, more importantly, by maintaining the viability of the resource base, could sustain the income flows on which capital formation depends. Capital conversion could still take place, although at a rather slower pace.

Forest capital can be readily converted to artificial capital, but the reverse process is very difficult, often impossible, and involves waiting a long time for the trees to grow. The creation of forest capital depends on patience; the rate of formation is limited by the natural growth rate of the trees and there is a long interval between regeneration and harvesting. Waiting has an opportunity cost — the land might be used for agriculture or young trees might be sold as poles to obtain an immediate income instead of delaying felling until they reached sawlog size. There is a cost to society of the opportunities foregone whenever present consumption is put off for the sake of future benefits. Furthermore, forest capital is not homogeneous. Some forms are irreplaceable, such as tropical rain forest supporting complex ecosystems which have taken thousands of years to develop; replanting after felling cannot fully compensate for loss of the forest as a source of biodiversity, although forest capital will be built up in the new tree crop. Artificial capital is therefore an inadequate and imperfect substitute for forest capital.

The fact that different forms of capital goods are not freely interchangeable has serious implications for development policy and the important debate about environmental safeguards which lies at the heart of concerns about sustainability. In Box 4.12 Pearce, Markandya & Barbier[22] identified three key issues: (i) valuing the environment to take account of quality changes, (ii) extending the time horizon, and (iii) meeting the needs of the least advantaged in society ('intragenerational equity') and fair treatment for future generations ('intergenerational equity'). All three are particularly relevant to changes in national endowments of forest capital.

**Box 4.12 Intergenerational equity and sustainability**

"These three concepts of environment, futurity and equity are integrated in sustainable development through a general underlying theme. This theme is that *future generations should be compensated for reductions in the endowments of resources brought about by the actions of present generations*.

The underlying logic of this proposition is in fact very simple. If one generation leaves the next generation with less wealth then it has made the future worse off. But sustainable development is about making people better off. Hence a policy which leaves more wealth for future development."

Source: Pearce, Markandya & Barbier (1989), pages 2–3.

Until recently, it was assumed by many economists that it was acceptable to degrade natural environments if man-made capital wealth was provided in lieu. This view is no longer tenable. The conversion of forest capital into artificial capital is likely to deprive future generations of a range of tangible and intangible benefits which artificial capital cannot provide. This is most evident in tropical forests, where destruction and progressive deterioration is taking place at a rapid rate. These losses are irreversible and, clearly, will leave our descendents worse off. In very many places the natural forest capital accumulated over centuries is being dissipated in order to provide subsistence for poor farmers and no compensating investment is taking place outside the forest sector, but even where some development capital does result, the conversion fails the intergenerational equity test of sustainable development.

## 4.5 TRADE

Forest sector activities generate a substantial amount of trade between countries. Trade flows consist of imports and exports of goods and services; the exports of one country become the imports of others. Inputs of machines, technology and skills, which are not available from local sources, are imported to sustain the sector's productive functions. Outputs of timber and other forest products are exported to foreign countries for either consumption or further processing. Countries which are deficient in forest resources are obliged to meet their needs by importing from elsewhere. Other countries may possess forests, but for a variety of reasons lack the processing and manufacturing capacity necessary to use them fully, so import the finished products that they cannot make. Many countries are both importers and exporters, bringing in roundwood or raw materials from forests in other countries for further processing, and sending out manufactured products for sale abroad. The great natural diversity of forests and variety of different outputs derived from them enhance the possibilities of trade and make it impossible for any nation to be completely self sufficient. Generally, trade widens the range of forest products available to consumers and is therefore beneficial.

The pattern of trade in the forest sector is very complex due to variations in the forest resource endowments of countries, their differences in climate, topography and ecosystem distribution, and the uneven distribution of manufacturing facilities throughout the world. Some countries are heavily dependent on exports of forest products to provide foreign currency for general development purposes, others rely on imports to generate value added and employment for their own populations from the raw materials or semi-processed goods supplied by other nations. To the extent that international trade is not inhibited by tariffs, embargoes or other restrictions, it flourishes on diversity of outputs and the comparative advantages that countries possess for growing, processing and transporting different forest products.

As time passes, changes in the availability of forest products affect prices and consumer preferences, and the resulting market changes affect future production and trade flows. The pattern of trade evolves as countries develop at different

speeds and in different ways; it is also influenced by social differences, power politics and economic forces which have little regard for the welfare of the forest sector. Over the years, forest sector trade has expanded remarkably — total exports of wood products more than doubled in value between 1973 and 1983, and more than doubled again in the following decade. However this growth in trade disguises substantial variations in the quantity and value of its various components and also changes in its direction. As world trading conditions alter, the pattern of trade continues to adapt and develop.

About 3 percent of world trade is attributable to forest products; the forest sector's share of trade is similar in both the developing and developed countries. As can be seen in Table 4.2, the percentage varies slightly between continents, North/Central America being highest with 5 percent, while Africa and Asia derive only two percent of their trade from forest resources. The FAO statistics show that individual countries differ much more widely, ranging from a negligible amount in the drier parts of Africa and Asia up to 63 percent in the Solomon Islands[10]. The share is highest in those tropical countries which are rich in forest resources, rely heavily on log exports and have poorly developed processing facilities, as in the Solomon Islands, Myanmar (50%), Equatorial Guinea (48%) and Laos (41%). The developed countries generally have more diversified economies and the forest sector's contribution tends to be lower. Forest-rich countries again head the list, but those at the top all have sophisticated forest industries which provide substantial exports of processed wood. Finland derived 32 percent of its trade from the forest sector in 1993, followed by Sweden (15%) and Canada (13%); these countries were also the three largest exporters of paper and paperboard in the world.

The developed countries accounted for about four fifths of world trade in forest products in 1993; 80 percent of exports came from them and 79 percent of imports went to them, by value. They continue to dominate as Table 4.3 shows. The most important single country remains the USA, which was the leading importer

*Table 4.3* Major importers and exporters of forest products in 1997 and 2001

| Country | Value of imports *(million $)* | | Value of exports *(million $)* | |
|---|---|---|---|---|
| | 1997 | 2001 | 1997 | 2001 |
| USA | 24 134 | 24 026 | 16 334 | 14065 |
| China | 12 656 | 14 571 | 3 746 | 3 698 |
| Canada | 3 976 | 3 866 | 25 648 | 24 317 |
| Japan | 16 684 | 11 194 | 1 640 | 1 593 |
| Germany | 10 916 | 11 311 | 9 828 | 10 538 |
| United Kingdom | 9 993 | 8, 938 | 2 124 | 2 022 |
| Finland | 716 | 976 | 10 414 | 10 093 |
| Indonesia | 976 | 1 030 | 5 115 | 4 994 |

Source: FAO. Forest Products Yearbook, 2001.

and ranked second as an exporter of forest products, after Canada. A significant share of the world trade in forest products is therefore centred on North America and much of this is concerned with coniferous timber. Trade in forest products is regionalized within three important trading blocs — North America, the Pacific Rim and Western Europe[23]. Much of the trade between European countries consists of manufactured products. Indonesia, Malaysia, New Zealand and Chile are major exporters, providing roundwood, sawnwood and panels to Japan, Korea, China and Singapore. Indonesia is a leading supplier of plywood and Malaysia is a large exporter of veneer sheets. Imports by China have more than doubled since 1993.

More detailed analysis of the data for 2001 provides a breakdown of the production and export statistics into their components by quantity. The largest components of production consisted of outputs before processing took place, with its accompanying loss of bulk on conversion. Table 4.4 shows the proportion of production that was exported for each of the main products derived from wood. In its natural state, either as roundwood or roughly squared, timber is relatively low in value, bulky and costly to transport. Consequently, nearly all fuelwood is used locally and very little is exported. The proportion of industrial roundwood (including logs, pulpwood and woodchips) that enters international trade is also quite low. After processing, the value to weight ratio is higher and the percentage

*Table 4.4* World production and exports of forest products in 2001, and proportions entering trade

| Product | Quantity produced 2001 *million units*[1] | Quantity exported 2001 *million units*[1] | Proportions entering trade[2] | |
|---|---|---|---|---|
| | | | 2001 % | 1973 % |
| Wood Fuel | 1, 784 | 4 | 0.2 | 0.2 |
| Industrial roundwood | 1, 543 | 117 | 7.6 | 8.4 |
| Sawnwood + sleepers | 378 | 110 | 29.1 | 16.4 |
| Coniferous | 271 | | | |
| Non-coniferous | 106 | | | |
| Wood-based panels | 181 | 60 | 33.1 | 15.2 |
| Veneer sheets | 7 | | | |
| Plywood | 56 | | | |
| Particle board | 83 | | | |
| Fibreboard | 34 | | | |
| Wood pulp | 166 | 38 | 22.9 | 16.2 |
| Paper + paperboard | 320 | 95 | 29.7 | 18.6 |
| Newsprint | 39 | | | |
| Printing + writing paper | 95 | | | |
| Other paper + paperboard | 187 | | | |

Notes:
[1] Unit = 1 cubic metre of fuelwood, roundwood, sawnwood or panels, or 1 metric ton of pulp or paper.
[2] Exports as a percentage of production in 2001 and 1973.
Sources: based on statistics from FAO's Forest Products Yearbook, 1983–1994 and Forest Products Yearbook, 2001.

that is exported increases significantly. As with value added and employment, so also with international trade; activities at the beginning of the processing chain contribute relatively little compared with the amount of trade generated by subsequent subsectors. Most of the exports and imports of the forest sector are the result of its manufacturing activities and the proportion traded increases with the degree of processing.

In general, except for industrial roundwood, production has expanded in all categories since 1973 and there have been significant changes in the proportions exported as Table 4.4 reveals. The proportion exported was higher in 2001 than in 1973 except for industrial roundwood. This was largely due to efforts by the developing countries to reduce their roundwood exports and encourage domestic processing. Production of non-coniferous sawlogs + veneer logs from developing countries increased by 72 percent while exports fell from 50 to less than 20 million cubic metres between 1973 and 1993. Within the 'wood-based panels' group, instead of exporting their veneers, countries have tended to use them locally in the manufacture of plywood and other types of panel.

World exports of wood products increased in value almost $4\frac{1}{2}$ times, from $22.4 billion in 1973 to $99.5 billion in 1993, and since then by more than a quarter. All groups of products showed export value increases between 1993 and 2001, except for wood fuel and industrial roundwood. As can be seen in Table 4.5, the smallest

*Table 4.5* World exports of forest products in 1993 and 2001, and composition by value

| Product | Value of exports 1993 *million $, f.o.b.* | Value of exports 2001 *million $, f.o.b.* | Composition by value[1] | |
|---|---|---|---|---|
| | | | 1993 % | 2001 % |
| Fuelwood + charcoal | 224 | 85 | 0.2 | 0.1 |
| Industrial roundwood | 9,878 | 7,958 | 9.9 | 6.2 |
| Sawnwood + sleepers | 21,292 | 21,721 | 21.4 | 17.0 |
| Coniferous | 15,102 | 15,422 | 15.2 | 12.1 |
| Non-coniferous | 6,190 | 6,299 | 6.2 | 4.9 |
| Wood-based panels | 13,149 | 16,352 | 13.2 | 12.8 |
| Veneer sheets | 1,537 | 2,572 | 1.5 | 2.0 |
| Plywood | 8,009 | 6,474 | 8.0 | 5.1 |
| Particle board | 2,237 | 3,929 | 2.2 | 3.1 |
| Fibreboard | 1,365 | 3,378 | 1.4 | 2.6 |
| Wood pulp | 10,996 | 16,081 | 11.1 | 12.6 |
| Paper + paperboard | 43,728 | 65,707 | 44.0 | 51.4 |
| Newsprint | 8,163 | 9,332 | 8.2 | 7.3 |
| Printing + writing paper | 16,822 | 28,582 | 16.9 | 22.3 |
| Other paper + paperboard | 18,743 | 27,793 | 18.8 | 21.7 |
| TOTAL | 99,492 | 127,904 | 100 | 100 |

Notes:

[1]Composition as a percentage of total value of exports.

Sources: based on statistics from FAO's Forest Products Yearbook, 1983–1994 and Forest Products Yearbook, 2001

gain was in sawnwood and the biggest increase was in paper and paper board products. Exports of products which involved less processing and used methods which were less capital intensive tended to increase at a slower rate than more sophisticated products further down the processing chain.

The most significant factor in forest sector trade is the extent of processing activities that takes place. This is evident from the statistics of quantities exported, but is also born out by the data on the composition by value in Table 4.5. A negligible amount comes from fuelwood and the largest contribution is made by paper and paper board manufacturing, which accounted for 44 percent of the total value of exports in 1993 and 51 percent in 2001. Value tends to be concentrated in the later stages of processing.

While trade expanded, changes in its composition have also occurred. The concentration of value in the more sophisticated products has been accentuated with the passage of time. Between 1973 and 1993, the proportion of total exports provided by industrial roundwood decreased from 17.8 to 9.9 percent; by 2001 it had fallen to 6.2 percent. The contribution from sawnwood fell from 25.3 to 21.4 percent and subsequently to 17 percent over the same time periods. Conversely, the contribution from the more highly processed products has increased.

The stage of development of forest-based industries in particular countries has a more potent influence on their trade than their endowment with forest resources. Some countries have extensive forests but little in the way of industries and negligible exports, while others have used their forest resources to build up large-scale industries which contribute substantial export flows. For example, Guyana has 15.1 million ha of forest (76.7% of its land area) but exports forest products worth only a fraction of those provided by Finland, with a similar percentage of forest (73.9), which produced exports worth $10 billion in 2001. More than 70 percent of Finland's exports consisted of paper and paperboard. Forest resources, used as a basis for industrialisation, can generate substantial export benefits. Malaysia, with a comparable area of tropical forest (20.9 million ha) to Guyana, produced exports worth $4.3 billion in 1993, of which 31 percent consisted of panels and 41 percent was sawnwood.

There are also some 'transit processors', notably Singapore and Hong Kong, which have no forest resources of their own, but have developed wood-based industries using imported raw materials. A large part of the output of these industries is then exported. Singapore imported forest products worth $779 million in 1993; domestic production was valued at $204 million and exports at $442 million. However, the considerable quantity of sawnwood and plywood manufactured there is declining as hardwood log supplies are restricted by exporting countries in the region, which seek to create value added and employment for themselves rather than allow these benefits to pass to foreigners. Indonesia, for example, imposed a log export ban on 1st January 1985 to protect its rapidly expanding plywood industry. These restrictions have also affected South Korea, Taiwan and Japan, forcing them to search for alternative supplies of logs.

Protectionism and trade interventions of various different kinds are commonplace. They do not always achieve their purpose and usually tend to restrict the flow of trade. The general view of economists is that international trade has a beneficial effect on economic development. Free trade and expanding markets enable countries to specialize in the production of those goods in which they have a comparative advantage and, in theory, all countries would be better off if trade could be liberalized. However, even if this is the best policy for the world as a whole, it may not be in the interests of particular countries or individual producers of specific commodities. Supporters of restrictions argue that they can be used to improve the terms of trade for importers, increase employment by substituting domestic production for imports, encourage industrialization by protecting 'infant industries', generate revenue for governments and improve the balance of payments[24]. In practice, national interests often prevail over wider economic welfare considerations; trade barriers are a fact of life.

Any government law, policy or practice which is intended to restrict trade is described as a trade barrier. Two categories are usually distinguished: tariff and non-tariff measures. Tariffs are relatively straightforward charges on imports, which have the effect of putting a tax on other countries' exports, thus raising their prices compared with domestically produced goods. Non-tariff measures are diverse, and sometimes difficult to identify and measure; they include quotas, prohibitions and licencing of imports, and a variety of export controls, duties and taxes. The effect of these barriers is to reduce the volume and influence the pattern of trade. International efforts to reduce the barriers have focussed on the series of multilateral negotiations conducted under the auspices of the General Agreement on Tariffs and Trade (GATT). Significant reductions in tariffs resulted from the Tokyo Round of negotiations, which was completed in 1979, and the Uruguay Round, finalized in April 1994, led to further substantial lowering.

International trade in forest products has benefited from these negotiations. The extent of the tariff reductions which were achieved differed according to the markets and the products. In a study of the effects of the Tokyo Round, tariff rates for wood and wood products in major developed country markets, were estimated to be zero for wood in the rough; to have declined from 2.4 percent (pre-Tokyo Round) to 1.7 percent (post-Tokyo Round) for primary wood products, and to have been reduced from 7.8 to 5.7 percent for secondary products (UNIDO, 1983). Rates in most developed countries had reached very low levels even before the Uruguay Round. Imports of forest products from all sources, valued at $40.6 billion, were subject to a pre-Uruguay Round average tariff rate of 3.5 percent, falling to 1.1 percent post-Uruguay Round[25]. Tariff rates in developing countries are generally higher, often substantially higher, compared with rates in developed countries.

An important feature is known as *tariff escalation*, which is common in agricultural and forest products. This is the extent to which rates rise with the level of processing and value added; lowest on unprocessed products and rising with increased processing. Low or zero rates on wood in the rough, higher rates on

**Box 4.13 New barriers to forest products trade**

"In recent years there has been a proliferation of additional policies and regulations that have the potential of becoming 'new' barriers to the forest products trade. These barriers include:

- export restrictions by developing countries to encourage domestic processing of tropical timber for export;
- environmental and trade restrictions on production and exports in developed countries that affect international trade patterns;
- quantitative restrictions on imports of 'unsustainably produced' timber products;
- the use of ecolabelling and 'green' certification as import barriers.

Although only the last two measures could be strictly defined as new, all of these trade measures have been increasingly employed in recent years and have the potential to affect forest product trade flows significantly."

Source: Barbier (1995), page 9.

sawn timber and panels, and even higher rates on secondary products such as furniture are found in the forest sector. Tariff escalation has an adverse effect on exports of processed products from developing countries and inhibits their efforts to promote further processing in the forest sector. The Uruguay Round has reduced significantly the degree of escalation faced by forest products in developed country markets; the reduction on panels was 30 percent, on semi-manufactures 50 percent and on manufactured articles 67 percent, while on pulp and paper products it was eliminated completely.

Trade interventions by exporting countries include various taxes or levies on exports as well as log export bans and other quantitative and qualitative controls applied to specific products or species. In the past, export taxes on wood in the rough were used in many tropical countries as a way of raising revenue. Taxes and bans are now increasingly used for strategic purposes, such as the encouragement of forest-based industrialization and attempts by the larger exporters, particularly Malaysia and Indonesia, to capture a large share of the international market for tropical timber. At first, the tendency was to levy export taxes at descending rates: typically rates on logs ranged between 10 and 20 percent, rates on sawn timber were half those on logs, while rates on veneer and plywood were negligible. This export tax structure was designed to promote the development of forest industries and is still being used in some countries. However, export taxes have now been replaced by bans in many tropical countries[26]. It has also become clear that, even though export restrictions may have been successful in stimulating growth and employment, they have also led to overcapacity and inefficiency in forest industries.

Environmental issues are beginning to have an effect on trade as noted in Box 4.13. Producer countries may impose restrictions on forest exploitation to

preserve particular species of wildlife, ecosystems or areas of outstanding natural beauty. These restrictions have knock-on effects on the levels of harvesting and processing activities, and quantities, prices and trade in forest products. Trade may also be curtailed by the introduction of sustainable levels of harvesting where resources are at present being overcut and depleted. Global warming has become a major concern which encourages forest protection and stimulates afforestation. Bans by importing countries on tropical timber have been suggested with the aim of arresting tropical deforestation, even though they are very unlikely to be effective. Exporting industries in developed countries may be more tightly controlled to reduce water and air pollution, putting up their costs and prices, and possibly driving them out to other countries where standards are less demanding. The possibility of using trade barriers to try to alter the behaviour of countries that ignore standards of behaviour set by the global community on environmental matters, has now become an issue that can lead to international tension and disputes.

## SUMMARY

- A variety of activities take place in the forest sector; some are forest-based and concerned directly with the protection and management of forest resources, others are focussed on the transformation and movement of forest products after they leave the forest en route to consumers. The *forestry* activities are 'supply' oriented, while the *industrial* activities are 'demand' or consumer oriented.
- A comprehensive view of the sector is obtained by dividing it into six subsectors based on the different kinds of activity involved in wood production: forest management, harvesting, primary processing, secondary manufacturing, construction, and distribution & trade. Some types of product do not involve all subsectors and service outputs accrue directly to end-users.
- The subsectors form a sequence, following the direction of flow of raw materials and outputs, from subsector to subsector along the processing chain. Different technologies, time horizons and types of enterprise or agency are involved at each stage.
- Value is added to forest products as they move along the processing chain. The total value added by the forest sector is its contribution to the gross domestic product (GDP); it is made up of the sum of its final outputs less the value of inputs derived from other sectors. It is necessary to make adjustments for stock changes. Alternatively, value added represents the sum available for payment of wages and salaries, interest, profits, taxes and depreciation.
- Value added builds up along the processing chain; the later subsectors contribute much more than the earlier ones.
- Forest sector activities generate incomes and provide employment. Employment also expands along the processing chain.
- The sector contributes to capital formation by investment; *artificial* capital is man-made, in the form of buildings, machines, vehicles and equipment, while *natural* capital is derived from nature and owes its value to the uses to which

it is put. *Forest* capital consists of the capital found in forests, including their ecosystems and the trees, plants, wildlife and other living organisms that live in the forest, which may be augmented artificially by forest management and tree planting activities.

- International trade results from forest sector activities. About three percent of world trade is attributable to forest products; the developed countries account for four fifths of this trade. Most of the exports and imports of wood products are the result of manufacturing. World exports increased almost $4\frac{1}{2}$ times in value between 1973 and 1993 and since then by more than a quarter, the more highly processed products showing the fastest increase. Trade in forest products has benefitted from tariff reductions resulting from negotiations conducted during the Tokyo and Uruguay Rounds.

## FURTHER READING

Hair's classic study of *The Economic Importance of Timber in the United States*, published in 1963 by the U.S. Forest Service (Miscellaneous Publication 941), provided the first full analysis of sectoral activities based on timber, with their contribution to value added and employment along the processing chain. A later report showed comparative figures for 1963, 1967 and 1972 (USDA Forest Service General Technical Report WO-21, 1980).

The treatment of natural resources in national accounts is dealt with by Repetto et al. Their contribution entitled *Wasting Assets: Natural Resources in the National Income Accounts* has been reproduced as Chap. 25 in *Environmental Economics*, edited by Markandya & Richardson, Earthscan, 1992.

An important source of statistics is the UN Food & Agriculture Organization. *Forestry Statistics Today for Tomorrow: 1945–1993.....2010* which gives output data by countries. The *Global Forest Resources Assessment 2005* provides upto figures or removales from the forest. Production and trade figures are produced annually in the Yearbooks of Forest Products.

Westoby's important contribution *The Role of Forest Industries in the Attack on Underdevelopment*, was published by FAO in 1962. It is available, and was given a fresh perspective, in the collection of his writings published by Blackwell in 1987, entitled *The Purpose of Forests*.

International trade issues are examined by Barbier et al. in *The Economics of the Tropical Timber Trade*, Earthscan, 1994.

## SOURCES

1 Dwight Hair. *The Economic Importance of Timber in the United States*. Miscellaneous Publication 941. Forest Service, U.S. Department of Agriculture, Washington, D.C. (1963).

2 The methodology was set out in *A System of National Accounts*. United Nations, New York (1968), since when a number of revisions have taken place.

3 Heikki J. Kunnas. Forestry in National Accounts. *Folia Forestalia* **121**, Institutum Forestale Fennia, Helsinki, 1971.

4 R. Reppeto, W. Magrath, M. Wells, C. Beer and F. Rossini. *Wasting Assets: Natural Resources in the National Income Accounts*. World Resources Institute, Washington, D.C. (1989) Reproduced as Chap. 25 of *Environmental Economics*. Edited by Anil Markandya and Julie Richardson. Earthscan, London (1992).
5 FAO. *A System of Economic Accounts for Food and Agriculture*. FAO, Rome (1996), see Annex 2.7.
6 Hugh Bigsby. National Accounts and Forestry. *New Zealand Forestry*, May, 1995, pages 15–18.
7 Hans Fredrik Hoen. Forestry and National Accounting. *Scandinavian Forest Economics*, **34**, 1993, pages 134–147.
8 USDA. *Timber in the United States Economy 1963,1967 and 1972*. Forest Service General Technical Report WO-21 (1980).
9 M. Gane. Priorities in Planning. *Commonwealth Forestry Institute Paper No*. **43**, University of Oxford (1969).
10 FAO. *Forestry Statistics Today for Tomorrow: 1945–1993. . ..2010*. Food & Agriculture Organization of the United Nations, Rome (1995).
11 Alexander Mather. *Global Forest Resources*. Bellhaven Press, London (1990).
12 Jack Westoby. *Introduction to World Forestry*. Blackwell, Oxford (1989).
13 Albert C. Worrel. *Economics of American Forestry*. Wiley, New York (1959), page 277.
14 John Valentine. Private Forest Development: Experiences from New Zealand. *Commonwealth Forestry Review*, **72** (2), 92–94, 1993.
15 Jack Westoby. *The Role of Forest Industries in the attack on Underdevelopment*. First published by FAO in *The State of Food and Agriculture 1962*, Chapter III, 88–128. Subsequently reproduced as Chapter 1 in *The Purpose of Forests*. Blackwell, Oxford (1987).
16 Anthony M. H. Clayton and Nicholas J.Radcliffe. *Sustainability: A Systems Approach*. Earthscan Publications, London (1996).
17 FAO. *The Outlook for Pulp and Paper to 1995*. Food & Agriculture Organization of the United Nations, Rome (1986).
18 FAO. *Pulp and Paper Capacities 1995–2000*. Food & Agriculture Organization of the United Nations: Rome (1996).
19 David N. Bengston and Hans M. Gregersen. *Technical Change in the Forest-based Sector*. Chapter 8 in *Emerging Issues in Forest Policy*. Ed. Nemetz, P.N. University of British Columbia Press, Vancouver (1992).
20 Jan G. Laarman and Roger A. Sedjo. *Global Forests: Issues for Six Billion People*. McGraw Hill (1992).
21 W.W. Rostow. *The Stages of Economic Growth*. 2nd. edition. Cambridge University Press, London (1971).
22 David Pearce, Anil Markandya and Edward B. Barbier. *Blueprint for a Green Economy*. Earthscan Publications, London (1989).
23 Edward B. Barbier *Impact of the Uruguay Round on International Trade in Forest Products*. Food & Agriculture Organization of the United Nations (1996).
24 I.J. Bourke. Trade in Forest Products: a Study of the Barriers faced by the Developing Countries. *FAO Forestry Paper **83***. Food & Agriculture Organization of the United Nations, Rome (1988).
25 E.B. Barbier. Trade in Timber-based Forest Products and the Implications of the Uruguay Round. *Unasylva **183***, vol. 46, 1995, pages 3–10.
26 Edward B. Barbier, Joanne C. Burgess, Joshua Bishop and Bruce Aylward. *The Economics of the Tropical Timber Trade*. Earthscan, London (1994).

CHAPTER 5

# OUTPUTS

In this chapter we turn from the activities of the forest sector to its outputs. The activities provide the means by which the population's needs and aspirations may be satisfied. Activities are influenced from one side by the sector's resource endowment and from the other side by the nature of the outputs of goods and services which the community desires. The availability of resources restricts the range and scale of the activities and hence the output possibilities; society's requirements prescribe the outputs and hence the nature of the activities undertaken to provide them. The outputs that are actually generated, represent a compromise between society's wishes and its capacity to make those wishes come true.

The output possibilities of the sector are exceedingly diverse. Some are tangible and some intangible. They include an almost limitless variety of wood and non-wood commodities as well as social and even psychological benefits attributed to the continued existence of forests. Forest resources serve many purposes and have numerous functions which are valued by different groups of people in very different ways at different times. Therefore the first aim of this chapter is to describe the range of outputs derived from forests and classify them according to their characteristics and ways that they are used.

Some outputs can be traded and have market prices, while others provide services which are very difficult to value, even though in some cases they are indispensible for our survival. Demand for the former provides an economic justification for their production. On their account much of the activity taking place in the sector can be described as *market driven*. Present consumer preferences and prices, coupled with expectations about what will happen to them in future years, largely control sectoral events. But non-market forces also affect the sector and recognition of their importance has increased significantly during recent years; *social objectives*, derived from people's basic needs and increased environmental awareness, now play an important part in determining its activities and development.

The outputs in both categories are influenced by the people that use and benefit from them. Their wishes, backed by the spending power of individuals, groups and governments, determine the range and diversity of outputs that are produced in particular places at particular times. The amount of each output depends, in part, on the relative strength of the desire for that output and the actual mixture of

outputs that results in various countries is due to the way that output preferences are combined and expressed. The influence exerted by consumers and society on output is what was called 'consumer pull' in Chap. 2.

Influences on output from the demand side interact with constraints derived from the supply side. Without resources there can be no outputs and the rich variety of forest resources makes possible a wide assortment of outputs. The output flow is affected by the character of the forest, the nature of the workforce and the supply of capital that is available. The availability of these factors of production limits the range and quantity of possible outputs. From a more positive standpoint, abundant or underutilized resources can also serve as a stimulus to development. Forest areas under improved management may be made more productive to provide increased quantities of raw material for processing, or wildlife benefits may be enhanced for tourists by the provision of better facilities for visitors — so-called 'resources push'. Sector output is affected by supply constraints and pressures as well as the pulling power of society's demands.

Both sets of influences depend on signals which are given by output prices and values. Prices provide market signals; they indicate consumers' willingness to pay for outputs and, where prices exceed the costs of production, the prospect of profits is likely to encourage producers to maintain or increase the output flow. In other parts of the forest sector, where social objectives predominate and market prices are either lacking or give inadequate signals, the benefits obtained by the community must be valued in other ways. It is necessary to understand and bear in mind the limitations of the free market system as a way of controlling the flow of outputs; the system is not always a reliable guide as to what outputs should be produced or how much of each. Sector development should not be left entirely to market forces. They need to be tempered by interventions based on a wider range of indicators of social preferences than prices alone can provide.

The interaction between these two sets of influences — from resources on one side and consumers on the other — can lead to either growth and development of the sector or its impoverishment and destruction. If the sector's resource base is not safeguarded, the demands for outputs from it cannot be sustained. Attempts to exploit forest resources at a rate which is greater than their ability to regenerate and replace what is removed are doomed in the long run, although they may survive such impoverishment for a time. Alternatively, if future needs are intelligently anticipated, the productive capacity of the forests and industries depending on them can be increased to meet higher levels of demand and different combinations of output preferences. The forest sector is capable of continuously supplying an appropriate mix of outputs if managed correctly. Sustainable management depends on finding the right balance between demand and supply and reconciling the influences coming from both sides.

This chapter is arranged in four sections. The range and diversity of outputs is described in the first section and their role in relation to subsector activities, technological progress and development is discussed. The influences which determine output flows are examined in subsequent sections. In the second section the charac-

teristics of consumer demand and society's preferences are considered, including the effect of prices and values on levels of output; local needs, national uses and overseas trade contribute to total market requirements and the way that international concerns affect resource management is explained. In the third section, supply features are covered, including the time lags which are inevitable when dealing with forest resources and the global significance of some environmental outputs. The fourth section deals with the continuity of output flows, examines the sustainability concept and reviews the way it has evolved; recent initiatives to develop criteria and indicators for sustainable forest management are considered. It is concluded that sustainable development now requires a sectoral approach, based on endeavouring to match supply and demand over time, for outputs of all kinds.

## 5.1 RANGE AND DIVERSITY

The forest sector provides an extraordinary array of outputs. They range from large physical objects such as tree trunks to perceptions in the human mind. Those that are tangible can be measured, weighed or counted; they include wood in many different forms and non-wood products of all sorts. Others are intangible and have no material existence. Nevertheless, all outputs are associated with value. Just as forests, people and capital are converted into resources on account of their usefulness, outputs become outputs because of their value. People value things, and if those things are bought and sold, their value is reflected in the prices which are paid for them. Individuals or the community as a whole may also be prepared to pay for services, such as the provision of access to fine scenery, or for their abstract beliefs, as in the importance of preserving biodiversity for future generations. Some outputs, particularly the intangible ones, have no market prices and are very difficult to value in terms of money. Nevertheless this does not imply that they are worthless.

The value of forest sector outputs depends on people's willingness to pay for the goods and services that forests provide. Output values depend ultimately on the strength of the demand at the final interface with end users. At earlier points along the chain of processing activities, values are based on derived demand. Thus the requirements of consumers for sawn timber induce a corresponding requirement for logs from sawmills, which in turn leads to harvesting activities to provide the logs. The value of mature standing trees before they are felled is derived from the value of the logs which can be obtained from them and, at the next stage, from the value of the sawn timber when the logs are converted.

All subsectors produce outputs. Some of the outputs provide inputs for processing by subsequent subsectors, while others pass directly to end users. The outputs of the forest management subsector include those intangible benefits, such as carbon sequestration, which accrue to the whole population as well as the flow of raw materials for subsequent harvesting and processing. Some roundwood outputs from logging activities are used as fuel, posts, poles and pitprops, while others provide inputs to the primary processing subsector. Harvesting subsector outputs include a varied assortment of fruits, foliage, resins, bark and wild animals, which are

gathered or hunted in the forests; most of these are consumed directly, although some require subsequent further treatment or manufacture, e.g. into medicines, turpentine and cork.

The complex pattern of output flows stems from the variety of forest resources and the many ways in which they influence the livelihoods, life styles and well-being of the community. Subsequent processing also affects output diversity by adding to the possible ways in which forest products can be used. As Fig. 5.1 shows, wood removed from the forest may be roughly fashioned or converted to suit the needs of a whole range of industries. Residues derived from wood processing are also utilized in various ways and fibres from other sources outside the forest sector are mixed with wood pulp for paper and paperboard production. Manufacturing technology contributes to the diversity of products and the development of new technology has added to their variety. Medium density fibreboard (MDF) for example was omitted from the flow chart reproduced here as Fig. 5.1; this product was unknown when this diagram was first published in 1962[1]. Technological progress has thus expanded forest sector potential and in many countries has opened up new development possibilities.

Wood is the basis for a very large and varied group of outputs. By quantity and value, wood in all its various forms far outstrips all other types of forest products. It is a basic commodity with many uses which is essential to peoples' existence in all countries, developed and underdeveloped. In very poor communities, human dependence on wood for fuel and shelter is almost complete because there are no available or affordable alternatives; in wealthier and more sophisticated societies, processed and manufactured wood products are indispensable components of a modern life style. World production of these outputs reached a total value of $391 billion in 1993, of which about 63 percent was attributed to the developed countries[2]. It continues to increase, year by year.

The economic role of wood products is so important that most countries now prepare statistics of their production and trade. These are collected, compiled and published annually by FAO in *Forest Product Yearbooks*. Definitions of the various product categories used in their preparation have been standardised; they follow those published in *Classification and Definitions of Forest Products*[3]. The definitions are important because some categories are aggregate commodities, made up of groups of products, the components of which need to be distinguished: e.g. 'wood pulp' includes four types (mechanical, semi-chemical, chemical and dissolving pulp) which are produced by different methods and have different properties. The production statistics are aggregated according to the standard classification which is reproduced in Table 5.1. The tables of imports and exports follow a similar sequence, corresponding with the code numbers of the United Nations *Standard International Trade Classification*.

The Yearbooks show how forest sector output has expanded with the passage of time. Table 5.2 provides comparative production figures for 1969 and 1994, with the changes that have taken place over this 25 year period, for the main groups of wood products. Generally, output in the developing countries grew more

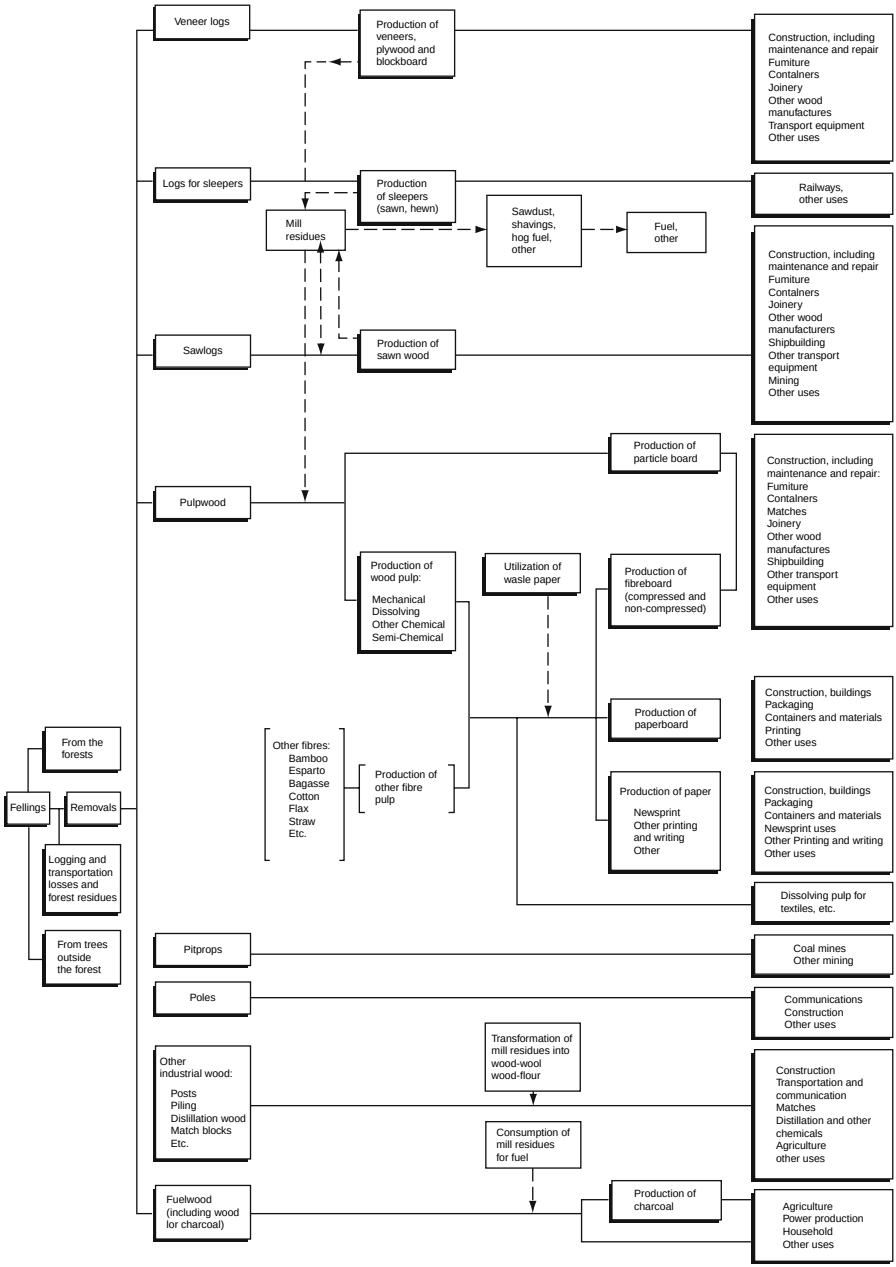


*Figure 5.1* Wood products flow chart
Source: Westoby (1987), pages 22–23.

*Table 5.1* Definition of commodity aggregates for production statistics

**Composition of Product Aggregates**

| Products | Units | AGGREGATES: Roundwood | Roundwood (C) | Roundwood (NC) | Wood Fuel, Including Wood for Charcoal | Industrial Roundwood-Wood in the Rough | Industrial Roundwood-Wood in the Rough (C) | Industrial Roundwood-Wood in the Rough (NC) | Sawlogs and Veneer Logs | Pulpwood, Round and Split | Other Industrial Roundwood | Sawnwood | Wood-Based Panels | Fibreboard | Wood Pulp | Chemical Wood Pulp | Pulp for Paper | Total Fibre Furnish | Paper and Paperboard | Other Paper and Paperboard | Forest Products Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CUM | CUM | CUM | CUM | CUM | CUM | CUM | CUM | CUM | CUM | CUM | CUM | CUM | MT | MT | MT | MT | MT | MT | US$ |
| | | P,I,E,C | P | P | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | P | P | P | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | P,I,E,C | I,E |
| Wood Fuel, Including Wood for Charcoal (Trade) | CUM | i,e | | | i,e | | | | | | | | | | | | | | | | i,e |
| Wood Fuel, Including Wood for Charcoal (C) | CUM | p | p | | p | | | | | | | | | | | | | | | | |
| Wood Fuel, Including Wood for Charcoal (NC) | CUM | p | | p | p | | | | | | | | | | | | | | | | |
| Sawlogs and Veneer Logs (C) | CUM | p | p | | | p | p | | p | | | | | | | | | | | | |
| Sawlogs and Veneer Logs (NC) | CUM | p | | p | | p | | p | p | | | | | | | | | | | | |
| Pulpwood, Round and Split (C) | CUM | p | p | | | p | p | | | p | | | | | | | | | | | |
| Pulpwood, Round and Split (NC) | CUM | p | | p | | p | | p | | p | | | | | | | | | | | |
| Other Industrial Roundwood (C) | CUM | p | p | | | p | p | | | | p | | | | | | | | | | |
| Other Industrial Roundwood (NC) | CUM | p | | p | | p | | p | | | p | | | | | | | | | | |
| Industrial Roundwood-Wood in the Rough (C) | CUM | i,e | | | | i,e | i,e | | | | | | | | | | | | | | i,e |
| Industrial Roundwood-Wood in the Rough (NC) Tropical | CUM | i,e | | | | i,e | | i,e | | | | | | | | | | | | | i,e |
| Industrial Roundwood-Wood in the Rough (NC) Other | CUM | i,e | | | | i,e | | i,e | | | | | | | | | | | | | i,e |
| Wood Charcoal | MT | | | | | | | | | | | | | | | | | | | | i,e |
| Wood Chips and Particles | CUM | | | | | | | | | | | | | | | | | | | | i,e |
| Wood Residues | CUM | | | | | | | | | | | | | | | | | | | | i,e |
| Sawnwood (C) | CUM | | | | | | | | | | | p,i,e,c | | | | | | | | | i,e |
| Sawnwood (NC) | CUM | | | | | | | | | | | p,i,e,c | | | | | | | | | i,e |
| Veneer Sheets | CUM | | | | | | | | | | | | p,i,e,c | | | | | | | | i,e |
| Plywood | CUM | | | | | | | | | | | | p,i,e,c | | | | | | | | i,e |
| Particle Board | CUM | | | | | | | | | | | | p,i,e,c | | | | | | | | i,e |
| Hardboard | CUM | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | | | i,e |
| Medium Density Fibreboard (MDF) | CUM | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | | | i,e |
| Insulating Board | CUM | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | | | i,e |
| Dissolving Wood Pulp | MT | | | | | | | | | | | | | | p,i,e,c | | | | | | i,e |
| Mechanical Wood Pulp | MT | | | | | | | | | | | | | | p,i,e,c | | p,i,e,c | p,i,e,c | | | i,e |
| Semi-Chemical Wood Pulp | MT | | | | | | | | | | | | | | p,i,e,c | | p,i,e,c | p,i,e,c | | | i,e |
| Unbleached Sulphite Pulp | MT | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | i,e |
| Bleached Sulphite Pulp | MT | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | i,e |
| Unleached Sulphate Pulp | MT | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | i,e |
| Bleached Sulphate Pulp | MT | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | | | i,e |
| Other Fibre Pulp | MT | | | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | | | i,e |
| Recovered Paper | MT | | | | | | | | | | | | | | | | | p,i,e,c | | | i,e |
| Newsprint | MT | | | | | | | | | | | | | | | | | | p,i,e,c | | i,e |
| Printing and Writing Paper | MT | | | | | | | | | | | | | | | | | | p,i,e,c | | i,e |
| Household and Sanitary Paper | MT | | | | | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | i,e |
| Wrapping and Packaging Paper and Paperboard | MT | | | | | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | i,e |
| Other Paper and Paperboard Not Elsewhere Specified | MT | | | | | | | | | | | | | | | | | | p,i,e,c | p,i,e,c | i,e |

**Legend**

**Aggregates**
- P=Production
- I=Import
- E=Export
- C=Consumption (P+I-E)

**Products**
- p=production
- i=import
- e=export
- c=consumption (p+i-e)

Notes:
- Production (P) for an aggregate equals the sum of production for all of its elements identified with a (p) in the column.
- Import (I) for an aggregate equals the sum of import for all of its elements identified with an (i) in the column.
- Export (E) for an aggregate equals the sum of export for all of its elements identified with an (e) in the column.
- Consumption (C) for an aggregate is calculated only when data for production (P), import (I) and export (E) are available for that aggregate.
- Consumption (c) for an element is calculated only when data for production (p), import (I) and export (e) are available for that product.
- Total import value (I) and total export value (E) equal the sum of import values (i) and export values (e) respectively identified in the column.

Source: *Forest Products Yearbook* (FAO, 2001). Symbols: C = coniferous, NC = non-coniferous, WIR = wood in the rough, CUM = cubic metres, MT = metric tons.

*Table 5.2* Output of wood products and changes over 25 years, 1969–1994

| Product | Developed countries | | | Developing countries | | |
|---|---|---|---|---|---|---|
| | 1969 *million units* | 1994 *million units* | Change % | 1969 *million units* | 1994 *million units* | Change % |
| Roundwood | 1,226.3 | 1,318.2 | 7.5 | 1,335.1 | 2,121.7 | 58.9 |
| Fuelwood + charcoal | 188.3 | 191.3 | 1.6 | 1,141.3 | 1,799.7 | 48.9 |
| Industrial roundwood | 1,037.9 | 1,126.9 | 8.6 | 193.8 | 422.0 | 117.8 |
| Sawlogs + veneer logs | 608.6 | 643.9 | 5.8 | 126.9 | 251.2 | 98.0 |
| Pulpwood + particles | 278.8 | 427.1 | 53.2 | 12.1 | 68.7 | 467.8 |
| Other industrial roundwood | 150.5 | 55.9 | -62.9 | 54.8 | 102.1 | 86.3 |
| Sawnwood + sleepers | 361.5 | 303.0 | -16.2 | 50.5 | 110.3 | 118.4 |
| Wood-based panels | 60.3 | 92.3 | 53.1 | 5.3 | 49.4 | 832.1 |
| Veneer sheets | 2.4 | 2.6 | 8.3 | 0.6 | 18.5 | 2,983.3 |
| Plywood | 27.5 | 28.8 | 4.7 | 3.4 | 20.1 | 491.2 |
| Particle board | 16.7 | 45.5 | 172.5 | 0.6 | 6.5 | 983.3 |
| Fibreboard | 13.6 | 15.4 | 13.2 | 0.7 | 4.3 | 514.3 |
| Wood pulp | 95.2 | 139.3 | 46.3 | 3.1 | 16.1 | 419.4 |
| Mechanical | 22.2 | 32.5 | 46.4 | 1.0 | 1.9 | 90.0 |
| Semi-chemical | 7.0 | 6.4 | -8.6 | 0.1 | 0.5 | 400.0 |
| Chemical | 61.0 | 97.6 | 60.0 | 2.0 | 13.0 | 550.0 |
| Dissolving | 4.9 | 2.9 | -40.1 | 0 | 0.7 | ~ |
| Paper + paperboard | 114.7 | 212.8 | 85.5 | 9.3 | 56.6 | 508.6 |
| Newsprint | 19.9 | 30.5 | 53.3 | 1.0 | 3.3 | 230.0 |
| Printing + writing paper | 23.8 | 66.6 | 179.8 | 2.4 | 15.4 | 541.7 |
| Other | 71.0 | 115.6 | 62.8 | 5.8 | 37.9 | 553.4 |

Note: 1 unit = 1cubic metre of roundwood, sawnwood and panels or 1 metric ton of wood pulp, paper and paperboard.
Source: FAO (1982). *1980 Yearbook of Forest Products* and FAO (1996). *1994 Forest Products Yearbook*.

rapidly than amongst the developed nations. This table also reveals significant differences between products; the increase in output has been greater amongst the technologically advanced products, such as particle board, than for long-established products, such as sawn timber. These trends have not changed in the last decade as Table 4.4 shows, although FAO statistics no longer distinguish between developed and developing countries.

Roundwood is produced by the harvesting subsector. The quantity of roundwood output far exceeds that from primary processing activities. Industrial roundwood is taken in for processing, during which its bulk is reduced by wastage; residues such as offcuts, plywood cores and wood chips emerge as bye-products during processing operations in addition to the main outputs of sawnwood, panels, pulp and paper. Fuelwood and charcoal are mostly used for domestic purposes. They account for only 15 percent of the roundwood produced in developed countries, compared with about 80 percent in developing countries where very large numbers of people rely on wood for cooking and heating. The total output of roundwood rose by one third over the quarter century, but the increase in the developed countries was only 7.5 percent whereas it reached nearly 60 percent in the developing countries.

The output of most types of processed wood increased at a faster rate than roundwood, although there were big variations between commodities. Sawnwood and sleeper production scarcely changed globally, but declined by 16 percent in the developed countries, while it more than doubled in the developing countries during the period. The world outputs of other product groups increased faster: wood pulp rose by nearly 60 percent, while wood-based panels and paper + paperboard more than doubled. Within these groups, particle board and printing + writing paper were the commodities which expanded most rapidly. Some of these variations were influenced by changes in processing technology as in the case of the differences between the types of wood pulp. Very large percentage increases in the output of all panel, pulp and paper products took place in the developing countries, pointing to the success of their efforts to build up forest-based industries.

Table 5.2 conceals large regional and national variations in output growth. As a group, the Asian countries expanded most rapidly and development of their wood-based industries has been unchecked throughout the period 1969–1994; their production of panels rose by a factor of 4.8 and paper + paperboard by a factor of 4.3. During this time, output in the African countries increased at a much slower average rate and actually declined after 1985. Within both regions, large producers followed the regional trends; between 1983 and 1994, Indonesian output of panel products increased more than threefold (mostly due to plywood) and paper + paperboard eightfold, while Nigerian sawnwood production remained more or less constant and panels decreased by about 100,000 cubic metres. Changes in Europe and North America were more moderate. Increases of about 20 percent in panels and about 50 percent in paper + paperboard production took place in the European countries over the period 1983–1994, while in North and Central America, dominated by Canada and the USA, the corresponding figures were approximately 15 and 37 percent. Industrial development in the forest sector, judged by the growth

of output, continues to make progress in most countries, although the pace of expansion has tended to slow down in those countries where economic development has gone furthest.

A broader historical perspective is provided by Mather[4] who identifies three major stages of development of forest resources in terms of their use:-

- the 'pre-industrial' forest, characterised by common property ownership and by the production of a wide range of products, of which wood for construction and fuel is only one.
- the 'industrial' forest, which is usually subject to use by private individuals or companies, although it may remain in public ownership. The product range is narrow and simple, with priority usually given to timber.
- the 'post-industrial forest, in which services such as conservation and recreation are provided alongside (or even to the exclusion) of timber production.

Although the sequence of stages is not rigid — some forests classified for management purposes as *protection* forests skip the industrial stage — and progress has been very uneven, these categories roughly correspond with the situation found in many developing countries, which are still in the pre-industrial stage, and the emergence in Western Europe, North America and Japan of the post-industrial stage. However, the stages tend to overlay rather than replace one another as the range of possible outputs widens and the relative importance of service uses increases.

In the pre-industrial stage, forest resources were largely used to meet the subsistence needs of the local population as shown in Box 5.1. Gradually, new opportunities for production and trade opened up, stimulated by population growth, better communications and technological progress; forest-based activities became increasingly commercialised. The traditional uses of forest resources were supplanted by the need for industrial timber of all kinds and its production became the primary objective of management. The industrial stage has been dominated by rapid expansion of wood processing and manufacturing in all its forms, aided by the invention of new ways of transforming wood as a raw material into more sophisticated products for consumers. This has provided the main driving force behind forest sector development during the twentieth century, although the rate of industrialisation has not been the same in all countries and some developing nations, such as Guyana, have lagged far behind.

From a development perspective, the predominant view of forests in the industrial era has been as the source of wood, forgetting the multiplicity of other products for which they were formerly valued. These became known as 'minor forest products' to distinguish them from wood, which was the 'principal forest product', as described in Schlich's *Manual of Forestry* published at the beginning of this century[5]. Non-wood forest products continued to be used, mostly locally, but tended to be overlooked and frequently went unrecorded. For example, the *Forest Products Yearbooks* issued annually by FAO are misnamed and only cover timber production. This attitude, which has been labelled 'timber primacy', is now being questioned as some countries enter the post-industrial stage. It has often led to a short-sighted use of wood resources, to the detriment and even destruction of the rest of the forest ecosystem, and has had adverse effects on forest dwellers in devel-

**Box 5.1 Uses of the forest resource**

| | |
|---|---|
| Traditional use and minor products | Fodder, grazing, shifting cultivation |
| | Food — fruit, nuts, honey, game |
| | Medicines |
| | Fibres |
| | Latex gums, resins |
| | Building materials |
| | Wood for utensils and furnishings |
| | Fuelwood |
| Industrial use | Sawlogs |
| | Pulpwood |
| | Veneer logs |
| | Fuelwood and charcoal |
| | 'Minor' industrial products, e.g. cork,turpentine |
| Non-consumptive uses | Soil conservation |
| | Water conservation |
| | Nature conservation |
| | Amenity |
| | Recreation |

Source: Mather (1990), page 124.

oping countries, who frequently depend on forest resources for subsistence[6]. Too often, the local population's share of the benefits of timber exploitation has been minimal, logging practices have been very destructive and the rate of felling clearly unsustainable. At the same time there has been a reappraisal of the significance of non-wood forest products (see Box 5.2). Their variety and value, if properly assessed, sometimes exceeds that of timber and they too may generate value added, employment and trade from processing, manufacturing and distribution activities.

The role of non-wood forest products derived from natural forests is twofold: for local consumption and as a basis for 'extractivism'. Local consumption is often very important ethnically and socially. Some of the concern about tropical deforestation is based on the injustice, hardship and deprivation suffered by tribes who inhabit remote forest areas; they depend on the forest for all their needs and without it, their customary way of life as hunter-gatherers or shifting cultivators becomes impossible; they must either adapt or perish. In a less extreme form of forest dependency, rural populations in developing countries collect fruit, foliage, fibres, flowers and fungi for local use, and hunt wild animals to supplement their diets. Similar traditional habits persist in developed countries where many non-wood forest products are consumed as delicacies (e.g. truffles) or collected as part of a recreational experience. Local consumption is not generally market-based and

**Box 5.2 The importance of non-wood forest products**

".....the belief that forests are of value only for wood production in a macro-economic context has gradually been modified — in the face of overwhelming evidence to the contrary, combined with a growing concern over providing sustainable benefits at both national and local levels. It is now apparent that forests provide a whole range of other products and benefits, most of which have long been known and utilized by local people, and many of which are still essential to their survival. The challenge is to better quantify and assess the value of these products; and then to transform the use of as many of them as are commercially, socially and ecologically viable from one of subsistence to one of development; i.e. to bring them into the mainstream of forest-products subsector planning and policy-making, alongside the already well established timber products of national and international commerce, while at the same time ensuring benefits to local people. These efforts must be an integral part of a comprehensive, realistic approach to realizing the full potential of forestry for sustainable development."

Source: FAO (1991).

many of these outputs are unpriced. It is small-scale and consequently does not have a large measurable economic impact.

Extractivism, on the other hand, depends on commercial forces and provides incomes and employment for local people. It has been defined as "the harvesting or extraction of naturally occurring non-timber forest products"[7]. In practice, traditional local uses of forest resources can turn into extractivism if wider markets for non-wood forest products emerge and their harvesting becomes organised. This has occurred in the past. Wild rubber from Amazonia, which was stimulated by the invention of vulcanization in the nineteenth century, is an outstanding example, but there are many others from other parts of the world. Saulei & Aruga[8] refer to the 'Minor Forest Product Industry' in Papua New Guinea, which started in the early 1900s during the colonial era and involved such products as gum copal, vatica gum, sandalwood, tannins, massoy bark, rattan and sales of butterflies and orchids.

Extractivism can be the basis of significant commercial and economic activity. Repetto[9] records that the exports from Indonesia of forest products other than timber, including rattan, resin, honey, natural silk, sandalwood, nuts and fruits, cosmetic and pharmaceutical products, reached US$ 120 million in 1982; there was also substantial domestic consumption. The value of these exports was nearly half as large as the total government revenue from timber exports. These products did not leave the country in the same state that they left the forest; preparation, grading, processing and packaging for sale followed harvesting, before they were fit for export markets. 'Downstream' activities undoubtedly added value to the products and generated employment, although there is no information about the amounts

or the numbers. In the same way that logging is the starting point for a chain of subsector activities based on timber, the collection of non-wood forest products also leads to manufacturing and distribution chains which connect the forest to end users. How long the chains are, how much value is added and how many people are employed, depends on the nature of the product and the requirements of the market. Each product is different and impact assessments are lacking. However, the economic effects expand along the chain, as with timber, and are likely to be comparable. Like wood, the non-wood outputs from forest resources are also capable of generating industrial activities, investment and economic expansion, and offer additional routes for forest sector development to follow.

A particular feature of non-wood forest products is their great number and versatility. To take just one class of products as an example, according to Lintu[10] about 3,000 essential oils are known of which about 300 are commercially important. He points out that non-wood products represent one of the most challenging product groups from a marketing point of view because of their diverse characteristics, variety of end uses and different types of producers, including individual gatherers, local cooperatives and large-scale, industrial plantations. Their markets range from simple, village level consumers to the most sophisticated industrial niche markets in both developed and developing countries. It is clear that these products have considerable potential from a development point of view, but realization of that potential depends very much on the skill with which they are marketed. Products and their end uses need to be defined and classified to provide satisfactory information for marketing and FAO has taken the first step by presenting a tentative classification system[11]. They have also been included in the 2005 Global Forest Resources Assessment.

Non-wood forest product development depends on exploiting opportunities for market expansion on the demand side and stimulating the flow of output on the supply side. In natural forest, either the populations of desired species may be enlarged by good management or net yields may be increased by better harvesting methods; alternatively, the domestication of suitable species and their intensive cultivation may lead to higher levels of productivity, as with tree crops such as cocoa and rubber. Research and field trials are necessary to select appropriate varieties, devise ways of raising yields and work out cultivation techniques. Further investment is then needed for plantation establishment, or other large scale application of the new methods, and subsequent processing, handling and distribution of the outputs. No doubt, the potential exists for forest sector development based on an enhanced range of non-wood products, but progress will be slow unless it is facilitated by the provision of information about production methods and appropriate incentives for investment at all stages along the subsector chain.

Industrial expansion, based originally on timber with the addition latterly of non-wood products, still provides most of the impetus behind forest sector development. Nevertheless, a new perspective has evolved, which become a major influence during the second half of the twentieth century. This is characterised by greater attention to the service functions of forests and less emphasis on the goods they

supply. The arrival of the post-industrial stage is marked by recognition of the need for broader environmental objectives, based on the sustainable use of forest resources. Forest management aimed solely at providing a sustained yield of timber is ceasing to be sufficient. It is being replaced by multi-purpose management and sector activities are now expected to deliver a much wider range of goods and services than formerly.

The output of goods is made up of timber and non-wood products. The services include the various protective functions fulfilled by forests, such as their role in soil and water conservation, which have been known for a long time, and other, more recently identified benefits, such as climate amelioration and the preservation of biodiversity. It has now become evident that the use of forest resources is not sustainable unless they are safeguarded and managed to provide both goods and services; there should be continuity of product flows without destroying the capacity of the resources to continue to provide services for future generations. Sustainability has moved on from a concern with continuity of timber supply to ensuring a continuous stream of tangible and intangible outputs of all kinds.

These services are sometimes described as 'non-productive' or 'non-consumptive' in the sense that physical products such as wood are not involved. However, these terms are misleading because forests may be managed to produce services, such as recreation, which are enjoyed by consumers. In some forests, the output of services generates more income and is worth more than the receipts earned from the sale of goods; services are certainly productive in terms of value and attract a share of the expenditure of consumers. There is no difference in principle between goods and services from a management point of view.

Traditionally, two categories of forest have been recognised for management purposes — productive and protective. Particular areas of forest were allocated in practice to one or other category. The principle objective of management in production forests was to produce timber, while protection forests were set aside primarily to safeguard watersheds, prevent erosion and protect soils. The services provided for environmental protection were therefore regarded as valid forest sector outputs, comparable to timber production, even if the cost of maintaining protection forests usually fell on the government. Similarly, the protection of areas of outstanding scenic and wildlife value has generally been regarded as a responsibility of the state. The national parks movement, for example, began in 1864 in the USA with the creation of the Yosemite National Park, which included a magnificent grove of the Sierra redwoods amongst its remarkable landscape features[12].

The output of services by the forest sector is not limited to recreation and environmental protection. There are also important cultural outputs. Laarman & Sedjo[13] have attempted to classify the role of forests in relation to five domains of human welfare, as shown in Box 5.3. Outputs which are physically consumed or used up, i.e. goods, form one group; the others can be regarded as services, although in some cases they have physical attributes, as with historic sites. The list demonstrates the variety of possible uses and the breadth of service functions, even though some items are questionable and others only relevant in very specific

circumstances. Thus, forests frequently offer opportunities for research, although the provision of research outputs is unlikely to be a forest management objective except over limited areas in a few special cases. Similarly, the deliberate retention of areas of forest, set aside to provide a stock of land for future agricultural use, can scarcely be regarded as a legitimate forest sector output, although it may be a reasonable land use decision in some circumstances.

Land use decisions affect the mixture of outputs and the balance between goods and services. Pearce[14] identifies various options for tropical forests which affect sustainability. They can be left alone — the *preservation* option. Maintaining the forest stock in broadly its original state but allowing human use of it, he describes as *conservation*; there is a broad spectrum of conservation options, including selective logging followed by natural regeneration, the harvesting of non-wood products such as rattan or latex, and possibly even a small amount of shifting cultivation provided it is on a scale that allows adequate time for re-establishment of the forest vegetation. However, any use which produces irreversible effects would not be classed as conservation. Options which are often called 'development' include clearance for permanent agriculture, clear felling of timber without regeneration and removal of the forest for roads, mining or industrial purposes. By these standards, conservation allows the forest to be used in ways which enable the continuous harvesting of goods to take place, while at the same time protecting its capacity to provide services; development on the other hand is viewed as destructive of the forest and precludes the possibility of growth and change on a sustainable basis taking place within it, i.e. it rules out development in the true sense.

At the beginning of this section it was pointed out that forest sector activities lead to outputs and that the distinguishing characteristic of all outputs is that they have value, even if this is sometimes difficult to measure. Attempts to value services have led to important new insights into the nature of the benefits derived from forest resources. Environmental economists have gone some way towards a taxonomy of economic value[15]. They distinguish user values which are derived from actual use of the resources, from intrinsic values which are based on their existence regardless of whether they are used or not. 'Use' means all forms of activity from which benefits are derived and includes pursuits, such as viewing scenery and studying wildlife, in which nothing is physically removed or used up. It also refers to opportunities to use resources in future years. By implication, all benefits derived from forests on which value is conferred, whether based on use or existence, should be regarded as outputs of the sector.

In order to compare conservation and development choices in a fair way, using cost-benefit analysis, it is necessary to capture the total economic value generated by all forms of output. This consists of use values and non-use values as shown below in Table 5.3; total economic value is the sum of the direct + indirect + option + existence values.

The *direct* and *indirect* use values are fairly straightforward in concept although they are not necessarily easy to assess in practice. They include the whole range of goods and services previously described. *Option* values relate to the amount that

**Box 5.3 The role of forests in five domains of human welfare**

**Protective services and influences**
- Climate regulation
- Regulation of atmospheric composition
- Stabilization of slopes, streambanks, water catchments and sand dunes
- Shelterbelts, soil moisture retention
- Streamflow regulation, flood reduction
- Land reclamation
- Buffer against spread of pests and diseases
- Nutrient storage, distribution and cycling
- Wildlife habitat
- Conservation of biological diversity

**Educational and scientific services**
- Research on ecosystems and organisms
- Zones to monitor ecological changes
- Specimens for museums, zoos, botanical gardens
- Wild stocks for foods, chemicals, biological control agents
- Environmental education

**Psychophysiological influences**
- Recreation, tourism, sports
- Sense of stewardship, peace, harmony with nature
- Inspiration for art, literature, music, myth, religion and philosophy
- Historic sites and values

**Consumption of plants, animals and derivatives**
- Timber: logs, pulpwood, posts, poles
- Fuelwood: firewood and charcoal
- Food products: fish, game, fruits, nuts, berries, seeds, mushrooms, spices, eggs, larvae, honey, syrups, teas, other beverages
- Herbs, flowers, medicinal plants, pharmaceuticals
- Gums, resins, lacs, oils, tannin, waxes, distillates
- Livestock fodder (grass, leaves)
- Thatch, ropes and string, weaving materials, silk
- Non-wood structural materials (e.g. bamboo, rattan)
- Skins, feathers, teeth, bones, horns
- House plants and pets

**Source of land and living space**
- New lands for cropping and grazing
- Habitat of indigenous (aboriginal) peoples

Source: Laarman & Sedjo (1992), page 3.

*Table 5.3* Total economic value in relation to the use of tropical forests

| Use value | | | Non-use value |
|---|---|---|---|
| Direct value | Indirect value | Option value | Existence value |
| Sustainable timber<br>Non-wood products<br>Recreation<br>Medicine<br>Plant genetics<br>Education<br>Human habitat | Nutrient cycling<br>Watershed protection<br>Air pollution reduction<br>Micro-climate | Future uses<br>(as in the direct and indirect value columns) | Forests as objects of intrinsic value, as bequest, as a gift to others, as a responsibility (stewardship). Includes cultural and heritage values. |

Source: Pearce (1991).

individuals would be willing to pay to conserve the forest for future use; even if no use is made of it now, the opportunity to use it later on is worth paying for. An option value is rather like an insurance premium which secures future outputs against the possibility that they will cease to be available because of deforestation. Genetic diversity is an example: within limits, paying to preserve diversity is worthwhile in case species or subspecies which might yield new crop varieties or medicines are wiped out. *Existence* value is based on people's willingness to pay for environmental assets even though they have no expectation or intention of using them. This is revealed by the widespread support for wildlife and other environmental charities. Debt-for-nature swaps, by which conservation organisations in rich countries buy up some of the foreign debts of developing countries in return for agreements to preserve particular areas of forest, are an example[16]. The motivation of those who contribute may be partly vicarious, in that they enjoy watching wildlife at second-hand through the lense of someone elses camera, but existence value probably owes more to a sense of disquiet about the state of the planet and peoples' desire to contribute to global protection in the only way open to them. Needless to say, it is very difficult to separate existence values from option values in practice and even more difficult to estimate their magnitude.

It is clear from this review that the forest sector is characterised by a very wide range and diversity of outputs. The range covers traded goods, various services and also invisible benefits derived from option and existence values. The latter are functional additions to the value created by forest resources, rather than true outputs, but they can be regarded as outputs from a management point of view because they contribute to the value generated by forest resources; decisions concerning future resource development should be based on their total value, not on incomplete assessments of their consequences.

It should also be noted that recognition of these wider categories of value inevitably leads to multiple-use management. Products like plywood or wild rubber are distinct entities which exist separately although they come from the forest. It is possible to focus management attention on them individually and to seek

to maximise their production regardless of any side-effects this may have on ecosystems or watersheds. In the past, as has been noted, timber production was paramount. Indirect benefits, such as nutrient cycling and climate amelioration, cannot be isolated in this way; they are inseparable from the forest resources which provide them and managers must consider output combinations instead of single outputs. Some are linked, such as timber production and carbon sequestration — young stands absorb carbon dioxide from the atmosphere, much of which is later released as the wood is harvested and utilized. Others are incompatible with each other, as with alternative species occupying the same site or the choice between plantation crops and natural ecosystems. The way that outputs can be combined and the value generated by possible combinations become unavoidable management issues. Similarly, option and existence values are additions to the value of direct and indirect uses; they cannot stand alone and must be considered in combination with other outputs.

The range and diversity of outputs available in particular countries, regions or forest areas is, of course, restricted — each is a subset drawn from the entire range of possible outputs. Each is composed of a mixture of outputs which depends on local circumstances, including the forest industries present, opportunities for trade, climatic conditions, terrain, the type of forest and the ecosystems present.These features set limits to the range of output possibilities. Within their limitations, the way the forest sector is managed puts further restrictions on the output mix. Some outputs may be favoured and others suppressed; some are produced jointly and others are incompatible with each other; more of one may mean less of others and choices made in the present may endanger future outputs. Sector management must deal with preferred combination of outputs rather than outputs taken separately and must accomodate shifts in consumer's tastes and evolution of the community's expectations.

## 5.2 DEMAND

Demand 'pull' represents the influence exerted by individual consumers and the community as a whole on output flows and the composition of the output mix. The basis of demand is the value of the outputs, as perceived by individuals and the community, backed by their purchasing power. Total demand for forest sector goods and services is restricted by society's ability to pay for them and peoples' willingness to forego outputs of other kinds in order to acquire them. The strength of the pull is counterbalanced by supply limitations due to the nature of the forest, the availability of human and capital resources, and the possibilities of trade.

In the previous section, value was identified as an attribute of all outputs, tangible or intangible, whether considered singly or in combination. The value of an output was taken as an expression of its worth to individuals and the community. More was intended than its money worth, although this is its customary meaning in economics. Value is often expressed or measured in monetary terms, but the underlying concept has a deeper meaning which is closer to the idea of 'utility' (see Box 5.4). By utility

**Box 5.4 The concept of value**

"The value of a thing derives basically from some need or desire which it has the capacity to satisfy. The greater this capacity, the greater its value will usually be."

"Value — as a property of a thing — can only be measured in terms of some desideratum, that is, some characteristic which people want in the thing. Using this desideratum as their criterion, people can rank things in an order of relative values. Those that have a high capacity for providing the desideratum are assigned a high value and those with a low capacity, a low value."

"....the value of a thing depends partly on the circumstances under which it is evaluated. Value is not a fixed, inherent property. Rather it is a variable property whose magnitude depends not only on the nature of the thing itself but also on who evaluates it and the environment in which it is assessed."

Source: Sinden & Worrell (1979), page 4.

is meant the satisfaction or pleasure that an individual derives from the consumption or use of an output; it cannot be measured directly because each person perceives utility differently, but the sum of the individual utilities within a population is equivalent to the value of the output to the community. Value is an indicator of relative importance and the comparative values of alternative things or actions provide guides for choices and decisions.

The measurement and comparative valuation of outputs is a separate subject in itself, which it is beyond the scope of this chapter. Our concern here is with the influence of utility and value on the size and composition of output flows. As perceptions of value alter, so also does the demand for different types of output in the forest sector. Table 5.2 demonstrated how the outputs of wood products changed in the 25 years after 1969 in response to changes in demand, with the largest increases taking place amongst the most highly processed products. The renewed attention given recently to non-wood outputs, as a group, has raised their demand profiles and consumers with increased incomes now seek more recreational and other services than previously. Generally, the strength of demand for most types of output increased and their range and diversity widened substantially during the twentieth century. Historically, the total recorded annual value of forest production in the world has risen year by year and new types of manufactured outputs have appeared; also, there is now a greater public willingness to pay for services which were previously unrecognised or taken for granted.

Outputs which are traded can be valued by the amount of money (or other goods) exchanged for them when they are bought and sold (or bartered). Market value is the product of the quantity and price at which transactions take place. Consumer demand varies with price and generally, the higher the price the less the quantity

demanded; economists portray this variation in the form of a demand schedule or a demand curve. When demand is very sensitive to price changes, i.e. when a small increase in price is associated with a large decrease in the quantity demanded, output flows are likely to be volatile and the level of activity in the industries which produce them tends to fluctuate. Conversely, when the quantity demanded changes little with price, employment and industrial activity are likely to be more stable.

Different products respond to price changes in different ways but estimates of elasticities of demand show quite a wide range of variation. In an extensive study over the period 1929 to 1960 in the USA[17], which is frequently quoted, a 1 percent increase in price led to falls in consumption of about 3.5 percent for sawnwood, 0.4 percent for paper and only about 0.1 percent for plywood. Other, more recent investigations relating to particular countries trade in timber products, which are cited by Barbier et al.[18], show many variations in elasticity and few significant differences between types of product, although sawnwood demand generally appears to be more responsive to price changes than panel products or paper and paperboard. There is no evidence that the derived demand for roundwood is more stable than the final demands for wood products, even though it might be thought that, as roundwood provides the raw material for several different kinds of processed outputs, it is therefore less dependent on the vagaries of particular, more specialised markets.

One feature of the processing and manufacturing chain, which affects the derived demand for timber, is the loss of bulk as material moves from subsector to subsector. Thus the final demand for a given quantity of sawnwood generates a derived demand for logs which is about double the amount of end product; during conversion the volume of logs is reduced by about half, by the removal of slabs and losses of sawdust. Conversion losses during plywood manufacture and the production of pulp and paper are comparable. Similarly, the derived demand for standing trees in the forest, prior to felling, allows for large quantities of branchwood and pieces left behind during crosscutting and extraction of the logs; much of the biomass accumulated during tree growth is discarded. The reduction in bulk between the forest and the consumer also affects prices because receipts from the sale of final products must cover it as well as meeting all the costs of processing and transport that are involved. The end result is that stumpage prices paid to owners of the forests are residuals — the amount left over after all other expenses are paid. Timber growers receive only a small fraction of the ultimate sale value to consumers. Fluctuations in the demand for final products tend to be transmitted backwards and magnified, leading to relatively large changes in growers incomes.

The main influences on demand for wood products, apart from price, are changes in population, incomes, tastes and technology[19] (see Box 5.5). Substitution usually has long-lasting effects, whether it takes place within the forest sector (e.g. sawnwood being supplanted by panel products) or results in the replacement of forest products by outputs from other sectors (e.g. wood fuel by alternative energy sources such as petroleum and electricity). Demand is also affected by the state of the economy and the general level of business activity, producing fluctuations which follow the trade cycle. The demand for internationally traded commodities

**Box 5.5 Influences on the demand for wood**

"Demand for wood products is affected by:

(a) population (quantity bought at a particular price increases, usually proportionally, with population);
(b) income per head (quantity of some goods, such as firewood, increases only slowly or may even decline with increasing national income, while other products, such as paper, form an increasing proportion of expenditure (income elasticity of demand for wood products varies widely around one));
(c) availability of substitute products (like fossil fuels) which reduce demand, or complementary products (like computer printers) which increase it;
(d) state of wood processing technology (without a domestic pulp or particleboard industry, there may be no industrial demand for small roundwood);
(e) tastes for timber products (since timber is often not sold directly to consumers, but undergoes further processing, formation of tastes occurs less through consumer advertising, more through supply of information to manufacturers on strength and working properties of particular species, and through general advocacy of wood as a material);
(f) state of business activity (if the economy is recovering from economic recession, the construction industry, a major consumer of sawn timber, is active: by contrast, during descent into recession, the construction industry is more depressed than the overall economy).

Source: Price (1989), pages 8–9.

is also uneven, depending on their availability elsewhere, competitive costs and prices, and the restrictions on imports and exports imposed by some countries.

Events outside the forest sector, which form part of the general mêlée of economic and social change, have the greatest effect on demand. The extent to which it is possible to influence demand from within the sector, to achieve sectoral aims or to manipulate it to suit the interests of particular individuals or corporations, is limited. There is little scope for advertising to increase the sector's share of national output because forest sector outputs are so varied and are marketed in such different ways; many are too specialised for mass consumption or can be easily obtained from alternative sources, making expenditure on product promotion unprofitable. Attempts to manage demand are more likely to come from publicity for new types of product or education aimed at correcting misinformation about products or practices alleged to be environmentally harmful.

These influences on demand operate in different ways and combine to produce patterns of use that vary greatly from place to place. Worldwide, population increase accounts for much of the expansion in wood consumption that took place in the twentieth century, but this generalisation disguises the significant differences

between countries and products revealed by the available statistics. Income levels also play an important part. Total sawnwood consumption per thousand of the population in 1991 for all countries was estimated at 85 cubic metres[20]. However, the comparable figure for the developed countries (275 $m^3$ per 1000) was more than ten times the consumption in the developing countries (26 $m^3$ per 1000). Canada (612 $m^3$ per 1000) and some European countries consumed double the global average, while insignificant quantities were recorded in the poorest countries in Asia and Africa. Similar discrepancies were recorded for paper and paperboard — world consumption was estimated at 45 metric tons per thousand people, the developed countries consumed more than three times as much (153 mt per 1000), while the developing countries used only about a quarter of the global average (12 mt per 1000). World consumption of paper and paperboard per head of population increased from 25 kg in 1960 to 38 kg in 1984, reaching 45 kg in 1991; production was expected to continue to grow by about 3.8 percent per annum[2].

Demand for non-wood products is subject to similar influences, although the extent to which most of these outputs are processed before they are fit for use is usually less than for timber, so that industrial requirements tend to have less influence on the output mix. However, non-wood products are so diverse that each must be looked at separately to understand the interplay of market forces that determine output. Extreme variations in demand are commonplace and prices are often unstable. Richards, writing about Amazonia, comments that expectations that non-wood products might become a major contributor to natural forest resource conservation have been badly over-estimated[7]. Among the reasons given for this are "the nature of the markets, with the inherent tendency to replace extractive products with synthetic substitutes and cultivated trees (domestication)". Export markets are often relatively small and volatile. Thus Babaçu oil exports from Brazil fell from $4.28 million in 1985 to $109,000 in 1989, due to substitution by synthetic detergents and less fatty edible oils. The future of natural rubber extraction is said to be bleak, due to competition from cultivated rubber elsewhere, and has only continued as a result of government subsidy.

Where markets are imperfect or even non-existent, monetary value becomes less reliable as a guide to the relative strengths of people's wants. Many of the forest outputs collected by the adjacent population for domestic use in developing countries, such as wood for fuel and grass for thatching, fall into this category; they are basic needs which most rural people have neither the income to pay for or the incentive to offer to supply on the scale required; the prices paid for the small amounts which are traded through local markets are not representative of the true extent and strength of consumer demand. Gathering of fungi, fruit and flowers from nearby woods and forests by country people is a traditional recreational activity in most developed countries, which also falls outside the market economy. It such cases it may be possible to estimate what people would be willing to pay for the outputs or the recreational experience, although the values obtained are often subjective and unreliable. It is difficult to infer prices for things which are not normally bought and sold, and hard to ascertain how much people might pay in hypothetical

circumstances which lie outside their experience. Demand assessment based solely on money values becomes questionable in these circumstances, although there is no doubt that the outputs concerned have an underlying utility for their consumers.

The demand for environmental services is particularly difficult to assess and some, such as clean air and water, tend to be regarded as 'free goods' of which there is an unlimited supply. Other service outputs, such as forest recreation, may yield revenue from service charges and it is possible to estimate the demand for recreation in particular places, taking account of travel costs to get to them. Monetary values can be put on specific outputs, such as those resulting from watershed protection and flood control, by carrying out cost-benefit analysis of their likely consequences, including downstream effects on agricultural crop production and damage avoidance benefits. However, it is more difficult to impute values to protective services like carbon sequestration that have widely dispersed climatic effects. Market forces do not instigate measures to reduce greenhouse gas emissions and civil action at national or international level is necessary to tackle global warming. The force of public opinion, expressed by environmental pressure groups such as Greenpeace, indicates the strength of public demand for action and influences government willingness to pay for remedial measures. Market valuation is replaced by political influence when resources are allocated, but this is likely to be an unreliable way of making choices about the use of forest resources. The problem for managers is how best to gauge the strength of demand for outputs that are not subject to market forces.

Biodiversity illustrates some additional difficulties involved in non-market assessment. Biological diversity is an umbrella term, which describes the variability of living things[21]. It can be interpreted in several ways and exists at several levels:

- *genetic* — the variety of genetic information contained in the genes of individual plants, animals and microorganisms;
- *species* — the variety of groups of genetically related individuals which breed with other individuals of the same species;
- *ecosystems* — the variety of distinctive collections of associated species which form biotic communities, occupying particular habitats and displaying different dynamic processes; they exhibit functional, community and landscape diversity.

It is necessary to identify the particular genes, species and ecosystems to be preserved, but genes and species only exist naturally, in various combinations, within ecosystems. Biodiversity is linked to associations of desirable genes and species, and the survival of the ecosystems in which they occur — it is site-related. In fact, it is a compound output composed of groups of interdependent organisms living in particular habitats. Biodiversity conservation is an aim that can only be achieved by protecting various combinations of characteristics in the places where they occur and the demand for biodiversity only becomes meaningful when it is related to the characteristics of particular forest areas. Furthermore, ecosystems exist in a state of dynamic flux. The conservation of biodiversity is therefore a slippery objective based on continually changing combinations of genetic material and species. The public desire for biodiversity of an unspecified kind that is commonly proclaimed,

needs to be pinned down and refined before forest managers can respond to it effectively.

It is clear that the forest sector is capable of providing a very diverse range of goods and services. Each type of output, treated separately, generates its own demand schedule, showing users willingness to pay, expressed either through market forces or the political process. The relative values of outputs are liable to alter as consumers' tastes change and public expectations of environmental quality evolve. However, joint production of outputs is usual; each piece of forest is capable of producing numerous outputs, many of which are interdependent, and the pulling power of demand is applied to the output combinations obtainable from different places and types of resource. The demand for outputs is, in reality, the demand for alternative output combinations which must be reconciled with the joint supply possibilities. The composition of output flows and the proportions in which outputs are combined are influenced by the relative strengths of demand; from the supply side, site limitations and management constraints determine the composition of the output mix.

## 5.3 SUPPLY

Supply represents the influence of resources on outputs. Forest resources provide a rich variety of outputs, which are produced in various combinations, depending on the capacity of the resources and the degree of human interference with their ecosystems. The output mix depends partly on environmental characteristics, such as geology, terrain, soils and climate, the type of forest and the ecosystems present, and partly on interventions in the systems, which favour some outputs in preference to others and lead to modification of the natural flora and fauna. Constraints on the outputs, due to natural causes, include site fertilitity, temperature, rainfall and location; the productive potential of each piece of land is also limited by the characteristics of the species present and their growth rates. Human intervention, when it is deliberate, seeks to loosen these constraints, increase the flow of the most desirable outputs and optimise the output mix. In extreme cases it may lead to replacement of natural forest by plantations, thus concentrating site potential on one (or a few) species and creating more intensive production systems. As with agriculture, there is a tendency towards monocultures as higher levels of output are sought. Alternatively, pure forestry may give way to agroforestry in which site potential is utilized more intensively to supply mixtures of food, fodder and fuel.

Forests which are in their natural state, without human intervention of any kind, are rare and only exist in places which people cannot reach because they are too unattractive or inaccessible. Historically, untouched forests were probably more extensive when populations were smaller, before the growth in numbers accelerated in the last hundred years, although what is known about human migrations suggests that few areas have remained completely undisturbed. However, even those forests which are truly pristine have been affected by climatic and geological changes to which their ecosystems have become adjusted. All forests are dynamic entities in

**Box 5.6 Changes in tropical forests**

"Throughout the tropics, evidence has been amassing over the last thirty years or so to show that the tropical rain forests are in the main less than 18,000 years old; that they change, both constantly and episodically, in all directions, just like European and North American forests; that they comprise species with totally different autecologies, so that no assemblage is ever precisely the same at any time,..... and, perhaps most surprisingly of all, especially for foresters, that the rain forests are infinitely younger than some of the world's savannas and tropical grasslands, formations which were once deemed to have been 'derived' from the climax forests."

"In a dynamic world, foresters must be seen neither to support discarded theories of stability, equilibrium, and 'forests as inviolate entities' nor to aid and abet the thoughtless production of landscapes of fear; their true value must be to play their part to the full to ensure maximum human benefit, for as long as feasible — allowing for constant change — in the landscapes that we *must* and *will* produce from the forests. Trees and wood, flowers and animals, can always have their role, but never the same, from one moment to the next."

Source: Stott (1997).

which adaptation is a continuing process, whether caused by human disturbance, changes in the external environment, or the internal rhythms and species interactions within the forest. The old idea that 'natural' forests are ancient, stable, climax communities, which must be protected from interference, is misleading (see Box 5.6) and the attitude to deforestation engendered by this belief is open to criticism. In particular, the conversion of some forest to agricultural systems appears inevitable and can provide greater value for people. Change, whether brought about by nature or human intervention, is a fact of life and what matters from a human point of view is the kind of change, its direction and extent.

Human intervention in forest ecosystems may be constructive or destructive — beneficial or harmful. As Stott[22] describes it, 'landscapes of hope' may be created if the existing natural forest is replaced by adaptive systems of land use, which enhance human benefits; alternatively, 'landscapes of fear' result from reckless forest exploitation and clearance, giving rise to erosion, soil degradation, poverty and misery. Deforestation is not always bad, but its consequences are likely to be irreversible and, as far as possible, should only follow careful consideration of its likely consequences; the benefits should be greater than the costs if it is to be worthwhile.

Forests which are free from human intervention, whether by geographical accident or deliberate exclusion of people, normally retain their protective functions. Most of the ecological changes that take place are gradual and the forests continue to provide

**Box 5.7 Rural poverty and tropical deforestation**

"Rural poverty is widely acknowledged to be the leading worldwide cause of tropical forest destruction. It is asserted that an estimated 200–250 million subsistence farmers and 'land-hungry migrants' living in a state of shifting cultivation and rural poverty destroy some 51,000 square kilometers of tropical forest every year. That is to say,the rural poor have been blamed for at least 45 per cent of the tropical forest area destroyed annually on a worldwide basis."

Source: Browder (1989).

a flow of intangible outputs, such as carbon fixation, biodiversity and watershed protection, which is only rarely disrupted by catastrophies like tropical cyclones, earthquakes or wildfires. The advent of people leads to use of the forests and widens the range of outputs to include timber and non-woody products, grazing and recreational services. New supply possibilities are opened up which do not necessarily interfere with the protective functions, provided that the level of exploitation is kept low. However, some disturbance within the ecosystem is inevitable and this leads to gradual changes which may affect species composition and distribution. At this level, the supply of desirable outputs from the forest is widened without threatening its existence.

Haphazard human intervention, due to indiscriminate cutting, uncontrolled burning or overgrazing, tends to build up as the population increases and may eventually reach the point when the restorative powers of the forest ecosystem are exceeded. After that, degradation and eventual destruction of the resource are likely, threatening the future supply of the entire range of outputs, both goods and services. The consequences of excessive use, if it is allowed to continue, may be serious where the indigenous population depends on the forests for its basic needs; eventually population growth will force people to migrate or change their way of life in order to survive. For example, scattered shifting cultivation in the tropics on long cycles may be supportable, but larger numbers of cultivators can lead to shorter and shorter 'fallow' periods and reduced soil fertility; transition to a more settled form of agriculture and displacement of people become unavoidable.

More generally, unprotected forests, treated as a 'common property' resource by the people living nearby, tend to deteriorate and disappear. This is evident in many developing countries where small farmers, who have no other way of making a living, cannot survive without clearing new land. Rural poverty has been linked to deforestation[23] as Browder explains in Box 5.7.

The uncontrolled exploitation of forest resources is liable to lead to loss of their capacity to provide goods and services. Their supply potential may be undermined gradually by overuse or, more drastically, by forest clearance for cultivation or by 'timber mining' by logging contractors. Logging often opens up the forest to subsequent settlement for agricultural purposes. The dangers of unregulated use

have long been recognised and, in some parts of the world such as the Mediterranean region, mismanagement of the land has been blamed for degraded scrub vegetation, denuded slopes, and silted river mouths[24]. Unsurprisingly, attempts were made in many countries to control the situation by government efforts to protect forest resources. In a few places all forests were nationalized in the belief that the people would then respect them and prevent their destruction (e.g. Nepal in 1957), in other countries (e.g. India) large areas were declared forest reserves, administered by government officials and managed in the national interest; in most countries privately owned forest is regulated to some extent.

The desire to prevent the deterioration and disappearance of natural forests is linked to concern about the future supply of vital goods and services which they provide. Destructive interference with forest ecosystems needs to be curbed. Based on this belief, the authority of the state has been widely used to try to safeguard the resource base and deter excessive levels of use; historically, the role of government in relation to forest resources has tended to be protective and preventative. This defensive attitude has had limited success, particularly in the face of overwhelming population pressure in the developing countries where basic human needs take precedence over wise use and deforestation continues unabated. It is now recognised that a more positive attitude is necessary — carrots rather than sticks. Instead of keeping people out of the forests, they should be motivated to look after them; rather than trying to reduce the flow of produce from the forest to match its productive capacity, outputs should be increased by better forest management and the encouragement of tree growing on farms outside. In those countries, government forest policies have shifted in favour of schemes which assist rural people to meet their own needs, such as community forestry (in Nepal), participatory forestry (e.g. India) and farm forestry (e.g. Tanzania).

Agroforestry, viewed as a source of supply of forest products, provides a limited range of outputs which are suited to the domestic needs of farmers (see Box 5.8) and, to a lesser extent, are sold to supplement the income obtained from agricultural cash crops and livestock. The growing of trees always involves some cost in terms of land, labour and capital invested, and must therefore fit into the overall farm economy; it must be related to farmers other objectives and alternative uses of their resources[25]. Furthermore, the outputs are not static. People's requirements and aspirations alter as their circumstances improve, other types of fuel and building materials become available at prices they can afford and new market opportunities open up for agricultural produce. Farm forestry, particularly in the earlier stages of rural development, can supply some of the outputs needed by the community, but it is not well-suited to the large-scale provision of wood as a raw material for industrial use or the long growing periods necessary to produce large, high quality logs. Nor is it capable of substituting adeqately for many of the service outputs of forests, such as scenic benefits, tourism and biodiversity. It is not a panacea although it can contribute significantly to total forest resources in appropriate situations.

The world's forests are shrinking while the demands on them are increasing. The only way that these demands can be met is by increasing the productivity of the

**Box 5.8 Tree growing by farmers in developing countries**

"Much of the early impetus for intervention to stimulate tree growing by farmers stemmed from concern about deforestation. Growing household demands both for wood and for land were perceived as progressively reducing wood stocks, and denuding the land of tree cover that performed essential protective and regulatory functions. Promotion of tree growing on farms was seen to be necessary in order to create new wood stocks where they were readily accessible to the main body of users, thereby reducing pressure on remaining forests, and to re-establish a protective tree cover in environmentally fragile landscapes."

"A powerful second, rural welfare, perspective focussed on the importance of tree resources in meeting people's fuel and other basic needs. Mobilizing farm households to grow more trees was identified as the most effective way for the rural poor to avert or reverse shortages of fuelwood and other essential tree products, from their own resources. As the diversity of goods and services derived from trees became better appreciated, a wider potential was postulated for 'agroforestry' — as a tool for resource-poor farmers in stabilizing and improving their farming systems. Tree crops could help the poor to increase output and generate income, and secure a greater degree of self sufficiency, with low inputs of capital and labour."

Source: Arnold (1996).

forest sector. Natural forests are giving way to other forms of land use in the third World while the area of forest elsewhere remains more or less constant. At the same time, the increasing industrial demand for wood products worldwide puts more pressure on the resource base. This opens up opportunities for constructive human intervention in the remaining forests in order to supply more of the material outputs that society desires on a sustainable basis. Constructive intervention is positive and purposeful; it involves deliberate choice of outputs and resource management. At first basic management is needed to protect the forests from destruction and control their rate of exploitation, later the emphasis shifts with the aim of increasing the output flow by interventions which affect the ecosystem. As management is intensified by the addition of more capital and human resources, the supply of the most highly valued outputs is enlarged to match as far as possible the long-term needs of the community.

It is to be expected that more and more forest will be actively managed, seeking the best way to combine natural, human and capital resources so as to supply a mixture of outputs in the optimum proportions. The higher the level of investment, the further from its untouched state the ecosystem is likely to become. Interventions result in modification of the natural flora and fauna, turning natural ecosystems into semi-natural systems. No doubt some places will be protected from human inter-

ference, preserved as wilderness areas or national parks and suffering only minimum disturbance, but, as standards of living rise, the need to increase production and market forces will lead to greater intervention and more substantial modification in the more accessible areas. Selective improvements in mixed forest stands progressively alter stand composition, increasing the the stocking of prime timber species while decreasing the proportion of secondary and noncommercial species. More drastic operations may turn uneven-aged forest into even-aged stands. Modification goes furthest when man-made forests are created, usually dominated by one tree species, occasionally by a mixture; often the species that are planted are 'exotics', such as teak, mahogany and Douglas fir, that have been introduced from foreign countries on account of their vigorous growth and exceptional value.

The choice of outputs that are bought and sold commercially, particularly timber and other forest products which are widely traded, is guided by market considerations. The prospect of future profits largely determines what will be produced and the amount of capital formation that will take place. Marketable outputs that can command high prices and are profitable to produce are likely to be favoured over less-attractive products with uncertain market prospects. The productivity of timber crops, as with agricultural cropping systems, can be intensified by investment aimed at maximising production of the most valuable species. Outputs which are not market driven, such as biodiversity and other environmental services, depend on administrative decisions. Forest managers control them, working within budget allocations which are influenced by perceptions of their environmental significance. To a large extent they are combined with the marketable outputs in joint production systems and have often been regarded as by-products.

An important task of forest managers is to reconcile the supply of marketable goods with non-marketed services in order to obtain the best mixture of outputs from the forest sector. Within physical and biological limits, it is possible to select the combination of outputs that is preferred. The mix may be altered over time; some outputs may be favoured and promoted while others are taken for granted or forgotten. However, since the outputs are derived from ecosystems, they are also interdependent and management interventions aimed at increasing one particular output may have unforeseen consequences on others. It is a great mistake to try to manage outputs in isolation.

Joint supply is a feature of the forest sector and forest management involves choices between various combinations of outputs. However, there are so many outputs that it is not practicable to consider every possible combination. Not all outputs are equally important, some may be irrelevant, some can only be obtained jointly and some are incompatible with others. It is necessary to select the outputs which are judged to be most significant in the given circumstances, leaving aside the rest on the assumption that they are not likely to alter resource management decisions. The choices can then be narrowed down for assessment purposes to consideration of alternative supply combinations of the significant outputs. The choices depend on:-

(i) the composition of the output mixture, i.e. what outputs to include and what weight to give to each?
(ii) the volume/size of each output flow, i.e. how to assess or measure them and how to combine flow assessments which are not directly comparable?
(iii) the timing of flows, i.e. how to take account of supply changes which take place at different times?

Each type of forest or forest area has many different production possibilities and its own particular set of limitations. Some places are suited to the conservation of wildlife, others are well-placed to supply timber, while the maintenance of vital water supplies may be the foremost consideration in upland catchment areas. The composition of the output mix that is appropriate is different in each case. The forest manager's task is to identify the optimum supply combination for that location — to select, in accordance with society's preferences, both the composition and the relative importance of the flows which make up the output mixture. These may be expected to change over time as the physical constraints and the availability of resources alter.

Some outputs are mutually exclusive and some are inseparably associated with others. Thus, the same piece of land can only be used to grow one species (or mixture of species) as a plantation crop; there may be alternative uses of the land — planting either spruce or pine perhaps, but not both. Similarly, management designed to maximise water supply is not likely to be compatible with planting Eucalyptus for maximum timber production, and biodiversity losses are inevitable if natural ecosystems are replaced by man-made forests. On the other hand, carbon sequestration and timber production go together; the higher the growth rate of the trees, the faster the build-up of biomass and the intake of carbon dioxide. Generally, it is easier to provide environmental services by protecting natural ecosystems in national parks or forest reserves than in forests managed for production. Up to a point, compromises can be achieved by assigning specific areas to particular main functions or groups of functions, thus obtaining a satisfactory blend overall from the resulting mosaic of predominant land uses.

Supply management is complicated by the time lags between decisions and their consequences, and also by the uncertainty that their effects may not turn out exactly as expected. Ecosystems do not respond immediately to interventions; the repercussions following disturbance may last a long time and their dynamic interactions are difficult to predict. Natural forests can be modified with the aim of increasing the yield of valuable species by selective felling and silvicultural operations, but altering the proportions of young trees does not lead to corresponding changes in the quantities harvested until many years later; furthermore the populations of forest dwelling animals, birds and insects will change gradually as their habitat alters. Plantation establishment does not result in mature timber in less than about twenty years, even on the most favourable sites in the tropics, and rotations of 50 to 100 years or more are common in Europe. Long delays increase uncertainty by extending the period during which expectations may be upset by events outside the

control of managers, such as changes in the world economy, political crises or chaos due to unpredictable climatic factors. The longer the wait, the greater the dangers.

In spite of these risks, which are unavoidable and unmeasurable, reasonable expectations about future supplies from the forest are essential to forest sector prosperity. Poor supply prospects hinder development, whereas optimism encourages it. Plentiful supplies lead to 'resources push' by encouraging forest industries to expand and develop. Where a ready supply of raw materials can be anticipated, either from existing underutilized forests or by increasing the future productivity of managed forests, new industrial investment can be justified, leading to more processed outputs and a larger volume of sales to consumers. When output from the forest can be expanded quickly, the stimulus to development may also be quick-acting; when there is a significant lag between forest operations and additional forest outputs, the knock-on effects on the rest of the sector also take time to emerge. Therefore, supply-driven industrial expansion in the forest sector is often delayed-action development, based on future increases in outputs.

No doubt satisfactory supply prospects are necessary for development to take place, but the same is true of demand. Supply on its own is not sufficient and needs to be matched by confidence about demand. In the short term, market expansion to match increased output may result from lower prices, better distribution, advertising and increased trade; over longer time periods, the level of demand is determined by population, incomes and international conditions. Within the limits set by future demand possibilities, forest sector development can be stimulated from the supply side. In the reverse direction, future levels of supply can be planned in response to demand stimuli. In practice, it seems likely that development opportunities come from both directions and the sector progresses by a series of adjustments aimed at balancing and rebalancing supply and demand. Because the sector is dynamic and its responses are uncertain, lasting equilibrium is never likely to be achieved. In fact, forest sector development appears to depend to a large extent on the capacity of individuals, organisations and nations to respond to new and often unexpected supply and demand opportunities.

Supplies of forest products need not come from domestic sources and many countries rely on trade. Shortage of forest resources need not prevent sector development if supplies of raw materials for processing can easily be obtained from abroad, as shown by the experience of places such as Hong Kong and Singapore (see Box 5.9). On the other hand there are resource-rich countries, such as Guyana and Papua New Guinea, where forest sector development has made slow headway, due partly to distance from markets and partly to difficulty in obtaining other factors of production. In addition to supplies of raw materials, forest industries need capital and human resources to expand and develop. Development has gone furthest where all three factors are available, as in Finland and Canada. Trade fosters development; it provides opportunities to both developing and developed countries by opening up new sources of supply and giving access to wider markets.

**Box 5.9 The significance of resource endowment and trade in forest sector development**

*Resource-poor countries*

Hong Kong lacks forest resources but has developed a significant forest sector based mainly on imports of industrial roundwood. ($529,000\,m^3$ worth $99.3 million). Hong Kong was the sixth largest importer by volume of tropical logs ($510,000\,m^3$), mainly from Malaysia and Papua New Guinea. Sawnwood ($441,000\,m^3$) and some wood-based panels ($41,000\,m^3$) were produced. Total production of forest products amounted to $189 million.

Singapore also has negligeable forest resources but imported industrial roundwood (32,000 m3 worth $3.7 million) and produced sawnwood ($25,000\,m^3$), wood-based panels ($355,000\,m^3$) and paper & paperboard (96,000 metric tons). This production (valued at $204 million) was about 1 percent of GDP and represented less than half of the island's apparent consumption of wood.

*Resource-rich developing countries*

Papua New Guinea has 36 million ha of forest, representing about 80 percent of its land area and 1.8 percent of the world's tropical forest resources; this amounts to about 9 ha per head of population. It produced forest products (worth $460 million), amounting to about 8% of GDP and was the world's second largest exporter of tropical roundwood. Wood exports (worth $464 million) represented about 19 percent of the country's trade. Most of the output of sawnwood ($117,000\,m^3$) and panels ($46,000\,m^3$) was used in the domestic market.

Guyana, with 18.4 million ha of forest, 94 percent of its land area and 1 percent of the world's tropical forest, is comparable to Papua New Guinea but has a smaller population and 17.7 ha of forest per head. The forest sector is relatively underdeveloped. Total production ($6 million), imports ($2 million) and exports (£6 milion) amounted to about 1 percent of GDP and trade. Industrial roundwood exports were insignificant, sawnwood production ($15,000\,m^3$) was very low and panel production was negligible.

*Resource-rich developed countries*

Finland is well-endowed with forests covering 20.1 million ha. or 66 percent of the country; it has about 4 ha per head of population. Total production (worth $9.2 billion)amounted to about 10 percent of GDP. 32 percent of the country's trade comes from wood, mostly exports ($7.4 billion) although imports ($475 million) were also substantial. Finland ranked third in the world in newsprint exports (1,252 metric tons) and fifth for woodpulp exports(1456 metric tons). Industrial roundwood was the main item imported, mostly from the Russian Federation.

Canada, with 453.3 million ha of forest covering 27 percent of the land area, was the world's foremost exporter ($19.3 billion) and also a large importer ($2.1 billion) of forest products. Total production ($30.7 billion) was about 6 percent of GDP. USA was Canada's largest trading partner.

Source: FAO. *Forestry Statistics Today for Tomorrow 1945–1993* and *1994 Forest Products Yearbook*.

The data refers to 1993; values are US dollars; non-wood products are not included.

Trade widens the range of choice for both suppliers and consumers. Without trade, supply possibilities would be restricted to what each country's forests could provide for its inhabitants and the living standards of consumers would be meagre in places which are poorly endowed with forest resources. Trade in forest products makes available a wider range of outputs all along the processing chain and extends consumer choice. Access to raw materials from abroad enables a greater variety of processed outputs to be manufactured and delivered to consumers, as happens in Europe for example, when tropical timbers are used for furniture manufacture. Market prospects may be enhanced in this way and may feed back to influence the suppliers of raw material in producer countries to increase their outputs and extend their activities; consumer pull from abroad can generate forest sector growth at home. However, the benefits of trade will be lost if the suppliers are unable to respond, either because forest resources have been squandered, as in many tropical countries, or because satisfying the overseas markets would lead to unacceptable overexploitation and rates of harvesting that cannot be sustained. The capacity to increase supply from the forest must exist, otherwise the benefits of trade will not materialize. It is generally easier to stimulate demand than to boost supply in the short term; longer term, the output flow is limited by the supply potential of the forest and its future productivity.

Imbalances between supply and demand arise because of the time taken for output flows to change in response to changing levels of demand. Shortages of outputs of goods which are traded are likely to induce immediate price rises and send signals to suppliers; they respond fairly rapidly with production increases within the limits of existing manufacturing capacity, stocks and raw material supplies. Underutilized forest resources usually take a bit longer to bring into production. Once their potential has been fully utililized, further supply expansion, if it is to be sustainable, depends on raising forest productivity levels which is often a lengthy process. The response times for outputs which are not traded, particularly those which affect environmental quality, are also lengthy; it has taken years of public debate to bring about changes in the public perception of issues, such as the importance of species protection and global warming, and similar time lags are likely before this heightened awareness leads to significant results on the ground. These imbalances can often be foreseen, although not always very accurately, and it is generally easier to forecast the future demand for goods than intangible services. Continuity of supply depends on anticipating and adjusting to these imbalances. It is a drawn-out process that requires a long-term approach to resource conservation and management.

## 5.4 SUSTAINABILITY

Sustainability refers to the continuation of output flows in a world that is changing for better or worse. It is desirable to have continuous flows of goods and services in the forest sector so that their utility for consumers and other beneficiaries is

not interrupted. Outputs are valued for various purposes by their recipients — they may depend on some types of output to meet their basic needs for food and shelter, on others to support their present lifestyles and provide luxuries, and on the services provided by forest resources to maintain the quality of the environment in which they live. Recipients rely on the continued availability of the outputs and are prepared to pay for continuity of supply. They seek reassurance which, like an insurance policy, can be obtained at a price. The cost of continuity is the sacrifice of some instant gratification for the sake of future satisfaction and some managerial resources devoted to ensuring sustainability.

The wish for continuity of supply touches on the human desire for stability and security. Sustainability provides safeguards for the future. If the flows of output are changed, people feel better or worse off. Loss of outputs deprives people of present satisfaction and also affects their future wellbeing. It may alter the future prospects of individuals, communities and nations, and influence their development. For this reason, sustainability is concerned with the loss of future options and was described in these terms by the Brundtland Commission[26]:-

> "Humanity has the ability to make development sustainable — to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs."

The Commission recognised that this concept involved limits. There are limitations imposed by the present state of technology and social organisation on environmental resources and by the ability of the biosphere to absorb the effects of human activities. Over time, by good management, it may be possible to relax these limitations to make way for a new era of economic growth. It was argued that widespread poverty is no longer inevitable and sustainable development involves meeting the basic needs of all, while extending to all the opportunity to fulfill their aspirations for a better life.

Sustainable development (see Box 5.10), in a broad sense, is therefore about making people better off, or at least stopping things getting worse. Three key characteristics have been identified, on which the achievement of sustainable development depends[15]. First, increased emphasis is needed on "the value of the natural, built and cultural environments" because environmental quality is part of the wider development objective of improved quality of life; there is more to welfare than rising real incomes. Second, the time horizon for planning and implementing decisions must be extended, beyond the short-term perspective of political manifestos to the long-term future to be inherited by our children and grandchildren and theirs. Third, emphasis must be given to providing for the needs of the least advantaged in society (*intragenerational equity*) and on fair treatment for future generations (*intergenerational equity*). These three concepts — environment, futurity and equity — form an underlying theme: future generations should be compensated for reductions in the endowments of resources brought about by the actions of present generations or the resources should not be used at all. The logic of this proposition is simply that

**Box 5.10 Sustainable development**

"To sustain is to support without collapse. Sustenance is that which supports life. Currently, humans are unequally provided with sustenance, and many suffer actual deprivation. It is widely believed that addressing these problems requires that levels of economic activity be increased worldwide. It is also generally accepted that increased levels of economic activity would potentially damage the natural environment and impair its ability to sustain humanity although some believe that current levels of economic activity are already unsustainable. Here, the sustainability problem is taken to be: how to address problems of inequality and poverty in ways that do not affect the environment so as to reduce humanity's future prospects."

Source: Common (1995), page 1.

". . ...sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs. We do not pretend that the process is easy or straightforward. Painful choices have to be made. Thus, in the final analysis, sustainable development must rest on political will."

Source: World Commission on Environment and Development (1987), page 9.

"if one generation leaves the next generation with less wealth, then it has made the future worse off".

These are general prescriptions for sustainable development. How relevant are they to the special circumstances of the forest sector? First, its contribution consists of a wide variety of goods and services, some of which are not traded and have no commercial value, although their continued availability has a significant effect on environmental quality. Continuity of supply over the whole range of outputs is therefore a necessary condition for sustainable development of the forest sector; it is not enough to ensure future timber production or safeguard particular wildlife populations, disregarding all the other outputs on which the community depends. Sustainability must not be selectively applied. The second prescription specifies long time-horizons, which match the slow rhythms and delayed responses of forest ecosystems, and the extended production periods usual in timber crops. Industrial activities in the forest sector need to be geared to the pace of change in the resources which underpin them. Equity considerations, which form the third prescription, impinge directly on the welfare of forest-dependent people, such as shifting cultivators, who may have few rights and little protection against exploitation. Indirectly, the incomes of owners, employers and employees, who work in the forests and forest industries, depend on the way the total return from sector activities is shared

out; gross imbalances are likely to be regarded as unfair. Intragenerational equity may also be involved if the forest sector workforce is beset by poverty or badly treated by comparison with other sectors. Intergenerational equity is affected if it is likely that future generations of workers will lose their livelihoods or consumers will be deprived of the benefits of goods and services from the forest sector.

Sustainability is concerned with continuity of supply across generations; future generations should not be less well-endowed with resources or receive a less satisfactory flow of goods and services than the present generation. But neither the resources or the social, economic and cultural environment in which development takes place are stable. Forest ecosystems are subject to natural processes of change and are affected by human interventions, while the factors which influence supply and demand in the forest sector alter all the time. The needs of future generations will not be the same as present requirements and the capacity of the forest resources to continue to supply outputs of all kinds is likely to change for better or worse. Continuity of supply in this dynamic setting can only be maintained by a process of continual readjustment.

Sustainable development in the forest sector depends on managing its resources, activities and outputs at the present time in ways that do not curtail their future availability and use. Development takes place in a changing environment which affects all parts of the sector and different management prescriptions for each part are necessary to ensure continuity of supply. The following set of aims provides a recipe for sustainability:-

- *safeguarding the resource base*: without forest resources there can be no activities or outputs, so protection of their potential is essential.
- *maintaining sector activities*: subsector activities generate outputs at all stages from the forest to the consumer; the flow of outputs depends on continuation of the activities.
- *preserving output choices*: the quantity and variety of outputs determines how far the future needs and welfare requirements of society can be met.

The first of these requirements seeks to protect the productive capacity of the forest resources; their ability to meet the need for outputs in future years should not be undermined by forest destruction. This does not involve a total ban on all deforestation, which would be unworkable and unwise. There are some situations where forest must be cleared to provide public services, such as highways or reservoirs, and some circumstances when changes of land use are justified because they lead to higher living standards without significant loss of forest benefits. Sometimes it is possible to compensate for the resulting loss of goods and services by increasing the outputs from other forests. The sacrifice of forest land in one place may be made good by afforestation of grassland or plantations on run down land elsewhere. If a country's total forest resources, including those on agricultural land, are more than sufficient to meet its forseeable requirements, then there may be a good case for putting some forest to other uses. Whatever the justification, such intentional forest conversion should only be undertaken after very careful consideration of all the pros and cons, taking full account of the risks involved. Clearing natural forest

often has irreversible consequences — natural forest ecosystems may take centuries to restore and some species may be wiped out; their full consequences may be very hard to predict and some groups of people may be unfairly disadvantaged. Unfortunately, most deforestation is not the result of deliberate decisions of this kind. Sometimes it comes from the traditional, unregulated land use practices of small farmers for whom survival comes first, in other places powerful interests are involved in 'timber mining' or 'land grabbing'. These threats to the forest resource base must be countered and other, less destructive ways found to provide them with alternative livelihoods before sustainable management can begin.

Ensuring that activities continue is the second prescription for sustainability. Outputs depend on activities, some of which take place in the forest and others subsequently in other sectors. The flow of intangible services, such as forest recreation and watershed protection, depends on the way the forest is managed. Similarly, silvicultural activities determine the flow of raw materials for harvesting and subsequent processing. Primary and secondary manufacturing activities are responsible for the range and variety of goods that are produced, while distribution and trade affect what is supplied to consumers. All these activities must be kept going to sustain the flows through the sector. In turn, as long as they continue, the activities generate employment, value added and incomes. They are supported by investment in physical capital and human resources, and their productivity is maintained by resource renewal through depreciation allowances, education and training.

Preserving choice is the third ingredient of the recipe for sustainable development. Present choices are limited to the range of outputs that are available now and future choices depend on what will be available in the years to come. It is necessary to preserve the variety of forest sector outputs so that the options available to society are not restricted; the community will be made worse off if consumers lose part of their present range of goods and services. It is also important to maintain the size of the output flow. A reduced supply of timber in future years, for example, will deprive some consumers of benefits; there will be less wood for construction and other purposes, and it will lead to price rises (or some other form of rationing) to match the quantity of wood demanded to the quantity available. In fact, maintaining a constant output flow will not be sufficient to maintain consumption standards in most countries, because rising population and incomes tend to increase the total demand for timber. An increasing output flow is necessary to avoid any loss of utility in future years.

This issue raises technical questions about the meaning of sustainability. Does it mean maintaining the total *quantity* of goods and services at present levels, or continuing to supply the same *quantity per head* of population as the total number rises? Alternatively, is it satisfactory to maintain the *value* of goods and services at a constant level, either in total or per head, irrespective of what happens to prices? Rising prices can cause values to stay the same, even though quantities decline, and increasing quantities accompanied by decreasing prices can have a similar effect. In the context of a developing economy, should sustainability be judged by comparing

future supply with the present level of demand, or by attempting to balance future supply against future demand, either by quantity or value? These questions reveal some of the problems of defining sustainable development. It is an ambiguous concept, capable of being interpreted in various ways. Although sustainability is now widely talked about and generally accepted as a desirable aim, there seems to have been little discussion of these issues so far and no general agreement yet about which meaning is best in practice.

The 3-point recipe for sustainable development of the forest sector which has been suggested does not lead us to a definition acceptable to all, if indeed there is one. However, there is a strong case for aiming at constant output per head in order to preserve intergenerational equity. It is also worth noting that continuity of supply depends on anticipating future supply and demand; it depends on projections or assumptions about what will happen in future. If the expected growth rates or levels of production are not achieved for any reason, the supply targets will be missed. Similarly, estimates of future demand may turn out to be wrong and may lead to over- or under-production relative to users' requirements. Sustainable development is based on expectations or forecasts which in practice are very unlikely to be achieved, particularly over the distant time horizons which are a feature of the forest sector. Plausible estimates of future supply and demand, that are adjusted from time to time as circumstances change, are the best that can be hoped for. Seen from this standpoint, sustainable development consists of a set of pious hopes and flexibility in the way the concept is applied is more important than precision in its definition.

The principle of sustainability has a long history in forest management. Forests were first protected as royal hunting preserves in Europe, later they were managed to provide a sustained yield of timber. This was achieved by balancing the volume to be harvested against the expected growth and regeneration of the trees. It is now recognised that management solely for wood is too restrictive and the concept of sustainable forest management has evolved to take in a wider range of outputs. Non-wood forest products are included and services such as recreation. The need to maintain the role of forests in environmental protection is also accepted and there is concern about the impact of forestry activities on indigenous people and their communities. Sustainable forest management is being brought into line with general perceptions of social, economic and cultural sustainability. However, it still overlooks the significance of trees and woody vegetation outside forests and tends to be focussed on forest resources rather than the forest sector, falling short of what is necessary to promote sustainable development of either wood industries or the sector as a whole.

Attempts to describe and define sustainability in relation to forest resources (see Box 5.11) make clear two things: first, the intention to deliver a continuous supply of outputs of many kinds from the forest, and second, that the forest must be protected and maintained in a fit state to keep on producing this flow of goods and services. Sustainability depends on the condition of the resource base as well as the composition and consistency of the output flow. When timber production was the sole aim, sustained yield involved preserving a succession of age classes or a

**Box 5.11 Definitions of sustainable forest management**

"The concept of sustainable forest management. . . . . ...is now seen as the multi-purpose management of the forest so that its overall capacity to provide goods and services is not diminished. A forest managed in this way will provide timber on a sustainable basis and will continue to provide fuelwood, food and other goods and services for those living in and around it. Its role in the preservation of genetic resources and biological diversity as well as in the protection of the environment will also be maintained."

Source: FAO (1993). *The Challenge of Sustainable Forest Management*, page 11.

"Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. These needs are for forest products and services, such as wood and wood products, water, food, fodder, medicine, fuel, shelter, employment, recreation, habitats for wildlife, landscape diversity, carbon sinks and reservoirs, and for other forest products. Appropriate measures should be taken to protect forests against harmful effects of pollution, including air-borne pollution, fires, pests and diseases in order to maintain their full multiple value."

Source: 2(b) of the Non-legally binding Authoritative Statement of Principles for a Global Consensus on the Management and Sustainable Development of all types of Forests. (Grayson & Maynard, 1997), page 9.

"Sustainable management means the stewardship and use of forests and forest lands in such a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems."

Source: Definition accepted at the Second Ministerial Conference on the Protection of Forests in Europe, held at Helsinki in 1993. (Dewar, 1997)

"Sustainability has been taken to mean maintaining or enhancing the contribution of forests to human well-being, both of present and future generations, without compromising their ecosystem integrity, i.e. their resilience, function and biological diversity."

Source: Definition adopted by the Centre for International Forestry Research (CIFOR) as a basis for its research on criteria and indicators. (Sayer, Vanclay & Byron, 1997)

mixture of trees of different sizes, which could be harvested in turn; both the land and the growing stock had to be kept intact. Wider interpretations of sustainability, based on a more varied range of outputs, make it essential to preserve the integrity and capacity of many other components of the ecosystem.

Largely because of widespread concern about the effects of tropical deforestation, sustainable use of forest resources has become an international issue. The United Nations Conference on Environment and Development, held at Rio de Janeiro in 1992, strengthened efforts to tackle environmental issues globally and promoted initiatives aimed at the adoption of sustainable forest management practices by governments. Deliberations at the Conference led to the 'Rio Declaration' designed to protect the integrity of the global environment and development system. The Conference envisaged "a new and equitable global partnership among States, key sectors of society and people" to be established by cooperation and international agreements. The Declaration contained 27 general principles which apply to all activities, including forestry. It was supported by an outline for follow-up action to the year 2000 and beyond (Agenda 21), and also by agreement on the means of reporting progress. The mechanism for this was provided by the General Assembly of the United Nations, which established the UN Commission for Sustainable Development to monitor achievements and identify problems; this body subsequently set up the International Panel on Forests (IPF) to deal with issues concerning forests. Chapter 11 of Agenda 21 provides a four-point programme for combatting deforestation and appeals to all countries to formulate national forestry plans, using agreed international frameworks such as the Tropical Forestry Action Programme (TFAP) and, more recently, the Mediterranean Forest Action Programme. The deliberations of the IPF have led to intergovernmental consensus about priorities for action on forestry issues.

The Rio Conference also agreed a *Statement of Principles for the Management and Sustainable Development of all types of Forests*. Although not legally binding, this is an authoritative declaration which has been followed up in several ways. Countries have been encouraged to adopt sustainable forest management policies and programmes, and international working groups have attempted to identify guidelines, criteria and indicators for forest managers to apply, which are suitable for use in various parts of the world. Sustainability is perceived to depend on a range of features; a number of conditions must be satisfied and processes maintained to protect the future flow of benefits for the community. Criteria attempt to describe conceptually these different aspects of sustainability — they specify a set of standards for good management. Indicators enable the degree of success in meeting those standards to be measured and recorded. It has been realised that, as our understanding of what constitutes sustainability progresses, the lists of criteria and indicators will also change and be improved. Criteria and indicators are recognised as important tools for guiding and assessing progress towards sustainable forest management. They can be adapted to suit local conditions and the stage of development reached in different countries, and can provide a common framework for understanding and action at international level.

The various lists of criteria and indicators that have been put forward relate to particular regions and are intended to operate at national level. The 'Helsinki Process', initiated by Finland, for example, led to a set of criteria for Europe, covering the principal boreal, temperate and Mediterranean forest types, which is intended to keep each country's forests in a condition to provide a regular yield of those goods and services that society expects at present and believes that future society will need or want. A parallel approach, arising from the 'Montreal Process', which covered 60 percent of the world's temperate and boreal forests, generated a more detailed list. Each criterion is supposed to represent a key component of sustainability, to be used in combination with all the others. Taken together, the criteria and indicators "suggest an implicit definition of the conservation and sustainable management of forest ecosystems at the country level"[27]. The lists resulting from these consultations are similar, except that the Montreal Process includes an extra legal, institutional and economic criterion.

The criteria selected for the boreal and temperate regions are remarkably similar in their general coverage to the lists proposed for other parts of the world, although there are significant differences in detail which reflect local conditions. The same seven components, or groups of features, which are listed in Box 5.12, are represented in all of them. This suggests a broad measure of agreement between the various working groups and the possibility of arriving at a common framework of criteria for all countries. Differences between the lists are more pronounced among the indicators than the criteria. Some of these are due to physiographic variations; e.g. the criterion dealing with land and soil conservation in the FAO/UNEP list for countries in the Near East includes an indicator to measure the extent of combating desertification, while the comparable criterion for the Amazon region refers to the percentage of forest which is flooded. Other differences are caused by variations in interpretation, particularly with regard to socio-economic functions. Thus the Helsinki process focussed on forest resources, i.e. it was oriented towards the forestry subsector, whereas the Montreal process went further and included

**Box 5.12 Components of sustainability included in criteria for forest management**

1. Conservation of biological diversity
2. Maintenance of forest ecosystem health and vitality
3. Maintenance of productive capacity of forest ecosystems
4. Conservation/protection of land, soil and water resources
5. Maintenance of contribution to global carbon cycles
6. Maintenance and enhancement of other socio-economic functions
7. Legal, institutional and economic framework for forest conservation and sustainable management

Source: Based on data contained in Grayson & Maynard (1997).

indicators such as the value added by 'downstream' processing, employment in forest industries and investment, including investment in research and development, within the sector as a whole. Furthermore, in relation to the external framework in which the forest sector operates, i.e. the seventh component above, the connection between sustainability and some of the proposed indicators seems tenuous. No doubt it is desirable to promote public education and extension programmes about the forests (Montreal process), harmonize legislation (Amazon) and build up capacity for implementing international instruments (Near East), but the inclusion of these features as indicators has little direct bearing on the supply of outputs from the forest.

Although a large amount of time and effort has gone into meetings of experts and the preparation of these lists of criteria and indicators for sustainable forest management, the scope of the discussions is unclear. Some of the items relate to forest resources, while others affect the development of the forest sector as a whole. In relation to the 3-point recipe for sustainable development suggested previously, most of the items are concerned with safeguarding the integrity and productive capacity of the **resource base** across a wide range of types of output. A small number refer to forest sector **activities** and their consequences, such as value added, employment generation and investment. The need to protect **output choices**, is not directly addressed, although the purpose of sustainable management is to meet consumers' requirements, now and in future; therefore the criteria and indicators should allow for flexibility to deal with changing patterns of demand and new output combinations. Sustainability has become a fashionable concept, but its application to forest management still has some way to go and falls short of becoming sustainable development of the forest sector.

The idea of setting standards for managing forest resources also faces difficulties in relation to the extent to which countries rely on trade in forest products and the level at which sustainability is assessed. At country level, some consumers needs are met by imports, which may come from unsustainable sources; reliance on trade tends to become greater as countries become richer and specialisation grows. Forest industries may depend on raw materials from elsewhere, as in Singapore and Hong Kong. In these circumstances, when sources are uncertain and future supplies are not guaranteed, can forest sector development be regarded as sustainable? Similarly, the management of a country's forest resources may be based on exports, as in Finland and Fiji, and sustainability may be undermined if there are significant changes in overseas market requirements. Trade is beneficial because it broadens the range of outputs available to consumers and opens up new production possibilities for forest managers. However, it also has important implications for sustainability unless continuity of supply can be guaranteed across frontiers.

At local level, sustainability may be impracticable due to uneven distribution of forest resources. Each area of forest land supplies a different mixture of outputs and cannot meet all requirements. If the forest resources of a country are fragmented, isolated areas in different districts may need to be managed as a group and felled

in sequence to provide a sustained annual yield of timber for the region or even over the whole country. Local level self-sufficiency is likely to be uneconomic except for village needs; internal trade provides economies of scale with most processed goods. With the service functions of forests, such as climate amelioration and biodiversity, the benefits are international and it is necessary to assess sustainability on a global basis. Therefore the level to which criteria and indicators are applied is important and needs to be related to the type of output under consideration.

Some of the impetus behind the search for appropriate criteria and indicators for sustainable forest management has come from consumers. Concern about tropical deforestation has led to resistance in the developed countries to buy timber obtained by felling natural forests and threats to boycott supplies derived from their unsustainable commercial exploitation. There has been a move towards product labelling and certification to restore consumer confidence in forest products. Products that are certified carry an assurance they have come from well- managed forests. Certification has generated a lively debate, revolving around self-regulation versus third party assessment of different management systems and whether sustainable forest management depends on specific standards or putting in place a system which aims at continuous improvement (see Box 5.13). The Forest Stewardship Council (FSC) is the main proponent of the standards approach, while the Canadian Standards Association (CSA), using the methodology of the International Organisation for Standardisation (ISO), has promoted continuous improvement. The FSC acts as an external arbiter of standards, while the CSA has identified the components of systems for ensuring sustainability, which involve audit procedures to ensure compliance[28].

A third contributer to the debate has been the International Tropical Timber Organization (ITTO), which has undertaken several specific studies relating to the tropical timber trade and tropical forests. These include the preparation of guidelines and criteria for their sustainable management, forest resource accounting to report on their condition, and certification of timber and timber products. The objectives of certification were said to be: first, to improve forest management and second, to ensure market access; ancilliary objectives include (a) control over illegal harvesting and unauthorised land use changes, (b) better collection of royalties, taxes and fees, and (c) increased transfer of funds to forest management. The scope of certification procedures has thus taken ideas about sustainable forest management a step further; it is now being recognised that sustainability is linked to the socio-economic conditions in which managers operate and that it is a dynamic aim to be pursued flexibly to suit changing local conditions. In fact, sustainability is regarded as inseparable from good management.

The pursuit of high standards of forest management, for which criteria, indicators and certification may be useful tools, is a dynamic process. Our perception of what constitutes sustainable forest management has changed and expanded over the course of the last century. As Prabhu[29] puts it "we are thus faced with a moving target". It is necessary to follow an adaptive management philosophy that

**Box 5.13 Different approaches to certification of sustainably managed forests**

The Forest Stewardship Council (FSC)

"The Forest Stewardship Council is an independent non-profit, non-governmental organization. It has been founded by a diverse group of representatives from environmental organisations, the timber trade, the forestry profession, indigenous people's organizations, community forestry groups and forest product certification organizations from 25 countries."

"The FSC seeks to promote good forest management throughout the world, and will evaluate, accredit and monitor certification organizations which inspect forest operations and certify that forest products have come from well-managed forests. The FSC does not itself certify forest management or products; its mandate is to set a code of practice for certification, to accredit the certifiers, and to promote the development of national standards of forest management for the purposes of certification."

"The FSC principles, used for certification, are designed to ensure that forests of all types are managed in ways that are:-

- environmentally appropriate;
- socially beneficial; and
- economically viable."

The Canadian Standards Association — Sustainable Forest Management System

" The CSA standard for Sustainable Forest Management (SFM) has grown out of the need to provide assurances that Canadian forests are being managed to an acceptable standard. The standard follows an environmental management system format — hence the title SFM System."

"There are three essential inputs into a SFM System which can be audited:-

- the current state of the forest (as defined by existing conditions and uses);
- stakeholder input related to the forest;
- the management goals and objectives for the forest.

These three inputs, typically unique for each forest, dictate how the components of a SFM System are applied. The components of a SFM System, designed to manage the above inputs, are:-

1 commitment;
2 public participation;
3 planning;
4 implementation;
5 measurement and assessment; and
6 review and improvement."

Source: Upton & Bass (1995). *The Forest Certification Handbook*, pages 131–2 and 138.

embraces persistence, change and unpredictability. This depends on feedback so that managers know what is happening and can adjust their activities to meet changing circumstances. Relevant and timely information is required, organised in such a way that new standards can be set and continuous improvement can take place at the forest level. Criteria and indicators help to set the standards and meet these information needs. Sustainability then becomes embedded in management practice and evolves as management progresses.

However, the perspective of forest managers still tends to be restricted, focussing on the forests rather than the forest sector. Forest managers are resource-oriented and see their role as the provision of a steady or increasing supply of goods and services of all kinds from the resources under their control. As the discussions about criteria and indicators show, sustainability is largely regarded by them as a technical forestry matter, although the management of forest resources cannot be isolated from activities in the rest of the sector or changes in the pattern of demand. From a sectoral standpoint, sustainability must be pursued in relation to forest sector resources, activities and outputs. Hence the recipe previously suggested, which is based on safeguarding the resource base, maintaining sector activities and preserving output choices, all with the aim of ensuring continuity in the supply flow. The whole of the flow should be considered, from forest to end-user, including all stages in between.

A sectoral approach to sustainability and development depends on analysis of the composition and timing of the flow and cannot avoid comparisons between supply and demand for each type of output. The quantities made available and the amounts for which people are willing to pay should correspond as far as possible, both now and in years to come, in order to preserve the range of choices for future generations. The stream of outputs of all kinds needs to be matched to the diverse requirements of consumers. Over time, the quantities of outputs will alter and their proportions will be modified to suit changes in the consumer preferences and alterations in the expectations of society. Sustainable development of the forest sector depends on preserving this dynamic balance in the output flow and the degree of success achieved by managers — the effectiveness of their management systems — can be judged by the closeness of the match.

Four features of the supply-demand balance are particularly important:-

(a) *joint supply*: some outputs are inseparable from others; supplying more of one leads automatically to more (or less) of others; thus carbon sequestration adds to biomass and is linked with timber production, while biodiversity is reduced by favouring prime timbers to the detriment of other, less-easily marketed species; forest managers have to deal with combinations of outputs with only limited scope for adjusting their proportions.

(b) *supply lags*: the rate at which trees grow and the pace of ecological changes lead to delays before any action to alter output flows produces results; thus it may take twenty or more years before seedlings reach timber size, and longer to produce fruit to sustain fruit-eating birds such as parrots.

(c) *self-sufficiency ν trade*: the extent to which a country or region seeks to be independent of others or to rely on trade to meet its requirements for forest products, affects the character and size of the forest sector; some outputs of services are global, as with climatic effects, while others, such as water supplies and river flows, may affect neighbouring countries; international imperatives are overtaking national rights and responsibilities in the management of forest resources.

(d) *preferences of consumers and society*: both consumers' incomes and the proportion spent on forest sector outputs change over time; similarly, the preferences of consumers and the distribution of their spending amongst traded outputs are likely to alter; expenditure to maintain services in the forest sector, some of which have no markets or prices, depends on social preferences expressed in various ways, which also change.

Matching supply to demand over time is not an exact science. It involves looking into the future, to anticipate what is likely to happen and to prepare for expected changes. Forecasting is notoriously difficult and often proves wide of the mark, various assumptions have to be made and uncertainty about future outcomes is unavoidable. There are usually many possible ways of satisfying demand, each with its own set of costs and range of prices. The outcome of each option is, to some degree, unsure; the desired supply of outputs from the forest may not be forthcoming because of some ecological mishap, or be too expensive to produce; similarly users' requirements may alter in unpredictable ways. Success in management terms depends on adaptability, altering assumptions and revising forecasts as the situation changes. It is necessary to keep pace with shifts in private and public preferences and periodically rebalance the supply and demand projections. Choices and compromises are unavoidable and sometimes deliberate strategies to reduce risk are needed. Sustainable management of the forest sector is, therefore, a task of considerable complexity.

The forestry profession was guided in the past by sustained yield and has recently turned to sustainable forest management. Sustainability, as a concept, began in Europe in the 18th Century to regulate timber production and has been extended in the twentieth century to cover all the goods and services obtained from forest resources. Foresters have applied it to the domain they controlled, i.e. to the forests in their care. The concept should now be extended beyond the forest boundary, to apply to the sector as a whole. This makes sustainability also the responsibilty of industrial managers, merchants and farmers. Forest managers can no longer act alone; they must cooperate with others to ensure that the principle of sustainability is adhered to. International agencies, national governments, beaureaucracies, corporations, voluntary bodies and individuals are all concerned, in one way or another, with the resources, activities and outputs of the sector. This shift in perspective poses a new set of questions. How are sectoral affairs managed? Who is responsible for controlling them? What kind of institutions are necessary and how best can they be organised? These matters form the subject of the next chapter.

## SUMMARY

- The forest sector provides a diverse assortment of tangible and intangible outputs. Resource availability determines the output possibilities; the preferences of consumers and society prescribe the outputs that are desired. The actual outputs that are forthcoming represent a compromise between supply 'push' and demand 'pull'.
- Wood and non-wood products are produced and also a range of services. All outputs possess value, even though some have no market prices. Their value depends ultimately on end users willingness to pay, either directly or indirectly. The value of manufactured products at earlier stages in the processing chain depends on derived demand.
- Wood is the basis for a very large and varied group of outputs, which far outstrip all other types of forest produce by quantity and value. World production of wood products reached US$391 billion in 1993, 63 percent from developed countries. Output growth continues, relatively slowly for sawnwood, fastest for pulp and fibre-based products.
- Non-wood products are widely used for local consumption, which is often unrecorded. Some have been commercially exploited on a larger scale and are traded internationally.
- Service outputs include recreational, protective and cultural uses of the forest. They also include option values based on their possible future use and existence values derived from their perceived intrinsic worth.
- Demand represents the influence of individuals and the community on output flows and the composition of the output mix. The basis of demand is the value people choose to put on the outputs; their values indicate their relative importance to users and society. Total demand for forest sector goods and services is restricted by the community's willingness to pay for them and people's willingness to forego other types of goods and services.
- Outputs which are traded can be valued by the money paid when they are bought and sold. Market value is the product of the quantity and the price at which transactions occur. The main influences on demand, apart from price, are changes in population, incomes, tastes and technology. Demand fluctuates according to the general level of business activity.
- The demand for environmental services is sometimes influenced by market forces, as with forest recreation, in other cases by imputed values for benefits which cannot be traded. Public opinion and political influence affect the willingness of governments to pay for outputs that are not subject to market forces.
- Supply represents the influence of resources on outputs. Outputs are produced in various combinations, depending on the nature of the resource and the degree of intervention in their ecosystems. Human intervention may be constructive or destructive. Uncontrolled exploitation is liable to lead to loss of resources' ability to produce future outputs. Constructive interventions involve choice of

outputs and purposeful resource management to increase outputs in the desired proportions.

- Sustainable development is about providing safeguards for the future and making people better off. Sustainability, in relation to the forest sector, is concerned with continuity of present and future supply across generations. It takes place in a dynamic setting and depends on the way that sector activities are managed. A recipe for sector sustainability involves safeguarding the resource base, maintaining its activities and preserving output choices.
- Sustainable forest management is focussed on forest resources. It is now seen as multipurpose management based on preserving the integrity of the forest ecosystem. There have been numerous international initiatives to identify guidelines, criteria and indicators of sustainability, and attempts to introduce certification procedures with the object of raising management standards and satisfying public concerns.
- A sectoral approach to sustainability and development depends on analysis of the whole output flow from forest to end-user, not just the management of forest resources. It involves comparisons of supply and demand over time, with particular attention to four features: joint supply, supply lags, self-sufficiency v trade, and changes in the preferences of consumers and society. Uncertainty about the future is inevitable, and sustainable development relies on the ability of managers to update their forecasts and adapt to change.

## FURTHER READING

Mather's book (*Global Forest Resources*. Belhaven Press: London, 1990) deals with the outputs as well as the resources of the forest sector and puts their development in a historical perspective.

FAO publications are the most important source of output data and future projections, notably *Forestry Statistics Today for Tomorrow: 1961–1991……2010* and *Forestry Statistics Today for Tomorrow: 1945–1993…...2010*, published in 1993 and 1995 respectively.

*Blueprint for a Green Economy* (Earthscan: London, 1989) by Pearce, Markandia and Barbier deals with issues of environmental value from an economic point of view and discusses sustainability. The Report of the Brundtland Commission should be read by everyone concerned with sustainability at the global level (*Our Common Future*. Oxford University Press, 1987).

Grayson & Maynard reviewed international moves towards sustainable forest management in *The World's Forests — Rio + 5: International Initiatives towards Sustainable Management*. Commonwealth Forestry Association, Oxford, 1997. *The Forest Certification Handbook* (Earthscan, 1995) by Upton & Bass, covers many of the same issues and deals with certification in more detail.

## SOURCES


1 Jack Westoby. *The Purpose of Forest*s. Basil Blackwell Ltd, Oxford (1987), pages 22–23. This diagram was originally published by FAO in 1962 as part of this author's classic paper on the role of forest industries in economic development.
2 FAO. *Forestry Statistics Today for Tomorrow: 1945–1993. . ..2010*. Food & Agriculture Organization of the United Nations, Rome (1995).
3 FAO. *Classification and definitions of forest products*. Food & Agriculture Organization of the United Nations, Rome (1982).
4 Alexander Mather. *Global Forest Resources*. Belhaven Press, London (1990).
5 W.R. Fisher. *Forest Utilization*. Schlich's *Manual of Forestry*, volume 5, 2nd. edition, Bradbury, Agnew & Co, London (1908).
6 FAO. Editorial for *Unasylva*, **42**, (165), 1991, page 2.
7 Michael Richards. The potential of non-timber forest products in sustainable natural forest management in Amazonia. *Commonwealth Forestry Review*, **72** (1), 1993, pages 21–27.
8 Simon M. Saulei and John A. Aruga. The status and prospects of non-timber forest products development in Papua New Guinea. *Commonwealth Forestry Review*, **73** (2), 1994, pages 97–105.
9 Robert Reppeto. *The Forest for the Trees? Government Policies and the Misuse of Forest Resources*. World Resources Institute, Washington (1988).
10 Leo Lintu. Marketing non-wood forest products in developing countries. *Unasylva*, **46** (183), 1995, pages 37–41.
11 FAO. *Terminology, definition and classification of forest products other than wood*. Paper presented at the FAO/Government of Indonesia Expert Consultation on Non-Wood Forest Products. Yogyakarta, Indonesia, January, 1995, pages 17–27.
12 Alfred Runte. *National Parks: The American Experience*. University of Nebraska Press, Lincoln (1979).
13 Jan G. Laarman and Roger A. Sedjo. *Global Forests: Issues for Six Billion People*. McGraw Hill (1992).
14 David Pearce. An economic approach to saving the tropical forests. Chapter 9 in *Economic Policy towards the Environment*. Edited by Dieter Helm. Blackwell, Oxford (1991).
15 D.A. Pearce, A. Markandya and E.B. Barbier. *Blueprint for a Green Economy*. Earthscan, London (1989).
16 David Pearce. *Blueprint 4: Capturing Global Environmental Value*. Earthscan, London (1995).
17 W. McKillop.Supply and demand for forest products, an econometric study. *Hilgardia*, **38** (1), 1967, pages 1–132.
18 Edward B. Barbier, Joanne C. Burgess, Joshua Bishop and Bruce Aylward. *The Economics of the Tropical Timber Trade*. Earthscan, London (1994).
19 Colin Price. *The Theory and Application of Forest Economics*. Blackwell, Oxford (1989).
20 FAO. *Forestry Statistics Today for Tomorrow: 1961–1991. . ..2010*. Food & Agriculture Organization of the United Nations, Rome (1993).
21 David Pearce and Dominic Moran. *The Economic Value of Biodiversity*. Earthscan, London (1994).
22 Philip Stott. Dynamic tropical forestry in an unstable world. *Commonwealth Forestry Review*, **76** (3), 1997, pages 207–9.
23 John O. Browder. Development alternatives for tropical rain forests. Chapter 3 in *Environment and the Poor: Development Strategies for a Common Agenda*. by H.J. Leonard and contributors. Transaction Books, New Brunswick and Oxford (1989).
24 J. V. Thirgood. *Man and the Mediterranean Forest*. Academic Press, London (1981).
25 J.E. Michael Arnold. Framing the Issues. Part I in *Farms, Trees and Farmers*. Edited by J.E.Michael Arnold and Peter A. Dewees. Earthscan, London (1996).
26 World Commission on Environment & Development. *Our Common Future*. Oxford University Press (1987).

27 A.J. Grayson, A.J. and W.B. Maynard. *The World's Forests — Rio + 5: International Initiatives towards Sustainable Management*. Commonwealth Forestry Association, Oxford (1997).
28 Christopher Upton and Stephen Bass. *The Forest Certification Handbook*. Earthscan, London (1995).
29 Ravi Prabhu. CIFOR's research on criteria and indicators for sustainable forest management. *European Tropical Forest Research Network News* 21, September-October, 1997.

CHAPTER 6

# ORGANIZATIONS AND INSTITUTIONS

The composition of the forest sector and the characteristics of each of its three main parts have been described in previous chapters. In this chapter the focus of attention shifts from 'parts' to 'people'. The sector is viewed from the standpoint of the men and women involved — all those who control its resources, participate in its activities and receive its outputs. They contribute as individuals, but also collectively and more importantly, in organized groups and administrative units composed of people who collaborate for particular purposes. The sector consists of organizations of various kinds, including government departments, private enterprises and NGOs. Perceived as a whole, it is a conglomerate made up of different units or groups, each having a particular role and contributing in a distinctive way to the wide range of activities which collectively distinguish the forest sector as an economic and social entity.

Human organizations are social systems of varying degrees of complexity. The forest sector contains a set of organizations, each of which is a distinct social unit. Seen in its entirety, the sector is also a large, complex social system which therefore can be regarded as a rather amorphous organization at a superior level. The sector has a multi-level structure, with subordinate organizations at subsector level and below linked to each other through their activities and outputs. Together, they form a recognisable whole, which displays its own set of distinctive sectoral characteristics.

The distinguishing feature of the sector is its dependence on forest resources. All the subordinate organizations which make up the sector, are involved, directly or indirectly, with forest-based activities. This dependency is obvious in the case of the individuals, groups and organizations engaged in forest management and tree growing; similarly, those employed in logging and other forms of forest harvesting rely on outputs from the forest. Direct dependency also extends further along the chain of production to organizations engaged in primary processing, secondary manufacturing, construction and overseas trade, which utilize wood and non-wood raw materials derived from the forest. The connection between forests and other organizations, which do not form part of the productive process, such as cooperatives and trade unions, is indirect; they serve the interests and protect the rights of people engaged in forest sector activities. Environmental NGOs seek to safeguard forest

resources by influencing public opinion and the media, altering the way forestry affairs are handled by governments, landowners and industrial enterprises; industrial NGOs look after industrial interests and may pursue different aims.

The forest sector is a loose conglomerate, held together by the interactions between organizations within it and by an institutional framework which supports its activities and controls its behaviour. Reliance on forest resources acts as a unifying influence. Market transactions connect organizations which manage forest resources to those that sell forest products; similarly, interactions between NGOs and other non-commercial bodies pervade the sector. All its participants have a common interest in preserving and protecting the forest resources on which their activities and prosperity depend, but different ideas on how that is to be done. The institutional framework regulates sectoral affairs by means of an infrastructure of policy, custom and law, allocates financial resources, and provides services, such as education and research. It contributes to the maintenance of harmonious relations within the sector and supplies leadership.

The behaviour of forest sector organizations and the institutional framework within which they operate can be influenced, for better or worse, by human intervention in sectoral affairs. The organizations which make up the sector have a mutual interest in promoting changes from which they can all benefit. Due to the interactions within the sector, it is necessary to manage it as a whole in order to obtain the benefits of synergy. A holistic attitude therefore implies the adoption of a comprehensive approach to sector management and the promotion of organizational change within it. As the forest sector is a voluntary association of member organizations, its development must be based on consent.

The organizational and institutional foundations for sector management are presented in the first two sections of this chapter. Section 6.1 deals with the way the sector is organized and the types of organization of which it is composed; Section 6.2 describes the sector's institutional framework and the functions it performs. The third section considers how best to manage the forest sector and develop its potential.

## 6.1 ORGANIZATIONS

When people associate in groups to undertake particular activities, as in the forest sector, they are said to be organized. 'Organization' refers to group activities carried out in an orderly fashion; the groups which carry out these activities are called 'organizations'. The members of each group share its workload, are responsible for its performance and contribute to its achievements. Some groups are highly organized and adopt formal working arrangements, others are loosely structured and informal. They vary in size from small families to large corporations with hundreds of employees.

Organizations are social groups that display organized behaviour (see Box 5.1). Each organization is a distinct unit, able to function separately, with its own internal distribution of power and authority, set of human relationships, aims and aspira-

**Box 6.1 Organizations**

"Organisation is understood generally either as an activity containing a multitude of factors that lead to a meaningful whole, or as an orderly system of people and assets, which can contribute decisively to the solution of a task"

Source: *Tropical Forestry Handbook*, vol. 2, page 1633.

"All organisations have some function to perform. Organisations exist in order to achieve objectives and to provide satisfaction for their members. Organisations enable objectives to be achieved that could not be achieved by the efforts of individuals on their own. Through co-operative action, members of an organisation can provide a synergistic effect."

Source: Mullins (1996), page 70.

Organizational behaviour refers to "the structure, functioning and performance of organizations, and the behaviour of groups and individuals within them."

Source: Pugh (1971), page 9.

tions, and sense of identity. Simple organizations contain a single social group, more complex organizations are made up of several groups working in combination. Large organizations are hierarchical and need a structure of power and responsibilities in order to provide leadership and control over lower level group activities. Organizations, large and small, can be associated to form compound organizations which display distinctive organizational characteristics of their own. The forest sector is a conglomerate of this kind. It consists of numerous separate organizations, each of which is, to a large extent, independent and self-regulating. Notwithstanding its diverse composition, the sector is an easily recognized entity which can be treated as a big, loosely-structured organization in its own right.

## Types of Organization

There are many sorts of organization, which perform a wide variety of functions. They vary greatly in size, complexity, structure, behaviour and style. Several attempts at classifying them have been made, based on their different characteristics, such as type of authority, purpose, beneficiaries and activities. These general systems of classification provide background information and some insights into organizational behaviour. They provide a starting point for more detailed examination of forest sector organizations and the way they work.

The sociologist Max Weber for example, distinguished between organizations according to the way in which authority is legitimized; he was interested in why people did what they were told[1]. He divided them into traditional, charismatic

and bureaucratic organizations. The *traditional* type is characterized by custom and natural right to rule (as with hereditary monarchs, the pope or a paternalistic employer), authority in *charismatic* organizations is legitimized by belief in the personality and inspiration of the leader, and the *bureaucratic* type, which Weber regarded as the most efficient, is based on the acceptance of law, formal rules and procedures. It is useful to distinguish these types of authority for analytical purposes, although real organizations do not display them in pure form. Bureaucracy is most closely linked with government organizations and, in the forest sector, is associated with forestry departments and the ministries responsible for administering forest resources. However, bureaucratic characteristics are displayed by all large organizations which rely on set procedures to control the activities of their personnel.

Classifications based on the purposes of organizations involve grouping them in various ways. Mullins distinguishes the following categories[2]:-

- economic organizations (business firms),
- protective organizations (armies, police forces, trade unions)
- associative organizations (clubs and societies),
- public service organizations (local authorities and hospitals),
- religious organizations (churches).

He also distinguishes political, educational, military and voluntary organizations. Many organizations do not fit easily into a classification of this sort and others are multi-purpose. In the forest sector, NGOs might be classed as associative or protective or political. Similarly, government forest departments have public service and protective functions. While it may be useful to separate commercial from non-commercial organizations or private interests from government, these distinctions are inadequate to describe fully the sector's composition, or to represent the diversity of its social groups, the differences in their structure, and the variety of interests they represent.

Similar shortcomings are evident in classifications based on primary beneficiaries, (excluding benefits accruing to managers). Four types of organization can be identified according to who receives the benefits[3]:-

- *Mutual-benefit associations*, where the prime beneficiary is the membership, such as political parties, trade unions and professional associations.
- *Business concerns*, where the owners and top management are the prime beneficiaries, such as industrial and other firms which are operated for profit.
- *Service organizations*, where the client group is the main beneficiary, such as hospitals, schools and welfare agencies.
- *Commonweal organizations*, where the prime beneficiary is the public-at-large, such as central government departments, the armed services and the police.

The prime beneficiary is not necessarily the only beneficiary. Thus companies may contribute to charity as well as making profits for their owners, and forestry departments provide services, e.g. facilities for tourists, as well as public benefits, such as biodiversity conservation. All four types are represented in the forest sector.

A system of classification based on primary activities has been suggested by Katz & Khan, which divides organizations into four classes[4]:-

- *Productive or economic* — concerned with the creation of wealth, the manufacture of goods, and the provision of services for the public.
- *Maintenance* — concerned with the socialisation of people to fulfil roles in other organizations and society, e.g. schools and churches.
- *Adaptive* — concerned with the pursuit of knowledge and the development of ideas, e.g. research establishments.
- *Managerial or political* — concerned with adjudication, co-ordination and control of physical and human resources and other sub-systems, e.g. government departments, trade unions and pressure groups.

The forest sector contains examples of all four. However, it is often difficult to decide to which group an organization should be assigned; forestry departments are frequently involved in all of them.

## Forest Sector Organizations

These general categories are not capable of describing fully the rich variety of organizations and interest groups found in the forest sector. They provide some useful information about types of activities, their purposes and beneficiaries, but a more detailed scheme of classification, is required to explain adequately the wide variety of sectoral interactions and behaviour. Each subsector performs particular functions and contains a different assortment of organizations adapted to those functions. Therefore detailed analysis of the various types of organization present in the forest sector should be based on a subsectoral framework.

The organizations and informal groups which make up the subsectors are listed in tabular form in the following pages. The tables indicate the form of ownership, the primary purpose, type of activity and main beneficiaries of each organization or group. The lists are not intended to be exhaustive, but serve to demonstrate the variety of organizational forms found in the forest sector. Neither is the scheme of classification very precise, because the organizations actually present in many countries do not fit neatly into the categories shown. Some categories are likely to be missing or combined with others. In some cases the scope of a particular organization may be expanded to include a wider range of activities within the same subsector, as with some forestry departments in developing countries which, besides managing the national forest estate, also undertake extension work to promote tree growing on agricultural land. Sometimes an organization's activities extend across subsector boundaries; e.g. large forestry corporations frequently use their forests to supply raw material to their own mills and construct storage facilities from which to distribute the forest products they have manufactured.

Sector boundaries are also blurred. Some organizations are active both inside and outside the forest sector, as with trade unions which represent equivalent grades of workers in several sectors (e.g. clerical staff in the civil service). Similarly, farmers engaged in agroforestry are included in two sectors — only their tree growing

activities form part of the forest sector. Many companies operate in several sectors, taking advantage of similar manufacturing technology or the same distributional facilities to supply a variety of products in the same markets. Profitable opportunities to invest in other sectors may encourage a forest sector enterprise to enlarge the scope of its activities. In this way, successful small companies can grow into large corporations, regardless of sectoral and even national boundaries. Whether an organization or group is included in the forest sector is a matter of convenience; it depends on the extent of its dependency on forest resources and joint membership of several sectors is not precluded.

Table 6.1 provides an organizational profile for the forest management subsector, which shows the types of organizations and interest groups represented, with their characteristics.

In most countries, forestry affairs form part of the portfolio of a government ministry with wider responsibilities, such as agriculture or the environment. The agency which looks after forests on publicly owned land may be a forestry department within that ministry, or a semi-autonomous forestry authority appointed by the minister, such as the Forestry Commission in Britain. In countries with federal constitutions, forestry responsibilities are usually shared with the states, as in the USA, where the US Forest Service manages national forests throughout the country and each state government has its own forest department to run the state's forests. In some places (e.g. Malaysia) the central government employs staff and is responsible for forestry research and education, while the states control the forests. The arrangements vary from country to country, depending on various features such as the system of government, the relative importance of forestry matters in the national economy and the pattern of land ownership or tenure. There is no standard or 'best' way of administering a nation's forest resources and the profile is a generalized representation of the organizational features that are commonly present.

Pettenella[5] has identified four models which describe the organizational arrangements for dealing with forestry by governments. In some countries forestry matters are the concern of a Ministry of Agriculture and Forestry or a Ministry of Rural Development; this model focusses attention on the role of forestry in the rural economy. A second model, applicable in countries where forestry is given considerable political and financial support and forest-based industries are important, is based on a separate Ministry of Forestry. A third type found in some countries such as Argentina, divides responsibility for forestry matters between two ministries: a Ministry of Economics, Finance or Planning, which is in charge of the commercial aspects of productive forestry, and a Ministry of Environmental Resources which looks after forest protection. The fourth type considers forests primarily as a provider of public goods and services, and allocates responsibility for them to a Ministry of Environment, or Ministry of Natural Resources or Ministry of Watershed Management and Forests. Pettenella points out that the effectiveness of the administrative arrangements depends heavily on inter-ministerial coordination and the avoidance of disputes. In practice, the type of model and the names of the

*Table 6.1* Organizations and interest groups in the forest management subsector

| Organization | Ownership | Primary purpose | Type of activity | Main beneficiaries |
|---|---|---|---|---|
| Government ministry with overall responsibility for forest resources | Public | Public service | Administration, coordination and policy making | Public-at-large |
| Federal and state forestry departments | Public | Conservation, production and amenity | Management of forest resources | Consumers, industrial users, employees |
| Other national and local government agencies with forestry responsibilities | Public | Conservation, production and amenity | Protection and management of forest resources | Consumers, industrial users, employees |
| Organizations engaged in promoting community and farm forestry | Mixed | Production and amenity | Promotion and advisory services | Local communities, consumers |
| Forestry companies and corporations | Private | Production | Forest management | Owners, industrial users, employees |
| Owners of forests and woodland | Private | Production and amenity | Forest management | Owners, users, employees |
| Farmers and agriculturists | Private | Production and amenity | Farm forestry, woodlots and shelterbelts | Owners, local communities, users of produce |
| Tree growers cooperatives and participatory forestry schemes | Mixed | Production and provision of services | Technical support, credit and marketing | Members, users of produce, consumers |
| Forest dwellers and shifting cultivators | Private | Production | Subsistence | Forest people |
| NGOs concerned with conservation and other special interest groups | Private | Conservation and amenity | Publicity and public awareness | Members, general public |
| Forestry consultants | Private | Provision of services | Management and advisory services | Consultants, employees and clients |
| Professional forestry associations | Private | Provision of services | Information, promotion and standards | Members |
| Trade unions representing forestry employees | Private | Provision of services | Negotiation and representation | Members |

ministries are less important than the political support, provision of finance, degree of commitment and competence of the staff.

The profile distinguishes between the government's general responsibility for forestry affairs and its particular responsibility for managing forest land owned by the nation; the former tends to be carried out at ministry level, whereas the latter

**Box 6.2 Separation of functions in the UK Forestry Commission**

"The Forestry Commission as *Forestry Enterprise* develops its forests for the production of wood for industry, manages its estate economically, protects and enhances the environment, provides recreational facilities, stimulates and supports employment and the local economy in rural areas by the development of forests and the wood-using industry, and fosters a harmonious relationship between forestry and other land using interests, including agriculture."

"The Commission as *Forest Authority* advances knowledge and understanding of forestry and trees in the countryside, develops and ensures the best use of the country's forest resources, promotes the development of the wood-using industry, endeavours to achieve a reasonable balance between the interests of forestry and those of the environment, undertakes forest research, combats forest pests and diseases, and advises and assists with plant health, and safety and training in forestry. Finally it encourages good forestry practice in private woodlands by administering grant-aid and felling controls, as well as through forest research and advice."

Source: Hart (1991), pages 1–2.

function is the task of government departments or specialized agencies. The state has a dual role - it is both a *forest authority*, with public policy functions, and a *forestry enterprise*, with the task of executing policy. The remit of the forest authority covers all forest resources in the country, including those that are privately owned, while the forestry enterprise manages the nationally owned forests. The Forestry Commission in Britain carries out both roles, although they are clearly separated (see Box 6.2). In many countries the distinction between them is not recognised and the functions are merged.

This separation of functions has been influenced by prevailing political attitudes, which in the 1990s favoured less government intervention in economic affairs and privatization of assets owned by the state. In Britain, the Forestry Enterprise is expected to operate commercially and, since 1981, about ten percent of the Forestry Commission's land has been sold to the private sector[6]. At the same time there has been an opposing policy trend which favours nature conservation and expansion of broad-leaved forestry, to which free-market disciplines contribute very little. The Forestry Commission cooperates with other environmental agencies (such as English Nature) to achieve these broader objectives.

The case for privatization is most obvious where commercial timber growing takes precedence over environmental quality considerations, as in countries which have established large areas of man-made forests such as New Zealand and Chile. New Zealand has about 1.3 million ha of plantations and 6 million ha of natural forest. In 1987, the New Zealand Forest Service was disbanded and its

commercial activities passed to a new state-owned enterprise — the New Zealand Forestry Corporation. The non-commercial functions were transferred to two new government departments: the Ministry of Forestry, which assumed responsibility for research, training, advisory and regulatory functions, and the Department of Conservation, which took over protection of the natural forests[7]. The Forestry Corporation was regarded as a stepping stone to privatization and it was decided that disposal of the assets should be done in stages. The transferable management rights to about a quarter of a million ha were sold in 1987 (not the land itself, in order to protect Maori land rights) and the unsold areas were grouped into three enterprises; more recently one of these enterprises has been disposed of on joint venture terms. The privatization strategy faces practical difficulties. It weakens the government's ability to ensure continuity of wood supply for forest industries and its commitment to sustainable management of the planted forest estate. It is not clear how much further the process will go.

Private ownership of forest resources is more extensive and fragmented in European countries than elsewhere. For example, 77 percent of the productive forest area in Norway is owned by individuals, various types of private common ownership account for a further 10 percent and only about 13 percent is in public ownership; the area owned by individuals consists of more than 118,000 holdings. 50 percent of the forests in Sweden are classed as private forests and a further 24 percent is owned by companies. Further south, nearly three quarters of the area of French forests and two thirds of Spanish forests are privately owned[8]. In some of the formerly communist Eastern and Central European countries (e.g. The Czech Republic), land seized by the state has been returned to private ownership. The functions of government ministries and departments which are engaged in overseeing private forestry activities, differ significantly from their role when their main task is to directly control and manage forests owned by the nation. Special legal requirements apply to private forest owners in most European countries, aimed at preventing destruction and encouraging good management of the forests. Finland and Sweden, for example, have forestry boards at national and local level, charged with the task of supervising and enforcing the forest law, and distributing loans and grants. France has 17 regional centres for promoting productivity and improving the structure of private forests.

In many developing countries, tree growing by local people has become an important concern (see Box 6.3), stimulated by the degradation and destruction of natural forests. It has led to communal forestry programmes on state- or community-owned land or on private land managed collectively, and to the widespread promotion of farm forestry. Various organizational arrangements have been developed to suit the situations in different countries. The government may be involved in either a participatory role or by providing support services or through financial incentives; it may work directly with villagers and farmers, assist cooperatives or collaborate with NGOs. Substantial international assistance has been channelled to such schemes in Nepal, India and East Africa. Generally, there has been a shift in emphasis away from centralised direction towards local control which has led to substantial (and sometimes painful) alteration of the way

**Box 6.3 The changing role of forest departments in developing countries**

"Forest Departments have historically been the organizations reponsible for implementing forestry programmes. Characteristically, however, except for policing, protection and revenue collection, government forest departments have had little interaction with rural people in the past. Involvement of forestry services in rural and community development, agroforestry, extension and programmes for employment and income generation is generally new and requires different roles than those forestry departments were required to play. The change in emphasis required is one from executive to support functions."

"In some cases, changes in the administrative structure of a forest department have been tried as a means of changing the negative rural perception of its role. In India, many of the state forest departments have added new and highly visible divisions for social forestry. In other cases, foresters may be attached to other services. In Senegal, foresters without uniforms and guns are attached to regional multidisciplinary development offices as well as to parastatal development organizations."

"It is not uncommon that the responsibility for reforestation or for other rural forestry activities is shared among a number of public sector organizations. In Kenya, independent rural forestry activities are administered by the Ministry of the Environment and Natural Resources (through the Forest Department), by the Ministry of Agriculture and Livestock Development and by the Ministry of Energy and Regional Development. Although this approach has been effective for the most part, there is a danger that a lack of inter-ministerial coordination may result in a duplication of efforts."

Source: FAO (1985), pages 97–8.

government forest departments are organised[9]. It has been accompanied by the growth of extension services, user groups, and the formation of cooperatives or other collaborative enterprises.

People who live in and around forests and are dependent on the continued existence of forest resources for their livelihoods and wellbeing are receiving more attention than formerly. The activities of shifting cultivators in tropical forests have been recognised for many years and their traditional land use practices have been adapted for reforestation purposes under the system known as 'taungya'. It is now realised that forest-based communities have been powerless to stop deforestation, because their customary rights were either not recognised or expropriated, and unable to defend their traditional way of life because they lacked organization[10]. They have been marginalized, but NGOs have been formed in recent years to represent indigenous and tribal peoples' interests and an international network of such groups has been set up. At the same time, respect has grown for their

**Box 6.4 NGOs in the forestry sector**

"In the forestry sector, NGOs offer distinctive perspectives, partly because they do not start with the concern for timber that dominates so many of the sector's established institutions. Some NGOs focus on the environment and are active in forest protection because of the critical role forests play in ecosystem conservation. For other NGOs it is poverty — the plight of people obliged to eke out a subsistence living in or near the forest — that draws them into the forestry sector. Still others start with a concern for social justice, particularly for indigenous and other marginalized forest dwellers whose cultures and rights have been abused by the larger society."

Source: Korten (1992), page 4.

traditional understanding of the forest and appreciation of the ecosystems on which they are dependent. There is now a Forest Peoples Charter aimed at securing their participation in management of the forests on which they depend. The movement started in the Amazon and other tropical countries but has spread to other parts of the world, such as Canada, and has become a human rights issue[11].

Non-government organizations (NGOs) play an increasingly important role in the forest sector (see Box 6.4). They are very diverse, but generally attempt to focus on issues that they believe have not been adequately addressed by government agencies or are avoided by commercial organizations. They vary in scope; they may be local, national or international. Some are profit-oriented and serve as public service contractors, others are non-profit organizations driven by a sense of values and a mission. Amongst the issues they have highlighted are people and wildlife, soil and water, sustainability and justice. Their roles include the questioning of long-held assumptions in the light of new realities, the development of new policies that respond to current needs and programme implementation in their areas of concern. They can disturb the forestry establishment by promoting public pressure through publicity, propaganda, boycotts and legal challenges. Traditional forestry institutions are being obliged to interact with this new group of players as their activities expand[12].

The increasing complexity of forest management, as it moves from traditional timber growing to wider concerns with non-wood products, environmental quality and sustainability, has led to outsourcing and consultancy services provided by individuals and small enterprises. They offer expertise across a range of disciplines, such as ecology, economics, planning and information technology, to private landowners, governments and international agencies engaged in forest sector activities. These enterprises are flexible and loosely organised, and can therefore respond quickly to a wide range of requests from different sources. They offer similar services to other sectors and facilitate the transfer of technology between the agencies that are involved in rural development.

The forest management subsector contains a varied assortment of organisations which undertake a variety of activities. They deal with forest resources which are valued for their diversity and provide many kinds of goods and services, coping with the problems associated with multi-purpose management. Public and private interests are mixed together and many of the outputs are public goods or lack market prices; government organizations in the subsector depend to a large extent on funds provided by taxpayers and the revenue that they are able to collect is often based on administered prices. Attempts to privatize forestry activities are beset with difficulties and simplistic attempts to increase organizational efficiency by allowing private enterprise to control forest resources, without safeguards for their unpriced outputs, are unlikely to provide long term, sustainable advantages for the general public.

Public ownership is less prominent in other subsectors. Their use of land is much less extensive and most of their activities are related to production rather than conservation or amenity. Market prices and market forces work better in relation to activities that provide goods that can be bought and sold than for the intangible outputs generated by the forest management subsector. Generally, governments are less involved in other subsectors and the role of public enterprise tends to diminish with movement along the subsector chain. The harvesting subsector includes some organisations under government control, but subsequent subsectors are dominated by private interests.

The harvesting subsector interacts directly with forest management and the organizations represented in Table 6.2 reflect the closeness of the relationship. The range of their activities depends on the nature of the forest. Industrial enterprises and informal peasant groups are included. Activities are often small-scale, mobile and widely-dispersed. Some of the people involved are tribal forest dwellers. Customary users of the forest tend to be poorly organized, although sometimes, particularly in developing countries, NGOs may represent their interests.

The harvesting subsector offers opportunities for small-scale enterprises. In Fiji, for example, 'landowner logging companies' have been promoted as a way for local communities to share more widely in the benefits from afforestation schemes by enabling them to undertake harvesting operations under contract. Similarly, resin tapping and the collection of other non-wood products provide opportunities to set up cooperatives and for other local group initiatives which provide advantages for their members.

Harvesting operations merge with primary processing at a rudimentary level through pitsawying, which is still practised in parts of East Africa to satisfy local needs. This involves felling trees, then rolling the logs over a pit and cutting them up by hand to obtain planks or scantlings which can be carried out of the forest. Harvesting and forest processing are also combined in the activities of partnerships or companies which operate mobile sawmills and woodchipping machines. The boundaries of the harvesting subsector are not always sharply defined.

Organizations engaged in forest management sometimes extend their activities into harvesting, as when government forest departments do their own felling and

*Table 6.2* Organizations and interest groups in the harvesting subsector

| Organization | Ownership | Primary purpose | Type of activity | Main beneficiaries |
|---|---|---|---|---|
| Logging companies | Private | Production | Timber felling, extraction and transport | Owners, sawmillers, timber users, employees |
| Enterprises supplying poles, fuelwood and charcoal | Private | Production | Cutting, preparation for sale and transport | Owners, fuel and pole users, employees |
| Operators of mobile mills and hand sawyers | Private | Production | Forest-based wood conversion | Rural communities, users, workers |
| Collectors of resins, gums, fruit, grasses, fungi and other non-wood products | Private | Production and amenity | Collection, preparation for sale and transport | Collectors, processors, consumers |
| Forest dwellers and other customary forest users | Private | Production | Collection for domestic use | Forest people and rural communities |
| Hunters | Private | Food production and sport | Hunting, game management | Rural communities, consumers |
| Graziers | Private | Livestock production | Obtaining fodder, herd management | Rural communities, consumers |
| NGOs concerned with traditional users' rights | Private | Protection | Representation, mutual support | Forest people and rural communities |
| Water authorities, water supply companies, hydro-electric power generators | Mixed | Water and power supply | Water collection, storage, treatment and abstraction | Users of water and electricity, public, employees |

logging to reduce damage. From the other side, sawmilling firms may obtain felling licences or purchase standing timber which they also fell, extract and transport. Some of the largest industrial corporations in the forest sector are 'vertically integrated' and operate across subsector boundaries. They own or lease forest land, harvest it themselves, and then process the timber in their own mills. For convenience, they may set up separate logging units or subsidiary companies, but harvesting subsector activities in smaller enterprises are less likely to be organizationally differentiated in this way.

Water storage and abstraction is a specialized harvesting activity, carried out separately from watershed management, by either public or privately-owned organizations. Usually the provision of water supplies is regarded as a public service, but where privatization has been attempted, as in Britain, the water companies are regulated and their prices to consumers are controlled. Storage in reservoirs, whether for water supply purposes or power generation, may involve large-scale construction works and is capital intensive.

The primary processing subsector (see Table 6.2) is largely made up of privately owned enterprises. Technological differences, economies of scale and capital

*Table 6.3* Organizations and interest groups in the primary processing subsector

| Organization | Ownership | Primary purpose | Type of activity | Main beneficiaries |
|---|---|---|---|---|
| Ministry for industry & trade | Public | Public service | Policy & control | General public |
| Sawmillers | Private | Production | Conversion of logs to sawn timber | Owners, timber users, employees |
| Plywood and veneer manufacturers | Private | Production | Production of sheet veneers, plywood and blockboard | Owners, users of wood panels, employees |
| Particle board and fibreboard manufacturers | Private | Production | Production of panel products | Owners, users of panel products |
| Pulp and paper companies | Private | Production | Pulp and paper production | Owners, pulp and paper users, employees |
| Enterprises engaged in extracting and processing non-wood products | Private | Production | Processing of non-wood forest products | Rural communities, owners, consumers, employees |
| Timber preservation and kiln drying units | Private | Production | Timber treatment operations | Owners, timber users, consumers, employees |
| Organizations involved in recycling waste paper and other forest products | Private | Production | Collecting and reprocessing | Owners, users of recycled products, employees |
| Forest products research laboratories | Mixed | Research | Testing and investigation | Forest industries, consumers |
| Trade associations representing forest industries | Private | Provision of services | Promotion, lobbying and advice | Members |
| Trade unions representing employees in wood processing industries | Private | Provision of services | Negotiation and representation | Members |

requirements determine the size of the organizational units. Sawmilling is usually carried out in relatively small establishments, which cost less to build and are less demanding from a technological point of view, than plywood or particle board manufacturing. Pulp and paper production needs large investments and big plants, which depend on international markets; consequently it tends to be concentrated in a few developed countries, such as Finland and Canada.

Non-wood products are very diverse and in many cases the type of processing required is relatively straightforward, consisting of sorting, grading and cleaning, purification, distillation of oils and other activities carried out in small plants at convenient locations.

Most of the raw material for primary processing comes from the forest in the form of logs, pulpwood, woodchips etc. However, there are also horizontal linkages

*Table 6.4* Organizations in the secondary manufacturing, construction, distribution and trade subsectors

| Organization | Ownership | Primary purpose | Type of activity | Main beneficiary |
|---|---|---|---|---|
| **Secondary manufacturing** | | | | |
| Furniture manufacturers | Private | Production | Design and manufacture | Owners, workers consumers |
| Joinery, turnery and other timber fabrication firms | Private | Production | Machining and assembly | Owners, workers, consumers |
| Organizations engaged in further processing and manufacture of non-wood products | Private | Production | Secondary processing and manufacturing | Owners,workers, consumers |
| Trade associations and trade unions | Private | Provision of services | Promotion and representation | Members |
| **Construction** | | | | |
| Enterprises engaged in building construction | Private | Production | Construction of buildings | Owners, workers, occupiers |
| Manufacturers of prefabricated housing and wooden buildings | Private | Production | Design and manufacture | Owners, workers, occupiers |
| **Distribution & trade** | | | | |
| Timber merchants | Private | Trade | Wholesaling and retailing | Owners, workers, consumers |
| Importers and exporters of forest products | Private | International trade | Importing and exporting | Owners, workers, consumers |
| Transport companies | Private | Distribution | Transport | Owners, workers, consumers |

within the subsector involving the utilization of waste materials or by-products. Thus, slabs and offcuts from sawmills are passed to board manufacturers and pulp and paper makers; similarly, the cores of logs left over after they have been peeled to make plywood can be utilized for sawn timber or turned into wood chips. Recycling of waste paper also provides an appreciable (and increasing) share of the input for paper-making. These transfers may occur between organizations, as when a sawmilling company sells its residues to a particle board manufacturer, or take place internally, between the parts of a large corporation which produces several types of forest product.

The secondary manufacturing subsector is made up of organizations which utilize the outputs from processing plants and subject them to further treatment or incorporate them in more sophisticated products (see Table 6.4). Thus, sawmills provide lumber which is transformed into mouldings or turnery products, and furniture

factories use sawn timber, veneers and plywood. Primary processing organizations often extend their activities and offer for sale 'finished' products such as kiln dried timber or tongue and groove boards, but operations which require more specialised machinery, such as lathes and presses, are likely to be carried out by separate firms sited closer to their markets. When wood, in one form or another, represents only part of the raw material input used by a manufacturing enterprise, as with leather, plastic and metal in furniture production, the different sorts of expertise required favour independent enterprises which are free to develop links outside the forest sector. Similarly with non-wood products, such as medicines derived from forest sources, which are manufactured by pharmaceutical companies.

Enterprises in the construction subsector also use inputs from primary processing, such as sawn timber and panel products. These are combined with various other types of building materials from other sectors. As with secondary manufacturing, only part of the output of the construction subsector is attributable to forest products. In fact the organizations represented in both these subsectors also contribute to economic activity in other sectors; they are members of more than one sector.

Some distribution and trade activities are undertaken by the same organizations that carry out harvesting, processing and manufacturing. Thus logging companies not only produce logs, but also sell and transport them; similarly sawmills often supply lumber directly to their main customers. There are also other firms which are trading organizations, specialising in the supply of forest products, who act as middlemen between producers and consumers. These specialised merchants may deal in unprocessed goods (such as poles and bamboo) as well as processed or manufactured articles. Often these organizations are engaged in international as well as domestic trade.

From an organizational point of view, subsector and sector boundaries are not significant. Companies seeking profits are likely to take advantage of business opportunities regardless of the subsector in which they arise. This may lead to *vertical* integration with a company operating in more than one subsector, or to *horizontal* integration in which a company grows by absorbing other organizations in the same subsector. Vertical integration may occur in a backward direction, as when a pulp and paper company buys forest land to secure future supplies of raw material, or a forward direction, when the same company extends into manufacturing and sells products made from paper and paperboard. The principal factors which determine company expansion are likely to be the expertise and capital available, the economies achieved by merging operations, and the aspirations of the managers or owners.

The more closely an organization's activities are concerned with forest resources, the greater its dependence on their sustainable management and the continued prosperity of the forest sector. Sector interests are dominant in organizations which operate entirely within the sector, whereas organizations which are also active in other sectors have divided loyalties. Multi-sectoral organizations, as found in the subsectors nearer to the consumer end of the supply chain, may pursue agendas which conflict with the best interests of the rest of the sector. This is more likely

to arise with large, diversified companies than with small enterprises and most likely with multinational corporations which have headquarters in other countries. It is important to recognize that a range of sectional interests is present in the forest sector, that the organizations which make up the sector may pull in different directions, and that agreement about what is best for the sector is likely to be difficult to achieve. The sector as a whole lacks coherence and seldom speaks with a single voice.

## International Organizations

The organizational profiles of the subsectors represent the typical situation at national level. A country's endowment of forest resources is the basis for a varied assortment of organizations connected with forest management, harvesting, processing, manufacturing and distribution. These organizations interact, but are also affected by external influences from other sectors inside the country and from international sources outside. At international level a different set of organizations is at work (see Fig. 6.1), some offering bilateral or multilateral aid, some engaged in world trade and some concerned with global humanitarian and environmental issues. They interact with the national organizations, but do not amount collectively to a structured entity at global level, comparable with the forest sector of a country. These international organizations represent various interests which seek to influence what happens in the forest sector, either generally or in particular countries.

At global level, forest resources and forestry matters are the concern of international agencies, such as the United Nations Food & Agriculture Organization (FAO) and the development banks. The Forestry Department of FAO is the lead agency, but several other UN organizations with wider responsibilities are also involved, in one way or another, with the forest sector, including UNEP (which runs the environment programme) and UNIDO (which promotes industrial development). The United Nations Conference on Environment and Development (UNCED), held at Rio de Janeiro in 1992, set out general principles for sustainable development;

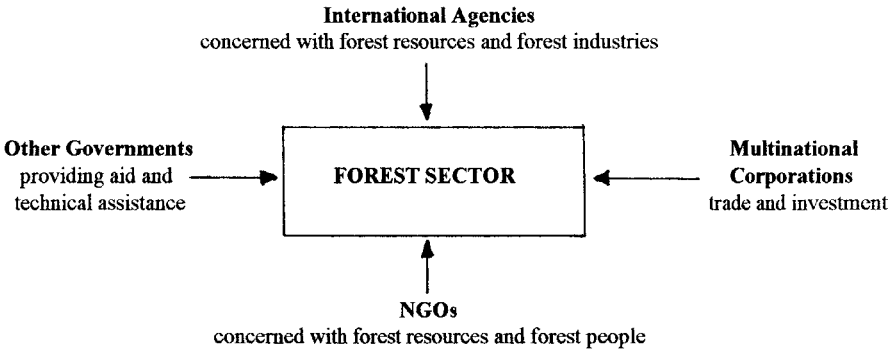


*Figure 6.1* International influences on the forest sector

Agenda 21 provided an action plan to the year 2000. Forestry was the subject of a 'non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forest'[13]. The Rio Conference has had a major impact on world opinion and set standards for forest sector organizations to follow.

Regional organizations such as the European Union assist member countries but also provide multilateral assistance to others for forestry purposes. The governments of most developed nations have programmes of bilateral assistance for developing countries, from which forestry also benefits. Some of this aid is directed at organizational restructuring and capacity building. Trade in forest products is largely undertaken by companies, some of which extend their influence by investing in production facilities overseas. Trade interests also lie behind the work of the International Tropical Timber Organization (ITTO), an inter-governmental body which is actively promoting sustainable industrial use of tropical forests. NGOs at international level (e.g. The World Resources Institute) have become powerful, independent sources of analysis and critical interpretation of events in the forest sector, which have led to new policies and have altered the behaviour of organizations in the sector.

International influences on the forest sector are diverse and represent different interest groups. The influence of the UN agencies is mainly directed at sustainable forest development and the environmental consequences of deforestation; their attention is focussed particularly on forest resources and organizations in the forest management subsector. These issues are also the concern of the development banks and other aid providers, although the terms of bilateral assistance usually reflect the national interest of the country which supplies it. Commercial organizations normally expect a return on their investments, although they are also keen to appear public spirited. International NGOs, such as Friends of the Earth, represent pressure groups of various kinds, which tend to focus on specific issues, often relying on emotional appeals to their supporters and confrontational tactics to achieve their ends.

This review of the organizations in the forest sector has demonstrated the variety of interest groups which shape sectoral behaviour at both national and international levels. The sector is an association of many different kinds of organization, representing a varied assortment of interests; it is a collection of stakeholders. Some of the organizations are involved first and foremost in forest sector affairs, while others have wider concerns and shared allegiances. Some of the influences and interactions at work in the sector are strong, some are weak, and many of them are liable to change due to events beyond their control. Structurally, the sector is an organizational conglomerate which is held together by common interests.

In previous chapters the complexity of the forest sector was described. The sector is dependent on forest resources which vary according to climatic conditions, terrain and the species present. It supports many different kinds of activity, generating value, employment and trade, and produces a diverse range of outputs, both tangible and intangible. Corresponding complexity is evident in the organizational compo-

sition of the sector. The types of social groups represented and the extent of their interests are wide-ranging. Each organization has its own purpose, set of interests and internal structure, which influence its behaviour. Each of them contributes to the behaviour of the sector as a whole, which can only be fully understood in relation to the structure and behaviour of its parts.

## Organization Theory

At this point it is appropriate to turn aside from the variety of organizations found in the sector and examine some general organizational features. The study of organizations and their behaviour progressed during the 20th century and now offers insights which can enhance our understanding of the forest sector. With their help it is possible to appreciate better both the working of its individual components and its behaviour as a loosely-structured, organizational entity with distinctive characteristics of its own. Organization theory may assist with the design and improvement of organizations, making them more efficient and better able to cope with change.

Whatever their size or the nature of their activities, all organizations have four factors in common[14]. These are the features on which organizational behaviour and effectiveness depend:-

- *people*, who interact with one another,
- *structure*, to channel and coordinate their interactions and efforts,
- *aims*, which the organization seeks to achieve,
- *management*, to direct and control the activities of the organization in pursuit of its aims.

The resources (natural, human and capital) that are available to an organization need to be combined and used effectively to achieve the best possible results. The management process integrates people, structure and aims, and controls the way resources are used. The outcome of the management process determines organizational success or failure.

An important distinction is made between formal and informal organization. These categories refer to the internal working of social groups. According to Buchanan and Huczynski[15], *formal* organization refers to the collection of work groups that have been consciously designed by senior management to maximise efficiency and achieve organizational goals, while *informal* organization refers to the network of relationships that spontaneously establish themselves between members of the organization on the basis of their common interests and friendships. The informal component affects the working and efficiency of an organization. It has an important influence on morale, motivation, job satisfaction and performance. It can encourage members to use their initiative and creativity for the benefit of the organization or can impede it by covert and obstructive activities.

Organization theory depicts informal organization as a feature which occurs within the framework of the formal relationships in a company or agency as described in Box 6.5; the behaviour of the people in an organization is viewed

**Box 6.5 Informal organization**

"Within the formal structure an informal organisation will always be present. The informal organisation arises from the interaction of people working in the organization, their psychological and social needs, and the development of groups with their own relationships and norms of behaviour, irrespective of those defined within the formal structure.

- The informal organization is flexible and loosely structured.
- Relationships may be left undefined.
- Membership is spontaneous and with varying degrees of involvement.

Group relationships and norms of behaviour exist outside the oficial structure and the informal organisation may, therefore, be in conflict with the aims of the formal organisation."

Source: Mullins (1996), page 72.

from two aspects — formal and informal — which exist side by side. No doubt this duality is present in the larger forest sector organizations, as it is in comparable organizations outside the sector. Forest departments and forest industry corporations have an elaborate formal structure and defined set of relationships governing their operations. The people working in them also become members of informal groups of various kinds, based on their personal relationships and social affiliations, and may occasionally be involved in trade disputes, go-slows or strikes. However, this formal/informal idea is less easily applied to many of the other, smaller interest groups in the forest sector, such as NGOs or members of participatory forestry schemes. These groups are usually loosely structured with ill-defined relationships. They are informal by nature.

It is more realistic to visualize the organizations in the forest sector along a scale running from highly organized to chaotic. Those at the highly organized end of the spectrum also contain informal groups, those towards the other end have more flexibility, operate by consensus, and have less need to formalize their structure and relationships. Only the larger, more elaborate organizations depend on discipline imposed by management to achieve their aims.

Seen as a whole, the forest sector of a country is a loosely structured conglomerate composed of organizations/interest groups of many kinds. It is not a highly organized entity and the organizations within it are not subject to obvious unified control. Like the informal groups within an industrial organization, the organizations and interest groups at the less highly organized end of the range may have divergent interests and may oppose the activities of the more highly organized agencies in the sector. As a unit, the forest sector usually lacks coherent direction and overall management. It has no discernable formal structure or arrangements for power-sharing and control. These factors add to the difficulty of achieving national development aims.

Generally, the formal structure of organizations varies according to their size, function and activities. Mullins[16] relates structure to the process of management and describes it in the following way:-

> "Structure is the pattern of relationships among positions in the organisation and among members of the organisation. The purpose of structure is the division of work among members of the organisation, and the coordination of their activities so that they are directed towards achieving the goals and objectives of the organisation. The structure defines tasks and responsibilities, work roles and relationships, and channels of communication."

In small organizations, interpersonal relationships are simple, and the distribution of work, authority and responsibility can be arranged informally. With increasing size, the structure needs to be more carefully designed, purposeful and formal. Large organizations, particularly those with dispersed activities, rely heavily on internal information exchange and communications.

Structure differs from organization to organization to suit their particular circumstances and management styles. A variety of organizational forms is found in the forest sector, ranging from rudimentary, in small local enterprises managed by their owners, to complicated, as in corporations which may have several factories located in different places, making assorted products for sale in various markets. Government departments are bureaucracies, structured to conform with civil service regulations, while NGOs are loosely-structured, flexible and adaptable voluntary groups which depend on maintaining the sympathy and support of the public.

Organizations have layers within their structure which relate to levels of responsibility and authority. Mullins distinguishes three:-

- an *operational* or technical level, at which tasks are performed, work is done and services are provided,
- a *managerial* or organizational level, which deals with coordination and integration of the work at operational level,
- a *community* or institutional level, which is concerned with broad objectives and the work of the organization as a whole.

These levels are interrelated and the boundaries between them are often fuzzy. Typically, the effects of decisions at the institutional level permeate downwards to provide direction for the managerial level, which in turn controls operational activities. However, action taken at the work face sometimes restricts the choices open to managers and affects overall policy. Two-way communication is essential so that managers, when drawing up plans and supervising operations, can make use of the technical expertise and know-how of the people most closely concerned with the work. Similarly, if those at the institutional level lose touch with middle managers and operatives, misdirection, misunderstandings and loss of confidence are likely to result.

In practice, in small organizations, such as a family-run bush sawmill, the same people may do everything and functional specialization is minimal. Larger organizations engaged in processing and manufacturing, divide the work and resort to devices

such as job descriptions and organization charts to clarify employees' responsibilities and authority. The functions of the three levels — operations, coordination and overall direction — are necessary in all types of organization, but a stratified command structure to carry them out is not always desirable or required. Cooperative relationships may suffice in some organizations and collaboration between organizations is the only satisfactory basis for administering the forest sector as a whole.

Larger organizations are usually subdivided into sections, departments or even subsidiary companies; they are multi-layered. Each unit in the hierarchy has limited authority and responsibilities in accordance with general guidelines set from above. Units may carry out particular tasks, such as marketing, or undertake different stages in the productive process, such as machining or timber preservation. They may be located at different sites if operations are decentralized, or concentrated in one place to achieve economies of scale. Service organizations (e.g. forest management consultancies) may have branches to serve their clients and sales organizations (e.g. timber merchants) often set up networks of depots and warehouses.

Organization structure is very varied and is influenced by such factors as the objectives of the organization, the nature of its activities, the preferences of those in control, the environment in which it is operating, and its history. Past events are important because they create sets of interrelationships and establish behaviour patterns that are often difficult to change. The way that an organization has grown, the present location of its facilities, the kind of technology employed, its financial stability, its style of management and similar characteristics are all features that can restrict choice in relation to structural change. Structures evolve as situations alter and frequently are shaped more by force of circumstances than managers' intentions.

Part of this variety stems from differences in circumstances which lead to different organizational responses. Several factors are at work, which change over time. Organizational effectiveness is said to stem from the interaction between seven factors (see Fig. 6.2) for which a diagrammatic framework has been suggested by Waterman, Peters and Phillips[17]. The distinguishing characteristics of each organization depend on these factors and the way they interact.

There is no 'best' structure, which fits all organizations and all circumstances — no single, optimum solution to the problems of organizational design. This conclusion emerges clearly from many studies of organizations and the extensive literature about them that has become available. Organization theory started in the early part of the 20th century, in an industrial context, with the idea that there were common principles of good management applicable to all organizations. The early writers — Taylor, Fayol and Weber — thought of organizations in terms of their purpose and formal arrangements. Their approach was based on the belief that organizations were rational entities, that the design of organizations was a science and that people were economic beings, solely motivated by money. This, so-called, Classical approach was superseded in the 1930s by the Human Relations approach and in the 1960s by the Contingency approach (see Box 6.6). The former was a

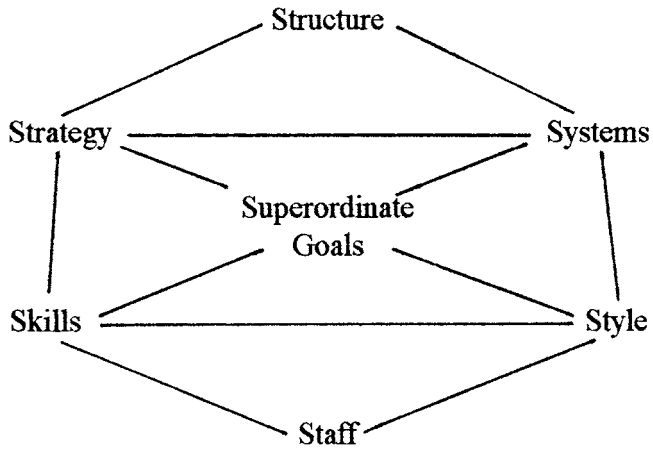


*Figure 6.2* The 7-S Framework of organisational interactions

reaction against the mechanistic views of the early writers, the latter rejected the idea that there is a 'one best way' for all organizations[18].

However, organizational circumstances are not the only formative influence. The forms which organizations take and their characteristics are also shaped by managers' preconceptions. Gareth Morgan[19] has pointed out that "all theories of organization are based on implicit images or metaphors that lead us to see, understand and manage organizations in distinctive yet partial ways". He identifies eight such metaphors: organizations seen as (i)machines, (ii)organisms, (iii)brains, (iv)cultures, (v)political systems, (vi)psychic prisons, (vii)flux and transformation, and (viii)instruments of domination. The metaphors create insights, although they also have limitations. The mechanistic view belongs historically to the mechanical age and corresponds with the Classical school of thought. Organizations perceived as living systems, which adapt to suit their environment, are related to Contingency theory. Foresters, working in the bureaucratic environment of government forestry departments, have tended to think along classical lines and often fail to appreciate that their preconceptions are out of date. The need to allow for organizational learning (the 'brains' metaphor), the influence of organizational culture and the fact that organizations are intrinsically political, containing diverse and potentially conflicting interests which must be reconciled, are factors that foresters have been slow to recognise.

Recently, new insights have come from research and experience on both sides of the Atlantic. The design and management of organizations has moved from an ad hoc process based on guesswork to one that is highly complex. Burnes[20] refers to 'paradigms' — the sets of assumptions, theories and models that have emerged and become commonly accepted — in the field of management and organization theory. He points out that it has become difficult to apply and defend the old paradigms in today's turbulent business world. The old preconceptions are breaking down and

**Box 6.6 Features of the Human Relations and Contingency approaches to organization**

"The main precepts of the Human Relations approach were almost diametrically opposed to those of the Classical approach. In particular it was argued that:

- *Man is an emotional rather than an economic-rational being* — human needs are far more diverse and complex than the one-dimensional image that Taylor and his fellow travellers conceded. People have emotional and social needs that can have more influence on their behaviour at work than financial incentives.
- *Organisations are co-operative, social systems rather than mechanical ones* — people seek to meet their emotional needs through the formation of informal but influential workplace social groups.
- *Organisations are composed of informal structures, rules and norms as well as formal practices and procedures* — these informal rules, patterns of behaviour and communications, status, norms and friendships are created by people to meet their own emotional needs. Because of this they can have more influence on individual behaviour and performance, and ultimately overall organisational performance, than the formal structure and control mechanisms laid down by management."

"Contingency Theorists adopted a different perspective, based on the premise that organisations are open systems whose internal operation and effectiveness is dependent upon the particular situational variables they face at any one time, and that these vary from organisation to organisation. This is consistent with evidence that not all organisations — or even all successful ones — have the same structure, and also that even within organisations, different structural forms can be observed. Though many situational variables, such as the age of the organisation and its history, have been put forward as influential in determining structure, it is generally agreed that the three most important contingencies are as follows":

- *Environmental uncertainty and dependence* — the management of any organisation is undertaken in circumstances of uncertainty and dependence, both of which change over time. Levels of uncertainty and dependence will vary, but can never be totally eliminated, and must therefore be taken into account, i.e. treated as a contingency, when designing organisational structures and procedures.
- *Technology* — Organisations creating and providing different products and services use different technologies. Given that these technologies can vary from large and expensive to relatively small and cheap, the form of organisation necessary to ensure their efficient operation will also vary.
- *Size* — The structure and practices necessary for the efficient and effective operations of small organisations are not suitable for larger ones. In the former case, centralised and personalised forms of control are claimed to be appropriate but as organisations grow in size, more decentralised and impersonal structures and practices become more appropriate.

Source: Burnes (1992) pages 28 and 40–42.

new forms of organization are emerging, which are remarkably different from most of the theory and practice that has gone before.

Organization theory has become more sophisticated as the variety of forms of organization has been revealed by research. There are no simple rules to determine how best to organize in any given situation. Companies operating in the same market are not all similarly structured. The culture and management style of organizations varies even though their functions appear to be similar. Firms in the same industry range in size from large to small. In public adminstration there are many ways of providing comparable government services, and the activities of ministries and departments may be centralized or dispersed. In the forest sector there are diverse solutions to apparently similar organizational problems. Forestry departments differ from country to country even though they provide the same services, and forest industries adopt a range of production systems to produce the same outputs.

The new techno-economic rationale has three main features: it is based on new information technology, more flexible production systems and greater integration. First, owing to more expensive energy and relatively cheaper information inputs, there is a shift towards information-intensive rather than energy-or materials-intensive products. Second, there is a change from dedicated mass production towards more flexible systems that can accomodate a wider range of products, smaller batches and more frequent design changes; 'just-in-time' manufacturing methods and 'total quality management' are cited as examples. 'Economies of scale' are being replaced by 'economies of scope'. Third, greater integration of functions and systems within companies and between suppliers and customers is taking place. This integration permits a more rapid response to customer requirements, whether this be in relation to quantities, product characteristics or new market opportunities.

These general features affect the organizations within the forest sector. New information possibilities, such as geographic information systems (GIS), are altering the way forest departments work. The trend towards greater flexibility is evident in forest management, which is expected to provide a wider range of tangible and intangible outputs than formerly, and in forest industries, which need to respond positively to changes in consumer preferences, such as the desire for wood from sustainable sources. Collaboration between organizations along the production chain is necessary in order to certify that the products reaching consumers have originated from well-managed forests. Production systems based on agroforestry and participatory forestry schemes require more responsive forms of organization than is provided by traditional forestry bureaucracies and large-scale industrial corporations are not easily adapted to the provision of small-scale, forest-based service outputs. New forms of organization are slowly emerging to meet the needs of the forest sector.

One of the leading thinkers on organizational matters is Charles Handy. He argues that change has become discontinuous and no longer part of a pattern. Discontinuous change calls for discontinuous thinking, which is liable to be confusing and disturbing. It calls for unorthodox organizational responses, suited to the

developments taking place in technology, work and employment. He distinguishes three new forms of organization, which have resulted from the adoption of less labour-intensive methods aided by clever machines[21]. The first of these generic forms he calls the *Shamrock* organization. Like the three leaves of a trefoil, this has three groups of workers with different functions and expectations: a small group of specialist, 'core' workers, a contractual fringe of semi-independent groups and individuals, and a flexible labour force. His second type is the *Federal* organization, which is an association made up of various individual groups or organizations allied together under a common flag with some shared identity. The third form of organization is the *Triple I*, based on **I**ntelligence, **I**nformation and **I**deas at the core; its success depends on knowledge and the ability to use that knowledge. These new forms rely on a culture of consent rather than command — agreement instead of orders. They are likely to dominate in the future, replacing traditional organizations which will either adapt to changing circumstances or wither away.

Generally, organizations in the forest sector are likely to become smaller, more flexible and less hierarchical. They will need to treat people as assets to be developed and motivated rather than liabilities which limit profits and progress. All three of Handy's emergent forms have a place in the sector. We can envisage forestry departments which fit the Shamrock description, each staffed by a small core of well-trained specialists, subcontracting non-essential services to outside organizations or consultants, and employing a mobile, flexible, skilled work force. This form is also suited to the needs of NGOs, eager to respond to opportunities to advance their members' interests, and private firms, striving to meet customers' requirements and competing demands in present-day world markets. The Triple I form of organization is applicable for the provision of specialized, technical services by small companies, such as forestry consultants; it is also appropriate at the core of other forest sector enterprises and to provide oversight, guidance and direction for development of the sector as a whole. The forest sector, which is a conglomerate, can only function as a Federal organization. No other form can adequately respect the rights, interests and responsibilities of member organizations brought together in a voluntary association.

## 6.2 THE INSTITUTIONAL FRAMEWORK

The organizational variety and complexity of the forest sector has been described in the previous section. In this section we examine the features which bind its disparate components together. Different interests are represented, sometimes in conflict with one another, but the sector as a whole is a loose association, which is characterised by its dependency on forest resources. The organizations in the sector have a common, long term interest in the protection and wise use of the forests which sustain them, even though their individual activities may deviate or run counter to it in the short term. This mutual interest justifies and underpins the institutional framework which binds the sector together and helps to make it a recognizable entity.

The framework consists of five groups of institutional features which enable the sector to operate in a coherent way. Each group is associated with a particular function or aspect of sectoral activities:-

(i) the established laws, customs and practices, which regulate the activities of organizations in the sector,
(ii) the policies and programmes relating to forest resources, activities and outputs, which give the sector a sense of direction and promote its development,
(iii) the financial and economic arrangements by which resources are allocated,
(iv) the arrangements for education, research and data handling, which assist organizations and individuals to acquire knowledge about the sector,
(v) procedures which regularise relationships between groups, providing for participation, conflict resolution and leadership in sectoral affairs.

The characteristics of these groups are discussed individually in subsequent pages. They interact and complement each other. Taken together, when properly coordinated, they constitute an effective infrastructure for the sector and serve as the main means by which it can be managed and developed.

External factors impinge on the institutional framework, particularly policies and programmes in other sectors, and development of the sector may be curtailed by the flows of financial and other resources available from outside sources. Internationally, the framework is constrained by various conventions and agreements, which limit the scope of sectoral activities. Institutional support is provided, particularly in developing countries, from UN agencies and other sources of foreign aid. The framework provides the main route by which outside events and global changes can influence what happens in the sector and its future development.

The institutional infrastructure plays a key role in forest sector development. It can facilitate progress or hold it back. Harmonious relations between organizations may be encouraged or conflicts of interest may remain unresolved, leading to counter-productive effort which dissipates scarce resources. It can create fruitful opportunities, constructive attitudes and social harmony, or lead to squabbling over shares of the available resources, confrontation and tension. Communications within the sector are an important element. Participation and consultation are necessary ingredients, which help to foster a sense of 'togetherness' and establish a common purpose. Relations with other sectors and with the international community are largely determined by the institutional framework. It is therefore a target for intervention by those trying to further their own aims or, more disinterestedly, seeking to relieve poverty in third world countries, improve standards of living and safeguard the global environment.

## Law, Custom and Practice

The institutional framework has a *regulatory* function, based on formal, legal enactments, which are made effective by decisions of the courts, and a range of informal rules or norms, established by society through tradition and everyday usage. Typically, legislation protects forests from destruction and regulates forest

**Box 6.7 The role of the legislature**

"Legislatures are the primary means by which modern democratic societies establish and maintain legal order, crystalize and settle conflicts, grant legitimacy to policies and programs, and adapt the existing rules of society to new conditions. Their staying power — they have existed for over 200 years in the United States — attests to their ability to aggregate diverse interests and to maintain a degree of consensus within society. To be sure, legislatures are only a part of the apparatus for making authoritative social decisions. In a variety of ways they share power and responsibility with chief executives, bureaucracies, courts, political parties, interest groups and the like. Time, place and leaders shape these relationships. If they so choose, legislatures may follow the lead of separate power centres, join with them, ignore them, pit one centre against another, or struggle against them. Legislative systems are fascinating political entities. They have much to do with policies and programs that are focussed on the use and management of the nation's forests and related resources."

Source: Ellefson (1992), page 207.

industries in the interests of society, while land tenure and usage often depend on local customs and traditional practice. Law, custom and practice interact and form a continuum, which confers legitimacy on the institutional framework.

The authority of the state is expressed through the primacy of the legislature in democracies. The legislative system is used in order to regulate forest sector activities and the organizations engaged in them. Laws are passed by the legislature, which apply to trees and forests, and establish the principles by which they should be safeguarded and managed. More detailed interpretation is normally provided by supplementary forest regulations, as permitted by the principal legislation, covering such things as fees, licences, protected species and management responsibilities. Regulations are frequently amplified by administrative instructions, issued by forestry departments and agencies. Laws, regulations and executive guidelines, taken together, supply the legal and administrative basis for the institutional framework.

Legislation, which is aimed primarily at other types of activity or sectors of the economy, often affects forest resources or influences the way they are managed, as with conservation legislation designed to protect wildlife and laws which control hunting. Similarly, laws intended to regulate industial and commercial activities generally, may affect sawmills and other forest industries. All such legislation (including supplementary regulations and procedures) contributes to the institutional framework.

The legislature is responsible for making laws, but also has wider functions as Ellefson[22] explains (see Box 6.7). Ultimately, what happens to the forest sector depends on the legislature, although much of its influence on events is derived from debate, inquiry and political pressure rather than legal sanctions. It can confer or withhold legitimacy.

Land tenure and the rights of people to use forest land for various purposes, whether formally recognised in law or not, form part of the institutional framework. Ownership of forests seldom confers unfettered rights to use of the land. Owners' property rights sometimes include the soils and rocks on which the trees are growing, and may extend to minerals or the right to extract water, but this is not necessarily the case; rights to harvest timber are often sold or leased separately from the land. In one way or another, the rights of owners are frequently limited. Thus the New Forest and the Forest of Dean in Britain, which were formerly royal hunting preserves, are subject to local grazing and mining rights; similarly, in Lithuania, there is a general right of public access to all forests more than 100 m from homesteads and anyone can collect fruit and mushrooms in them, even if they are private property. Forest managers must respect these rights and adapt their methods to suit the local circumstances.

It has been suggested that private property rights have evolved from a primitive regime in which no property exists. As demands on resources grow, users begin to interfere with each other's production unless they develop ways of allocating scarce resources among themselves; this leads to private property. When a resource is abundant relative to the demands on it, so that its value is low, the system of users' rights remains crude; but as resource values rise, more sophisticated systems of property rights are likely to emerge. The history of forest resources development in Canada is said to fit this theory well[23]. The first European settlers found more than enough fish, timber, water and wildlife for everyone. As the population and the economy grew, land was first appropriated for settlements and agriculture, exclusive rights to minerals and timber followed, and rights to fisheries, wildlife and water are still being worked out. The early settlers acquired freehold forest lands; tenure is now conferred by means of long-term management agreements which confer rights to harvest timber in return for responsibilities for managing and developing the forests, and payment of stumpage fees to the state. Property rights, other than the land itself, have become stratified, so that the same area may be covered by separate rights to minerals, water, timber, hunting etc.

In the Third World, land usage is undergoing drastic change as the pressure on natural resources increases (see Box 6.8). Governments have not always respected customary rights to forest use by indigenous tribal people, whose way of life and even survival frequently depend on the forests. Subsistance agriculture based on shifting cultivation is still practised in the tropics[24] and forests have been widely regarded as common property, used to sustain agriculture and the rural household economy[25]. However, traditional practices are breaking down and becoming unsustainable as more permanent agricultural systems are developed and the area of forest shrinks.

The laws, customs and practice, on which the institutional framework of the forest sector is based, evolve in response to events occuring outside the sector and changing attitudes among legislators and the public. Forest legislation requires revision from time to time, to accord with shifts in public policy and to meet

**Box 6.8 The decline of off-farm tree resources in the tropics**

"In most parts of the developing world, rural households have historically obtained most of the complimentary inputs of fodder, fuel, green mulch, food and saleable commodities that are often critical to the continued functioning of their agricultural systems from nearby areas of forest, woodland or scrubland that were used as common property. However, nearly everywhere these resources, and their management and use systems, have been progressively eroded and undermined as a result of a long period of political, economic and physical changes.

State assertion of control first over the forest resource and then over the land has widely reduced access and rights of usage. At best people were left with usufruct rights, application of which was subject to the whim of the State and its officials. In recent times the reduction in availability of common property resources has nearly everywhere been massively accelerated. Privatization and encroachment, as well as government appropriation, have been the main processes taking resources out of common use. Increasing pressures on what is left have frequently led to its progressive degradation.

Concurrently, traditional methods of access control, usufruct allocation, and conflict resolution have become widely ineffective or have disappeared, undermined by political, economic and social changes within the village and nation. Increasing population pressure and in-migration of outsiders, greater commercialization of the products of the resource, and technological changes that encourage alternative uses of the land, have all contributed to increased differentiation within communities that reduces communal cohesion and uniformity of interest in the management of communal resources."

Source: Arnold (1997), page 6.

changing demands on forest resources. Harmonization with other laws, particularly conservation legislation, becomes necessary. International affairs also stimulate revision of official policy and procedures, as with the sustainability and biodiversity commitments entered into by many countries following the 1992 UNCED Conference at Rio. The regulatory infrastructure which supports the sector has a dynamic dimension and needs to be kept up-to-date.

### Policy and Programmes

The second function of the institutional framework is *directional*. This is concerned with the route that forest sector development should follow and the form that it should take in future years. The forest sector needs to be steered if its activities and outputs are not to be haphazard and unsustainable. The desired direction is imparted by means of policy and programmes. It involves identifying the strategic aims to be

pursued and the means by which those aims are to be achieved. Policy statements are prepared to define the objectives and provide guidance for their implementation; plans and programmes describe the action to be taken, their timing and costs.

The intentions of governments in relation to the forest sector are expressed in formal declarations of national forest policy and can also be inferred indirectly from legislation, administrative decisions and the activities of ministries and departments reponsible for forestry affairs[26]. The contents of plans and programmes reveal the specific achievements that are intended. Not all countries have issued policy statements, but it is possible to discover their forest policy from these other sources. A formal declaration is not essential, although managing without one is a disadvantage because it creates uncertainty about the precise aims and leaves room for doubt about the extent of the government commitment to those aims. Policy statements are advocated to overcome these difficulties and also to provide guidelines for action by the organizations which carry out the policy. Decisions about resource allocation, priorities and budgets are simplified if there is a clear statement of policy and confusion can be avoided about the particular roles and responsibilities of organizations in the sector. Many countries which lack policy statements, such as the former communist countries in Eastern Europe, are taking steps to remedy this deficiency.

In the British Commonwealth, the importance of having a written statement of forest policy has been recognised for many years[27]. The first resolution of the first (Empire) Forestry Conference, held in 1920, advocated that each government "should lay down a definite forest policy to be administered by a properly constituted and adequate forest service". Three reasons for this were stated: first, people should know what the policy is, second, for the sake of other government departments, and third for the sake of forest officers guidance. Delegates to the Conference envisaged a policy declaration as a precondition to be met before legislation was enacted and to enable forest land to be adequately protected. At that time no adequate forest legislation or competent forest authority existed in many countries and, to put matters right, the delegates sought to obtain from their governments public affirmations which could not be easily evaded. This approach to policy-making, which has been called the *manifesto* approach, led to similar official policy statements in most of the countries which now make up the Commonwealth. Typically, each statement consisted of a catalogue of aims intended to safeguard the forest resources of the country concerned, without indicating priorities or the way that the policy should be implemented. The resolution established a pattern, which has continued after the countries became independent nations. Policies of the manifesto type, sometimes with little modification since they were first formulated, remain in force in many places.

Policy-making is now generally perceived as a *process* rather than a one-off declaration of intent. The process approach is based on a continuous sequence of stages. There are various versions, but all are based on what might called the three A cycle: **A**nalysis leading to **A**ims, followed by **A**ction. The process consists of a rational series of steps to decide what to do and how to do it; action

produces results after which the sequence is repeated. In relation to the forest sector, Merlo & Paveri[28] provide a recent example, showing a five-phase process accompanied by evaluation and revision. Ellefson[29] puts the process into a public policy context, starting with agenda setting, followed by formulation of policy alternatives, legitimation of the chosen aim and its subsequent implementation.

The first three phases are collectively known as 'forest policy formation'. They are procedural stages, which do not necessarily involve formulation of a manifesto type policy declaration. A statement of forest policy may be useful for legislative, administrative or public relations purposes, but is not an essential step in the process. Furthermore, there is no reason why policy statements for these purposes should be limited to definitions of aims, as is customary; they would be more useful if they also explained how the policy objectives were to be achieved. The link between aims and action needs to be emphasised.

In the policy process, decisions about the courses of action are followed by the implementation phase. This is the stage at which plans and programmes are drawn up. It is succeded by the monitoring phase, which leads back to a new analysis of problems, the start of another cycle and revision of the policy. The process is described as 'rational, systematic and continuous' and has been widely applied, particularly by FAO, for National Forest Programme (NFP) preparation. However, the results of these country programmes have often been disappointing. Deforestation and degradation have continued, particularly in tropical countries, and sustainable resource management often remains wishful thinking. In practice, there has been a widespread discrepancy between policy formation and its implementation, which is referred to as 'policy failure'.

Merlo & Paveri attribute policy failure to inadequate attention, when plans and programmes are prepared, to the 'policy tools' that should be used. Forest policy tools are at the heart of the policy process, as shown in Fig. 6.3. They consist of

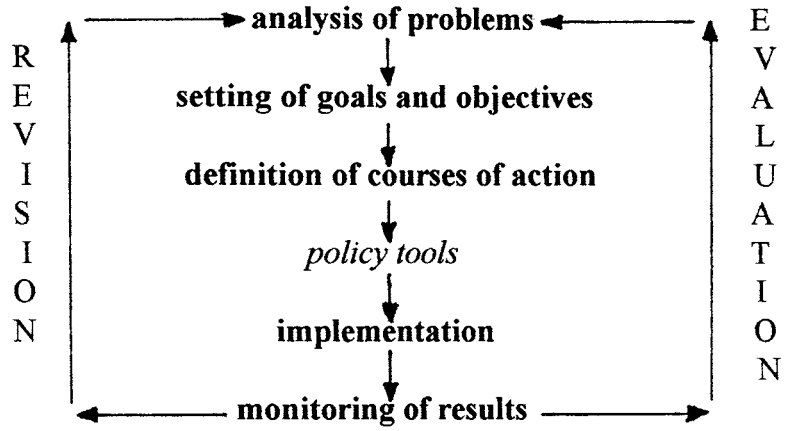


*Figure 6.3* The policy process (Source: Merlo & Paveri, 1997)

various instutional means, juridical, financial/economic and market-based, which are available to policy makers. They include regulations and property rights, taxes and subsidies, prices, tariffs and negotiated agreements. Some are mandatory, some are voluntary and some complement the effects of others. Tools are frequently used in combination. Therefore, it is necessary to select not only those which are suitable, but also the appropriate mix of tools for the purposes of the policy. The choice will, of course, depend on having, or building up, sufficient administrative capacity to apply the tools that are selected.

Plans and programmes describe the means of implementation in detail. Strategic aims, which indicate the general direction of change and development for the sector, need to be converted into more precise specifications. Subprogrammes need to be elaborated, particular projects identified and their operational details worked out. A breakdown of the activities is required so that each can be costed, included in the budget and the necessary resources allocated. Schedules need to be prepared showing the duration of each stage of the work and the timing of events. The achievement of national aspirations depends on the success of field operations; progress is measured against the regional and local targets set by the programmes.

National forest policies are generally interpreted and focussed by means of national plans/programmes. There has been a considerable advance in the methodology employed to prepare these documents during the last three decades. Starting with the international impetus derived from the Tropical Forestry Action Plan and various forestry sector planning exercises by the World Bank in the early 1980s, countries began to produce 'action plans' or 'master plans' covering the forest sector (e.g. the Nepal Master Plan reviewed by Gane, Thorud and Watt in 1988). International aid for these was provided from bilateral and multilateral sources and usually the plans were donor driven. From about 1990 onwards the plans have been oriented more towards recipient countries' needs and aspirations. They have also been called 'programmes' rather than 'plans', to reflect the long-term, continuing nature of forest sector development. International guidelines recommend national forest programme (NFP) preparation be based on a strategic review of the forest sector[30]. The aims are thus linked to the action through the policy process (see Box 6.9).

The directional function of the institutional framework includes both policy and programmes. It deals with two types of questions relating to the forest sector: the 'what' and the 'how' of sectoral development. The policy element refers to the aims and objectives; it defines the purposes of development and the achievements that are hoped for; it seeks to answer the 'what' question. The programmes element specifies the way forward that has been chosen, the action to be taken and the means to be used; it responds to the 'how' question. These questions are interrelated because the choice of aims is influenced by the means available for their achievement and the choice of means depends on the aims to be pursued. The aims should be realistic and the action should be purposeful. The policy process is intended to reconcile these aspects.

**Box 6.9 The National Forest Programme Approach**

- "National Forest Programmes follow a participatory planning and implementation approach that encourages the involvement of all forest-dependent actors at local, national and global levels and the development of a partnership between all stakeholders, emphasizing national sovereignty with regard to the management of forest resources and the need for country leadership and responsibility.
  - As a framework for planning, the National Forest Programme provides strategic orientation for the forestry sector, in harmony with other sectors of the national economy.
  - As a framework for action, the National Forest Programme provides an environment for the concerted and coordinated implementation of programmes and activities by all stakeholders based on mutually agreed objectives and strategies.
- The National Forest Programme approach is flexible and can be adapted to a wide range of situations. Although originally devised for tropical countries and national level planning and implementation, the basic principles and operational guidelines of the National Forest Programme can be applied to all kinds of forests and at various levels: national, international and sub-national."

Source: FAO (1996), page 13.

Administrative arrangements are necessary to support all phases of the policy process. These arrangements form part of the institutional framework. The framework should provide for strategic review of the sector, facilitate policy formulation and include procedures that allow for participation by stakeholders and the public when programmes are drawn up and revised.

### Financial and Economic Arrangments

The third institutional function is *allocative*. It concerns the arrangements for maintaining the momentum of forest sector activities, supplying resources to keep them going and distributing the benefits. The sector has a financial and economic infrastructure, which includes budgeting and allocation of funds, the preparation of economic appraisals, provision of incentives and subsidies, and market intervention by means of prices, tariffs, trade restrictions and international agreements. The institutional framework utilizes a range of policy tools. It also has to grapple with allocative difficulties caused by distorted prices and some intangible outputs, such as biodiversity, which have no market prices.

Forest sector activities depend on input and output flows. The values of these flows are shown in budgets, which provide the main means of allocating and

controlling expenditure. In commercial enterprises, such as sawmills, the productive process is sustained by inputs of roundwood, labour and other factors of production, which are bought and paid for with the income obtained from sales of goods and services. Provided that an enterprise breaks even, the cost of the inputs is covered by the cash flow from sales. In theory, inputs are allocated according to their marginal costs and outputs are distributed amongst customers according to their willingness to pay. In practice, managers use budgets to control expenditure on resources and attempt to increase net income over time by investments which increase productivity. Non-commercial organizations, such as NGOs, whose main aim is not profit maximization, also budget to match their outgoings to their expected income. Forest departments and other public sector organizations compete for funds as part of an allocative process based on estimates of government revenue and expenditure. The national budget reflects social and political priorities; forest department budgets reflect forest sector priorities. Budgets are used by organizations throughout the sector to manage their resources. They form an important part of the institutional framework.

Resource allocation within the forest sector is influenced by national policy and plans. The annual round of budget preparation and approval, which all government departments undertake, assigns expenditure to meet short-term, operational needs. Government development budgets and national plans are designed to stimulate investment in the longer term; usually prepared at five yearly intervals, they indicate priorities for using the resources that are expected to become available during the plan period. Priorities for annual budget preparation come from the national plans, based on their medium to long-term projections. Directional guidance for the forest sector is supplied by the sector strategy and NFP in countries where these exist. National development budgets and plans usually contain provision for government investment in forestry projects, corresponding with the proposals in the NFP. The arrangements for both recurrent and development budget preparation form part of the institutional framework of the forest sector.

The institutional framework also needs the capacity and expertise to process investment proposals. Particular projects normally undergo detailed investigation at the design and approval stages. Project planning includes financial and economic appraisal to determine the viability and compare the merits of alternative methods and scale of operations. Specialized skills are required, including supply and demand forecasting, cost-benefit analysis, scheduling, monitoring and evaluation. In developing countries, where overseas aid is involved, such analysis is normally a prerequisite of donors and project preparation is often a lengthy, drawn out process. These functions are best carried out at forest sector level by small planning units set up to deal with forest project and NFP preparation.

Resource allocation in the forest sector depends partly on commercial considerations based on profitability and partly on expenditure plans that are intended to procure wider benefits for the community. Several factors affect the balance between these two influences. They include the nature of the country's forest resources, the proportion of forest in public ownership, the relative importance of forest

sector activities which are controlled by private interests, and the value attached to non-market benefits by the community. Public sensitivity to environmental quality issues has increased. Forest managers tend to spend relatively less money on timber production than formerly and pay more attention to activities which result in non-wood outputs and intangible benefits. Resources are being channelled away from production that generates revenue, towards financially unprofitable activities that need to be subsidized. This trend increases the financial burden on the public purse. For example, the response to emotive appeals to stop deforestation or safeguard the habitat of endangered species is usually based on government action. Private interests, unaided, have neither the money or the capability to tackle such problems. Environmental outputs, regardless of their social value, tend to add to the flow of costs without any corresponding increase in revenue. The sector's financial and economic infrastructure has to cope with this imbalance.

The benefits of managing forests to meet environmental objectives are very difficult to value. Subjective judgements are involved and assumptions about peoples' future preferences that are difficult to substantiate. In an ideal situation, resource allocation decisions would balance supply and demand for each output over time, to achieve sustainability and produce the mix of outputs that society prefers. Then, if a price could be put on every output, it would not be possible to increase the total value to society of all outputs combined by altering the quantity of any one of the outputs or changing the pattern of resource use. However, the achievement of such an optimum in the forest sector is well nigh impossible. Some outputs have no market prices (eg. scenery) and can only be valued indirectly, using surrogate methods and assumptions about people's willingness to pay, while others are supplied jointly, so that increasing the supply of one (e.g. timber) alters the output of others (reduced biodiversity and increased carbon sequestration). Market prices are frequently distorted due to monopoly, monopsony or regulation by governments. The pattern of resource allocation is therefore the result of estimates, compromises and market imperfections. Furthermore, as has been pointed out, allocation is controlled indirectly, as the result of financial decisions made through budgets. At best, the financial and economic arrangements lead to imperfect allocation, at worst, resource allocation is arbitrary.

The institutional framework makes use of various policy tools in order to overcome allocation difficulties caused by the imbalance between financial outlays and receipts. They include a range of measures intended to make forestry activities financially more attractive, such as planting and tending grants, or to compensate private owners who are obliged to protect particular species or habitats. Incentives, such as tax 'holidays' or tariff reductions, may be offered to encourage environmentally beneficial activitities, or financial penalties imposed for damaging or polluting the environment. In some cases, special funds may be earmarked for forest conservation and development activities, with support from foreign donors, or governments may be able to draw on international assistance to support particular projects which meet global concerns, such as biodiversity or climate amelioration. Policy instru-

ments are frequently used in combination and the mix of financial/economic with legal, or other methods is often critical to successful implementation.

### Education, Research and Data Handling

The institutional framework's fourth aspect is information-based and may be called the *knowledge* function. It relates to the acquisition of knowledge and the way it is communicated and stored. The knowledge function underpins development of the sector's human resources. It includes the provision of formal education and training for personnel employed in the forest sector and informal arrangements to meet the learning needs of other groups of people who are involved in one way or another in sectoral affairs. The acquisition of new knowledge by investigation and research, and the transfer of existing scientific and technological information from elsewhere are also covered. Arrangements for information storage in libraries, record systems and data bases are necessary, with appropriate access facilities for both specialists and the general public.

The sector's human resource needs can be portrayed as a pyramid[31] (see Fig. 6.4). Its broad base is made up of relatively numerous, semi-skilled and skilled workers, the middle layers consist of smaller numbers of technicians and subprofessional employees, and the upper levels contain relatively fewer personnel with university degrees and postgraduate qualifications. The composition of the pyramid, and its shape, varies according to circumstances; each country has a different balance of needs, which alters with time. Each level in the pyramid merits appropriate educational arrangements. The institutional framework should aim to provide education and training facilities, of a suitable kind, sufficient to cater for the numbers required at each level. Sometimes the needs of workers near the base of the pyramid get

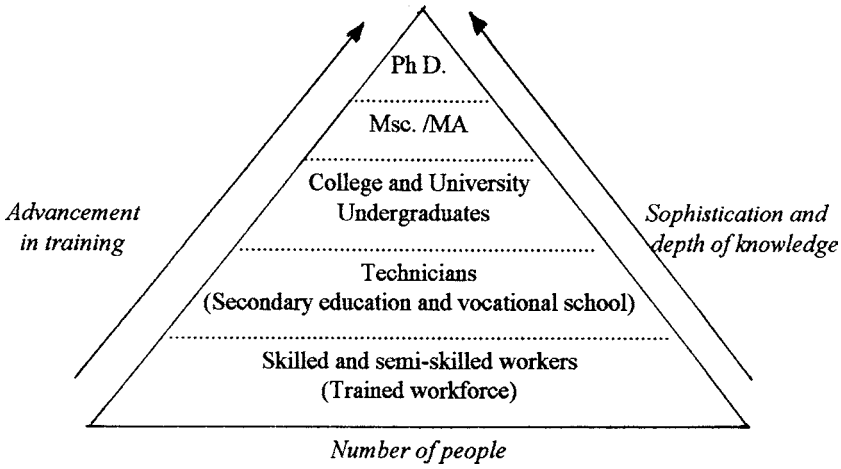


*Figure 6.4* Investing in people: ideal human resource development pyramid (Source: Guevara, 1997).

overlooked, but all levels are indispensable and the framework should address the task of developing human resources for the whole sector. A suitable mixture of facilities is desirable, balanced to suit the situation, although the best blend may be difficult to achieve in practice.

It is important to perceive education and training as an investment which produces returns. Improvements in skills and knowledge add to the stock of human capital, enhance the economic prospects and welfare of poor people, and increase the capacity of the sector to supply outputs of all kinds for the community. The allocation of resources to this part of the institutional framework is justified by its results. In the long run, the knowledge possessed by the people and organizations in the sector, their ability to learn and willingness to adapt, determine how well the sector performs and its future development possibilities.

Education is required at the professional level, to produce foresters, ecologists, engineers, technologists and managers. The higher echelons in the civil service and senior management in private sector corporations are normally occupied by personnel with degree-level educational qualifications. In most countries, higher education is supported by the government and courses are provided to improve the general level of education and meet the needs of particular sectors, the forest sector included. University departments and colleges that specialise in rural affairs offer forestry courses, while graduates in other disciplines, such as biology and engineering, put their specialised knowledge to work in forest sector activities. Students are required to study for three or more years, so that there is a time lag before the educational system can respond to increases in the demand for graduates. To ensure that the higher education system produces an adequate flow of the right sort of trained people, some attempt to anticipate future requirements is necessary, even if precise numbers are difficult to predict.

Education and training at the sub-professional level and for workers, such as fire crews and machine operators, is usually less lengthy. It is provided either through special training courses or by on-the-job instruction. As with professional training, one of the important functions of the institutional framework is to provide courses and opportunities to build up and maintain the expertise that is essential for forest sector operations and activities. The sector depends on the quality of its work force and its practical skills, which will decline if not supported by adequate initial training and regular updating.

The role of educational institutions is changing. Formerly, universities and colleges were mainly concerned with preparing young people for their subsequent careers; what happened after that was seen as the responsibility of employers. This perception has been replaced by a more dynamic approach, based on lifetime learning, which seeks to update student's knowledge throughout their careers and provide opportunities for further study and additional qualifications. It is necessary to transmit new information, research results and a broad range of subject matter to enrich the sector's human capital resources. Educational establishments have extended their activities to provide in-service training and refresher courses. There has also been a marked growth of post-graduate courses and opportunities for further

education. Access to new information technology and the world-wide-web adds another dimension by enabling people to obtain information from global sources while studying from home at their own pace. Continuing education is being woven into the fabric of peoples lives, whether they work in the field or in factories.

The content of forestry courses is also changing in response to the challenges and opportunities which face the profession, although there is much room for improvement. Roche[32] has pointed out that forestry, in both the developing and developed world, is attracting unprecented public attention and, "at a superficial, journalistic level", foresters are being unfairly criticised for deforestation and environmental degradation. He fears a loss of confidence, which the institutions responsible for education and training must confront by strengthening technical and professional competence. As with professions such as medicine and engineering, there are consistent principles which apply in all parts of the world. These are based on the range of scientific disciplines required to manage forest land to obtain multiple outputs (not only timber) in perpetuity and an interdisciplinary approach that views trees and woody vegetation in a rural land use context. Batchelor degree courses need revision to bring them up to date, but the false dichotomy between 'social' and 'production' forestry that has grown up, largely as a response to tropical deforestation, does not justify a plethora of fashionable new courses or overloading curricula with diverse, extra sociological topics. A minimum set of core subjects should be taught, sufficient to instill professional competence in all situations, wherever the country and whatever the clime, and to provide enough familiarity with other disciplines to enable foresters to work with others.

The educational needs of foresters can no longer be subservient to timber production; forest management has to tackle the problems associated with other tangible and intangible outputs, and of combining multiple outputs in optimum proportions. Interactions with other sectors need to be understood before their effects can be moderated. A broader and more open-minded approach to problem-solving needs to be demonstrated and instilled as part of the educational process if foresters are to justify their place in rural development. It is also necessary to break the traditional, bureaucratic mind-set of foresters employed in state forestry, who are in danger of being sidelined because of their lack of appreciation of alternative organizational models which are better suited to dynamic conditions in the modern world. These are the conditions in which the educational portion of the sector's institutional framework has to operate.

Education and training transmit existing knowledge and skills from one generation to the next. They are also concerned with disseminating new information about the sector, both internally and to the general public. News of relevant scientific discoveries and technological advances may come from abroad, research may produce useful information that can be applied in the sector and new insights may derived from practical experience. The interpretation of such information to make it intelligible, and its spread amongst those able to make use of it are important tasks. The underlying objective of ordering, digesting and passing on the accumu-

lated stock of knowledge about the forest sector remains the primary educational function, which the institutional framework should address.

Research generates new knowledge and technology transfer applies existing ideas and know-how in fresh situations. Both activities contribute to sector development and suitable administrative arrangements for carrying them out are a necessary part of the institutional infrastructure. Initiatives may come from government or private sources, but many studies in the forestry sector bring no direct commercial benefits and depend on finance provided by the state. Opportunities for research and development, which may directly benefit particular organizations or indirectly contribute to sectoral performance, require assessment to avoid wasteful expenditure. It is desirable that worthwhile proposals should be thoroughly investigated from a sectoral point of view, both as to their financial profitability and the economic benefits that may accrue to society. Project priorities can then be assigned and a balanced programme prepared, covering all aspects of sectoral activity. Research and development needs to be planned and implementation of the plans calls for collaborative action under government leadership. Most forest research aimed at environmental benefits will need to be undertaken by public sector institutions because it has no payoff for the private sector, while studies aimed at increasing productivity in timber growing, harvesting and processing are more likely to attract investment from private sources. The institutional arrangements for coordinating the research efforts of forest sector organizations should cover both the investigations and the subsequent take-up of their results.

As with education and training, the content of research programmes in the forest sector is changing (see Box 6.10). It has been argued[33] that the need is for "more and different forestry research" as the world moves towards a knowledge-based society and a globalized economy; countries that invest heavily in education, science and technology are more likely to make rapid economic progress than those that do not. Forestry research tends to be underfunded compared with agriculture and is often misdirected. More resources are needed to strengthen national and international research capacity. Different types of research are required to answer the new questions now being posed. These include investigation of the extra-sectoral interactions which affects forest resources, such as the effects of agricultural, infrastructure and trade policies, and to how best to deal with the ecological and social problems related to multipurpose forest management, such as the sustainability of particular species and the survival of communities of forest-dependent people.

These changes come at a time when the finance available from national and international sources is stagnating or declining. The pressures for economic efficiency and competitiveness are reducing the resources available to state forest agencies and in some cases the management of forests for timber is being transferred to the private sector. The institutional arrangements for forest research are affected, with responsibility tending to pass to the private sector for research directed at productivity enhancement, biotechnology, harvesting and processing, while investigation of environmental and social issues is left to the state. The need for research into

**Box 6.10 Changing expectations from forestry research**

"...there is also a widely perceived need to change the culture of science as applied to forests. In the past, most forestry research was carried out by public sector forest research institutes whose primary mandate was the national forest estate. The normal scale at which research was conducted was the management unit or forest stand. Foresters did not in general look outside the limits of the forest that was allocated to their state forest service. Much of research was concerned with improving productivity for timber — genetic improvement of trees, site management, silvicultural treatments, and inventory and monitoring of forest stands. If there is a world forest crisis, it is not so much a crisis of declining supply of industrial raw materials, as one of declining supplies of environmental services and of forest products essential to the still-marginalised populations of less developed countries."

"In the past, forest research has generally been poorly linked to research on social, economic and ecological issues relating to forests. This must change if we are to achieve a holistic understanding of the role of forests in society, as the basis for sustainable management. Many of the problems facing forest science can only be adequately understood and addressed by adopting an inter-disciplinary approach that combines methodologies from the social and biological sciences, including economics, geography, political science and sociology, in whatever combination each problem can be addressed most effectively."

Source: Byron & Sayer (1999).

international issues, such as climate change, is leading to collaborative programmes under international leadership and cooperation across national boundaries.

Research organization and methods are also affected by the impact of modern information technology on data storage, retrieval and transmission. It is possible to handle much larger quantities of data than in the past with the aid of computers and to carry out detailed spatial analysis using satellite imagery and GIS. Communications via e-mail and the internet are revolutionizing the availability of information and its transmission generally, not only for exchanging technical data between research workers in different parts of the world, but also for any members of the public who wish to take advantage of the new availability of knowledge. Information technology has the potential to produce a more open society, which is less easily manipulated by vested interests and those in positions of power.

## Participation, Conflicts and Leadership

The fifth function of the institutional framework is *relational*. It is necessary to regularise relationships between stakeholders (i.e. those with influence on sectoral

development) by providing arrangements for effective participation in sectoral affairs, maintain harmony between organizations and interest groups, and provide effective leadership to stimulate and guide sectoral development. Without participation, there will be no sense of mutual advantage or common purpose amongst the various groups; without harmony, their efforts are liable to be dissipated by internal squabbling; without leadership, progress in the sector is likely to be haphazard and fragmented. Formal or informal procedures, which are designed to facilitate these three aspects of sectoral behaviour, therefore contribute significantly to the institutional framework. They provide cohesion and preserve the unity of the sector while encouraging organisational change which leads in the desired direction.

Participation has become a fashionable watchword. It has been promoted in publications and at international conferences as the mode of professional behaviour that foresters should adopt in order to achieve sustainable development (see Box 6.11). In part, this is a reaction against the demonstrable failure in many countries of policies that assigned responsibilities and rights over forest resources to governments, excluding local communities and other groups from resource management decisions which affected their interests[34]. The belief that state ownership and control was the most satisfactory way of safeguarding forests has been questionned. The implicit assumption that officials employed by the state, by virtue of their expertise and positions, were best able to judge what was in the long term interests of society is no longer accepted. The dominating position that state forestry once occupied (and still pertains in some countries, due to the extensive areas of forest land, which are owned, managed and controlled by the government) is being modified to meet changing perceptions worldwide. More positively, participation is being promoted because it is recognised that the forest sector is made up of multiple interests, with legitimate concerns that need to be accommodated, and it is necessary to adopt a management style that allows for their differing and often conflicting positions. A participatory approach, based on partnerships and cooperation, is advocated instead of the outdated, paternalistic attitudes of the past.

The need for a different ethos and more collaborative management style is not in doubt, but what is meant by participation is less clear. Its interpretation certainly differs from place to place. In developing countries, various forms of social, community and agro- forestry, often aimed at meeting basic needs, depend on direct participation by villagers and farmers in cooperative schemes. For example, since 1978 in Nepal, the control and management of forests has been handed over to local user groups under government supervision, while 'joint forest management' became official policy in India in 1988, enabling local communities to rehabilitate degraded forest land in partnership with state forest departments[35]. In South Africa, private sector/community partnerships, which relate to afforestation of communally owned land, take two forms: contract tree growing by outgrowers to supply pulpwood and equity sharing schemes in which profits from tree growing enterprises are divided according to the participants' stakes[36]. In these cases, participation means literally 'taking a part'; it involves sharing[37]. In this sense participatory forestry has been enthusiastically promoted by aid agencies, though not always with

**Box 6.11 International declarations advocating a participatory approach for forestry**

Point 6 of the Antalya Declaration recording the conclusions of the 11th World Forestry Congress, held in Turkey in October, 1997 called on:-

"Countries, international organizations and forestry professionals to work in *open and participatory partnership* with all interested parties, including non-governmental organizations, the private sector, indigenous people, forest dwellers, forest owners, local communities and others affected by forest and other land use policies and decisions."

The resolutions of 15th Commonwealth Forestry Conference, held at Victoria Falls in May, 1997, included the following group of recommendations on participation, addressed to "nations including Governments and civil society (non-governmental organisations, research and educational institutions, the private sector, forest services and communities in their heterogeneity)":-

- "all those concerned in forest management strive to develop strong collaborative mechanisms at all levels to promote and implement sustainable forest management practices.
- donor organizations reorient their approach to facilitate these collaborative mechanisms.
- relevant interest groups to be clearly identified to promote sustainable forest management and to ensure equitable benefit sharing.
- decision making should be devolved to the most appropriate level taking into account the local realities and the need to empower the local level decision makers and resource managers.
- sustainable forest management practices, participation and ownership at the local level need to be complemented by legislative and institutional adjustments.
- appropriate land and tree tenure arrangements are promoted to encourage wise use of forest resources and community self-sufficiency."

Source: Reproduced from *Unasylva*, 192, 1998/1 and *Commonwealth Forestry Review*, **76**, 1997/3.

satisfactory results. Success depends on donors' ability to encourage supportive institutional changes and reallocation of benefits, which participants often find painful or unacceptable.

Participation is also advocated in relation to decision making. It is regarded as a necessary part of the decision making process in a modern democracy. Interest groups are invited to be represented when policies are formulated and plans are drawn up; stakeholders are consulted before forest management decisions are taken. In this context, participation can be interpreted as 'listening and learning'. Techniques for discovering peoples' attitudes and opinions have been developed,

particularly in Europe and North America, which use both broad-based surveys and focussed groups. Thus, various methods are being applied in Canada for contemporary forest management decisions, such as the extent of the Wakimbi Provincial Park in Ontario[38], and for practical investigations into sustainability in Model Forests[39]. Participation is seen as a two-way communication process that influences both the decision makers and public opinion. Its objectives are said to include information gathering, consulting on reactions, defining issues, testing ideas, seeking advice, obtaining consensus, and delegating authority; the methods used include preparing position papers, written briefs, opinion surveys, public meetings and hearings, workshops, task forces, advisory committees and joint planning teams.

National Forest Programme preparation, as advocated by FAO, is perceived as a participatory process based on consultation[40] (see Box 6.12). It involves government and non-government organizations as well as the private sector, with particular

**Box 6.12 Participation in National Forest Programmes**

"National Forest Programmes are participatory processes. From planning to implementation and including evaluation, these promote and assist, when necessary, the participation of all stakeholders.

Through public participation the divergent views and conflicts of interest of the various stakeholders are openly recognised and can thus be resolved where possible. Issues, options and the resulting policies, strategies and programmes are agreed upon through participatory decision-making and consensus building among all interested partners. Participation is required in order to:

- raise awareness of the importance of forests and environmental conservation for the benefit of present and future generations;
- enhance the dialogue between the forestry sector and other sectors of the economy in order to emphasize cross-sectoral issues and impact, to harmonize sectoral policies and actions, to ensure the full integration of the National Forest Programme within the National Development Plan and harmonization with other planning initiatives that influence forestry activities;
- identify the aspirations and promote the needs of various stakeholders with regard to forest lands and resources;
- strike a balance between forestry development activities and conservation imperatives in the light of perceived needs (present and future);
- develop a sense of 'ownership' of the National Forest Programme (appropriation of the process) and commitment to the proposed policies and programmes by all partners, not only government institutions."

Source: FAO (1996), page 17.

attention given to the participation of local and regional level organizations, women and local communities.

The accommodation of multiple interests has been called pluralism. It is based on recognizing the inevitable existence of differing, often conflicting, positions on any significant question, ranging from politics to ecosystem management. It describes situations where groups are autonomous and independent, but often interdependent, with legitimate claims and different positions on critical substantive issues[41] (see Box 6.13). This situation pertains in the forest sector and has important implications. Pluralism helps to explain why some attempts at adopting a participatory approach have failed, due to imbalance in the basic relationship between the government agency responsible for forest management and other organiza-

**Box 6.13 Key concepts for pluralism in sustainable forestry and rural development**

- "Different groups have and always will have different experiences, positions, opinions and objectives on sustainable forest management and rural development.
- Groups are autonomous and independent; there is no single, absolute and permanent solution to any substantive natural resource management problem — for any given land unit there is no single, absolute, sustainable management land use scenario (there are numerous 'sustainable scenarios').
- No group/organization can claim a superior or absolute scenario.
- Sustainable forestry and rural development decision-making is no longer the sole mandate of expert authorities.
- A system of organizational checks and balances is central for avoiding errors of a narrow single entity management system — this is the positive aspect of 'bounded conflict'.
- Conflicts are inevitable and cannot be resolved but managed.
- Equity in decision-making is a distant but worthy ideal.
- Platforms, mediators and facilitators are often needed to provide the conditions for negotiation and cooperation needed for sustainable forest management.
- Communication is essential and helps participants understand their differences better.
- Consensus is unlikely but progress can be achieved without it.
- Approaches to sustainable forest management that aim at consensus are often misguided and unsustainable.
- Proactive approaches and new processes of sustainable forest management decision-making in pluralistic environments are emerging — more experience is needed."

Source: Anderson, Clément and Crowder (1998).

tions/groups with differing ideas[42]. Meaningful participation is a two-way process in which the technical solutions to management problems cannot be imposed by officials on others or by a powerful group on the rest. The forest service may be the lead agency, but it needs to embrace alternative perspectives and discordant views, bringing them into the open rather than suppressing or overriding them. Participatory management implies respect for minority interests and partnership.

Pluralism also throws new light on sustainability by revealing that many versions of sustainable management are possible, based on the competing interests and values of the participants; this is more likely to be achieved by compromise than consensus. Some may prefer one mixture of outputs (say one that favours timber production), while others put a higher value on other combinations (say landscape and biodiversity), although both options satisfy the three-point recipe for sustainability suggested in the previous chapter. This pluralist view differs from the idea that sustainability can be judged according to a predetermined set of criteria and indicators, which seems to imply that sustainability is a definable standard, regardless of who is doing the judging.

Acceptance of the pluralist perspective implies that conflict is inevitable. Although not all conflict is bad — within limits opposing viewpoints and competitive situations are desirable — it is necessary to avoid disfunctional conflict A conflict is said to be *functional* if it improves the quality of decisions, stimulates creativity and innovation, provides a way of airing grievances, releases tensions and encourages self-evaluation and change; it is *disfunctional* if it breeds discontent, dissolves common ties, retards communication, reduces group cohesion, allows individual interests to supplant group goals, reduces effectiveness and threatens group survival[43]. Therefore, the institutional framework of the forest sector should encourage the positive and discourage the negative aspects of conflict. It should provide mechanisms for the resolution and management of conflicts of all kinds, whether caused by competing demands for resources, incompatible activities or alternative claims on outputs.

Basically there are five ways of dealing with a conflict: forcing the issue, avoiding it, compromising to reach agreement, accommodating the oppposing view or collaborating to solve the problem together. Which of these is chosen depends on the relative powers of the organizations/groups involved to impose their will on others, the cost of continuing the conflict, the attitudes of the disputants, and the significance of the conflict in relation to their goals and long term aspirations. A minor difference of opinion may be settled by avoidance, compromise or accommodation for the sake of maintaining harmonious relations or as a bargaining counter in a more important dispute; as the saying goes, ‘he who turns and runs away, lives to fight another day’. The parties in a dispute may be drawn or forced into confrontation, when the outcome is likely to be disfunctional. Settlements arrived at voluntarily may be reached by negotiation, mediation by a third party or arbitration by a higher authority. Forest sector institutional arrangements should be designed to avoid confrontation, as far as possible, and to support conflict

resolution by voluntary means, offering mediation and arbitration in appropriate circumstances.

Many conflicts affecting the forest sector are disputes with external interests, as between alternative claims to the use of land, or the relative share of the national budget allocated to forestry. In some cases conflicts arise between forestry interests, as perceived nationally or locally, and international opinion, as expressed by international agencies or environmental pressure groups. Other disputes are internal, involving differences between organizations/groups within the sector, such as the size and share of the permitted annual yield of timber made available for different industrial uses, or for log exports instead of domestic processing. Conflicts about the management of forest land arise with conservation interests eager to protect biodiversity and tribal communities anxious to safeguard their basic needs and preserve their way of life. The administrative arrangements necessary to anticipate, contain and resolve these different types of conflict are likely to vary according to their nature. Formal procedures, sometimes involving legal processes backed up by appeal to the courts, may be required to protect the rights of minority groups. Informal conciliation procedures, including regular meetings between stakeholders, which allow opinions to be voiced and arguments to be heard, enable conflicts to be exposed and managed rather than allowed to develop into damaging confrontational situations.

Maintaining cohesion in the forest sector depends partly on the effectiveness of its arrangements for dealing with conflicts and partly on the quality of its leadership. Conflict resolution prevents the sector from disintegrating while leadership encourages organizations to work together towards shared goals; disputes lead to organizations squandering their energy in trying to protect their short term interests, while purposeful direction and effective implementation of sector strategy help to induce confidence in its future development. Effective leadership helps to transform the forest sector from a mere collection of groups and individuals pursuing their independent agenda into a conglomerate in which interdependencies are appreciated and the advantages of cooperation and association are recognised.

Leadership has been defined as the relationship by which one person or group influences the behaviour and actions of others[44]. It has similarities with management, but, particularly in relation to business organizations, leadership tends to be associated more with personal characteristics and the potential of individuals to bring about change and development. With reference to the 7-S organizational framework previously described, it has been suggested that leadership is particularly concerned with organizational style, staff, skills and shared goals; whereas strategy, structure and systems are management functions. However, this interpretation applies to a single organization; not a conglomerate. In the context of the forest sector, it is evident that leadership also includes initiating and controlling the process by which sector strategy and programmes are prepared; it is about identifying the right direction for the sector as well as generating a sense of unity and common purpose among stakeholders. Sector leadership is concerned with both vision and enthusiasm among stakeholders.

Sectoral leadership covers a wider managerial span than planning and direction; it covers the whole of the institutional framework. Attention should be paid to all five of the framework's functional aspects. For the sector to function properly it is up to the leadership to see that the necessary laws are passed, plans prepared, resources allocated, education provided and intergroup relationships maintained. Leadership works through the institutional framework. It provides the main means by which the behaviour and actions of organizations/groups can be influenced and the shape of future events determined. Effective leadership depends on how well the sector's institutions are used. Imagination to spot development opportunities and drive to take advantage of them are required, but, in a sectoral context, leadership is likely to be less dependent on personal characteristics and charisma of an individual than on the power of a lead agency to coordinate and control the institutional infrastructure. The functions of leadership in relation to the sector are more likely to be exercised by an organization than an individual.

The pluralistic nature of the forest sector invites the question, who should lead? Which of the numerous organizations/groups in the sector should act as coordinator, facilitator, mediator and conducter of the band? Leadership in this context depends on willingness to be led; the association of stakeholders must be voluntary, it cannot work by compulsion. At the same time, in terms of national responsibility, the government has the last word as legislator and policy maker. Forest policy should be developed by consultation and consent, but must be ratified by the government. It follows that only a ministry or government department is likely to have the power and authority necessary to act as lead agency. Generally, this task falls on the ministry responsible for forest resources, or is delegated to the forest department or forest service. Other ministries' remits may include forest sector activities (eg. industry and trade) in their portfolios, but they are unlikely to be able to give forestry matters their undivided attention or possess the expertise to deal with the problems associated with natural resources. For this reason, the government agency which handles forestry matters is usually made responsible for overseeing the national forest programme and also represents the interests of the sector in its dealings with other sectors and international agencies.

## 6.3 SECTOR MANAGEMENT

The topic of leadership and, more generally, the relational aspects of the institutional framework lead us to the broader subject of management. Most definitions of management incorporate some notion of leadership[45]. In an organization, managers are expected to display leadership qualities; in a sectoral context, leadership is bound up with managing the sector. The quality of leadership in the forest sector determines the style of management that permeates its affairs. Sector management is usually in the hands of senior staff in the forest department or ministry and the way the sector is managed depends, to a large extent, on the perspective and attitudes of professional foresters.

The task of managing a single organization, like the forest department, is different from the problems associated with managing a conglomerate such as the forest sector. The difference is comparable to the contrast between government of a unitary state and the difficulties of governing a collection of subsidiary states under a federal constitution. The forest sector is a sort of federation, though it does not have the benefit of a formal constitution to regulate its internal relationships and the separate organizations which constitute the sector have not given up their sovereign right to manage their own affairs. Their association is voluntary, although they are subject to various obligations and sanctions which the state has power to impose. It is based on informal agreement, held together by common interest, which members can depart from at any time, provided they do not break the law. In such circumstances, management of the sector is different from managing a business enterprise, government department or NGO. It is more a matter of coordination, indicative planning, providing incentives, generating enthusiasm and fostering unity, and less a style of management based on authority, direction, control of costs and outputs, staff discipline and orderly structure. Sector management not only requires different skills and attitudes, it is also a more difficult undertaking.

Management style is therefore a subject that merits further examination. There are also other aspects of sector management to be considered in this section. Some relate directly to the institutional framework and the way the sector works. The integrity of the sector as a unit needs to be preserved and its activities coordinated, the way it changes needs to be managed positively, and its capacity to deliver the goods and services that society requires needs to be built up. However, sector cohesion, change and capacity are means to an end. The primary justification for managing the sector is to achieve its development objectives. Deciding what these objectives should be and how best to attain them is the primary task of sector management, which is therefore concerned with strategy and its implementation. This section addresses all these topics. They are key issues, which distinguish forest sector management from the management of the companies, government departments and other unitary organizations which make up the sector.

Forest sector management is a novel concept, particularly for senior officials in forest services, departments and ministries, who are the people most likely to be engaged in it. Usually they have been accustomed to traditional public administration and are not used to the idea that the forest sector can, or should, be managed in its entirety with a sectoral perspective. They do not always recognise that their responsibilities as managers are not limited to upkeep of the forests but should take account of social and economic development priorities. Their primary objective should be properly coordinated development of the whole sector in the interests of all its stakeholders for the benefit of the community at large. This requires a transformation in managerial attitude, a process which has begun (though not always successfully) in those countries where national forest programme preparation has been undertaken. Sector management, as an idea, needs to be promoted and extended to include the other institutional functions. Forest sector development

concerns all forest sector organizations, affects the interests of all stakeholders, and should spread to cover all aspects of sectoral development.

### Management Style

Much of the difficulty that has been experienced with sector strategy and NFP preparation originates with the style and organizational culture that has prevailed amongst professional foresters within public forest administrations. They were successful in their traditional role as protectors of forest resources and providers of forest outputs during the first three quarters of the twentieth century. They were trained to take control of events in the forests and adopted 'machine model' thinking in their organizational structures. Since then, many long-standing natural resources policies and practices have been questioned and there is now public scepticism of the professed skills and idealistic stance adopted by many professionals, including foresters, in Europe and North America. This change is part of the general transition to an urban, post-industrial, global economy and its associated social consequences. The machine model is being replaced by more complicated 'organic model' perspectives[46]. Many of the traditional agency assumptions, values and core beliefs are being reconsidered as we move into the twenty-first century.

The emergence of a new paradigm for public administration has been described by Hughes[47]. The rigid, hierarchical, bureaucratic form, which has predominated for most of the twentieth century, is changing to a flexible, market-based form of public management. He points out that this is not simply a matter of reform or minor change in management style, but a change in the role of government in society and the relationship between government and citizenry. Traditional public administration has been discredited theoretically and practically. The assumption that following the classic principles enunciated by Weber is the best way of running an organization in the public sector is no longer accepted. The new managerial model is based on different perceptions. Delivery by a bureaucracy is no longer seen as the only way of providing government goods and services. More flexible management systems are being adopted and, in appropriate circumstances, governments may operate indirectly through others instead of being the direct provider. The public expects better standards of accountability. Traditional bureaucracy is being replaced by a more open style of administration, which is also concerned with policy development, objectives, efficiency and effectiveness. This general revolution in attitudes applies equally to management of the forest sector as to other areas of government activity. Professional foresters risk being sidelined or made redundant if they fail to respond adequately to the challenges that it presents.

Development of the new paradigm for public management in general is matched in forestry agencies in the Western world by the transition in organizational style from machine thinking to an organic perspective, which Kennedy, Dombeck and Koch have identified. Their analysis applies to public agencies concerned with natural resources management, such as the Forest Service in the USA and the Forestry Commission in UK. Machine model thinking perceives management in

rather simple, segmented and linear terms as opposed to the complex, highly integrated systems approach of the organic model; the former relies on deductive logic and simple, optimization methods, whereas the latter uses inductive, integrative logic and complex, simulation techniques. Table 6.5 shows the differences in more detail. The changes are far reaching and necessitate a profound shift in professional attitude and understanding.

The new paradigm is applicable to all organizations in the forest sector, whether public or private. All need to broaden their thinking and appreciate the need for changes in the way they operate and cooperate with others. However the role of the lead agency is vital. It sets the style for sector management and creates the conditions for the spread of new ideas. As has been noted, the government department responsible for forestry affairs is most likely to be assigned the leadership functions. This puts a double burden on professional foresters: not only should they change their methods in relation to management of the forests which are their direct responsibility, but they also must adopt new ways of working and altered relationships with regard to forest sector management. Perseverence and adaptability are necessary to bring about this shift in organizational culture.

## Cohesion

The lead agency's responsibility for transforming organizational style is accompanied by its duty to maintain sectoral cohesion and foster unity among member organizations. It must hold the sector together while managing the processes of change which affect both the conglomerate and the organizations within it. Opposing forces are at work, which have been described as *centrifugal* and *centripetal*[48], the former tending to fragment the sector while the latter seek to hold it together. The lead agency has the task of maintaining the balance between them.

In any organization, a kind of entropy is at work which leads to disorganization; there is a tendency for subgroups to develop their own aims, interests and identities, which may be contrary to those of the parent organization. This disruptive tendency needs to be countered by measures that strengthen internal bonds and maintain discipline. The measures vary according to circumstances and each organization strives to maintain its own equilibrium and internal harmony. The internal dynamics of relationships in government departments differ from those found in profit-seeking enterprises, non-commercial organizations and representative interest groups. Small firms and organizations located in one place are easier to control than ones that are widely distributed or operate internationally. In a decentralized organization with regional or district offices, or where activities are dispersed amongst field stations, as is the case with forest departments, the geographical spread of operations encourages fragmentation. Field staff are encouraged to develop their own ideas and isolation throws them onto their own resources; they must resolve difficulties themselves and may evolve informal policies of their own which differ from the official line; their sympathies may even be captured by local populations in disputes with the government. These centrifugal factors are countered from the centre by issuing standing

*Table 6.5* Machine model views of forest management and managers evolving into organic model perspectives

| | MACHINE MODEL First 75 years of twentieth century | ORGANIC MODEL Close of twentieth century |
|---|---|---|
| **Common management perspective** | Guiding norm: maximum sustained yield of wood, game or forage (output-focussed) and economic efficiency. | Sustainable, healthy forest systems (process-focussed) for diverse, changing market and non-market social values. |
| | Plantations intensively managed for timber. | Diverse, multifaceted and multivalued forests (including plantations), watersheds and ecoregions managed for diverse, changing social values. |
| | Foresters must protect forests from hostile forces (fire, insects, vegetative competition, recreational users, politics) both within and outside the forests. | Foresters can help forest ecosystems to be healthy and robust enough to adapt effectively to many uses and forces. |
| | Forests seen as objects to use, control and manage for production of goods/services for humans. | Healthy, enduring forest ecosystems as 'subjects' of value and respect in utilitarian, symbolic, identity and other relationships with humans and their cultures. |
| | Fascination with new industrial age technology (e.g. machines, chemicals, linear programming, genetics). | Rethinking the balance of technology in management innovation, efficiency and resource use. |
| | Management era: primarily one-way, paternal flow of control from foresters to forest and other 'outside' forces (including users). | Facilitation era: foresters in partnership with forests, diverse and interdisciplinary colleagues and public in collaborative socio-economic, ecological and other systems management. |
| | World is predictable: be smart, rational, plan, model and exert control. | World is unpredictable: be open, aware, widely connected and adaptable. |
| | Economic growth/development model: develop capital, increase resource utilization, produce more. | Evolution towards sustainability and community quality of life perspectives. |

*(Continued)*

*Table 6.5 (Continued)*

| | MACHINE MODEL First 75 years of twentieth century | ORGANIC MODEL Close of twentieth century |
|---|---|---|
| **Respected forester role models** | Era of tough independent great men, omnipotent foresters and other professional heroes. | Era of interdisciplinary teams, power sharing and forester diversity to reflect national diversity. |
| | Patroniostic management: caring, knowing, benign forest expert who is 'in charge'; foresters manage forests for the people. | Partnership management: foresters facilitating a more open democratic process of public involvement, customer service and broad, diverse partnerships. Forest ecosystems managed in partnership with the forest and with the people. |
| | Objective professional, educated in hard sciences and, perhaps, economics. | Professional educated in traditional hard sciences balanced and strengthened with philosophy, social science or communications skills. |
| | Tendency to specialize in separate forest or ecological subsystems, often in different bureaucracies. | Specialization must be linked, validated and operationalized in larger ecological, political and socio-economic systems. |
| **Time perspective** | Targets: fiscal year, project horizons or stand rotation. | Targets include broader, long-term view of desired future conditions. |
| **Space perspective** | Focus on the forest stand. | Expand to ecosystem, landscape and ecoregional spatial dimensions. |
| | Local and regional focus. | Regional-national-global view. |

Source: Kennedy, Dombeck & Koch (1998), page 20.

orders, technical instructions and guidelines, setting standards, inspections, reviews of progress and similar bureaucratic procedures. Good internal communications are essential to success in public organizations responsible for state forestry.

In a coalition such as the forest sector, the inherent tendency to disintegrate is reinforced by conflicts of interest between member organizations. These disruptive forces are more powerful than those in a single organization and appropriate means of preserving the sector's holistic integrity need to be devised. The causes of tension include external threats to forest resources from alternative forms of land use and differences in opinion within the sector about the purposes and ways of managing resources. Different management regimes provide different combinations of outputs, yielding different output mixes for consumers. For example a decision to reduce the allowable cut of timber, for whatever reason, is likely to be opposed by timber processing interests, and proposals to boost timber output by replacing natural forest with high yielding plantations, although supported by industry, may run into objections from conservationists and local communities deprived of traditional forest rights. Disputes between interest groups within the sector are inevitable and it is therefore essential for the lead agency to have in place procedures for conflict resolution and maintaining harmony. Also, since the members of the coalition are independent organizations, their disputes must be settled by voluntary means. The pluralist philosophy goes beyond disputes and their resolution to a framework for participatory decision making based on consent. Pluralism is based on harmonious relations; without cooperation, sector management will break down.

The centripetal tendencies in the forest sector are based on common interest and the interactions between its members. Processing chains link forests to consumers and the provision of services for the community, such as landscape protection and biodiversity, is dependent on the forest ecosystems and the way they are protected. Management of the sector can reinforce these tendencies by appropriate action aimed at building strength through unity, when confronting external interests and resolving internal conflicts, which dissipate energy and waste resources. The lead agency can represent the sector, so that it speaks with one voice, and can facilitate collaboration between member organizations in the interests of economic development and increased national welfare. It influences resource deployment and the distribution of effort within the sector, working through the institutional framework to improve the efficiency and effectiveness of sectoral activities. Sector management therefore aims to foster a common purpose and provide a basis for joint action.

Cohesion is justified by the potential benefits of managing the sector as an entity rather than leaving it alone as an assortment of independent organizations following their own, separate inclinations. A policy of non-interference would have serious disadvantages, leading to underprovision of services which are valued by society but have no market prices and unsustainable exploitation rates where forests are treated as common property. Therefore, it is generally recognised that a *laisser-faire* policy is not tenable; some government control of sectoral activities is essential and some influence on their development is in the public interest. This is evident from

**Box 6.14 Change management**

"Whatever type of organisation people work in, and whatever type of job they do, the one fact that can be relied on is that the organisation and their job will change, sometimes quite dramatically, and not always for the better. It follows that the ability to initiate and manage change is one that all managers need to possess. It could even be argued that what distinguishes the successful manager and the successful organisation from their less successful counterparts is the ability to manage change."

"The actual process of organisational change, no matter what theory or approach is being applied, requires someone or some group to intervene in the running of the organisation to effect this change. The intervention could be led by the people who are the subject of the change process. More often, it is led from outside the department/area concerned, or even from outside the organisation. However, regardless of who leads the process, ..... such interventions must be planned and structured activities initiated in response to a recognised need for change, and having as their objective a direct or indirect improvement in organisational performance."

Source: Burnes (1992), pages x and 166.

the emphasis now given internationally to NFP preparation. Sector management is based on appropriate intervention in sectoral affairs, recognising the interactions which link different parts of the sector and the community of interest which binds it together. The task of the lead agency is to advance the interests of the sector as a whole. Cohesion depends on building a sense of identity and a distinctive sectoral ethos. Under dynamic conditions, a recognizable identity and ethos help to provide stability and continuity. They assist the organizations and institutions which make up the conglomerate to adapt to change in an orderly manner.

## The Management of Change

Cohesion strengthens the sector in relation to other sectors and other countries. Through unity comes strength. But cohesion should not be preserved by attempting to prevent change. People tend to be resistant to change and it is potentially disruptive, but change is inevitable and needs to be managed rather than avoided. Dealing with change is a vital concern of sector management. The lead agency is continually called upon to cope with changes originating inside and outside the sector. It is necessary to minimize their disruptive effects as far as possible and to take advantage of the new opportunities for development which changes bring. However, change needs to be carefully and sensitively managed, both at the individual level, within sector organizations and for the conglomerate as a whole. Forest managers need to become change agents.

The management of change (see Box 6.14) has become an important responsibility of managers[49]. The forest sector is affected by internal changes and external changes originating in other sectors or derived from international sources. Sector organizations can respond flexibly to changes in their circumstances by redeploying resources, altering their activities and modifying their outputs. They can also change themselves deliberately in order to take on new tasks, restructure themselves or develop their roles. The performance of an organization may be improved by influencing the attitudes of those who work in it, its customary practices, organizational culture and style. In a passive sense, sector organizations are the recipients of change, in an active sense, they can initiate and encourage change. Both categories — responsive and developmental — require management to mitigate their undesirable consequences.

Change management is a concept that is applicable to all the organizations that make up the forest sector. It has even greater significance for the sector as a whole, as a means of reducing tensions between stakeholders and rival groups, and as a way of promoting its development. Organizational change can be initiated from the periphery or from the centre. Particular individuals or groups may press those in authority for changes in working practices or managers may initiate planned changes affecting the structure and the work force. In a firm or government department, the process is more likely to be top-down than bottom-up; in NGOs, the membership usually provides the stimulus. Sectoral change is mostly driven from the centre, with the action controlled by the lead agency. A participatory style of sector management is essential if planned changes are to become actual alterations of style and content. Generally, managing organizational change is problematical. Even in a limited context, within a single organization, it is difficult to reorganize operations and transform attitudes; the difficulties are compounded when the aim is to bring about changes affecting the whole sectoral conglomerate.

Various triggers for organizational change have been identified in private sector companies, including increased competition, new technology, environmental sensitivity and workforce diversity; the most potent cause is financial losses or profit reductions[50]. In the public sector, market signals are not so obvious and consumers' interests must be reconciled with the collective interests of the community. The dilemma for managers in the public domain is how best to achieve public purposes, as determined by collective choice and social policy, while responding to the needs and rights of individuals[51]. In an age of rapid change and peoples'growing awareness of injustice, the problems that this issue poses for public sector administration have been a feature of the last part of the twentieth century. The management of change, for a forest department, involves anticipating and, as far as possible, meeting the changing expectations of the public for goods and services derived from forest resources, some of which are traded while others have no market prices. The dilemma is compounded when the forest sector is considered, because consumers' needs must be balanced against the interests of organizations and groups within the sector, whilst also meeting the requirements of society, expressed either directly or through the political process. None of these demands and pressures remain

unchanged, so managers are obliged to respond by continual adjustment and must learn to live with uncertainty.

Burnes points out that organizational changes come in many shapes and sizes[52]. He distinguishes two categories: *radical* changes, which relate to large-scale, organization-wide transformation programmes involving the rapid and wholesale overturning of old ways and old ideas, and *incremental* changes, which are relatively small-scale, localised and designed to solve particular problems or enhance the performance of part of an organization. Radical change necessitates a break with the past; it is also known as revolutionary or discontinuous change. Incremental change, which is less dramatic, is described as evolutionary or piecemeal. A coordinated programme of gradual improvements may succeed in bringing about substantial changes over a period of time, but lacks the shock effect necessary to deal with the impact of sudden or severe disturbance which is a feature of radical change. It should be noted that change management at forest sector level has to cope with both categories. It is also likely that failure to recognise the need for radical change when preparing NFPs has led to their failure in some countries.

Change management is not a distinct discipline with well-defined boundaries. There are various schools of thought, based on the behaviour of individuals, groups and complete systems. From an individual point of view, behaviour is learnt and changes in behaviour can be taught; therefore the behaviour of individuals in an organization must be influenced by training, rewards and sanctions in order to change its culture and performance. The group dynamics school is based on the rationale that people in organizations work in groups, so that it is necessary to modify group practices and norms to alter the behaviour of the organization. The systems approach views the organization as an open system, made up of interconnected subsystems. By studying and altering its parts, it is possible to change the whole; overall objectives and synergy can be achieved by modifying the behaviour of the subsystems. In practice the systems perspective is surely correct because organizations are social systems. Change at one level or in one area should take into account the effect it will have elsewhere in an organization. However, whether the perspective is organization-wide, or limited to groups or individuals, it is behaviour that is being changed. This requires the cooperation and consent of the groups and individuals that make up the organization, and only through their behaviour can the objects of change — the proposed new structures, technologies, systems and procedures — be turned from ideas into reality.

It is clear that all three approaches have their place in the organizations which constitute the forest sector. Successful change management at sector level depends on using various methods in combination to achieve maximum impact. The sector can be regarded as a system and its parts as subsystems. Sectoral change is achieved by altering individual attitudes, group behaviour and organizational style. New skills must be learnt and new technology introduced. Therefore, education and training play an important part. Restructuring involves altering the range and content of sectoral activities and also the balance between them. The interactions between levels and the relationships amongst organizations are affected. A vital feature is coordination and control of the change process, which is achieved by formulating

appropriate strategies and programmes. The way that the sector is transformed depends on creating changes at all levels. The system as a whole is altered by numerous subsidiary modifications within the system, in accordance with an overall national programme for forest sector development.

## Sector Capacity

Change management enables the sector to adapt to altered circumstances and shifts in society's output preferences. The process of adaptation involves alterations in sector capacity. The role and standing of the sector in national and international matters is based on its continued ability to satisfy society's wants and basic needs. Another important aspect of management of the sector is therefore concerned with changing its capacity to match changes in the demands made on it. As economies grow, capacity needs to be expanded by adding to the resources of the sector, increasing the level and effectiveness of its activities, and extending the range of its outputs. Capacity limitations restrict sector development and capacity building enables the sector to increase its contributions to the wealth and welfare of the community.

Resource capacity is determined by the productivity of the forests, the amount of capital invested in sectoral assets and the abilities of the people in the sector. Capacity building therefore involves increasing the flow of outputs from forest resources, improvements in plant, equipment, machinery etc. and the acquisition of new technology, and the development of human resources. A minimum level of capacity is necessary for the sector to function, from which quantitative and qualitative improvements enable sector capacity to be built up. The institutional framework plays an important part in this process. The build-up affects natural, man-made and human resources and the way they are combined. The process involves additional inputs and knowledge.

Additions to the productive capacity of natural resources may come from afforestation, which adds to the area of forest land, or from changes in productivity by altering the way existing forest resources are managed. Natural forest can be manipulated silviculturally to favour particular species, at the expense of others considered less desirable, or converted to plantation monocultures supplying larger outputs of one specific kind. The available moisture, minerals and sunlight available from the site can be concentrated on producing the types of output which are most preferred, ignoring other types or species of lower value. The 'improvement' process is specific to the outputs and may lead to reduced benefits of other kinds, such as increased timber production at the expense of biodiversity. The process is similar to that practised for centuries in agriculture, giving more productive pastures and arable crops composed of single species in fields which are free of weeds; the improvements extend into selective breeding of plants and livestock, which favour particular outputs. Tree breeding for timber crops is no different in principle from the development of new varieties of grain for food and, similarly, forest management is open to technological advances in genetic modification.

Increases in capital resources come from investment in additional assets and upgrading the quality of existing capital by replacement of outdated plant and equipment with new designs and improved technology. Changes in sectoral capacity accrue, for example, from computerized control of wood processing machinery and the use of information technology to improve communications. The knowledge required for satisfactory management also needs to be collected and stored, and represents capital of another kind. A minimum level of information can be identified, which is essential for sustainable management of forest resources. This includes maps showing the distribution of topography, soils, forest types and ecosystems, and inventories which describe and enumerate their content. Similarly, it is necessary to acquire information about the sector's physical assets, which determine harvesting, processing and transport capacity, and changes in stocks.

The institutional framework affects the capacity of the sector. The regulatory infrastructure and allocative arrangements are necessary functions, which restrict sectoral activities, and capacity building is influenced by the policy and programmes that are chosen. Human resources development depends on education and training. From a dynamic point of view, the sector should be regarded as a *learning organization*. Its capacity can be increased by providing facilities which enable individuals and organizations to appreciate what the sector is capable of achieving and to introduce new ideas and methods of working. Research leads to the discovery of new facts and a better understanding of how best to improve sectoral performance.

Various types of organizational learning have been identified[53]. Single loop learning is concerned with improving performance in relation to a fixed or unchanging objective, double loop learning is about improvements in both performance and objectives. The latter allows for the constant re-evaluation of the goals, values, beliefs and assumptions that underpin performance.

Both categories affect sector capacity. 'Adaptive' learning, which is concerned with how to adjust to environmental change, is distinguished from 'generative' learning, which involves constant re-evaluation of the situation and organizational innovation and creativity. A fully developed learning organization goes beyond knowing, understanding and thinking to a situation in which change is regarded as a way of life. It involves listening to dissent, recognising that events represent learning opportunities and experimenting. This is the philosophy to which the forest sector should aspire.

## Growth and Development

Capacity building enables growth and development to take place. Growth refers to increases in the quantity of outputs produced as the economy expands, while development has a wider connotation, covering qualitative changes in the output mix as well as additions to the volume or value of goods and services. Even if no growth takes place, development is possible if satisfaction with the performance of the economy is improved. Development is also concerned with the equitable distribution of benefits to different classes in society and protecting the interests of

future generations. A nation may be made better off by changes that bring a broader range of benefits to more people, or spread existing benefits more widely, or offer additional choices in later years. The primary interest of forest sector managers should therefore be with development rather than growth.

Development of the forest sector is based on increasing the contribution that it makes to the wellbeing of society. It is a dynamic process that depends on changes to the resources, activities and outputs of the sector. The process is also concerned with meeting peoples' physical and spiritual requirements, fair shares to stakeholders and sustainability. Development involves making adjustments to the quantity and quality of the output flows derived from forest resources, altering the activities of forest sector organizations and improving the distribution of the benefits derived from their activities. The sector responds, quantitatively, to increased demand for its goods and services as populations and incomes expand, and, qualitatively, to changes in the preferences of consumers and society as tastes alter and peoples' life styles evolve. The concern for equity is addressed by ensuring that the poorest sections of the community do not get left behind in the distribution of benefits. Sustainability involves continuity of supply and safeguarding forest resources so that their future ability to supply goods and services of all kinds is preserved. The sector is also open to external influences from other sectors and expressions of wider environmental concerns. Development is achieved by adaptation in response to internal and external pressures for change. The process enables the sector to adjust to changing circumstances and allows it to move with the times.

Development takes place as a consequence of change; it is also a deliberate process that induces changes leading to transformation of the sector. It involves intentional interventions that bring about desired changes to the organizations that make up the sector and modify the interactions that take place between them. Development may be stimulated by interventions at either end of the processing chain. Supply side changes affect activities and output along the chain in a forward direction, and changes in demand work backwards to influence their scope and range. The way resources are managed affects what sector organizations do and the resulting flow of goods and services; consumers' choices, expressed through their purchasing power or via pressure groups and public opinion, influence what is produced and the flow of raw materials and other services that feeds the productive process. These interactions, pushing and pulling the organizations in the sector, provide a mechanism for sectoral growth and development. Positive management seeks to increase productivity, make better use of resources, overcome bottlenecks and alter organizational behaviour in ways designed to optimize economic and social welfare. Provided the process of change is managed carefully, it is possible to maintain harmonious relationships between organizations while sustaining the momentum of development.

The organizations that make up the sector develop by increasing the scale and changing the nature of their activities. Alterations to their behaviour are necessary. Larger inputs of resources may be involved, as with land acquired by forestry departments for afforestation purposes or by conservation agencies to protect forest

ecosystems. Wood processing operations may be expanded by increasing the input of roundwood, enlarging factory capacity and improving the productivity of the people employed. Development may also result from increased efficiency, when inputs are reduced relative to the quantity of output, or from greater effectiveness, due to alterations in the methods and technology used. In relation to the management of existing forest resources, development may be based on making land more productive by expanding output per hectare; extra income may be derived from growing more of the same product on the same land or extra benefits obtained by extending the range of goods and services produced to give greater satisfaction to consumers. Each organization needs to identify development opportunities that are suited to its circumstances and then convert these opportunities into actual improvements in its structure and performance. Opportunities are expected to deliver extra profits or additional benefit flows and it is necessary to decide which options are most likely to generate the largest profits or net gains. The development process is therefore linked with choices, projects and plans. It is necessary for managers to be clear about their organizational aims and the methods that they intend to pursue to achieve those aims. Their intentions are subsumed in the changes to resources, activities and outputs that they are able to achieve and their success depends on their ability to alter organizational behaviour.

At sector level, development results from the combined effect of the efforts of the individual organizations. It is the outcome of the interplay of their activities and interactions, some of which may be counterproductive. The linkages along the processing chain are a centripetal influence, which connects the productive potential of resources to consumers' needs and desires; they help to bind the sector together. The pursuit of organizational self-interest acts in the opposite direction; where an organization's aims conflict or diverge from sectoral interests, they form a centrifugal influence which tends to subvert unified development. Discrepancies are likely to occur between the short-term interests of individual organizations and the long-term interests of the sector as a whole. Sustainability and the preservation of environmental quality are most likely to be sectoral concerns, whereas individual organizations, particularly in the private sector, concentrate on their own financial viability and survival. The reconciliation of short and long term aspirations is therefore an important function of sector management.

Sector management depends on reconciling, as far as possible, the aims of the organizations in the sector and providing constructive guidance for their activities. It is necessary to have a clear statement of sectoral aspirations to which all the organizations can subscribe. Success in forest sector development terms can then be measured by the extent to which these good intentions are achieved in practice. Therefore leadership in the management of sectoral affairs should focus on long-term strategy and the preparation of NFPs. Change should be strategy driven. Sector policy and programmes should seek to accommodate organizations' particular interests, while providing the institutional framework necessary for their growth without discord. Although some constructive tension between particular organizations may be advantageous, generally, it is beneficial to encourage cooper-

ation, collaboration and mutual support. Planned interventions are required to build up capacity and strengthen the sector in its external relationships and international affairs. It is necessary to identify the best way forward for the sector and promote its development in the interests of all its members. This can be done most effectively by formulating a grand design for the sector, in the form of a written development strategy, which provides direction, fosters cohesion and imparts strength. This statement needs to be backed up by a detailed programme, specifying the action to be taken to implement the strategy, which is sufficiently flexible to allow for unexpected events in the future.

The correct perspective from which to view strategy and development is to regard the sector as a system. A holistic approach ensures that it is seen in its entirety and the interactions between its parts are not overlooked. Sector development involves development of the whole system, not just some of its parts. As a conglomerate, development involves changes over time amongst the organizations which form the system and also changes in their interrelationships. It is also likely to involve alterations in the linkages between the sector and other sectors; the forest sector is not a closed system. System behaviour over time results in changes in the output streams and sustainability. Deliberate changes to the system, based on strategy, lead to its development. The parameters of successful development are revealed by the behaviour of the system. Systems thinking therefore offers a useful way of exploring and increasing the contribution of the sector to individual welfare and the public good. It offers a valuable tool for promoting sector management and development, which is examined in more detail in the next chapter.

## SUMMARY

- From a human standpoint, the forest sector is a conglomerate, made up of individuals and organizations performing various public and private roles, which are supported and held together by a framework of institutions.
- Organizations are social groups, which exist for a purpose and operate in an orderly manner. They vary greatly in size, structure, complexity and function.
- Forest sector organizations are characterized by dependency (direct or indirect) on forest resources. They include government ministries and departments, other public sector agencies, private companies, landowners, NGOs, trade unions, cooperatives and various informal groups. Some are active in more than one subsector and some also operate outside the forest sector, in other parts of the economy; others have an international remit.
- Organization theory, which deals with the way organizations work, suggests that there is no 'best' structure, suited to all types and situations. Various forms of organization are found, depending on circumstances and the implicit assumptions (or images) in managers' minds. Forest sector organizations are likely to become smaller, more flexible and less hierarchical.
- The institutional framework of the forest sector consists of five groups of features, each associated with a particular function: (i) the laws, customs and

practices, which regulate sector activities; (ii) the policies and programmes, which give direction to its development; (iii) financial and economic arrangements for allocating resources; (iv) education, research and data handling facilities, which supply knowledge relating to the sector; (v) procedures for participation, conflict resolution and leadership, which regularise relationships in the sector.

- These institutional features interact and complement each other. When all are present and properly coordinated, they provide an effective sectoral infrastructure, which is sensitive to external influences and serves as the main means for controlling and developing the sector.
- The forest sector is a pluralistic association of autonomous organizations with multiple interests and different, often opposing, positions, which can only function as a unit by consent. Cohesion depends on effective participation and arrangements for dealing with conflicts. Leadership is a government responsibility, usually carried out by the department responsible for forest resources.
- Forest sector management requires changes in attitudes and style in order to encourage development and foster unity among member organizations. The management of change is an important responsibility, involving capacity building and the maintenance of stability. The sector should be regarded as a 'learning organization'.
- Development is a deliberate process that aims to increase the sector's contribution to the wellbeing of society. It involves intentional interventions in sectoral affairs and constructive guidance for member organizations. A systems approach ensures a holistic perspective. The process is promoted by formulating strategy and undertaking national forest programmes to implement the strategy.

## FURTHER READING

Organizational behaviour and management are comprehensively covered, mainly from a business standpoint, in general textbooks, such as Mullins (*Management and Organizational Behaviour*, 4th. edition, Pitman, 1996) and Buchanan & Huczynski (*Organizational Behaviour*, 3rd. edition, Prentice Hall, 1997). Gareth Morgan provides a stimulating review of organization theory in *Images of Organization*, Sage Publications, 1997.

*Public management and administration*, by Owen Hughes (Macmillan, 1994), discusses changes in the approach to policy and strategic management issues from a government point of view. Similar coverage, with emphasis on learning, is provided by *Management for the Public Domain*, by Stewart Ranson and John Stewart (Macmillan, 1994). Change management, from a strategic point of view, is perceptively discussed by Bernard Burnes (*Managing Change*, Pitman 1992).

## SOURCES

1 D.S. Pugh and D.J. Hickson. *Writers on Organizations*, 4th. edition, Penguin Books (1989), pages 5–8.
2 Laurie J. Mullins. *Management and Organisational Behaviour*, Pitman (1996), pages 77–78.

3 P.M. Blau and W.R. Scott. *Formal Organizations*, Routledge & Kegan Paul (1966), cited by Mullins, pages 78–79.
4 D. Khatz and R.L. Khan. *The Social Psychology of Organizations*, 2nd. edition, Wiley (1978), cited by Mullins, pages 79–80.
5 Davide Pettenella. New trends in public forestry administration. Special Paper prepared for XI World Forestry Congress, Antalya, Turkey, 1997.
6 Cyril Hart. *Practical Forestry for the Agent and Surveyor*, 3rd. edition, Alan Sutton Publishing Ltd. (1991), pages 1–10.
7 C.L. Brown and J. Valentine. The process and implications of privatization for forestry institutions: focus on New Zealand. *Unasylva*, 178, 11–19, 1994.
8 FAO. Forestry Policies in Europe. *FAO Forestry Paper 86*, FAO, Rome (1988).
9 FAO. Tree Growing by Local People. *FAO Forestry Paper* 64, FAO, Rome (1985).
10 Joji Carino. Indigenous peoples, forest dwellers, women and local communities. Special Paper prepared for Section F, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, October 1997, volume 5, pages 143–153.
11 Geoff Quaile and Peggy Smith. An aboriginal perspective on Canada's progress towards meeting its national committments to improve aboriginal participation in sustainable forest management. Special Paper prepared for Section F, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, October 1997, volume 5, pages 154–161.
12 F.F. Korten. NGOs and the forestry sector: an overview. *Unasylva*, 171, 3–10, 1992.
13 David Humphreys. *Forest Politics*, Earthscan (1996), page 89.
14 Laurie J. Mullins, op cit, pages 70–71.
15 David Buchanan and Andrzej Huczynski. *Organizational Behaviour*, 3rd edition, Prentice Hall (1997), Chapter 11.
16 Laurie J. Mullins, op cit, pages 332–334.
17 Robert H.Waterman, Thomas J. Peters and Julien R. Phillips. The 7-S Framework. Pages 309–314 in Chapter 6 of Henry Mintzberg and James Brian Quinn. *The Strategy Process*, 2nd edition. Prentice Hall (1991).
18 Bernard Burnes. *Managing Change*, Pitman (1992), Chapters 1 and 2.
19 Gareth Morgan. *Images of Organization*, Sage Publications (1997).
20 Bernard Burnes, op cit, Chapter 3.
21 Charles Handy. *The Age of Unreason*, Century Business (1992).
22 Paul V. Ellefson.. *Forest Resources Policy*, McGraw-Hill (1992), Chapter 10.
23 Peter H. Pearse. Forest tenure, management incentives and the search for sustainable policies. Chapter 5 of W.L. Adamowicz, W. White and W.E. Phillips (eds). *Forestry and the Environment: Economic Perspectives*, CAB International, Wallingford, UK (1993).
24 C.J. Jepma. *Tropical Deforestation*, Earthscan (1995), Chapter 5.
25 J.E. Michael Arnold. Framing the issues. Chapter 1 of J.E.M. Arnold and Peter A. Dewees (eds). *Farms, Trees and Farmers*, Earthscan (1997).
26 Bertram Husch. Guidelines for Forest Policy Formulation. *FAO Forestry Paper 81*, FAO, Rome (1987), page 6.
27 M. Gane. Forest policy-making. *Commonwealth Forestry Review*, 62 (2), 85–91, 1983.
28 Maurizio Merlo and Manuel Paveri. Formation and implementation of forest policies: a focus on the policy tools mix. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, October, 1997, volume 5, pages 233–254.
29 Paul V. Ellefson. *Forest Resources Policy*. McGraw-Hill (1992), page 22.
30 FAO. *Formulation, Execution and Revision of National Forest Programmes: Basic Principles and Guidelines*. FAO, Rome (1996), pages 27–45.
31 Ruben Guevara. Human resources development: education, training, research and extension for sustainable forestry. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, October, 1997, volume 5, pages 305–323.
32 Laurence Roche. The profession of forestry now and in the year 2000. *Commonwealth Forestry Review*, 71 (1), 13–19, 1992.

33 Neil Byron and Jeffrey Sayer. Organising forestry research to meet the challenges of the Information Age. *International Forestry Review*, 1 (1), 4–10, 1999.
34 FAO. Accommodating multiple interests in forestry. Editorial in *Unasylva*, 194, page 2, 1998.
35 Katherine Warner. The vision and role of community forestry in sustainable development. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, October, 1997, volume 5, pages 57–68.
36 T.J. Foy and M.J. Pitcher. Private sector/community partnerships for commercial forestry development: recent experiences from South Africa. *International Forestry Review*, 1 (4), 222–227, 1999.
37 Pippa Bird. Funder or founder: the role of development agencies in shared forest management. *Commonwealth Forestry Review*, 76 (3), 179–181, 1997.
38 Peter N. Duinker. Public participation's promising progress: advances in forest decision-making in Canada. *Commonwealth Forestry Review*, 77 (2), 107–112, 1998.
39 John E. Hall. Canada's Model Forest Program: a participatory approach to sustainable forest management in Canada. *Commonwealth Forestry Review*, 76 (4), 261–263, 1997.
40 FAO. *Formulation, Execution and Revision of National Forest Programmes. Basic Principles and Operational Guidelines*. FAO: Rome (1996), page 17.
41 J. Anderson, J. Clemént and L.V. Crowder. Accommodating conflicting interests in forestry — concepts emerging from pluralism. *Unasylva*, 194, 3–10, 1998.
42 N. Hildyard, P. Hegde, P. Wolvekamp and S. Reddy. Same platform, different train: the politics of participation. *Unasylva*, 194, 26–34, 1998.
43 David Buchanan and AndrzeHuczynski, op cit, Chapter 21.
44 Laurie J. Mullins, op cit, Chapter 8.
45 David Buchanan and AndrzeHuczynski, op cit, Chapter 20.
46 J.J. Kennedy, M.P. Dombeck and N.E. Koch. Values, beliefs and management of public forests in the Western world at the close of the twentieth century. *Unasylva*, 192, 16–26, 1998.
47 Owen E. Hughes. *Public Management and Administration*. Macmillan (1994), Chapter 1.
48 Herbert Kaufman. *The Forest Ranger: a study in administrative behaviour*. Resources for the Future, John Hopkins, Baltimore (1960).
49 Laurie J. Mullins, op cit, Chapter 20.
50 Derek Rollinson, Broadfield Aysen and David J. Edwards. *Organisational Behaviour and Analysis*. Addison Wesley Longman, Harlow, Essex, (1998), Chapter 19.
51 Stewart Ranson and John Stewart. *Management for the Public Domain*. MacMillan (1994), Chapter 1.
52 Bernard Burnes, op cit, Chapter 6.
53 Derek Rollinson, Broadfield Aysen and David J. Edwards, op cit, pages 57–59 and 625.

CHAPTER 7

# THE FOREST SECTOR AS A SYSTEM

In previous chapters the forest sector was examined from four aspects: resources, activities, outputs and people. This chapter brings these together and presents a unified view. The sector is described as holistic in the sense that it is a 'whole', recognisable in its entirety. The Oxford Dictionary definition of holism is the "tendency in nature to form wholes that are more than the sum of their parts by ordered groupings". However, this definition is somewhat misleading because the forest sector is composed of many dissimilar parts which cannot be summed mathematically — it covers plants and animals, machines and factories, and people, associated in various ways, which have no common denominator. The distinctive characteristics of the sector arise from the arrangement of its parts and it is their interrelationships rather than their aggregation that produces the holistic effect. The parts occupy appropriate niches in the sectoral conglomerate, which enable them to contribute interactively to its total performance.

The sector should be viewed as a *system*. This perspective emphasizes the interdependence between parts of the system, and between the system and its environment. It integrates biological processes with industrial activities and combines ecological with socio-economic functions; it connects the scientific aspects of the sector with its human aspects. The system is composed of numerous subsystems which interact with each other and with events taking place outside. From a human standpoint the system represents a loose association of various groups which is held together by their reliance on forest resources and common interest. The purpose and overall justification of the system depends on its ability to deliver outputs in the form of goods and services of all kinds for the benefit of the community.

The systems approach is descriptive and analytical. It sets out to provide a complete portrayal of the various parts of the forest sector and their complex relationships. It shows the elaborate structure of the sector and the way that changes at one point produce effects elsewhere. By tracing the interactions that take place it becomes possible to see how development of the sector as a whole can be influenced. The responses to change involve both space and time; in some cases there are lengthy delays before the effects of interventions are felt, as with plantations established to increase future timber supply. Feedback, which uses information derived from other parts of the system at a different time to influence its present behaviour, is an

important feature. Up to a point, the system is capable of self-adjustment, learning from mistakes and evolving; within limits, it behaves as if it has a life of its own. These characteristics tend to make its future behaviour difficult to predict.

The complexity of the sector, both in its structure and responses, and the difficulty of foreseeing events either inside or outside its boundaries, contribute to the problems of forest sector management. The systems approach provides an overall management perspective, without which sectoral development is bound to proceed in a piecemeal manner. By portraying the sector as a system, its workings can be better understood, but comprehension is only the first step towards directing, regulating and controlling sectoral affairs. In order to manage the sector it is necessary to study the consequences of alternative courses of action and decide which are preferable. Scenarios must be prepared, showing what is likely to happen in given circumstances and under ranges of assumptions, before the most suitable development path for the sector can be identified. A technique for making informed choices is needed, based on the systems approach. Fortunately the great advances in computer technology since about 1980 have provided the means for making complicated assessments of this kind.

Modelling the sector, or relevant parts of it, provides an appropriate technique for tackling these problems. Models are simplified representations of systems, which are generally purpose-built to solve particular problems. There are various types of model, suited to different types of system and based on different mathematical principles. Simulation modelling is of particular interest because it is well-suited to management situations. It offers a way of working out and comparing the long-term consequences of alternative courses of action. In the forest sector, the possibilities of this method have been demonstrated in a number of countries and its potential use as a tool for strategic management and planning offers exceptional opportunities.

This chapter is divided into four sections. General system characteristics and the distinguishing features of the forest sector as a human activities system are dealt with in the first section. The second section explores the underlying composition of the system, its division into subsystems based on input-output transformations and the interactions which affect its behaviour. Modelling methods are outlined in the third section, along with a more detailed explanation of forest sector modelling based on system dynamics principles. Systems development is discussed in the fourth section, as a dynamic process in which strategy formulation plays a vital role.

## 7.1 SYSTEM CHARACTERISTICS

The dangers of concentrating on details instead of the looking at a situation as a whole are well-known; the old saying about ‘not seeing the wood for the trees’ makes the point. However, it is often difficult to understand large-scale phenomena, like the behaviour of the forest sector, because they are too complicated for the human mind to grasp unless broken down into manageable bits. Each piece needs to be viewed in context, in relation to all the other pieces, but the whole picture

**Box 7.1 The nature of systems**

"The central concept 'system' embodies the idea of a set of elements connected together which form a whole, thus showing properties which are properties of the whole, rather than properties of its component parts."

Source: Checkland (1981), page 3.

"A system, formally, is a set of components that interact with each other. Changes in one component will induce changes in another component, which may in turn induce change in a third component. Any one interaction of this kind is causal and directional. Many such interactions can be linked together in chains of cause and effect relationships."

Source: Clayton & Radcliffe (1996), page18.

"The systems approach employs the idea that the observer or analyst should assemble descriptions of systems, each based upon a main activity in the situation under study, or upon the smaller contributary activities that make up the whole, The main assemblies are called systems; these may be subdivided into subsystems, and when subdivision into smaller and smaller pieces ceases to be fruitful these final subdivisions are called components. Components also occur outside the system, in the sorroundings: components that interact with the system make up what is called the environment."

Source: Bignell & Fortune (1984), page 153.

is liable to be lost in a mass of detail. The search for ways of overcoming this problem has led to the idea of treating them as systems.

Systems thinking and systems theory were developed in the latter half of the twentieth century (see Box 7.1) in response to the need for "a unifying analytical and explanatory framework throughout the hierarchy of nature"[1]. Ludwig von Bertalanffy, a biologist, was the first to outline the general principles of the subject[2]. He distinguished between open and closed systems. A system is 'open' if material enters or leaves it, 'closed' if there is no interaction with the outside world. Living systems are open systems which maintain themselves by exchanging energy and matter with their environment. The same idea has been applied to social systems. Organised groups of people, such as corporations and NGOs, form open systems which rely on external sources for information, raw materials, financial services, trade etc. The forest sector contains various types of open systems, both natural and man-made. It is made up of numerous subsystems interacting with each other and open to influences from outside. The sector, in its entirety, is a large, complex, open system which forms part of the national and global economy.

Open systems are sustained from outside; otherwise they would inevitably tend to run down due to the dissipation of energy through entropy. Entropy is the universal law of nature by which all forms of organisation move towards disorganisation and

death. It applies to the forest sector and has implications for sustainability. The flow of outputs from the sector can only be sustained if the flow of inputs is also maintained. In the long run, management of the sector must pay attention to ensuring a continuous supply of external inputs as well as to the state of the forest resources. Unfortunately, this is not reflected in the ongoing, rather introverted debate about forest management criteria, indicators and certification. Forest sector sustainability depends on more than the protection of ecosystems and control of forest operations; a whole range of other inputs to the sector also need to be safeguarded.

Katz & Kahn[3] have identified nine characteristics of open systems (see Box 7.2). All open systems require inputs, through-put and outputs, and there is a tendency for events to occur in cycles. They point out that a system can only survive if the entropic process is reversed by negative entropy, and that control mechanisms are essential to allow the system to respond to change without losing its identity. Systems develop dynamically by moving towards greater specialisation and elaboration in response to change.

These characteristics apply to open systems of all kinds, whether living or non-living, concrete or abstract, natural or man-made. Large systems, such as the forest sector, are combinations of smaller systems. These complex systems consist of numerous subsidiary systems arranged hierarchically. They contain various levels, with the more complex upper levels controlling those lower down. Each level has emergent properties that cannot be readily explained by the structure and activities of the level below. Information is transmitted between levels so that systems at lower levels can be regulated and monitored by those higher up. Control is exercised through feedback loops. These are chains of cause and effect which relay information about the performance of the system to earlier stages in order to modify its operation. In human systems, people think, act and adjust their behaviour in the light of previous events; such systems are capable of learning by experience.

The sector, with its subsidiary systems, forms a large, dynamic system, which responds to change and interacts with the environment outside. It fits Clayton and Radcliffes' description of a *complex adaptive system*[4]. Systems of this type tend to be ordered and stable in spite of internal alteration and disturbance. They include ecosystems, which retain their character while their precise species composition fluctuates, and companies, which carry on operating, even though their activities are modified in response to changing markets. These systems are adaptable, within biological and economic limits, and continually alter without losing their character. The forest sector as a whole displays the same characteristics of continuity and adaptability, which are largely supplied by its human elements. Peoples' ability to adjust to new situations and unexpected events determines the resilience of the sector and their capacity to manage change is largely responsible for the future course of sector development.

There is no universally accepted classification scheme for systems, but Checkland[5] has suggested the following:-

- natural systems (e.g. the solar system),

**Box 7.2 Nine characteristics of open systems**

1 "*Energy is imported* in various forms from the external environment, e.g. from the sun, power stations, suppliers of materials, educational institutions, banks, the government and the international community.
2 There is a *through-put* by which energy is transformed and work is done, as with solar energy producing biomass, processing activities leading to manufactured products and training to provide skilled personnel.
3 *Outputs are exported* into the environment, including goods and services of all descriptions, and waste products.
4 *Cycles of events* tend to occur, as with the conversion of raw material into finished products, their subsequent sale, followed by the purchase of more inputs to replace those used up.
5 *Negative entropy* — the entropic process must be arrested or reversed for the system to survive; as a result of negative entropy, stocks of various kinds (e.g. standing timber, raw materials, manufactured goods, money, skilled workers) are built up within the system; these stocks may be drawn down as needed, acting as buffers if the system becomes stressed and providing it with resilience.
6 *Information and feedback* to control the processes taking place in the system; living things respond to stimuli and organisations transmit information which alter their behaviour; feedback provides a corrective mechanism for deviations and helps to preserve the integrity of the system.
7 *Preservation of the character of the system*; open systems can maintain a 'steady state' while exchanging flows of energy, materials and information with their environments; they have control mechanisms which enable them to respond to change without losing their identity.
8 *Differentiation* — movement towards greater specialisation and elaboration, as has taken place during the evolution of plants and animals, and occurs in organisations as they develop technical skills and new products in response to changes in society.
9 *Equifinality* by which a system can reach the same final state by alternative routes, as with different methods of manufacturing the same product."

Source: Katz & Kahn (1966).

- designed physical systems, intended to serve some human purpose (e.g. machines),
- designed abstract systems, which are the conscious product of the human mind (e.g. mathematics),
- human activity systems, which consist of coherent sets of activities serving some underlying purpose or mission (e.g. political systems),
- transcendental systems, which are systems beyond knowledge.

Figure 7.1 shows the relationships between these classes of system. Natural systems are the result of the forces at work in the universe and the processes of evolution; they could not be other than they are without human intervention. Forest ecosystems in an untouched state are examples of natural systems. Other types of system originate with man, and are created and used by humans for a purpose. All these types, except the transcendental, are represented in the forest sector.

The forest sector can be portrayed as a large and complicated combination of these different classes of system. Its components are arranged in an hierarchy in which the various parts interact with one another and contribute towards the working of the sector as a whole. The sector forms a composite system, consisting of numerous functional units, which are themselves systems composed of many elements in interactive combination with one another. Each part affects the general behaviour of the whole, either directly or indirectly. Thus, the mechanical components of an electric generator form a designed physical system, which produces power, and the power may be used to drive a sawmill, which combines machines with human resources to transform logs into lumber. The sawmilling operations are part of a human activity system. Both the generator and the sawmill contribute to total sector output. Similarly, the flow of sectoral outputs may be diminished or increased by alterations in the rate of felling in the forest and the composition of sawmill output is likely to change with variations in market requirements. Breaking down the whole into parts and describing each part as a system is helpful because it describes their functions and linkages to other parts. By understanding the parts, sectoral behaviour can be studied, in totality, as an interactive system which covers the whole range of activities carried on in the sector.

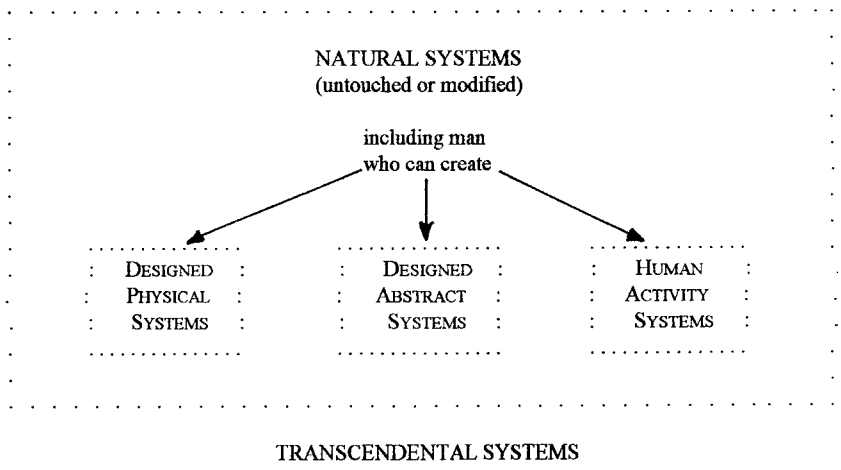


*Figure 7.1* Classes of systems

The forest sector contains various designed physical systems for harvesting and processing, and abstract systems for communication and control purposes. The types of system that are particularly interesting from a management point of view are the natural and human activity components. Forest resources consist of many natural systems ranging from individual living organisms to complete ecosystems. These natural systems may be untouched, but more often have been modified as the result of human intervention. Human activity systems include all the organised groups which are active in the sector, such as the agencies responsible for forest management and the companies operating in the industrial subsectors. The forest sector as a whole forms a large, complex human activity system, composed of many lesser human activity systems, all of which are associated with, or dependent on, a variety of natural systems.

Human activity systems are different in kind from natural systems. We can investigate, describe and learn from natural systems, whereas human activity systems are manipulated and managed. They are human constructs which originate in human self-awareness; their activities can be monitored and predictions about their future behaviour may be used to alter the actual course of events. They are purposeful in the sense that they are organised to achieve a particular aim or set of aims. Unlike natural systems, human activity systems involve choices and are suited to problem solving. By describing the forest sector as a human activity system, attention is focussed on it as an entity, which is adaptable and can be controlled within limits; it emphasizes that it is capable of being managed, directed and developed. The general purpose which drives the system is to increase human satisfaction. The system's particular function is to meet the needs of consumers and society for goods and services of all kinds derived from the forest sector.

The sector consists of a loose, hierarchical arrangement of subsidiary systems. Each organization in the sector is a human activities system, which is managed separately and has its own agenda. The aims of these subsystems are related to their activities and the interests of those who control them. As pointed out when pluralism was discussed in the last chapter, their aims do not necessarily correspond with the sectoral purpose, although their activities contribute to its achievement. The objectives of the subsystems are usually more specific and likely to be based more on self interest than the general interest in increasing social welfare. Their aims overlap because the organisations which make up the sector have a common interest in its prosperity and development, but otherwise tend to diverge and may even conflict. Thus logging companies with short term licences tend to overexploit the forest, while forest departments seek to reduce the permissable cut for the sake of sustained yield. Competing interests of many kinds are at work in the systems hierarchy, as is evident in the tensions between groups seeking to preserve biodiversity and those wishing to exploit the forest for the sake of incomes and employment. To a large extent, coherence of the sector as a system depends on harmonisation of aims throughout the hierarchy and this, in itself, can become a major task for sector managers.

Checkland points out that the way a system is described depends on the observer's point of view and motives. The standpoint from which this book is written looks at the forest sector as a coherent entity for sustainable development purposes. The development problems to be addressed are strategic in character and the description of the sector as a human activities system is intended to assist in dealing with its management at the directional level. Part of our concern is with long-term supply problems, sustaining the flow of outputs of all kinds and maintaining the capacity of forest resources to continue to provide them. Difficulties also arise on the demand side, particularly the kind of outputs that will be required and balancing the competing claims of different sections of the community. The key to successful sector management lies in achieving a satisfactory reconciliation between supply and demand. Conflicts of aims and human adaptability are involved. The problems are often unstructured and difficult to define. In these complex and difficult situations, a systems approach, which enables the best match to be identified by showing the likely consequences of various courses of action and responses to future events, provides a useful management tool.

Systems methodology was first used for what was known as 'systems engineering' or 'systems analysis'. The RAND Corporation in America developed systems thinking in the 1950s, as a way of making choices between alternative means of achieving known ends. It was applied to structured situations — so-called 'hard' systems — where objectives could be precisely defined and some sort of optimum solution could be envisaged, as with finding the most efficient combination of machines to produce a given output or the most cost-effective way of achieving a particular result. This approach is of limited use for policy making and public sector management questions, which are 'soft' problems, often defying goal-directed analysis. Human activity systems in general and the forest sector in particular, need a kind of dialogue between means and ends to solve their problems. The debate frequently depends more on learning from the system than discovering what is the best theoretical solution.

By depicting the forest sector as a human activities system it is possible to understand better the complexities of its structure and interactions, and to explore the way that the system is likely to respond to change. Instead of the analytical scientific method by which problems are reduced to their simplest components in order to understand how they work, the systems approach seeks to investigate problems in their proper setting, by seeing how they affect the overall behaviour of the sector and its emergent properties. The reductionist method of science, which is most familiar to foresters from their training and customary practice, is less useful than systems thinking for dealing with the involved issues of sectoral adaptation, human preferences and ecosystem interventions. The benefits of the systems approach are evident. However, to take advantage of them a satisfactory systems description of the forest sector must be prepared. This should provide insights into sector structure, allow for the complex relationships between inputs and outputs and assist managers to deal with issues of sustainability and development.

## 7.2 TRANSFORMATIONS

In Chap. 4 the forest sector was divided into subsectors according to the nature of their activities — forest management, harvesting, processing etc. This view of sector structure reveals the relative importance of the contributions to value added, employment and trade that comes from each type of activity and the way that these contributions build up along the processing chain. While useful, a structure based on activities at this level is an inadequate foundation for a systems description of the sector. The subsectors are components of the sector system but do not specify in sufficient detail the input-output relationships that are the foundation of the sector's role as provider of goods and services.

It is better to start from the individual inputs and outputs, and the processes by which inputs are converted into outputs. These can be called *transformations*. Thus, solar energy, moisture and nutrients become biomass, logs are transformed into sawn timber and coniferous resin is turned into turpentine. The forest sector can be regarded as a collection of transformations. With reference to a particular area, country or region, a complete listing of all the transformations present in that place is essential to obtain a full specification of the sector as a system. If any are omitted, the system description will obviously be incomplete.

A transformation consists of one or more inputs, a conversion process, and a single output. The process is continuous. Even if the output emerges intermittently in discreet units, like large wooden buildings which are completed at intervals, it results from a continuous flow of activity. The rate of flow is liable to alter over time, either because the inputs are changed, or due to alterations in the conversion process, or from variations in demand for the output. For example, a processing plant may use a larger or smaller quantity of raw material, or substitute machines and equipment for workers, or adopt new manufacturing technology, or increase production to meet the needs of an expanding market. The supply of roundwood may be reduced, because forests are destroyed, and consumer requirements may be diminished, due to altered tastes. These are some of the factors that may affect the throughput. The way that transformations are portrayed should allow for the influence that various factors may have on output flows and the resulting impact on the whole system.

Some forest sector activities do not at first sight appear to be transformations. They involve moving outputs from place to place, without altering them physically. Forest products are transported from factories to consumers, or exported to foreign countries. However, marketing and distribution activities involve the use of manpower and capital resources, and a product at the factory gate does not equate with the same product when it is delivered to a customer; value is added along the way. Therefore, such movements should also be regarded as transformations, which convert commodities at one point to higher value commodities at another point. There is no difference in principle between spatial transformations of this kind and others which involve more obvious changes to the composition of the output.

Six questions are relevant to each transformation: what, how, by whom, in which, where and when? The systems description should be capable of explaining:-

- **what** inputs are used and **what** output is produced,
- **how** the inputs are converted into the output and the relationships between them,
- **by whom** the transformation is carried out,
- **in which** subsector (or subsectors) it occurs,
- **where** the transformation is located and **where** the output goes,
- **when** the transformation takes place and the duration of the process.

These six questions are applicable to all transformations.The first question seeks an input specification. It should include the raw material that is to be converted into output (e.g. logs into sawn timber) and also the other inputs necessary to effect the transformation, such as human resources, machines and equipment. Transformations which occur in the forest (such as carbon sequestration) depend on sunlight, moisture and nutrients derived from nature, which are the raw materials for growth of all living things. Management inputs, provided by human resources, may also be required, as with ecosystem interventions, such as silvicultural operations, which influence the extent and speed of transformations in the forest. Management is also a vital ingredient in industrial processes. Managers of various sorts — forest, wildlife, sawmill, transport etc. — are the agents responsible for many transformations, usually on behalf of the companies, NGOs or government departments that employ them.

The relationships between inputs and outputs are specific to the places and circumstances in which they occur. The conversion factor for turning logs into sawn timber, for example, varies from sawmill to sawmill, depending on the size and quality of the logs, the amount of wastage, the skill of the operators and the type of lumber produced. Other factors of production also vary; some mills employ more workers than others, or spend more on machines and equipment per unit of output. Production costs, investment expenditure and mill efficiency all vary from place to place and time to time, and affect the transformation process. Other industrial transformations vary for similar reasons. Forest transformations are site-related and affected by such factors as rainfall, temperature, humidity and soils; productivity varies greatly and depends on the form of management and the other resources available to the managers.

Table 7.1 provides examples of transformations. Some of these are really groups of similar transformations, as with the collection of non-wood products, furniture making and transport.

One area of forest may be the source of numerous transformations and a variety of outputs. Thus, several non-wood products can come from the same place, the mixture depending on local conditions and the vegetation; each type of product that is collected, sorted and cleaned, and conveyed to market is the result of a slightly different transformation, with different costs. Some non-wood products, such as essential oils or pine resin, require extraction or refining, involving industrial processing transformations specific to the type of product. Wood and non-wood products may be harvested from the same trees, giving rise to markedly different

*Table 7.1* Examples of forest sector transformations

| Transformation | Subsector | Inputs | Output | Agent | Destination |
|---|---|---|---|---|---|
| Photosynthesis | Forest management | Solar energy, water, nutrients | Biomass | Natural processes | Build up of forest resources |
| Tree growth | Forest management | Reproductive material, nutrients, water, sunlight | Mature trees | Natural processes, silvicultural operations | Harvesting |
| Water conservation | Forest management | Rainfall | Water supplies | Natural processes, watershed managers | Streams, aquifers, water users |
| Wildlife conservation | Forest management | Wildlife habitat | Numbers & species safeguarded or increased | Wildlife managers | Recreation, tourism, shooting, photography |
| Ecosystem enrichment | Forest management | Flora & fauna | Increased biodiversity | Natural processes, conservationists | Environmental improvement |
| Felling and extraction | Harvesting | Standing trees | Roundwood (logs, poles, fuelwood etc) | Logging companies | Processing plants (sawmills, pulp mills etc) |
| Hunting | Harvesting | Wild animals | Carcasses & parts (skins, tusks, meat, bones etc), sport | Hunters | Food, clothing, trophies |
| Resin tapping | Harvesting | Trees | Resins, gums, latex | Collectors | Processing plants |
| Collection of non-wood products | Harvesting | Vegetation | Flowers, fruit, nuts, grass, bamboo, etc | Individuals, collection agencies | Local consumption, commerce & trade |
| Sawmilling | Primary processing | Logs | Sawn timber | Sawmillers | Consumption, trade, secondary manufacturing |
| Plywood & veneer production | Primary processing | Logs | Plywood & veneers | Plywood manufacturers | Consumption, trade, secondary manufacturing |

*(Continued)*

*Table 7.1 (Continued)*

| Transformation | Subsector | Inputs | Output | Agent | Destination |
|---|---|---|---|---|---|
| Pulp & paper manufacturing | Primary processing | Pulpwood & woodchips | Pulp & paper | Pulp & paper manufacturers | Consumption, trade, secondary manufacturing |
| Cleaning, sorting, grading & packing of non-wood forest products | Primary processing | Non-wood forest products in natural state | Non-wood forest products after preparation & packing | Companies, cooperatives | Consumption, distribution & trade |
| Extracting & refining of oils & spirits | Primary processing | Resins, gums, latex, leaves, flowers etc. | Oils & spirits after processing | Processing companies | Consumption, distribution & trade |
| Joinery | Secondary manufacturing | Sawn timber | Finished wooden articles (doors, window frames etc) | Woodworking companies | Consumers, building construction |
| Furniture making | Secondary manufacturing | Sawn timber, panel products | Household & office furniture | Furniture makers | Domestic & business users |
| Building construction | Construction | Sawn timber | Wooden buildings & timber used in construction | Construction companies & builders | Completed buildings |
| Exporting | Distribution & trade | Forest products ex mill or factory | Forest products fob or cif | Transport & shipping companies | Foreign purchasers |
| Transport of forest products | Distribution & trade | Forest products ex mill or factory | Forest products at point of delivery | Transport companies | Users |

processing transformations, as with rubber tapping and rubber wood. Similarly, a variety of wood products, each manufactured in a distinctive way, can originate from the same species. The transformations involved are characterised by the nature of their input-output relationships and the kind of organizations that carry them out.

The number and variety of possible transformations is very large and only a selection of them will be found in one region or country. The assortment differs from place to place and time to time. Some forest transformations are ubiquitous, such as the production of biomass, while others are confined to particular climatic zones or ecosystems, as with tropical timbers or species of wildlife. Roundwood from the same source may be converted into veneers, or lumber, or woodchips, to suit variations in national consumption patterns. Industrial transformations tend to be linked to plant size and access to markets; sawmills exist almost everywhere, but pulp and paper production, which is large-scale and capital intensive, is concentrated in relatively few countries which export to the rest of the world. The set of transformations which form the system depends on the local resources and markets; every country has a distinctive profile of its own.

Furthermore, similar types of transformation may produce different results, depending on local conditions. The quantities of inputs and outputs vary with the scale of the operations and may increase or decrease over time. The outputs may differ in quality. The same tree species may grow slowly at one site and faster at another, yielding different exploitable volumes of timber. Harvesting may be done by animals or machines. Rates of handling and processing vary, and the efficiency of the transformation process may be different, as with bandsaws which operate faster and waste less than circular saws. Even if the same set of transformations is present in the sector systems of different countries, they are unlikely to utilize resources similarly or produce identical outputs.

Transformations are frequently linked together to form systems which cut across subsector boundaries. For example, a seedling, as the result of natural growth in the forest, becomes a mature tree, which is transformed by harvesting into a log, then converted into sawnwood, and manufactured into, say, furniture, which is finally distributed to consumers. Each individual transformation is a necessary step in the chain; together, the steps form a composite transformation connecting the initial input to the final output. The sector is composed of sets of related transformations of this sort, covering all the inputs and outputs throughout the entire system.

These sets of linked transformations are responsible for producing streams of output which permeate the system. Often the streams intersect or interact. Sometimes one input leads to more than one output, via several transformations, as with plantations that produce timber, firewood and non-wood products. Conversely, raw material flows from different forest sources, requiring different forms of processing, may be combined into one final product. The streams may also be interrupted by stock building or depletion at appropriate points, as in log yards and storage facilities. The nature of the transformations is not altered by the accumulation of stocks, although they may intervene to influence the volume and timing of the flows.

The sector, viewed as a system, can therefore be portrayed as a complex web of transformation activities. Their complexity is partly due to the way transformations combine and interact with each other and partly attributable to the range of variation within the transformations themselves. Each type of transformation, identified by its output, exhibits local variants which produce the same (or closely similar) outputs from different combinations of inputs. The variations are caused by many factors, including site characteristics, location, the availability and relative prices of inputs, environmental constraints and access to markets. Management differences are also responsible for variations; each organisation has its own way of doing things and therefore tends to produce a transformation variant of its own. The style of management depends on the nature of the organisation, its ethos and its aims. Companies pursuing commercial objectives dominate the industrial subsectors, whereas government bodies, with social and environmental responsibilities, manage large areas of forest land for public purposes. Transformations are influenced by the nature of the organizations that carry them out.

The transformations listed in Table 7.1 are shown according to the subsectors in which they occur. Similarly, the agencies which carry out transformations can be grouped according to the subsectors in which they operate. Some organisations work in several subsectors (e.g. The Weyerhauser Corporation which controls forest land as well as operating processing plants) and some composite transformations cross subsectoral boundaries. Nevertheless, the entire range of forest sector activities can be divided up in two ways: either by type of transformation or by class of organization. Therefore, it is possible to construct a matrix as shown in Fig. 7.2 with the organisations along the horizontal axis and the types of transformation listed down the vertical axis. Each completed cell in the resulting table indicates a transformation activity undertaken by a particular agency. The matrix is capable of describing the system comprehensively, provided all the organisations are included and the list of transformations is complete.

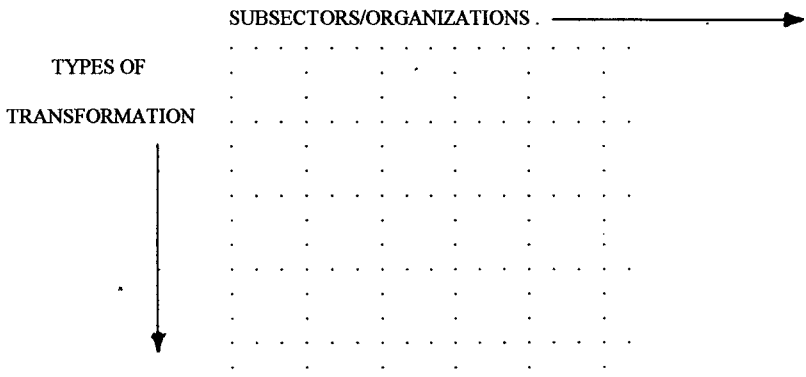


*Figure 7.2* Transformations/organizations matrix

The structure of the sector is revealed by the axes of the matrix. Each organisation is related to the transformation activities which it carries out by entries in the appropriate cells; similar transformations carried out by different organisations are shown in separate cells. Each cell describes a transformation *variant*, i.e. the way that a particular transformation is carried out by a particular organisation at that particular time. The cells utilise identifiable inputs, including raw materials, human and capital resources, to produce their designated outputs (see Fig. 7.3). They may also provide utilisable residues or other by-products. They interact with other organizations and other transformations within the matrix, and with external agencies and events. Each variant can be specified by means of parameters, such as the conversion factors by which inputs are transformed into outputs. For example, a sawmilling transformation may involve an input of, say, $2\,m^3$ of logs to produce $1\,m^3$ of sawn lumber plus $0.4\,m^3$ of sawdust and other by-products. Similarly, each unit of output requires, on average, a given amount of manpower and capital, expressed as ratios.

The cells in the matrix interact with each other and are influenced from outside. Transformations are linked together in chains, producing output streams that connect the natural environment at one end to the consumption of final products at the other end. Each cell in the stream represents one organizational contribution. Organizations interact with each other along the chain, transmitting demand signals backwards and supply signals forward. Chains are foreshortened where outputs of services or intangible benefits flow directly from forest management agencies to the public. Public opinion affects sector activities, particularly concerns about ecological transformations and the threats from organisations that are thought to endanger forest resources. Interventions by the government may affect any part of the matrix, but are most evident where markets fail to stimulate the provision of public goods, such as biodiversity, or where activities need to be regulated because they unfairly harm particular interest groups, such as forest-dependent tribal people.

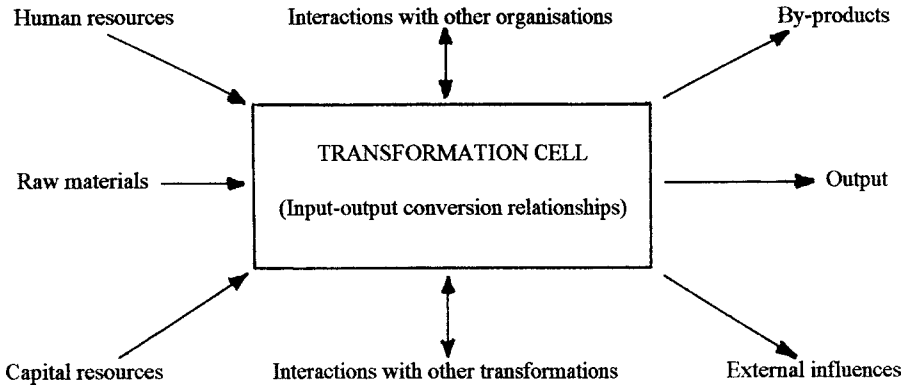


*Figure 7.3* Transformation cell inputs, outputs and interactions

The transformation matrix alters with time in response to these interactions and influences. Some transformations are long drawn-out processes, so that a change at one point leads to subsequent changes elsewhere, as with the establishment of plantations which affect harvesting and processing activities in later years. There may also be a considerable time lapse before the full impact of industrial investments is felt. Other transformations are quicker acting, altering prices or affecting employment in the short-term. With the passage of time, new types of transformation may be added or old ones discontinued. Changes in the matrix are determined partly by changes in the cells and partly by changes in the transformation relationships within the cells as the forest sector develops. The effect of these dynamic changes is to add another dimension to the matrix; a third, temporal axis should be added, along which the table travels. From a development perspective, the system should be represented three-dimensionally, as an entity which evolves in space and time (see Fig. 7.4).

It is clear that a comprehensive description of the forest sector as a system can be built up from all the transformations which take place. The system is portrayed as a complex web of transformation activities which alters with time. Their interactions produce behaviour patterns that are influenced by human activities and often difficult to predict. A full description of the forest sector as a human activities system requires data for a large number of transformations and projections of what will happen to them in future. Serious practical problems arise in collecting the mass of information required and in handling it to solve strategic problems in sector development. In order to learn from the system, it is necessary to have models that can be used to study its behaviour over time. Therefore, model building forms the subject of the next section.

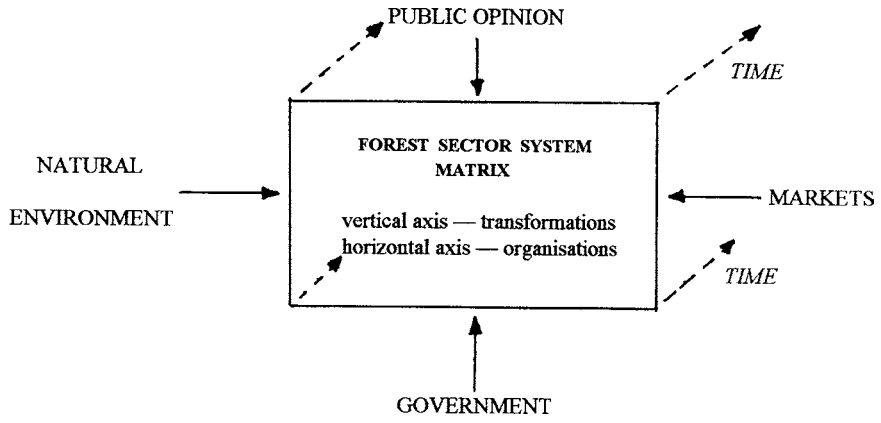


*Figure 7.4* Three-dimensional forest sector system matrix

## 7.3 MODELLING

The complexity of the forest sector is so great that a comprehensive, detailed description of the entire system, including its dynamic dimension, would be extremely difficult, if not impossible, to assemble. It contains a vast number of subsystems, all in a state of flux, and the time, effort and cost of studying each one of them, with their interactions, would be immense. The task could not be justified and its purpose would probably get lost in the mass of detail. It is necessary to simplify matters by concentrating on partial descriptions for particular purposes. These should deal with the main physical components of the system, the flows of materials, money and information within it, the activities taking place and the way they are controlled.

Simplified representations of systems are called *models*. They have been defined as "descriptive intellectual constructs"[6], which indicates that they are mental devices intended to assist understanding of particular situations and sets of interrelationships. Models are designed for particular purposes. Dynamic models are used to predict the effects of changes to a system or its environment. Mathematical models make use of equations and symbols to represent the behaviour of whole systems or their components. Models may be purely conceptual or, as is now commonplace, rely on computers to calculate and portray system changes. It would be well-nigh impossible to model complex adaptive systems, such as the forest sector, without the help of computers.

Models of complex adaptive systems are likely to have a hierarchical structure. Typically, model construction proceeds by combining small, relatively simple models to produce larger, more complex system representations. Small models are set up first to explain the behaviour of separate parts of the system. These are then combined to produce subsystem models. Finally, a model of the system as a whole is assembled from the subsystem models. The process is incomplete in the forest sector. Modelling has been widely used to describe particular features, such as the growth of tree species, or identifiable components of the forest, such as ecosystems. The development of more complicated models at subsector, sector, national or regional levels has been less frequent. Most higher level models have been set up for particular purposes, to deal with specific features such as timber supply or future wood consumption. Attempts to combine several aspects of sectoral activities and their complex interactions into comprehensive, aggregated models have been less common. National forest sector models have been put together in several countries, mainly for policy purposes, and there was an attempt at global modelling, begun in 1980, known as the IIASA world trade model project, which was based on combining the results of national forest sector models[7].

Partial models, which deal with particular components of the forest sector without fully taking account of their interactions with the rest of the sector system, or between the forest sector and other sectors, are liable to mislead. The optimum solution to a local problem may be an unsatisfactory answer when viewed from a national standpoint. A forest management model which indicates that maximum profitability can be achieved

by growing one particular species on a given site, may fail to show that other uses of the same land would perhaps increase net gains in harvesting and processing or lead to larger overall economic benefits elsewhere in the sector. The practical consequences of not considering the system holistically can result in partial optimization at the expense of general solutions which are less than the best. Sub optimization carries obvious dangers, comparable to a mountaineer ascending a subsidiary peak in the belief that he has climbed to the top of the mountain (see Fig. 7.5).

Models fall into two main categories, depending on the way they operate. *Optimization* models employ mathematical procedures, such as linear or dynamic programming, to identify a single, 'best' solution to the particular problem being addressed. The solution that is chosen represents the optimum disposition of available resources or set of arrangements for achieving a specified objective. For example, the rotation length which yields the highest net present value (NPV) may be calculated from a growth model of the forest stand, or the maximum allowable cut can be determined for a specific forest management unit within given constraints, such as the area of land available and the requirements of sustainability[8]. *Simulation* models offer a choice of solutions. They mimic the situation and reveal the consequences of alternative courses of action, leaving to the decision maker the judgement about which option is most preferable. Unlike optimization models, their objectives do not need to be specified in advance. Under conditions of uncertainty and multiple policy aims, which are often ill-defined, simulation modelling provides a more flexible approach. It is particularly suited to large-scale problems, such as tropical deforestation for which a global policy simulation model called IDIOM was developed by Jepma[9]. As a general method of handling complex adaptive systems, simulation has many advantages. In the context of strategy formulation for the forest sector at national level, it provides a useful technique to help managers work out the likely future consequences of their decisions.

Representations of the future state of a system are called *scenarios* and models which are designed to portray the imagined future consequences of alternative courses of action are known as scenario models. Large scale scenario modelling of forestry activities and the forest sector has attracted considerable interest as an aid to policy making. The need for analysis of alternatives has led to the development of a variety of models, designed to meet the different circumstances in various countries. They are simulation models, although partial optimization procedures are

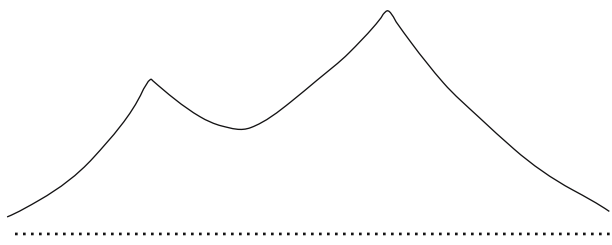

*Figure 7.5* The danger of suboptimal solutions

also built into them in some cases. They have been classified and described by Nabuurs and Paivinen[10] in a review carried out at the European Forest Institute. All these models are wood oriented, focussing on either forest resources as the providers of timber or the processing and use of wood products. Although called 'forestry' and 'forest sector' models, their scope is limited; they are not intended to deal with non-wood outputs or environmental services. Their main purposes are for timber supply planning and the estimation of timber consumption requirements, demand and prices. Comprehensive scenario modelling for policy purposes, covering all types of output and all aspects of sectoral behaviour, has not been attempted.

Simulation is particularly useful as an iterative procedure for exploring the behaviour of complex systems over time and for sensitivity analysis. These features are important in the forest sector due to the longevity of timber crops and the need to sustain the flow of future outputs in circumstances when there is considerable uncertainty about future events. It reveals what is likely to happen in future years under a range of different assumptions. Variations in future output flows, due to changes in the growing stock, regeneration, growth rates and harvesting intensity, can be investigated and compared with expectations of future requirements, based on population growth, income changes and alterations in consumers tastes.The ability of the system to continue to deliver outputs in the face of natural catastrophes or human disruption, and its sensitivity to interventions of different kinds can be tested on the model, so that appropriate precautions can be taken to minimize risks. In general, simulation modelling facilitates sensitivity analysis by enabling the resilience of the system to be investigated. Most systems are responsive to changes at particular points and small variations at those places have relatively large effects on the system as a whole. These pressure points are not always obvious, but can be revealed by experimenting on the model with alterations of various kinds.

The task of managing the forest sector at national level can be greatly assisted by setting up scenario models based on the transformations taking place in the system. Model structure is determined by the transformation matrix. Each transformation is associated with a flow of output, which connects forest resources to end uses and consumers. The size of the model depends on the diversity of the forest and the number of transformations, model complexity on the way the transformations interact. To assemble a model, the ecosystems and types of forest that give rise to the flows must be categorized and their productivity assessed. The inputs required for each transformation can then be quantified and input-output relationships specified. Consumer requirements need to be identified in relation to each type of output. Transformations are affected by their interactions with other transformations and external events taking place outside the sector.These linkages, portrayed by means of their relationships, influence the behaviour of the whole network in space and time. Starting from the present situation, dynamic changes in the flows and the transformation relationships can be postulated to represent future states of the system.

Scenario modelling for the forest sector should satisfy three requirements: it should assist decision makers to (i) match supply to demand for outputs, (ii) plan for

continuity of supply and sustainability, and (iii) meet social demands for equitable distribution of benefits. The transformations enable the balance between supply and demand for each type of output to be investigated under a range of assumptions. The action necessary to maintain resources in a productive state and to add to their capacity to meet future needs can be studied in relation to the requisite levels of output. The interventions that are necessary to maintain continuity of supply and the conditions for sustainability can be identified. Equity requires judgements about fairness in the way that resources and outputs are distributed among various sections of the population and also proper consideration of the needs of future generations. The distributional consequences of different courses of action can be tested to see how organizations and their production functions are affected by changes in the transformations and who is likely to gain or lose from those changes. Future states of the sector can be envisaged by revealing what is likely to happen under alternative strategies or sets of assumptions. The scenario which best satisfies these three requirements of balance, sustainability and equity can then be selected as a basis for future sector development. Choice of scenario depends on the judgement of decision makers, not on a computer-controlled optimization procedure.

With these three requirements in mind, a modelling framework, that has been used successfully in a number of countries for analysis of timber production at national and district level, is described in the remainder of this section. Known as TIMPLAN, it enables the forest management, harvesting and primary processing subsectors to be modelled holistically, including their economic aspects[11]. The method is capable of application to non-wood products and, with some modification, might be adapted for analysis of services and other intangible outputs (see footnote*). It is based on the modelling technique known as *system dynamics*, which serves as both a convenient way of describing systems and an illustration of the principles involved in model building. The systems dynamics methodology is first explained, and then related to scenario requirements by focussing on what is called 'gap analysis' and various issues arising from continuity of supply.

## System Dynamics

System dynamics is the method of simulation modelling, which originated in the 1960s from the work of Forrester[12] and has been applied widely in many different contexts since. Its most significant feature is the use of a small set of standard components, arranged in different ways, to represent the stocks and flows in complex systems. The same components are used to model all kinds of systems. The method has been used for many purposes, ranging from localized manufacturing operations in private firms to analysis of the consequences of global growth and development[13].

---

* Two other related modelling systems, VOLPLAN and GROPLAN, for physical planning of the sector and private timber growers, have also been developed. All three systems are being modified to deal with carbon sequestration as this book goes to press.

The models are designed to simulate system behaviour over time — hence the name 'systems dynamics'.

The standard components used to construct a system dynamics model are called levels, rates and auxiliaries. There are also time lags (referred to as 'delays')[14]. Levels represent the stocks in the system, which are liable to change with time and can be measured at successive intervals. Thus the volume of timber in a given area of forest (the 'growing stock') can be regarded as a level which alters year by year. Rates represent the flows, measured over a given interval of time. In the forest example, the year by year additions to the growing stock, due to annual growth over the whole forest area, are treated as a rate. Auxiliaries provide supplementary information used for rate calculations, as with the mean annual increment per ha from which the growth rate is derived. Levels and rates are represented mathematically by equations. The relationship between components is shown in diagramatic form in Fig. 7.6.

Levels, rates and auxilliaries can be used to represent all kinds of measurable elements in the system, not necessarily only its physical attributes. Thus TIMPLAN provides year by year projections of levels of demand for wood products (at given prices), annual levels of costs of forest operations and the value each year of capital stocks of machinery and equipment. Rates represent the input and output flows that are associated with specified levels, e.g. the rates of increase (or decrease) in demand, felling and regeneration rates, and additions to capital stocks due to investment in machinery and equipment. Auxiliaries are very diverse, including conversion factors for roundwood to processed wood, costs per ha for afforestation and numbers employed per unit of output. Delays are the time intervals that elapse between events, such as the rotation length in even-aged tree crops.

Models are constructed by arranging these standard components in various combinations to represent different parts of the system. Each type of component is used repeatedly, to portray the different parameters and relationships in the model. The arrangements can be shown in flow charts, which help to clarify how the system works. Complex systems, such as the forest sector, can be handled more easily if they are broken down into convenient parts or modules. For example, TIMPLAN contains a total of 11 modules, each dealing with a particular function such as supply, forest operations or harvesting[15]. Each module contains a group of associated components and a set of equations which govern their behaviour.

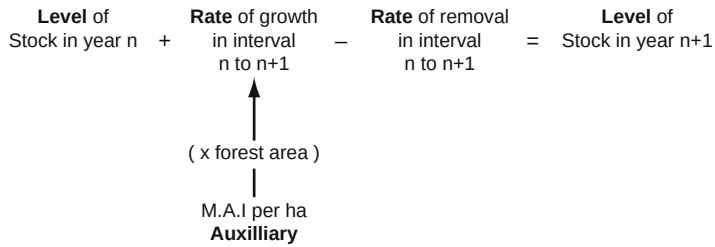


*Figure 7.6* Systems dynamics model components

Systems dynamics models are designed to reveal the consequences of change. The values attached to the components depict the state of the system at a particular time; as the system changes, so also do the values of the components. Each component is assigned a starting value, from which subsequent values are derived by using the equations. The values of all the components are recalculated at regular intervals (known as the 'solution interval'). TIMPLAN takes its base-year values from a data file and calculates subsequent values at annual intervals. The whole model is updated by the computer, year by year.

Difference equations are used to calculate the levels, which have the following form:-

$$\text{Level at start of year} + \text{additions} - \text{deductions} = \text{Level at end of year}$$

$$L_{(n-1)} + R^1{}_{(n-1 \text{ to } n)} + R^2{}_{(n-1 \text{ to } n)} + R^3{}_{(n-1 \text{ to } n)} \text{ etc} \ldots\ldots = L_{(n)}$$

During the course of each year, the level, L is raised (or lowered) by the additions (and deductions) denoted by the rates, $R^1$, $R^2$, $R^3$ etc. One or more rates may feed a single level. The situation is comparable to the level of water in a cistern, which fills or empties according to the rates of flow through input and output valves; the level is calculated at regular intervals and the values, which are measured periodically, describe the behaviour of the water supply system.

The TIMPLAN framework contains a total of 121 levels, 45 rates and 105 auxiliaries. In many places auxiliaries complement or substitute for rates, linking different levels at the same point in time. Thus an auxiliary specifies the factor used to convert cubic metres of sawn timber to the corresponding quantity of roundwood required. A feature of auxiliaries is that their values can be altered over time, exponentially or incrementally, as the model is run in the computer; for example, it is possible to simulate improvements in sawmill efficiency, as reflected by changes in the conversion factor.

The state of the system at the beginning of each year is used to calculate its condition at the year's end; year by year, by repetitive recalculation of all the equations, future states of the system are revealed. The results of each year's calculations show what is likely to happen to all the most important variables in the system. They make it possible to analyse in detail the way the system is expected to develop. Projections of the future values of the variables enable the characteristic features of sectoral behaviour to be identified and development scenarios to be constructed.

The information that is fed into the model at the outset, taken from the data file, determines the results produced by the computer — change the data and the projections will also be altered. The set of data contained in the file includes the base year values of all the variables and also contains assumptions about future changes, such as the expected rate of increase of demand for sawnwood and future regeneration and felling programmes. When the model is run through the computer, this data gives rise to a 'standard' set of results. TIMPLAN provides a mechanism for testing the effects of variations in the data, entered through the

keyboard of the computer, to discover their effects. Each variation represents an 'option' which produces a new set of projections. The results from the option are then compared with those from the standard to reveal their differences. By trying out various options, it is possible to work out alternative scenarios and compare their consequences.

The systems dynamics approach, as applied in TIMPLAN, does not produce optimum solutions. Instead it offers choices, which forest sector managers can evaluate by a wide range of criteria, in order to select the path of future development for the sector that is judged to be the most beneficial. New development possibilities are opened up by revealing the consequences of human interventions of various kinds, ranging from land use changes to investment in new manufacturing capacity and shifts in consumer preferences. Once a model is in place, it makes possible continuing reappraisal of alternative courses of action as new development possibilities come to light. Therefore, scenario modelling with TIMPLAN is an analytical technique which assists managers and decision makers to meet whatever criteria and objectives they consider appropriate in their particular circumstances.

In particular, TIMPLAN can be used to explore the sector's future capacity to meet the requirements of the community for wood products of all descriptions and to provide exports. The model provides projections of annual output and forecasts of demand based on assumptions which are made explicit in the data. These projections can be made over lengthy periods (up to 100 years), to allow for the time lag between regeneration and maturity in newly established tree crops. They make possible gap analysis of the supply/demand balance and assessments of the action necessary to ensure continuity of supply in future years. Projections of future employment and incomes in forestry and forest industries assist decision making on issues concerning equitable shares in the benefits derived from sector activities.

## Gap Analysis

An important feature of scenario modelling at national level is the contribution that it can make to reconcilatiation of long-term supply and demand. Supply projections can be compared with projections of future requirements and, where mismatches are identified, ways of closing the apparent 'gap' between them can be explored. In reality, a gap only arises because the estimates are based on the assumption that prices will remain unchanged; in the event, prices will alter and the actual quantity supplied will balance the actual quantity demanded (see Box 7.3). The methodology of gap analysis has been developed for studying the production and consumption of wood products, but is also applicable to other types of output.

The methodology of gap analysis has evolved from trend extrapolation of consumption and production in the USA and the sets of forest sector accounts produced for FAO, first by Gregory and subsequently by Gregersen[16]. Later, the methodology was developed by Buongiorno using cross-sectional analysis. Successive European Timber Trend studies have also improved on the basic gap model. The latest trend is towards models which allow for prices to be adjusted

**Box 7.3 Gap analysis of production and consumption**

"Most basic forestry sector models have consisted of the so-called 'gap model'. This model attempts to quantify the gap between the potential demand for and supply of different forest products over time, usually at today's price levels. Of course, supply and demand always match in real life, but at different price levels. The terminology of supply and demand is not appropriate in this case, because price is usually not a variable in the demand or supply equations. The correct terms are rather 'consumption' and 'production' of forest products. The model is static, but assuming different demand and supply elasticities, a deterministic sensitivity analysis can simulate possible price responses."

Source: Harou (1992).

so that the gap disappears, as with the multi-regional spacial equilibrium model developed by the Forest Service in the USA[17].

The projections on which gap analysis is based are subject to two different sets of influences. On the supply side, the biological characteristics of the forest set limits to potential future output; on the demand side, consumers' preferences and trade requirements restrict the quantities that it is worth producing. These influences are transmitted in both directions through the transformations. The transformation processes may also impose limits on the quantities produced, due to the finite capacity of mills and machinery, and customary working practices of employees. These limits can be altered to some extent by human intervention in the form of improved forest management, investment and training. However, human intervention takes time to produce results and, even in the long term, is unlikely to result in a perfect match between production and consumption. In practice, the gap is bridged partly by interventions and partly by price changes.

Year by year supply projections are derived from inventory, increment and harvest data. The existing growing stock and the rate at which trees grow limit the quantity available for harvesting. In the long run, as a general principle, the volume of standing timber felled annually should match the volume added by annual increment; removals should be replaced by new growth to ensure sustainability. In the short term, it is possible for the quantity of roundwood that is harvested to exceed the increment, thus causing a reduction in the total growing stock, provided there are enough trees of exploitable size; however, prolonged overfelling will lead eventually to reduction in the productive capacity of the forest. The distribution of tree size and age classes in the growing stock has an important influence on the projections and a very uneven distribution may lead to irregularities in the output flow, either because trees are still too young to cut or because there is a preponderance of overmature, large trees that need to be removed to make way for more vigorous, younger crops. It may be necessary to smooth out the annual flow, with some trees cut before and some after maturity to provide reasonable

continuity of supply. Forest management decisions about the felling rate affect the composition of the growing stock in future years and the prospective sustainable yield. Therefore it is necessary to have a growth model of the forest that allows for the distribution of size classes and keeps track of their expected changes under alternative felling regimes.

National models, which cover all the forest resources of a country, need to allow for different forest types, some of which may be mixed, multistorey 'natural' forests, others even-aged plantations or areas regenerated under a 'shelterwood' system. Furthermore, depending on climate, altitude and past management, different areas support a variety of species, each with its own growth rates and timber qualities,. It may also be necessary to split the forest into zones according to their form of management, accessibility and cost of harvesting. For modelling purposes, it is necessary to divide up the forest into various categories based on these features, with separate output projections for each category. These are called *crops* in TIMPLAN. Each crop gives rise to a flow of output, distinguished by its source, physical characteristics, silvicultural system, uses, harvesting costs etc.

Market forces, working backwards along the production chain, influence felling rates. Because output is based on biological features and trees usually require many years to reach maturity, long term felling rates in managed forests are unresponsive to temporary changes in timber prices. A price increase may have some short term effect which leads to larger quantities being felled for a year or two, perhaps exceeding the prescribed yield, but in the long term, more can be harvested only if more is grown. Cyclical movements in world trade which cause price instability may give rise to output fluctuations, but the long-term trend in output cannot be upwards unless productivity is increased.

The supply module in TIMPLAN contains a growth model for forest crops that is flexible with respect to length of rotation or felling cycle and can accommodate a variety of regeneration and felling programme specifications. Increment rates are set by the user of the model. It keeps track of age classes and the growing stock, providing projections of the areas and volumes to be felled each year, areas regenerated, annual growth and inventory changes. The regeneration rate can be controlled to replace the area that is felled annually, or to meet future requirements when the trees reach maturity, or it can be determined arbitrarily. Felling rates can either be set to meet the requirements of end users or so that each age class is felled when it reaches maturity. Supply projections from the model can be based on alternative growth rate expectations combined with any of the other rate specifications. Therefore TIMPLAN is capable of generating scenarios to meet a wide range of possible future supply situations.

By simulating events at the consumer end of the chain, the demand module in TIMPLAN provides projections of annual requirements, based on the assumption that prices remain unchanged. The annual rates of change in requirements can be set to alter incrementally or exponentially. The rate for domestic purposes can be specified in line with the assumptions that the user makes about future trends

in incomes and population growth, which are the main determinants of domestic demand; changes in foreign trade requirements are usually based on expectations of regional or global market trends. As shown in Fig. 7.7, these changes in processed outputs are converted to their equivalent quantities of roundwood by means of a conversion factor which reflects the efficiency of the transformation process. Scenarios can therefore be generated to demonstrate the effects of different demand assumptions on the magnitude of the gap.

The demand module represents the future requirements of a particular type of output, in its final form, after it has been prepared or processed. Each type of output, such as sawn timber or plywood, is called a *product* and a TIMPLAN model may contain many products. Just as the forest is subdivided into various categories called crops, each of which is a source of outputs, the requirements of end-users are disaggregated into various products. A model consists of crops and products arranged in various combinations. Each crop is represented by a different version of the supply module and each product has its own demand module with appropriate data. The supply and demand modules are used repeatedly to simulate

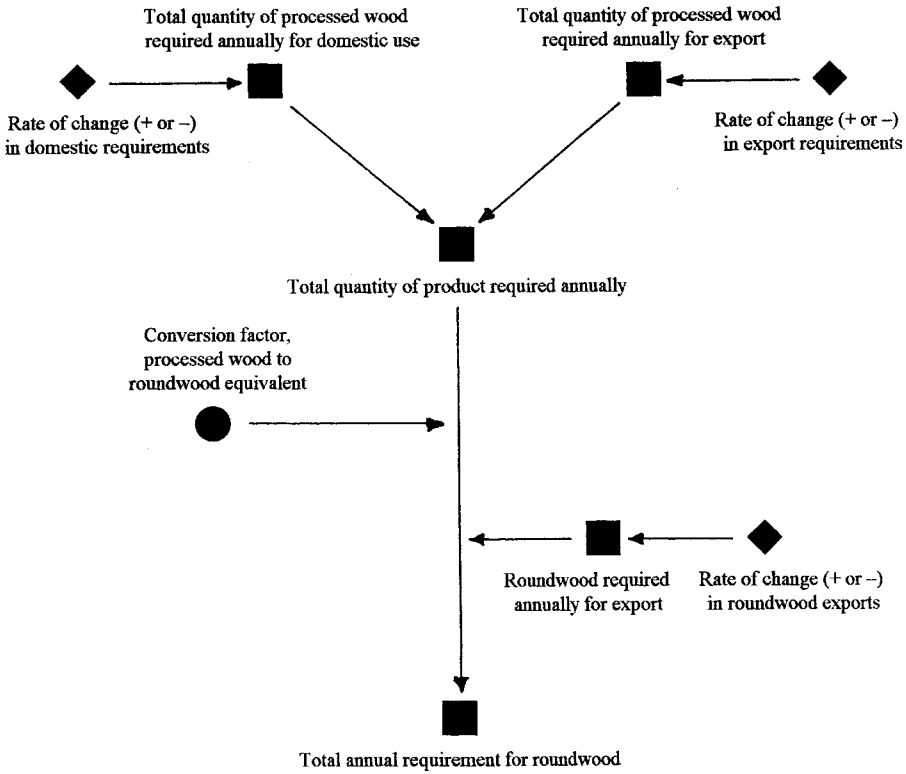


*Figure 7.7* Simplified flow chart of demand module in TIMPLAN (Key: level, ■; rate, ♦; auxilliary, ●)

the interrelationships between the various crops and products that are present in the sector. The demand for each product is met by the supply derived from one or more crops; projections from the model reveal the size of the gap when outputs and requirements are mismatched. The size of the model is variable, depending on the number of crops and products.

Other TIMPLAN modules simulate stages in the transformation process and enable the consequences of changes in forest management, harvesting and processing methods to be investigated. The forest operations module deals with the costs of silvicultural operations and employment generated while crops are being grown. The logging module covers activities, such as felling, extraction and transport, which are related to each crop. The processing module, which is product related, represents the conversion process by which roundwood is turned into products, e.g. logs into sawn timber. Each harvesting module is fed by a supply module and each processing module is linked to a corresponding demand module. Investment requirements during forest operations, harvesting and processing can be altered in line with changes in the volumes being grown, harvested or processed. It is also possible to vary the relative costs of operations and output prices. Year by year projections of all the significant variables in the system facilitate gap analysis and investigation of the likely consequences of alternative scenarios at all stages along the processing chain.

The TIMPLAN modelling technique is flexible and easy to use, and enables supply and demand to be reconciled under a wide range of conditions. It enables output from the forest to be matched to requirements by controlling the felling rate where there is sufficient mature timber and, if desired, can work out a regeneration programme which will satisfy future requirements when the trees reach maturity. The range of projections that the method provides give forest managers invaluable insights into the future state of the growing stock and its continuing ability to sustain the output flow.

## Continuity of Supply and Sustainability

Continuity of supply depends partly on the composition of the forest as a resource and partly on the way that it is exploited to meet human needs. For timber crops, it is necessary to generate projections which show the areas and volumes of the growing stock as well as the amounts of roundwood to be harvested in future years. According to the classical theory of sustained yield, there should be a balanced sequence of age classes in even-aged crops, or a balanced mixture of size classes in uneven-aged crops; the aim of forest management should be to create a 'normal' forest[18] so that the same amount can be harvested every year in perpetuity. The system will then be in equilibrium, with the quantity of timber removed each year being matched by the annual increment and the area felled being equal to the area regenerated, while the volume of the growing stock remains constant. This equilibrium will be upset if the felling rate is altered or the composition of the growing stock is changed. A forest that contains an abnormal series of age

classes will produce an irregular annual yield unless steps are taken to even out the fluctuations.

In real forests, the age class distribution tends to be skewed or uneven and felling does not always take place at the optimum rotation age. Even those forests which have been under management for a long time seldom come close to achieving a normal distribution of age classes. Consequently, the quantity felled annually tends to fluctuate unless it is smoothed out by cutting some trees earlier and some later than they should be. Yield regulation is based on knowing how the age classes will develop, when areas will be ready for felling, their extent and the quantities of timber that can be obtained from each coupe. It is necessary to model the forest, using TIMPLAN or some comparable method, to obtain reliable projections of its future composition under alternative cutting regimes. The tests of success of forest management are how well continuity of production is preserved while working towards a normal forest structure and how closely the output flow conforms with the requirements of consumers.

In practice, normality is a theoretical ideal which is unattainable. Forests are not uniform; site quality and growth rates vary over relatively short distances according to slope, aspect, soil depth and fertility, the distribution of species is patchy and the composition of the ecosystem changes over time. Harvesting is affected by the terrain, ease of access, the condition of the roads and the weather. Felling plans are upset by market changes, price fluctuations and the state of the economy. Forest management may aspire to the ideal but the age class series inevitably evolves somewhat unevenly, supplying an output flow which is continuous but not constant. Therefore, sustained yield is best regarded as a guiding principle rather than a working rule. It is rather like a statistical trend from which annual outputs deviate according to circumstances and the quality of management. The average output should approximate to the theoretical norm, but felling plans need flexibility to allow them to respond to unexpected events.

Scenario modelling deals with long-term trends rather than short-term fluctuations. Unexpected disturbances to the system or catastrophic upsets, such as hurricanes or economic crises, are liable to disrupt the output flow and are likely to undermine attempts at sustainability. It is possible to allow for them with TIMPLAN in two ways: either by imagining the possibility of such events in advance and simulating their consequences with the model in order to develop a precautionary strategy, or by updating the model after the event has taken place, revising the scenarios and altering the existing plans for sectoral development. A precautionary strategy will not prevent such events from happening, but it may reduce their adverse consequences; it is a form of insurance. Responding to disruptions after the event leads to alterations in the output flow which seek to restore normality in the growing stock and recalculation of the permissable yield; the aim is to minimize the impact on processing activities and end users.

The theory of sustained yield was developed in relation to timber growing over long rotations, but similar principles apply to ensure continuity in the flows of non-wood outputs which reach maturity in a shorter time. In the wild, annual

harvests of such products as thatching grass, bushmeat, fruit or mushrooms are limited naturally to the quantities available seasonally and, though the supply may fluctuate from year to year according to the weather, continuity depends primarily on protecting the land where they grow from deforestation or excessive disturbance. In a model, the annual output is likely to be calculated from the average yield per ha. multiplied by the area which is harvested. Where the pressure from collectors is excessive, it may be necessary to limit removals to safeguard the breeding stock for future years, either by restricting the number of collectors or by controlling the quantities they are authorized to take. In some places, human intervention in the forest ecosystem is possible, designed to increase the frequency of particular species or the extent of the areas where they are found. In instances where intensive methods are feasible and financially viable, particular species may be propogated and treated as a crop in order to increase productivity and yields, as with some medicinal plants and game birds reared for shooting. This kind of management is comparable to timber growing in plantations or farming and can be modelled in a similar fashion.

Forests are frequently managed to produce multiple outputs, which raises problems of choice. In the past, timber production tended to be given priority and other outputs were treated as by-products. It was often assumed that if the yield of timber was sustained, the supply of so-called 'minor forest products' would continue to be available, and foresters thereby discharged their responsibility to meet the needs of local communities. Climate change and biodiversity were not considered. This attitude is no longer realistic or tenable. The scope of forest management has been widened to cover a much wider range of tangible and intangible outputs, the relative importance of timber has been reduced and sustained yield is now being reinterpreted as 'sustainable forest management' (SFM)[19]. Multiple output forestry is becoming the norm and this change in attitude brings with it awkward questions about choosing the best mix of outputs and sustaining those that are less easily quantified than timber. TIMPLAN, which was designed primarily for timber production, is helpful for making choices between different types of output but cannot cope with the full range of services and intangible benefits derived from the forest sector. In the absence of a comprehensive scenario modelling technique, which covers all aspects of sectoral activity, TIMPLAN can be used in parallel with other partial models to obtain a full assessment of alternative strategies for developing the sector.

However, as Box 7.4 shows, there is no general agreement about the nature of SFM. This hampers the application of scenario modelling to the forest sector system. SFM has emerged in response to a range of social concerns. Deforestation, particularly in tropical countries, has provided one important trigger. Other factors include the growth of the world economy amidst worries about widespread poverty, population growth and the misuse of natural resources. The source of the difficulty seems to be uncertainty about the purpose of SFM, with various groups adopting different positions according to their particular perspectives. Some are primarily concerned with ecosystem functions, some about continuity of production, and

**Box 7.4 The objectives of sustainable forest management**

"Since the 1992 Rio Earth Summit, the term 'sustainable forest management' (SFM) has been widely used in forest policy circles. Several perspectives about SFM exist today: some view SFM as production of a continuous flow of desired forest products without loss in inherent productivity; others say that SFM does not entail production or extraction, but is all about maintaining and enhancing ecosystem functions; some say SFM is nothing but wise management. This term is variously used — in political, scientific, environmental and public relations contexts.

Traditional forest management was supposed to be based on managing forests for a combination of forest values, but timber and fibre production and profits derived from these have dominated. SFM requires integrating concerns for economic and ecological viability of forests, while ensuring that their use and management contribute to the social objectives of societies.

In order to secure this range of economic, ecological and social values a strategy for SFM must reflect the following objectives:

- to indefinitely satisfy needs for timber, fibre and non-fibre forest products,
- to ensure conservation of soil and water,
- to sustain the resilience and renewal capacity of forests,
- to support the food security and livelihood needs of marginalised communities which are dependent on forests,
- to conserve biological diversity,
- to achieve all the above consistent with the incremental productive capacity of forests and the requirements of ecological security,
- to realise a more equitable sharing of the benefits from the uses to which forests are put,
- more organised management, cultivation, harvesting and utilisation of minor forest products as potential pillars of sustainable forestry to sustain livelihoods from dwindling resources,
- reduction of industrial pollution which is inimical both to soil and atmosphere, affecting the forests and biodiversity,
- better management of effluents which have serious degrading effects on soil and flora,
- securing tenurial rights of the millions of people living in villages skirting forest areas as a means to promote conservation."

Source: World Commission on Forests and Sustainable Development (1999), page 81.

others with protecting the rights and welfare of groups in society. The three-point recipe for sustainability, which was identified in Chap. 5, roughly corresponds to these points of view: the forest resource base must be safeguarded, sectoral activities must be maintained and output choices must be preserved.

SFM needs clarification in order to make it more useful as an operational concept. The comparatively simple idea of sustained yield, aimed at timber production, has been transformed into the much more complicated SFM concept, which is based on multiple outputs. Sustained yield had a single aim, which was achievable by establishing a normal forest, whereas SFM lacks a comparable, clear prescription to guide operations in the forest. The debate about criteria and indicators, in all its complexity, attempted to set measurable standards by which managers' success in achieving sustainability could be judged, but has shed little light on how SFM might be achieved in practice or what a sustainably managed forest might look like. The problems associated with combining different objectives, which sometimes conflict, have not been adequately attended to, although it is not possible to formulate sector strategy and development programmes until they are addressed.

Choice is an essential feature of forest management. Human intervention in the forest involves ecosystem modifications which favour some species over others; forest management is unavoidably selective and seeks to increase particular types of output, usually at the expense of others. Indeed this is the essence of productivity improvement, which concentrates site resources, in the form of the available nutrients, moisture, air and sunlight, on selected species in order to boost the production of desired outputs, while reducing the numbers of other, so-called 'weed' species. The process is familiar in agriculture and applies also in forestry where, for example, natural forest is felled selectively or replaced by plantations. The pursuit of greater crop productivity tends to reduce biodiversity and, therefore, also leads to impoverishment of the environment. Some people might regard this as unsustainable development, although in reality it represents a limited trade-off in benefits — extra output from a particular piece of forest in exchange for a bit less biodiversity in that area. The choice between more output and biodiversity preservation depends on a value judgement about the significance of the losses and gains. When viewed from a national standpoint, the conclusion might be that society stood to gain more from the extra output than would be lost due to a relatively small reduction in the number of species in that place, particularly if the species concerned were widely distributed elsewhere. Alternatively, the sacrifice might be considered too great if the productivity gain was relatively small, or the loss involved either an ecosystem with a very limited geographical range or species that were endangered.

The dilemma for managers is how best to balance gains and losses when their activities affect the composition of the forest. Priorities and trade-offs are invitable when there is more than one output. Sometimes outputs are in joint supply, so that increasing one also increases the quantities available of others, as with sawlogs which are accompanied by pulpwood or firewood obtained from lop and top. Alternatively, increasing the production of one type of output can lead to reduction of others, as with selective felling and thinning of mixed forest to favour those timber species which command the highest prices. Generally, high yields of timber from plantation monocultures are likely to be associated with relatively low levels of recreational, amenity and ecological benefits. Many of these advantages and disadvantages occur at different times or affect different sections of the community.

It is seldom possible to sustain at constant levels the yields of all the outputs in a mix, due to their interdependency and the perturbations that occur in the system. These problems are compounded because some outputs are products which can be assessed in monetary terms, while others are services or public goods which may be highly esteemed but are difficult to measure and value. When gains and losses are not comparable, decision making cannot be an exact science.

The traditional concept of sustained yield was based on continuity of supply at a constant level. It asserted that output from the forest should not diminish over time (although it might increase). It was a resource-oriented view, concerned mainly with the capacity of tree crops to sustain the flow of forest produce. The possibility was not considered that users of timber might require more in future years or, conceivably, use less because other types of materials might replace wood. Availability was seen as the main limiting factor rather than consumers' wants or purchasing power. However, a different interpretation of sustainability results if the output flow is viewed from the demand end of the processing chain. This perspective is based on meeting users' requirements. As population numbers and incomes increase, the quantity required tends to rise year by year (assuming prices remain the same). Unless supply also increases to match the rise in demand, some consumers will be deprived of forest products (or pay more) and become relatively worse off; the needs of future generations will not be satisfied to the same extent as they are at present. It might be argued that this is unfair treatment which contravenes the Brundtland Commision's definition of sustainable development quoted in Chap. 5. This view implies that, instead of ensuring a constant output from the forest, managers should aim to provide an increasing supply to enable consumers to enjoy the same standard of living as previously. A demand-oriented approach leads to the conclusion that forests are not being sustainably managed unless consumers' requirements are met, both at present and in the future.

The discussions about sustainable forest management that were associated with the 1992 Rio Conference and the exhaustive debate about criteria and indicators that followed appear not to have explicitly addressed the issues raised by these two possible interpretations of sustainability.

SFM also falls short in other important respects. The sustained yield concept, based on the idea of producing a constant flow of timber from a normal forest, has been revised and broadened to cover multipurpose forest management but in the process, the simplicity and clarity of the normal forest concept has been lost sight of. SFM offers little practical guidance on how managers are expected to provide a continous supply of multiple outputs, whether as a steady flow or varying over time to satisfy changing requirements. It remains focussed on resource limitations rather than consumers' needs and fails to recognise that forest management is not the only part of the sector concerned with sustainability. Output flows are affected by activities in the harvesting, processing and distribution subsectors before they reach end users; similarly, consumers exert a backward influence on the forests and the way they are managed. SFM is not a holistic concept and does not view the forest sector as a system.

Whereas forest management based on sustained yield had a limited objective, SFM depends on a very broad set of ecological, economic and social aims. According to the World Commission on Sustainable Development, it should reflect the eleven objectives listed in Box 7.4.

Some of these relate directly to the way that forest resources should be managed, others to the impact on the forest of activities in other sectors, such as industrial pollution and effluents, which forest managers can only seek to influence indirectly. While the desirability of these management aims is not disputed, they are so general that their usefulness for determining what should be done is very limited. They are open to the criticism that they attempt to be 'all things to all men' and, due to their lack of focus, are of no help when controlling activities, deciding priorities or choosing scenarios.

It might be more useful to treat many of the items in the list as restrictive conditions or 'constraints' rather than objectives. For example, achievement of the first five items is subject to the conditions laid down in the sixth item. The conservation of water, soil and biodiversity puts restrictions on the way the forest should be managed. The seventh item calls for more equitable sharing of benefits from the forests and the eighth item for the promotion of activities associated with minor forest products in order to sustain livelihoods; the attainment of both these objectives depends on the way that the other objectives are pursued. These items are also vague because they do not explain what is considered equitable or whose livelihoods need be safeguarded. Judgements are called for, but the list offers no help with defining the range within which an acceptable balance of objectives might lie. Those responsible for guiding the development of the forest sector may note the items in the list, but cannot use them in a practical way to help choose the best course of action. In relation to modelling the sector, or parts of it, and using models to construct scenarios of what the sector might look like under alternative sets of conditions, these objectives indicate in a very general way some of the features to be included in the analysis, without specifying either their limits or their relative importance.

In spite of the wider perspective of SFM, compared with sustained yield, the list of objectives still tends to be resource-oriented and deals inadequately with the full range of outputs as viewed from the standpoint of end-users and consumers. Needs for "timber, fibre and non-fibre forest products" should be "satisfied indefinitely" in order to comply with the first item on the list, but all the other services and intangible benefits derived from forests are not treated as outputs. The requirements of society, for which people are prepared to pay, undoubtedly include services as well as goods and all of them should be regarded as outputs which forest managers are responsible for providing. They all form part of the mix of requirements desired by society and they all need to be sustained. Conceptually, the principal purpose for which forests are managed can be briefly stated as the provision of a sustained flow of outputs of all descriptions, combined together in appropriate proportions, to give the greatest possible satisfaction over time for consumers and society. However, as described in Box 7.4, SFM fails to convey either the idea of society's changing

output requirements or the choices needed to combine outputs in the optimum proportions.

How best to tackle these serious shortcomings of SFM so that it becomes more useful in practice? Clearly, the transition process which began with sustained yield needs to continue. The SFM concept should be extended to cover all types of output and all the activities that go on in the forest sector; it should be broadened to deal holistically with the sector in its entirety, including all the actions and interactions which extend from the forests to end users. Sustainability depends on observing the three rules set out in Chap. 5, i.e. safeguarding the resource base, maintaining sector activities and preserving output choices. These rules must be adhered to while the sector undergoes change induced by natural events and human interventions. Most important of all, SFM should evolve from a static concept into a dynamic process. It is necessary for it to be transformed from a set of forest management objectives into an operational procedure for achieving sustainable development which covers the whole sector. Sustainable forest management needs to be converted into a purposeful process aimed at sustainable development of the forest sector as a system.

In order to 'operationalize' sustainability for the forest sector, attention needs to be focussed on the information that is necessary to influence the development process and the methods by which continuity in the flow of outputs can be achieved. As far as possible, outputs should be quantified and their future flows predicted. The development process should be guided and controlled by judgements about what is expected to happen in the future. Forecasts of the supply-demand balance under alternative assumptions are required. It is necessary to have data relating to the future state of the forest resources, their management and their productive potential in order to analyse supply alternatives; estimates of future requirements are needed, based on assumptions about changes in consumer's preferences and ability to pay. Growth of demand needs to be matched against possible output increases due to higher productivity and also compared with the possibility of meeting shortfalls by means of imports. These informational requirements highlight the significance of an approach based on modelling and scenario generation, which can offer practical assistance for decision makers by revealing the consequences of alternative courses of action.

## 7.4 SYSTEM DEVELOPMENT

In this chapter, the forest sector has been viewed as a system within which numerous transformations take place. These can be represented by computer models which describe the dynamic behaviour of the system. Scenario modelling is a particularly useful method of portraying what might be expected to happen to the system in different sets of circumstances, as a basis for decision making designed to promote sectoral change and development. The system is affected by unavoidable ecological, economic, political and social changes, which are generated externally. It also responds to deliberate attempts to change it from within and to lead it progressively

**Box 7.5 Sustainable Development combines needs and limits**

"A dozen years ago the Brundland Commission, later supported by the UNCED process, set a new paradigm for the world: Sustainable Development. It is a term that implies two concepts: the concept of needs and the concept of limits. The needs of present and future generations must be met with the full support of human ingenuity but within the limits of a stable biosphere. For the forests this requires that if we want to benefit from the material goods and services of the forests, it has to be done in a way that does not jeopardize their ecological functions. Both forests and development have to be sustained."

Source: World Commission on Forests and Sustainable Development (1999), page xi.

in a particular, desired direction. System development includes both adaptation to altered circumstances and intentional changes. The sector's resources, activities, outputs and institutions are all affected. Purposeful management of the system as a whole is necessary to achieve development aims and this raises a number of procedural questions that are considered in the remainder of this chapter. The nature of the development process is examined first, followed by the practical steps that can be taken to promote development and, finally, the aims which determine the development path that the sector should follow.

System development is a process that is subject to qualification. It must be sustainable and forms of development that are judged to be unsustainable are no longer considered acceptable. Even though the precise meaning of sustainable development is by no means clear, sustainability is specified by means of conditions to be met while development proceeds. The adoption of SFM has led to the preparation of various sets of criteria and indicators for managers to comply with, as described in Chap. 5. Similarly, the more general, tripartite prescription covering the sector as a whole, which was identified in that chapter, is also conditional. Sustainability is restrictive in character. Development on the other hand is expansionist, aiming to meet people's requirements and to achieve the greatest possible benefit for society. Sustainable development is therefore a blend of two ideas, part negative and part positive, which must be reconciled for progress to be made. While the development process is ongoing, if the limits imposed by the need for sustainability can be eased, the rate of advance can be speeded up.

The dual nature of sustainable development has been interpreted by the World Commission on Forests and Sustainable Development in terms of 'needs' and 'limits', as shown in Box 7.5. It can also be described in relation to the outputs generated by the system: on one hand, meeting peoples' requirements and on the other, the extent to which their desires can be satisfied. The availability of outputs of all kinds, now and in the future, puts practical limits on the hopes and expectations of the community. Some output flows can be enlarged for a short period by increasing the exploitation rate in the forest, as with timber supplies,

but sustainable additions to supply depend on long term resource availability and productivity. Intangible outputs are sustained by ensuring that the ecosystems that provide them remain intact. The limitations imposed by sustainabilty can only be relaxed if supply levels can be permanently increased by means of investment. Society's rising expectations from the forest sector need to be reconciled to what the sector is capable of delivering in perpetuity.

The chief means of reconciliation is through the spending power of the community. This restricts the ability of people to pay directly for outputs from the forest sector. Indirectly, the size of the sustainable output flow depends on the willingness of society to allocate more of its available resources to increase investment in the sector. Development is the process by which output flows of all kinds are expanded and the mix of outputs is adjusted to enhance people's total satisfaction. However, prices of those types of output that can be traded also form part of the equation. Lower timber prices for example, caused by an increase in supply while the quantity consumed remains the same, may add to total satisfaction by enabling the community to spend more on other things. A satisfactory formula for sustainable development requires attention to both the resource limitations on which the output flows depend and the limitations imposed by the pattern of spending of the community which affect the amount and kinds of output required. To ease these restrictions over time, more must be produced and more must be spent by the people likely to benefit from the increased outputs. The cost of producing extra outputs must be matched to the possibilities of additional expenditure in the forest sector by society as a whole.

It is important to take a holistic view of sectoral development. SFM concentrates on natural resource limitations in the forest management subsector and tends to disregard other factors which affect the output flow. The forestry limits are set in two ways. First, the resource is limited by natural features, including its extent, ecological characteristics, condition and rate of growth or renewal. Put simply, the size of the output flow depends on the amount of forest, and therefore the forest must be protected from encroachment or other changes in land use. Second, the level of harvesting or other interference in the ecosystem should not damage the system's integrity. Its ability to continue to provide benefits in future must not be undermined by excessive use or alterations in its composition. However, sustainable management as seen from a sectoral rather than a forest resources standpoint, should also take account of supply bottlenecks outside the forest, such as inadequate investment in wood processing or restrictions on distribution and trade. Sectoral development therefore requires a broader approach, which is focused less on supply limitation and more on ways of meeting increases in the requirements of consumers and society, than is evident in most of the explanations of SFM that have been published.

Development is promoted by human interventions in the system which serve two purposes: first, to ease the limits on output caused by the need for sustainability and, second, to increase and modify the output flow in order to meet changes in requirements. Sustainable development, as a process, involves a series of such

interventions, made with the object of steering the system in the desired direction and facilitating change by good management and appropriate investment. Progress depends on making correct strategic choices and following up those choices with action to turn intentions into reality. Decision making can be assisted by the techniques of modelling and scenario preparation, which reveal the likely consequences of alternative courses of action, but is fraught with uncertainty about the future.The long time-spans involved in the management of forest ecosystems extend the number of years during which unexpected events may occur and therefore increase the uncertainty; they add to the period when sustainability may be upset by unexpected interference with the output flows. Sustainable development is therefore a speculative process, based on assumptions, likely trends and expectations, which are liable to be upset by the actual course of events. By nature, the process depends on a succession of enlightened judgements and the development path that is actually followed is likely to evolve as it goes along.

Success in promoting development depends on the quality of the judgements that are made. Decisions are based on expectations, which are unlikely to be fulfilled in their entirety and may be seriously upset by unforseen events. Flexibility is essential to allow the system to be redirected if this happens. Primary decisions concerned with the route that development should follow may be affected; more frequently, it is necessary to reconsider the consequential decisions that relate to the action to be taken to achieve the desired ends. Changes in development strategy are likely to lead to alterations in implementation plans. Therefore, it is necessary to view the development process in dynamic terms, as a series of choices, with repeated readjustments, which are intended to meet requirements, balance competing demands and maintain continuity in the output flow as, far as circumstances allow.

## Strategy, Programmes and Projects

Sectoral development is a continuous process, although it consists of various steps or stages which are repeated with different time scales. The process is like an endless journey in which the traveller never arrives at a final destination; the destination keeps altering as the journey proceeds. Its route is decided when a development strategy is chosen, but from time to time the strategy is revised and the direction alters. Each change in direction leads to a new set of arrangements for achieving the aims set out in the strategy — a new implementation plan is prepared. The plan is then put into effect and the development journey continues until, at the end of the plan period, the time comes to review progress, decide on any change of direction and prepare a fresh set of development proposals. The strategy — planning — implementation sequence is repetitive; each stage represents another step along the chosen route and each repetition extends the journey for another five or more years.

The strategy and planning stages in the succession correspond with the 'directional' function, which forms part of the institutional framework of the forest sector as described in Chap. 6. In a national context, policy making and the preparation of national forest programmes are identified as necessary tasks which fall to the

government to oversee; both are perceived as parts of an ongoing process. The development process continues through NFP implementation which involves the whole range of sector organizations, both public and private. Effective sector management consists of supervising and steering the process, coordinating the activities of all the agencies engaged in the sector, providing leadership and maintaining momentum. The key to success in sector development lies with the arrangements for taking important decisions. The strategy, planning and implementation sequence involves a series of choices taken at each stage, with overall direction of the development process provided by some designated central authority.

A simple procedural description of choice, as related to the policy process, was given in Chap. 6. This was based on the 3A cycle of Analysis, leading to definition of Aims, followed by Action to achieve those aims. The process is circular, with action leading back to re-analysis and revised aims. The underlying principle is the idea of continuous improvement. The same principle appears in various different forms in other contexts. In manufacturing, for example, W.E. Deming's well-known ideas on 'total quality control'[20] have been interpreted as a serial process for designing and developing better products. In the 1970s, Warren Baum articulated the *project cycle* used to deal with development projects in the World Bank[21]; he identified six steps in the process as shown in Fig. 7.8.

Cycles of improvement are used at various levels, with different time scales, in the forest sector. At the strategic/programme level, a complete cycle, lasting five or more years, starts with a review of the sector's resources, activities and outputs; this should also include a SWOT analysis to identify the sector's Strengths, Weaknesses, Opportunities and Threats. This stage is followed by identification of possible scenarios, a consultation process to choose the preferred way forward for the sector and selection of an appropriate set of strategic objectives. An implementation plan is then prepared, typically in the form of a national forest programme, made up of subprogrammes and projects covering particular aspects of sectoral activities. Some forestry projects are really convenient 'time slices' of ongoing subprogrammes, such as afforestation or farm forestry, which enable financing institutions or aid donors to

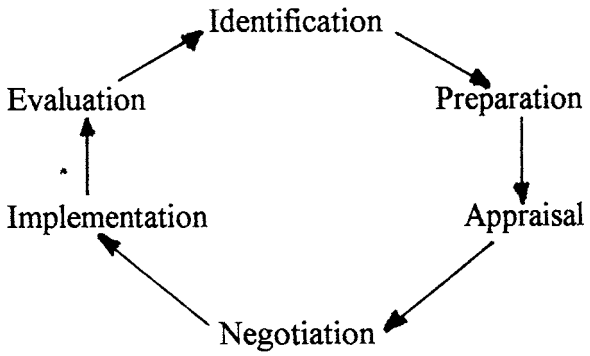


*Figure 7.8* The Project Cycle

limit their financial commitment although the project will need to continue for a much longer period to ensure sustainability in the output flow. The action phase of the cycle covers the period of the NFP, during which intentions are transformed into visible and measurable results. Progress during the action phase can be monitored, leading to evaluation and review at the end of the plan period. The cycle then begins again with a new analysis of the state of the sector and preparation of a revised strategy.

NFPs are medium to long-term programmes which often cover a decade. They frequently last longer than the national development plans prepared in many developing countries to which forest sector activities should relate. National plans usually follow a 5-year cycle, so that an NFP frequently corresponds with two consecutive national plans. National plans focus attention on those parts of the national economy that should receive particular attention and identify significant capital investment projects that the government intends to promote; it is important that the forest sector receives its fair share. NFPs that last longer than national plans need to be sufficiently flexible to accommodate future changes in national priorities which cannot be forseen at the time the forest sector programme is drawn up. Flexibility is also necessary to enable the development process to continue without interruption, even though each NFP starts and finishes at prescribed times and the projects within it are likely to be modified as it goes along.

NFP implementation depends on the projects which make up the programme. The preparation of capital projects, such as a plantation programme or construction of a wood processing plant, typically follows the steps in the project cycle. The time scale of individual projects is usually shorter than the NFP cycle, although this is not always so in practice because the first four stages in the project cycle (identification, preparation, appraisal and negotiation) often take longer than the implementation stage, particularly if a project is complex or involves substantial capital investment from abroad. Project cycles seldom synchronize with the NFP cycle and, often, a project starts during one NFP period and ends in the next. Furthermore, continuous improvement is likely to come into play during the life of the project so that, within financial and administrative limits, its actual progress and results seldom correspond exactly to its planned performance. As Albert Hirschman vividly demonstrated in his well known study of World Bank development projects[22], many projects would never have been started if all their difficulties had been anticipated and many would not have succeeded in overcoming those difficulties without human resourcefulness and inventiveness. Projects are frequently modified in the light of experience during the course of their implementation; the project cycle contains feedback loops.

The process by which strategy is formulated and an NFP is produced is illustrated by the preparation of the National Forest Programme for Cypress[23], as described in Box 7.6.

The Cyprus example demonstrates how scenarios were used as analytical devices to formulate a strategy. They represented imaginary future states of the forest sector and provided alternative views of how the sector might develop in later years. The logical consequences and expectations derived from the different scenarios were compared and a compromise solution, obtained by combining the best features from two of them,

**Box 7.6 Choice of strategy and NFP preparation in Cyprus**

"Four scenarios were identified, describing possible routes which forest sector development could follow. Scenario A was the baseline, representing the existing situation, from which the other scenarios start. Scenarios B, C and D represent new directions for the forest sector to take; they were based on broad social aims. All scenarios involved multiple use of the forest resources, but with different emphases. These scenarios indicated the main choices open to the Government about the kind of forest sector that is desired and the sort of activities and contribution to the national economy that may be expected in each case. They were as follows:-

Scenario A, which described the 'now' situation, showing what is happening at present and what is expected to happen in future if things continue according to present practices and current priorities.

Scenario B, based on multiple use of forest resources focussing on *production*, primarily of timber,

Scenario C, based on multiple use of forest resources, focussing on the *protection* of the environment and heritage,

Scenario D, based on multiple use of the forest resources, focussing on *recreation and tourism*."

"Consideration of the scenarios led to the adoption of a **Rural Betterment Strategy**, which combines features from the last two scenarios. The strategy aims at safeguarding and expanding forest resources for the benefit of the whole community while capturing the advantages of development based on ecotourism. The strategy will be achieved by:-

- action to protect and enhance water supplies, wildlife and the national heritage in State forests,
- afforestation and the restoration of degraded land in the wider countryside,
- safeguarding as national parks and nature reserves, particular places which have outstanding scenery, cultural importance, exceptional ecological or scientific interest, and developing them for recreation and tourism where this does not conflict with conservation aims. These sites will be delineated both inside and outside the State forests,
- encouraging, guiding and controlling recreation and tourism development through Local Plans, zoning and development permits, in conformity with Town and Country Planning Regulations, on the strict proviso that State forests will on no account be used for building development,
- providing information and publicity about the forests and the flora and fauna they contain, directed particularly at schools, colleges, tourists and the general public, using up-to-date information technology and interpretation techniques."

"This strategy is a broad statement of aims. It indicates the general direction to be taken, but is not a detailed 'blueprint' for future development of the forest sector. Implementation depends on converting the strategy into a costed and time-based programme……"

"The NFP covers the ten year period, 2000–2009 and is based on the five action areas identified in the strategy. It contains seven subprogrammes, each consisting of several projects. They deal with the following groups of activities:-

A. Afforestation and silviculture,
B. Production of timber and non-wood products,
C. Protection against fires and other hazards,
D. Conservation of ecosystems, flora, fauna and heritage,
E. Water,
F. Local plans and village development,
G. Institutional reform, modernization and capacity building."

Source: Final Draft National Forest Programme for Cyprus, October, 1999.

emerged as the preferred option. The analysis led to a strategy that served as the basis for NFP preparation. The five action areas identified in the strategy, combined with the seven subprogrammes of the NFP, formed a matrix from which priorities were derived. The subprogrammes consisted of projects of various kinds, related to the action areas, which involved different organizations in the sector; the rate of project implementation would be determined by the available resources.

The strategy was called a Rural Betterment Strategy because it was expected to lead to: better conservation of natural resources, better facilities for visitors, better forest villages and a better rural environment. It was emphasized that the strategy was a broad statement of aims. It indicated the general direction to be taken, but was not a detailed 'blueprint' for future development of the forest sector. Implementation depended on converting the strategy into a costed and time-based programme, which was flexible and could be elaborated as circumstances allowed. A small unit would be set up responsible for project development, monitoring and control. The NFP document also stressed the need for joint action with other government ministries, departments and agencies, and with individuals and organizations in the private sector, NGOs etc. It was envisaged that the Forestry Department would be the lead agency, providing continuity, coordination and accountability.

**Development Aims**

The Cyprus NFP illustrates the hierarchical nature of development aims. The strategy is a general statement of intent which describes the form of multipurpose development that is considered to be best suited to circumstances on the island. Natural resources are to be protected and ecotourism encouraged, but this combination of objectives is to be achieved by five main types of action, which are specified in the strategy. These strategic aims are then interpreted, at the tactical level, by subsidiary objectives expressed through the seven subprogrammes. They contain numerous projects, each representing a specific aim which it is hoped to achieve within the timeframe of the NFP. Each project generates a set of operational objectives; the various tasks and activities necessary to carry out the projects can be defined in the form of targets and other measurable results which it is intended to attain by specified dates. The logical progression leads from strategy through tactics to operations as shown in Fig. 7.9.

At each level in the hierarchy there are choices to be made, which limit the range of choice in the levels lower down. The kind of strategy that is selected determines the composition of the NFP and its subprogrammes; they should conform with the strategic requirements and should not pursue objectives which are at variance with the strategic aims. Similarly, the projects which comprise the programme must comply with its objectives and the form of development envisaged by the strategy. Day-to-day activities, which enable the projects to make progress and achieve their targets, should follow the prescriptions laid down when the projects are approved. The strategy restricts the range of choice at the tactical level and, in turn, the tactics determine what happens at the operational level. Sector development depends

on conformity at each level and failure to comply will undermine the strategic intentions. There is therefore a possible danger that a strategy may fail due to uncontrolled deviations from its aims at programme level or a comparable lack of discipline during project implementation. The development process needs to be monitored and guided at all levels to ensure that aims are adhered to throughout the hierarchy.

There are also external or superior constraints which affect the whole development process. Strategy is not formulated in a vacuum, it is subject to overriding conditions with which it must comply. These general restrictions have also been called *imperatives*. They must be observed; if they are neglected or avoided, the strategy is likely to fail. For example, three imperatives were identified for Cyprus, where it was declared that all forest sector activities should be:-

- Holistic, i.e. based on a comprehensive view of forest resources and the activities associated with them, taking account of the interactions and linkages which connect them, and treating the forest sector as one unit instead of separate parts.
- Sustainable, so that the sector's capacity to provide future outputs and benefits of all kinds is not diminished and the stock of natural resources is not depleted.
- Equitable, so as to ensure that benefits and costs are distributed widely and fairly among all sections of society, with due regard to the needs of future generations.

The first condition needed to be observed from the outset, when the NFP was drawn up, otherwise there would be a serious risk that unforseen social or economic consequences might make the strategy unworkable. Sustainability is essential to comply with international opinion and the specific undertakings required for Cyprus to join the European Community. Unfair treatment of particular social groups, such as the village communities living in and around the forests, might lead to their antagonism and could undermine the strategy by putting forest resources at risk from fire and other hazards. These imperatives are probably valid everywhere, not just in Cyprus.

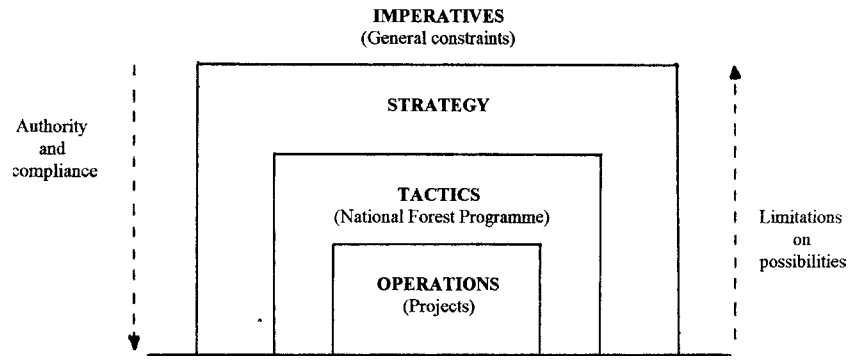


*Figure 7.9* Levels in the development hierarchy

The imperatives impose general constraints on the hierarchy as a whole. Within the hierarchy, two sets of influences flow in oppposite directions. Authority and compliance with aims flow downwards; conversely, there are practical restrictions on tactics and strategy which are transmitted upwards. Aims must be capable of being implemented. It is pointless to select a strategy that is unrealistic or devise an NFP that is unworkable. The nature of the forest restricts the range of outputs that are possible. Projects are limited in scope by the technology and skills of the workforce, and by the availability of capital and human resources. Often, there are project complementarities which need to be observed, such as the need to construct access roads or tracks at the same time as installing radio communications to protect the forest from fire; these, and other, means of controlling wildfires are unlikely to be effective unless provided as a package. At the operational level in many cases there are local organizational difficulties to be surmounted. Generally, development opportunities and project possibilities are restricted by what is achievable, and an awareness of practical limitations must be transmitted upwards when strategy and plans are prepared, otherwise sectoral aspirations will be frustrated and lead to failure. Forest sector development, like politics, can be described as the art of the possible.

The hierarchy, with its upward and downward information flows, shows that strategy plays an important part in a continuous development process. Strategy occupies a key position in the hierarchy and controls the process. It performs the directional function, as previously described in Chap. 6, setting out the aims, mapping the route to be followed and deciding the means of implementation. If the strategy is wrong, all the planning and action based on it will also be wrong. However, strategy is pointless if separated from the programmes and projects associated with it; action at all levels is necessary to transform good intentions into reality. Cycles of improvement, with different time scales, operate at each level and help to drive the process forward. Therefore the function of the strategic level in the hierarchy should include organizing the cycles, coordinating action at the tactical and operational levels, and monitoring progress. The whole process needs to be managed. *Strategic management* conveniently describes the ongoing task of providing direction to the sector and overseeing the development process at all levels.

Consideration of the strategic management process leaves aside the question of its general purpose. What is forest sector development for? What justification is there for deliberately intervening in the system and attempting to guide it in one direction rather than another? It is necessary to ask about the benefits that are expected to flow from managing the sector as a conglomerate. The Rural Betterment Strategy adopted in Cyprus aims at "safeguarding and expanding forest resources for the benefit of the whole community …." and indicates the nature of the action to be taken to obtain that benefit. Through that action it is assumed that society will become better off. In general, it can be said that all national forest strategies, everywhere, aim at improved welfare for society, even if they are vague about its precise meaning or how to measure it. Some indications are given, in a negative sense, by identifying the imperatives; unless specified general conditions are met, such as the development being holistic, sustainable and equitable, the expected

benefits will not accrue. However, a positive approach would be preferable, enabling sector managers to understand what social welfare is, rather than what it is not.

Additions to social welfare which are attributable to the forest sector appear to fall into two categories: first, the additions to GNP created by increasing the flow of tangible outputs from the sector and second, improvements in the wellbeing of the population due to intangible benefits and the reassurance provided by living in a nicer and safer environment. The former consist of goods and services that can be valued in monetary terms, while the second is much more difficult to value and involves judgements based on wider considerations, such as the aesthetic preference for one landscape over another. Welfare is related to the output flows that sector activities generate, including those classed as option and existence values in Chap. 4. It concerns the whole range of possible outputs of all descriptions and choosing a suitable strategy for sector development involves selecting the mixture of outputs that is appropriate to the circumstances.

The outputs are the end result of transformations which connect forest resources to consumers. System development therefore involves changes to the transformations and a sector strategy which seeks to adjust output flows and their proportions should focus on the alterations to the transformations that are necessary to achieve this at the tactical and operational levels. Each transformation utilizes resources and generates activities; it can be described in the form of a 'production function' which measures the quantities of the inputs required to produce a unit of output. An increase (or decrease) in an output is accompanied by a corresponding increase (or decrease) in the inputs required to produce that output, provided the production function remains the same. Transformations may also change in character if their input-output relationships alter due to efficiency improvements, alterations in technology or innovations. Both types of transformational change contribute to the development process and should be born in mind when sector strategies and plans are drawn up.

Another factor to consider at that stage is the likelihood of interrelationships between transformations.The forest sector consists of a web of transformations which interact and have side effects. Joint production of outputs is frequent so that changes to one set of transformations are likely to induce alterations in others. A strategy that attempts to boost a particular type of output (e.g. timber production), calls for changes in the transformations associated with it (e.g. timber growing and wood processing). The effects also spread out through the system, affecting the resources and activities which produce other types of output, changing the input-output relationships in the transformations and altering the composition of the total output flow. The benefits of extra production, such as wood supplies for construction and other purposes, which help to raise the standard of living directly, may be supplemented by fringe benefits. These include indirect economic gains generated by investment, employment and trade elsewhere in the sector; additional investment has a multiplier effect on employment and incomes. Social effects may accrue, such as enhanced environmental security, due to better forest fire protection, soil and water conservation, and safeguards for the landscape, subject to the proviso that the development strategy is sustainable. It is also likely that a higher standard of management, introduced to

increase one type of output, will set a good example for managers to follow and lead to comparable improvements in other parts of the sector.

The efficient use of inputs in transformations is important. Outputs result from inputs which have costs; inputs have alternative uses and the opportunities foregone represent their costs, even if they are not all paid for at market prices. Thus forest land can be used for other purposes and human resources can be employed elsewhere. Therefore, an important aspect of any strategy is to utilize sector resources in the most efficient way, so as to obtain the greatest output from the least input. The quantity of resources available to the forest sector at any time is limited. The total may grow over time as development proceeds, but forest sector strategy should be based on a realistic assessment of the resources available at the start and any extra resources that are likely to become available within the period of the NFP. The strategy should aim to make the best possible use of these resources in order to maximise the output flow.

The ultimate purpose of forest sector development is to create extra value for society from the outputs generated by forest resources. By providing a balanced mixture of outputs of all descriptions, society's desires for material goods can be combined with the feeling of wellbeing derived from intangible outputs provided by the forest ecosystem. The function of a strategy is to interpret this general purpose in a particular setting; every strategy is specific and relates to a country, region or other geographical area. The strategy should be adapted to suit that location, local conditions, the nature of the forests and the preferences of the population; it should also be designed to make the best use of the available resources. Within the limits set by these circumstances, the strategy should seek maximum social value from the output flow, expanding the total flow, in the optimum proportions, for the benefit of present and future inhabitants. National strategies are aimed primarily at adding to the welfare of the country's own citizens, although other people elsewhere and the global community may also benefit.

Strategic decision making is a complex business with many aspects to consider. The task is made more difficult because the forest sector is a conglomerate composed of a varied assortment of organizations and interests. Their different activities produce the diversity of sector outputs. The notion of creating public value by joint action may conflict with the separate aims of its members. The pursuit of private value by companies and individuals does not necessarily coincide with the goals of organizations in the public sector, which are predominantly service providers. Government agencies, which are not oriented towards profits, have aims which are based on the idea of generating value for the public, although their organizational mandates are usually more restricted than the forest development concept outlined above and their interpretation of what constitutes public value is often vague[24]. Forest sector development is a part private and part public matter and those responsible for managing the sector must attempt to reconcile and combine the diverse aims of its members at the strategic level.

The development process involves a sequence of difficult choices, leading downwards through the hierarchy, for which the views of those affected should be

sought in an organized and systematic manner. First, the general welfare aim must be interpreted in the form of a strategy which suits the local situation; the strategy should be acceptable to sector organizations and interests. Choice of strategy leads to NFP preparation for which subprogrammes and projects are selected; it is at this stage that the roles of sector organizations in the development process are crystalized out, with each responsible for making a particular, measurable contribution. Tactical decisions lead to ongoing, operational decisions by those carrying out the work, subject to any special labour relations arrangements that have been established. It is vital that suitable consultation procedures are put in place, as appropriate for each level, so that all those with legitimate concerns about their futures can be involved in the decision making process. Strategic management of the forest sector cannot work without consent.

Development aims can only be achieved if the decision making sequence works effectively so that the most satisfactory options are selected at each level. What is considered the 'best' choice depends on the specific circumstances and conditions. In particular, it is vital that the strategy should be well-chosen because all else depends on it. Special attention to strategic decisions is merited because of the importance of strategy in the development process. In this and the preceeding chapter the role of strategy in influencing and promoting change in the forest sector has been examined, but little consideration has been given to the methods of analysis on which choices should be based or the procedures used to formulate strategy. Furthermore, strategy is a concept that is widely used in other areas of human endeavour where theoretical ideas and practical experience have been built up. These other sources deserve to be studied so that the lessons learned can be applied for the benefit of the forest sector. With this object in mind, strategic ideas and problems are considered in Part II. Forest sector development cannot be successfully promoted without first, an appreciation of the nature and characteristics of the sector and second, an understanding of what strategy is and what strategic management consists of in the context of the forest sector.

## SUMMARY

- The forest sector should be viewed as a complex system consisting of interdependent parts which interact with each other and the external environment. The purpose and overall justification of the system depends on its ability to deliver outputs in the form of goods and services of all kinds for the benefit of the community.
- The sector forms a large, dynamic open system, partially sustained from outside, which would otherwise run down due to entropy. Complex adaptive systems of this type, which contain numerous subsidiary systems, tend to be ordered and stable in spite of internal alteration and disturbance. It fits the description of a *human activities system*, consisting of coherent sets of activities serving some underlying purpose or mission; such systems involve choices and can be managed.
- The sector system is composed of numerous *transformations*, each consisting of inputs, a conversion process and an output. Transformations are frequently linked

together to form subsidiary systems, which provide output streams linking forest resources to consumers. The sector can be portrayed as a web of transformation activities, which combine and interact with each other.

- Transformations can be grouped according to the subsector in which they occur, to form a matrix of cells which interact with each other and are influenced from outside. The matrix alters over time as transformations change, due to influences from the natural environment, markets and public opinion.
- The forest sector is so complex that a comprehensive and detailed description, including its dynamic dimension, would be impracticable. Simplified, partial representations, known as *models*, are used to assist understanding of particular situations and sets of relationships. Computers greatly assist modelling and enable the behaviour of complex adaptive systems to be better understood.
- Simulation modelling, based on the transformations, is particularly useful for exploring the dynamic behaviour of the forest sector under various assumptions. Scenario models are used to depict the future condition of the system for policy and planning purposes. A modelling framework known as TIMPLAN, which is based on system dynamics principles, has been used to set up national models in a number of countries. Scenario models are particularly helpful to decision makers by assisting them to match supply to demand for outputs, plan for continuity of supply and sustainability, and meet social demands for equitable distribution of benefits.
- Development of the forest sector is promoted by interventions in the system which aim to increase and modify the output flows to meet changes in requirements, while satisfying preconditions such as sustainability and equity. It is a continuous process, marked by various stages which are repeated at intervals. The development process is never-ending.
- Development proceeds at strategic, tactical and operational levels. It should follow a circular process of continuous improvement at each level, based on the 3A cycle: Analysis leading to definition of Aims, followed by Action to achieve those aims.
- Development aims are hierarchical: strategic aims limit the kind of action proposed for NFPs at the tactical level, and these, in turn, restrict the projects to be undertaken at operational level. General conditions, called imperatives, affect the whole development process. The ultimate purpose of forest sector development is to create extra value for society from the outputs generated by forest resources. Choosing a balanced mixture of outputs of all descriptions is necessary to derive the maximum social benefit.

## FURTHER READING

Clayton & Radcliffes' *Sustainability: A Systems Approach* (Earthscan, 1996) provides a useful introduction to systems theory and its application to sustainability.

*Our Forests, Our Future*, The Report of the World Commission on Forests and Sustainable Development (Cambridge University Press, 1999) is essential reading for those interested in sustainability and sectoral development.

## SOURCES


1 Anthony M.H. Clayton and Nicholas J. Radcliffe. *Sustainability: A Systems Approach*. Earthscan, London (1996), page 17.
2 Ludwig von Bertalanffy (1950). The theory of open systems in physics and biology. *Science*, 111, pages 23–9, 1950, reproduced as Chapter 4 in F.E. Emery, (ed.). *Systems Thinking*. Penguin Books, Harmondsworth (1969).
3 D. Katz and R.L. Kahn. Common characteristics of open systems. Chapter 2 in *The Social Psychology of Organizations*, Wiley (1966), reproduced as Chapter 5 in F.E. Emery (ed.). *Systems Thinking*, Penguin Books, Harmondsworth (1969).
4 Anthony M.H. Clayton and Nicholas J. Radcliffe, op cit, page 23.
5 Peter Checkland. *Systems Thinking, Systems Practice*. Wiley (1981).
6 Anthony M.H. Clayton and Nicholas J. Radcliffe, op cit, page 26.
7 Risto Seppälä. The Forest Sector Project of the International Institute for Applied Systems Analysis. Part I in Risto Seppälä, Clark Row and Anne Morgan (eds), *Forest Sector Models*, A B Academic Publishers, Berkhamsted (1983)
8 Howard M. Hoganson and Thomas E. Burk. Models as tools for forest management planning. *Commonwealth Forestry Review*, 76 (1), pages 11–17, 1997.
9 C. J. Jepma. *Tropical Deforestation*. Earthscan, London (1995).
10 G.J. Nabuurs and R. Päivinen. Large scale forestry scenario models — a compilation and revue. *EFI Working Paper 10*. European Forest Institute, Joensuu, Finland, 1996.
11 Michael Gane. TIMPLAN: a planning system for industrial timber-based development. *Commonwealth Forestry Review*, 65 (1), pages 41–49, 1986.
12 See J.W. Forester's books *Industrial Dynamics*, M.I.T. Press (1961) and *Principles of Systems*, Wright Allen Press (1968).
13 See the Report prepared for The Club of Rome by D.H. and D.L. Meadows et al., *The Limits to Growth*. Earth Island, London (1972).
14 Described for practical use in R.Y. Cavana and R.G. Coyle. *Dysmap User Manual*. System Dynamics Research Group, University of Bradford (1982).
15 A full specification of the model is contained in the TIMPLAN User Guide prepared by the writer, June 1993 and subsequently updated.
16 H.M. Gregerson. The use of sector accounting methodology in forest-based sector planning. In *Report on the FAO/SIDA Seminar on Forestry Development Planning for selected English-speaking Countries in the Near East, Asia and the Far East*. FAO, Rome (1973).
17 Patrice A. Harou. Minimal review of the forest sector. In *Forestry Sector Analysis for Developing Countries*. Proceeding of IUFRO Working Groups, S6.12-03 and S6.11-00 Meetings at 10th Forestry World Congress, Paris, compiled by Richard Haynes, Patrice Harou and Judy Mikowski, Portland, Oregon, March, 1992.
18 Sustained yield, as developed in Europe in the nineteenth century, was based on the concept of 'normality'. It is believed that this concept originated in Austria in 1788 and it was certainly used by Faustmann when devising his famous formula published in 1849. See the Introduction by M. Gane in *Martin Faustmann and the Evolution of Discounted Cash Flow*, Commonwealth Forestry Institute Paper No. 42, Oxford (1968). Schlich's *Manual of Forestry*, vol III, 3rd edition (1905), provides a detailed description in chaps 3 to 7.
19 Emil Salim and Ola Ullsten, Co-Chairmen. *Our Forests, Our Future*. Report of the World Commission on Forests and Sustainable Development, particularly pages 80–81. Cambridge University Press (1999).
20 W.E. Deming. *Out of Crisis*. MIT, Cambridge, Mass. (1986).
21 Warren C. Baum. The World Bank Project Cycle. *Finance and Development* 15, 4, 1978.
22 Albert O. Hirschman. *Development Projects Observed*. The Brookings Institution, Washington (1967).

23 Final Draft National Forest Programme and National Forest Policy Statement, prepared by Forestry Department of Ministry of Agriculture, Natural Resources and Environment, with assistance provided by FAO under Project TCP/CYP/6712, Nicosia, Cyprus, October 1999.
24 Mark H. Moore. *Creating Public Value*. Harvard University Press, Cambridge, Massachusetts (1955).

PART II

# STRATEGY

# INTRODUCTION TO PART II

The characteristics of the forest sector and the way it works were described in Part I. This sectoral approach is based on the contribution to society's needs and human welfare that comes from forest resources. The sector should be treated as a dynamic open system, made up of numerous interdependent components. In Part II, attention is focussed on the strategic ideas and methods by which this system can be guided, controlled and developed. Human interventions in the system, whether unthinking or deliberate, have affected the forest sector almost everywhere in the world. Its results are often destructive, leading to deforestation, degradation and unsustainable exploitation. Beneficial interventions, on the other hand, are intended to meet peoples' needs and aspirations; they involve deliberate attempts to manage the sector's resources, activities and outputs, and to bring about change in its organizations and institutional framework. Management of the system is likely to be most effective when it is undertaken with a clear sense of direction. The guidance that is necessary is provided by strategy. Forest strategy is the process that enables long-term development aims to be identified, to meet the sector's particular requirements and circumstances, and strategic principles to be applied to it in order to achieve those aims.

Strategy is a concept that originated centuries ago with military campaigns and has recently been extended into other fields such as business management and administration. It now represents a set of ideas that is applicable throughout the whole range of organised human activities. Strategy is formulated by individuals and groups at higher levels in private firms and in public services. It tends to be associated with the big issues and the broad picture rather than details, and depends on taking a considered, long-term view of the situation instead of just reacting to day-to-day events. It is concerned with identification of appropriate aims and also with the means for achieving those aims. In relation to the forest sector it is best viewed as a cyclical process, based on the three basic steps previously identified: *analysis* of the situation, selection of *aims* and *action* to implement those aims. The process involves treating the sector holistically, equitably and sustainably, and adopting a participative style of management. Forest strategy is a cohesive idea, based on coordination and integration, both in space and over time. It provides a flexible approach to the problems of the forest sector.

Part II contains three chapters:-

**Chapter 8** describes *strategic ideas*, their sources, evolution and use in different fields. Their application to the forest sector is discussed and a methodology for forest strategy is put forward.

**Chapter 9** examines the *strategic methods* available for directing, guiding and controlling the forest sector strategy process.

**Chapter 10** deals with *strategy in action*. It summarizes the general conditions that must be met and the tests that should be applied to promote successful development of the forest sector in the 21st. Century.

CHAPTER 8

# STRATEGIC IDEAS

Strategy is an important general idea which is widely applied to human endeavors in various fields. It has classical origins; first conceived for military/diplomatic purposes, the nature of strategy and strategic principles has been studied in depth during the twentieth century and used in business and government. Quantitative methods of analysis have been introduced, fresh insights have emerged and strategy, as a concept, has been significantly developed. It is now recognised that all management activities have a strategic dimension. There is a large and growing literature on corporate strategy and strategic management. Strategic principles are also being used to improve the effectiveness of public policy and administration. The task in this chapter is to review this eclectic assortment of ideas and provide an interpretation of the strategy concept which is relevant to management of the forest sector.

Strategic management is concerned with aims and the means by which those aims are achieved. Therefore, forest strategy is about the pursuit of development objectives related to the forest sector; it provides the guidance required to successfully manage forest-based activities, particularly at national level, but also in the organizations which comprise the sector. This is the traditional purview of forest policy. But, for our purposes, it is preferable to call it 'strategy' rather than 'policy'. As will be explained, policy is an ambiguous word with a variety of interpretations whereas strategy, as a concept, has acquired a more definite meaning. There are several reasons for adopting the word strategy: first, it is less inhibited by conventional ideas about the way that policies are prepared and presented, and second, the impression conveyed by strategy is more positive and action-oriented. At national level, a forest policy usually refers to the government's intentions for the management of forest resources, whereas forest strategy is linked to the achievement of results at all levels of sectoral activity. As pointed out in Chap. 1, forest policies have become associated with failure and a new, more positive, strategic perspective, which applies to conservation generally, is called for. Old style forest policies have tended to focus on aims handed down by political authority from on high, whereas strategy is more likely to be built up as the result of an organized decision making process. For all these reasons, the term *strategy* better describes the concept that we are attempting to get to grips with.

In the first section of this chapter we look at the main sources of ideas about strategy and the three perceptions to which they give rise. The second section examines the distinguishing features of corporate strategy and considers the range of types of strategy that has been identified. In the third section, the way public policy is formulated and the strategic functions of public administration are discussed. Finally, the application of strategic management principles to the forest sector is considered; forest strategy is defined as a process aimed at increasing social welfare through the promotion of sectoral development.

## 8.1 ORIGINS

There are three main sources of ideas about strategy on which to draw. Historically, the strategy concept originated with military campaigns; military strategy was studied to discover the way to win wars. After the Industrial Revolution, enquiry began into the nature of industrial organisations and the best way to manage them. Organisation theory emerged and business management evolved as a separate topic. Particularly since World War II, the importance of strategy has been recognised. There is now a substantial literature on corporate strategy and strategic management which is available to company executives and students of business methods. Recently, managers in the public sector have drawn on the same sources and have started to apply strategic management ideas to organisations which are not driven by profit. Generally, the study of strategic issues in public administration is referred to as 'public policy'. Each of these sources — military/diplomatic, business and public policy — provides a different context in which to develop and apply strategy.

Military/diplomatic strategies have existed since ancient times and have been studied by commanders and statesmen in the hope that past experience would help them to prevail against foreign powers. Many of the principles of strategy can be discerned from the way power was used to promote national interests, empires were built up and military campaigns were conducted. In this sense strategy represents a *grand design*. Philip and Alexander's campaign in Macedonia as described in Box 8.1 provides an illustration[1]. Their actions at Chaeronea in 338 BC reveal that their grand design involved establishing dominance over their opponents. They had a clear goal to take control of northern Greece, which was pursued in a planned sequence of actions by various methods including negotiation and deception, and they used their relative advantage in resources and organisation to defeat the Greeks. Their campaign illustrates important strategic principles which are also relevant to business and government.

Conflict between nations can be compared to competition amongst business enterprises, and corporate strategy or strategic management has emerged as a distinct subject. In a business context, strategy is concerned with the aims and future direction of the firm as a whole. It addresses the effectiveness and survival of the organisation, including its competitive position and share of the market. It

**Box 8.1 A Grand Strategy — Philip and Alexander's actions at Chaeronea in 338 BC**

"Philip and his young son, Alexander, had very *clear goals*. They sought to rid Macedonia of influence by the Greek city-states and to *establish dominance* over what was then northern Greece. They also wanted Athens to *join a coalition* with them against Persia on their eastern flank. *Assessing their resources*, they decided to avoid the overwhelming superiority of the Athenian fleet and *chose to forego* attack on the powerful walled cities of Athens and Thebes where their superbly trained phalanxes and cavalry would not have *distinct advantages*.

Philip and Alexander *used an indirect approach* when an invitation by the Amphictyonic Council brought their army south to punish Amphissa. In a *planned sequence of actions and deceptive maneuvres*, they cut away from a direct line of march to Amphissa, *bypassed their enemy* and *fortified a key base*, Elatea. They then took steps to *weaken their opponents politically and morally* by pressing restoration of the Phoenician communities earlier dispersed by the Thebans and by having Philip declared a champion of the Delphic gods. Then *using misleading messages* to make the enemy believe they had moved north to Thrace and also *using developed intelligence sources*, the Macedonians in a surprise attack annihiled the Greek's positions near Amphissa. This *lured their opponents away from their defensive positions* in the nearby mountain passes to *consolidate their forces* near the town of Chaeronca.

There, *assessing the relative strengths* of their opponents, the Macedonians first *attempted to negotiate* to achieve their goals. When this was unsuccesful they had a well-defined contingency plan on how to *attack and overwhelm* the Greeks. Prior to this time, of course, the Macedonians had *organized* their troops into the famed phalanxes and had *developed the full logistics* needed for their field support including a longer spear, which helped the Macedonian phalanxes penetrate the solid shield wall of the heavily massed Greek formations. *Using the natural advantages* of their grassy terrain, the Macedonians had developed cavalry support for their phalanxes movements far beyond the Greeks capability. Finally using a *relative advantage* - the command structure their hierarchical *social system* allowed-against the more democratic Greeks, the Macedonian nobles had *trained their personnel* into one of the most *disciplined and highly motivated forces* in the world."

Source: Mintzberg & Quinn (1991) p.7.

involves high level decisions with far-reaching implications on the kind of goods and services produced, numbers of employees, financial arrangements and type of organization. The success of a business depends on the way it allocates its resources. Strategic decisions shape the future of the organisation and, from a decision making

perspective, strategy has been described by Stahl & Grigsby[2] as the *rationale* that governs the organisation's choice among its alternatives.

The study of government aims and decisions is usually called public policy. In reality, public policy is national strategy by another name. It is concerned with the goals of development, the role of the state viz a viz private companies and individual citizens, and the programmes of action of government departments and other agencies of the state. National strategy is more influenced by politics and politicians and less affected by the pursuit of profits than is business strategy, but in many other respects they are similar. Both attempt to influence or control future events and the pace of change. Therefore, strategy seeks the best way forward — the optimum path of progress and development. From this perspective, strategy is a *sense of direction*.

Each of these three sources provides an alternative perspective on strategy. The same set of ideas is involved although they are perceived differently, depending on the interests of the people involved: military strategy is based on the use of force, business strategy depends on competitive advantage and public policy is guided by social and political aspirations. The classical military/diplomatic view draws attention to the national interest and power, the business management view focusses on the choices that organisations make and the public policy view looks at the direction that a country's development should follow. Strategy can be perceived either as a grand design, a basis for decision making or a sense of direction, depending on the context in which it is used as shown in Fig. 8.1.

Different perspectives on strategy originate from the circumstances in which strategic ideas are applied. Those concerned primarily with power politics have different motives from entrepreneurs and government officials. Strategy should be seen in context and related to the interests of the groups involved in its formulation.

How do these three perceptions of strategy relate to the forest sector and its interest groups? The section of public policy which deals with forestry and forest industries has traditionally been called forest policy. Just as public policy relates to national strategy, forest policy corresponds with forest sector strategy. It follows that forest strategy can be interpreted as a sense of direction for the forest sector. Alternatively, either of the other perceptions may be emphasised. Therefore, forest strategy can viewed in three ways:-

- a grand design for the forest sector,
- a basis for decision-making in the forest sector,
- a route for forest sector development to follow.

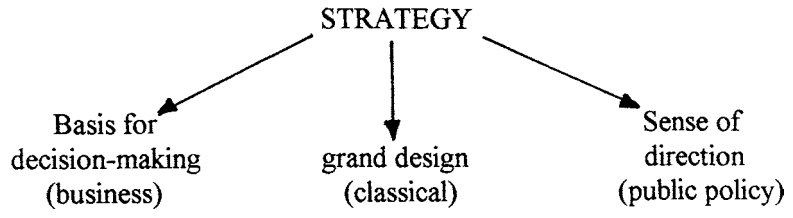


*Figure 8.1* Three perceptions of strategy

It has not been customary to describe forest policy in these terms. Cubbage et al. view forest policy as a 'subset' of public policies and define it as 'a purposive course of action regarding the use of forest resources'[3]. Another frequently quoted definition, put forward by Worrel[4], states that:-

"A forest policy specifies certain principles regarding the use of a society's forest resources which it is felt will contribute to the achievement of some of the objectives of that society."

Most of what has been written about forest policy focusses on forest resources and their management instead of the forest sector as a whole. The holistic nature of the forest sector has not been fully taken into account. Generally, forest policies lack the vision implicit in a grand design for the sector or the sense of direction that its development requires.

In practice, forest policies have usually been presented as a declaration of intent relating to the way forests are managed, without recognising that some of their objectives may conflict with each other, or be at odds with policies in other sectors or diverge from wider national policies[5]. They tend to contain a set of aims, each of which is worthy but unrelated to the other aims, with no sense of priorities or the availability of resources necessary to implement the policy. The forest policy of Cyprus (see Box 8.2), which was in force from 1950 to 1999, provides an example[6]. The conventional approach is primarily managerial, taking account of the lengthy time spans required to grow timber crops, the need for continuity in their management, and application of the principle of sustained yield, which is the cornerstone of foresters' professional training. Large-scale state ownership of forest resources in many countries and the consequent direct involvement of government departments in the planning and execution of forestry programmes has reinforced this managerial bias. There is an obvious gap, both theoretical and actual, between forest policy based on the management of forest resources and the tripartite perception of forest strategy outlined above.

## 8.2 BUSINESS STRATEGY

Whichever perception of strategy is chosen, the concept involves human intentions and behaviour. Strategies are based on thoughts and ideas harnessed to peoples' ambitions and aspirations. They are the product of the reasoning processes and imagination of individuals and social groups. As Mintzberg[7] has pointed out:-

"... all strategies are abstractions which exist only in the minds of interested parties. It is important to remember that no one has ever seen a strategy or touched one; every strategy is an invention, a figment of someone's imagination, whether conceived of as intentions to regulate behaviour before it takes place or inferred as patterns to describe behaviour that has already occurred."

Abstractions they may be, but strategies attempt to deal with real situations and actual problems. Strategy is a practical subject. As Sir John Harvey-Jones puts it, managers are responsible for 'making it happen'[8]. Strategic decision-making is

**Box 8.2 The forest policy of Cyprus**

The Statement of Forest Policy of the Government of Cyprus, published in 1984, illustrates the format in use up to 1999 when a new style based on strategy was adopted. This Policy recognised that the practice of forestry and sound forest administration needs long term planning, based on continuity of policy and finance; having a formal policy statement helps to focus attention on the main questions affecting forest administration. The Policy asserted that 'it is now a recognised duty of any State to safeguard national assets such as its forests' for which purpose the enlistment of public opinion in support of the policy is required. This need is urgent in places, such as Cyprus, where the direct benefits of the forests, as a source of forest produce, are outweighed in importance by indirect benefits such as the protection of catchment areas and the control of erosion directly affecting water supplies and food production, and where also the forests are understocked and stand in need of development.

The general policy aim was stated as 'to conserve and develop the forest resources of the Island'. Sixteen 'special objects' followed which relate to all aspects of forestry activity. The full text of the Statement runs to eight pages and includes, in subparagraphs, some indications of the way that each of these objectives was to be applied. The objectives were as follows:-

Forest reservation: to reserve in perpetuity as protection forests as much as possible of the high level catchment areas and sufficient other lands, whose cultivation cannot economically be justified, to ensure a prudent balance of agricultural and forest products.
Climatic protection: to have proper regard to the importance of rehabilitating and conserving vegetation in order to maintain and improve climatic conditions.
Water conservation: to prevent flooding and waste, and to regulate the flow of waters by protecting the catchments of streams and other waters.
Soil conservation: to prevent dessication of the soil and to arrest soil movement caused by water and wind erosion.
Agricultural protection: to provide where possible protection for agriculture.
Public amenity: to exploit the value of the forests as areas of scenic beauty and amenity for the development of recreation and the expansion of the tourist industry.
Wild life: to preserve wildlife both flora and fauna.
Forest protection: to recognise the special needs of villages within the borders of forests in order to prevent depredations by the villagers and to encourage them to act as guardians of the forests.
Forest management: to apply the principles of sustained yield to the management of all forests.
Timber supplies: to achieve self sufficiency for the island so far as is possible in supplies of timber, fuel and other forest products required by the population.
Fuel supplies: to produce sufficient fuel for the rural population by encouraging tree crops in village lands and fuel plantations on lands better suited to fuel production than agriculture.
Employment: to pay full regard to the possibilities of using the forest estate for the provision of employment and a means of livelihood.
Forest industries: to develop the economic use in local industry of forest products.
Research and education: to promote research and education in all branches of forestry.
Private forests: to influence the management and usage of forests not in state ownership and to impose measures of control should this be necessary in the public interest in order to prevent their deterioration.
Forest revenue: to provide for the community the maximum revenue compatible with sustained yields after all the above aims have been achieved.

Source: *A Statement of Forest Policy*, Government of Cyprus, September 1984.

complex and difficult, and takes place in constantly changing dynamic situations. It has to deal with uncertainty and the possibility, even likelihood, that what is intended will not happen. The grand design may not be achieved or there may be deviations from the development path that has been chosen. Coping with change lies at the heart of successful strategy making. A strategy is rather like a recipe, either formulated in advance or emerging in response to events. The resulting pudding may be a culinary disaster or be capable of improvement. The recipe may need to be altered to suit changes in taste or modified to meet unforseen conditions in the kitchen; a better recipe may be discovered through a process of trial and error. Strategic thinking, like recipe making, is about making judgements which are then translated into decisions. Judgements are not context-free and neither is strategic decision-making.

Regardless of their context, Quinn[9] has identified four distinctive features of strategy, based on analysis of military/diplomatic strategies and analogies in other fields. He points out:-

1. Effective strategies contain three elements:-
   - *goals* or objectives to be achieved,
   - *policies* which guide or limit action,
   - *action sequences* (or programmes) to accomplish the desired goals within the limits set.

   Since strategy determines the overall direction and focus of an organisation, its formulation is more than mere programme preparation; goal identification is also an integral part of strategy formulation.
2. Strategies develop round a *few key ideas and thrusts* which give them cohesion, balance and focus. The success of a strategy may depend on concentrating resources and effort in a coordinated way in particular directions at different times, e.g. a thrust by an army or a marketing drive by a manufacturing company. Strategies may have several phases, which must be done in sequence. Each phase needs adequate resources, organisation and coordination or the strategy as a whole will fail.
3. Strategy deals with future events which may be *unknowable* as well as unpredictable, e.g. the future behaviour of an enemy in a war, the reactions of business competitors, government responses to a collapse in the value of the currency or the impact of a natural disaster. Risks, which are measurable, can be allowed for by calculating their probabilities, but other contingencies, even if they are recognised, cannot be countered by statistical adjustments to the expected value of the outcome. Therefore the essence of strategy is to try to *build a posture* that is so strong and flexible that the organisation can achieve its goals regardless of the impact of external forces.
4. Strategies are *hierarchical* and composed of subordinate, mutually supporting strategies. They match the complex structure of organisations which have interacting levels and sections. Each strategy should be more or less complete in itself, according to the level of decentralisation, but fitting in to higher level strategies. Often a strategy is functional; thus a sawmilling enterprise may have

a marketing strategy, which forms part of its general corporate strategy, or a government forestry department may formulate separate strategies for research, agroforestry, harvesting etc. Each of the main administrative units which make up a large organisation may require its own divisional strategy in order to contribute effectively to the working of the whole. In a multinational corporation, the directors of subsidiary companies coordinate their strategies and plans to fit the aims and expectations set out in the global strategy of the parent company.

These are important insights into the nature of strategy as a concept. They are obviously applicable to the forest sector, both in relation to the sector as a whole and to its component parts. Sectoral goals, policy and action sequences are necessary; within the sector, each separate organization needs goals, policies and programmes to guide its particular activities. Key concepts and thrusts can be identified at all levels, which require coordination and concentration of resources. The long time intervals in forest production make it essential to build a posture with sufficient flexibility to cope with unpredictable events. These features take us far beyond the normally accepted limits of forest policy. Forest policy declarations, such as that for Cyprus, provide guidance on aims and sometimes go further to indicate the sort of action programme envisaged to achieve those aims, but the other issues identified above — key concepts and thrusts, coping with uncertainty and hierarchical structure — have seldom (if ever) been directly addressed. Forest strategy is therefore a wider concept than traditional forest policy; strategy includes features that are absent from most forest policies.

## Functional Characteristics

Johnson and Scholes[10] have provided a different set of characteristics associated with strategy and strategic decisions in a business environment. These features are concerned with what strategies do rather than what they contain. They include:-

- Strategic decisions are likely to be concerned with *the scope of an organisation's activities*. Should the organisation concentrate on one area of activity or many? To what extent should it be integrated backwards into manufacturing or forwards into distribution? Should it attempt to compete widely in international markets and could it survive without a wider international role? Scope is fundamental to strategic decisions because it describes where those responsible for managing the organisation conceive its boundaries. It is concerned with what they want the organisation to be like and what it should do.
- Strategy is to do with *matching the activities of an organisation to its environment*. How are market conditions changing? How best to take advantage of new opportunities and counter any threats? Since the environment is continually changing for all organisations, strategic decisions necessarily involve change. The extent and speed of environmental change will vary and the pace at which strategy must change will also vary accordingly. If the sort of strategic changes necessary are fundamental they may be extremely difficult to accomplish.

- Strategy is also to do with *matching the organisation's activities to its resource capability*. There would be little point in trying to take advantage of some new opportunity if the resources needed were not available, could not be obtained, or if the strategy was rooted in an inadequate resource base. It is necessary to make future projections of the availability and requirements of resources such as finance, plant and machinery, design and technological capability, workforce skills and so on.
- Strategic decisions often have *major resource implications* for an organisation. Rationalisation of its activities may lead to the acquisition or disposal of major resources. It may move into new areas of technology and production. The decisions may lead to reductions in the workforce or substantial investment in equipment. Changes in the organisation's resource base are likely to result.
- Strategic decisions *affect operational decisions*; they set off waves of lower level decisions. Thus a new marketing strategy or production process will affect the day-to-day decisions made by sales and production managers. Strategic decisions have wide ramifications throughout the organisation.
- The strategy of an organisation will be affected by the *values and expectations* of those who have power. Strategy can be thought of as a reflection of the attitudes and beliefs of those who have most influence in the organisation. *Mission* is the word used to describe their attitudes and expectations about the scope and posture of the organisation, its standing in relation to competitors, technological advance, product quality etc. and meeting owners' aspirations.
- Strategic decisions are likely to affect the *long term direction* of the organisation. They have long time horizons and long term implications.
- Strategic decisions are often *complex in nature* — arguably, strategic management can be distinguished from other aspects of management by its complexity. It arises because there is often a high degree of uncertainty involved, an integrated approach is usually necessary and major changes are likely to be required.

These characteristics are obviously relevant to business enterprises operating in the forest sector, such as sawmilling companies and board manufacturers. Effective strategic management is just as important for wood and non-wood processing enterprises as for companies operating in other sectors. Every enterprise needs to consider the scope of its activities, how these activities relate to its environment and resources, its mission and its long term direction. The same features can also be applied with minor modification to other organizations in the forest sector which are not primarily interested in profits. Forest departments and other government agencies with responsibilities in the forest sector have need of a strategic approach when reassessing their roles, activities, resource deployment, values and future development in the light of changing social and economic conditions. In fact, all organisations, government or non-government, make strategic decisions, although the contents and motivation of their strategies may differ.

The same features can be applied to the forest sector as a whole, regarding it as a large, complex organization consisting of numerous parts. Sector strategy is concerned with the scope, range of activities, deployment of resources and long term

contribution of the sector to the national economy and welfare. These characteristics apply at all organizational levels throughout the sectoral hierarchy.

### Deliberate and Emergent Strategy

Other writers on business strategy have looked beyond these features, however, to explore the meaning of strategy as it is used in theory and practice. The survey provided by Moore[12] reveals that strategy is not a precise concept. It has no single, universally accepted definition. It can be interpreted in different ways, sometimes it is used ambiguously and often its meaning depends on the context in which it is applied. However, the exact meaning of the word is less important than understanding what lies behind it. In fact, strategy is a complex idea and it is useful to look at a variety of interpretations, because they help to enlarge our comprehension of the concept and provide a better basis for developing a strategic approach to forest sector management.

The study of strategy in the business world has been approached from opposing directions[11], depending on the author's experience, attitudes and beliefs about organisational behaviour (see Box 8.3). One school of thought sees strategy as *deliberate*. According to this view, strategy sets the agenda for action; strategy is formulated first and implementation follows. The alternative view is that strategy *emerges*. Enterprises respond to external events, which are outside their control, and the sum of their responses adds up to a strategy. Action comes first and strategy is inferred subsequently.

Burns[13] makes the same point in a different way. He asks two questions about strategy:-

- Is it a process or the outcome of a process?
- Is it an economic/rational phenomenon or is it an organisational/social phenomenon?

**Box 8.3 Two views of strategy**

"Views of strategy fall into two camps. There are those who equate strategy with planning. According to this perspective, information is gathered, sifted and analysed, forecasts are made, senior managers reflect upon the work of the planning department and decide what is the best course for the organization. This is a top-down approach to strategy. Others have a less structured view of strategy as being more about the process of management. According to this second perspective, the key strategic issue is to put in place a system of management that will facilitate the organization to respond to an environment that is essentially unknowable, unpredictable and, therefore, not amenable to a planning approach."

Source: Dobson & Starkey (1993), p.1.

There is one body of opinion, which sees strategy as an intentional, prescriptive process, based on a rational model of decision making, and a second which argues that it is the outcome of the complex social and political processes involved in organisational decision making. In Burn's view the weight of opinion is shifting from the former to the latter; the social perspective has now come to the fore.

Susan Segal-Horn[14] considers the historical development of ideas about strategy in more detail. She suggests that strategy has progressed from being seen as a 'rational process of analysis' — called the Classical school — through four further stages: evolutionary, processual, systemic and resource-based. The 'evolutionary' approach views rational planning as frequently irrelevant, due to environmental turmoil; markets are dynamic and companies (and their strategies) must evolve or die. According to this view, successful business strategies emerge in response to market forces. The 'processual' approach perceives strategy as a process by which strategy emerges from a combination of influences within the organization; it is not deliberate, rational and top-down as the Classical school would argue, but a process reflecting the views of top management, representing compromises between various stakeholders in the organization. Systems thinkers have adopted the 'systemic' approach, which sees strategy as contingent on the context in which it operates; viable strategies depend on the social, geographic, political, social and economic circumstances of the organization. The 'resource-based' stance has emerged in the 1990s. This sees organizations as bundles of resources which managers attempt to develop and build towards achieving their strategic objectives; this point of view underlines the importance of sustainability and capacity building.

Nearly all forest policy and planning have been based on the Classical approach. By training, the forestry profession is inclined towards scientific, rational explanations. The unstated assumption has been that 'ends' should precede 'means' — first choose what to aim at, then select the best way to achieve those aims. Traditional forest working plans contained two parts, the first was descriptive and the second was prescriptive; the latter defined the 'objects of management' and specified how they were to be achieved[15]. They prescribed in some detail the way that particular areas of forest were to be managed. Similar thinking has continued with forest policy. Merlo and Paveri[16], for example, describe the policy process schema shown in Fig. 6.3, which is based on setting goals and objectives leading to definition of courses of action and implementation. This schema is defined as 'rational, systematic and continuous'. However, a procedure that is suitable for managing forest resources at local level may not be appropriate for forest industries or the management of an organizational conglomerate and a policy for forest resources does not amount to a strategy for the forest sector as a whole. As has been stressed, strategy is a context-related concept. Strategic thinking has progressed far beyond the Classical approach, and foresters should consider whether other approaches would be more appropriate in present circumstances. The diversity of organizations within the sector and the range of variation amongst the forest sectors of different countries suggests that one type of approach may not fit all types of organization, all conditions and all parts of the world.

The deliberate and emergent types of strategy represent the ends of a spectrum. At one extreme is the situation where precise intentions are formulated by a central leadership, backed by formal controls to secure implementation in a predictable environment. At the other end, the strategy is formed by circumstances, the external environment is liable to change unpredictably and the enterprise is forced to react as best it can to outside influences. In practice, most strategies lie somewhere in between. The type of strategy that is appropriate in a given situation depends on the nature of the enterprise, its style of leadership, the resources it has available, the nature of the environment in which it operates and the amount of uncertainty it has to contend with.

Henry Mintzberg is a writer who has made a significant contribution to the study of business management. He has suggested five definitions or interpretations which he called the five Ps of strategy[17]. Depending on circumstances, the word is used in different ways, each of which provides an insight into a different aspect of the strategy process. He has labelled them:-

plan
ploy
pattern
position
perspective

Most people think of strategy as a **plan**. It is some sort of consciously intended course of action which is created ahead of events and is purposive. Military strategy is concerned with preparing a plan of war, deciding on individual campaigns and, within each of them, choosing the engagements. In Game Theory, a strategy is a complete plan which specifies what choices the player will make in every possible situation. A business strategy can be regarded as a unified, comprehensive and integrated plan designed to ensure that the basic objectives of the enterprise are achieved. Strategies, as plans, may be general or specific, either a plan for the whole organisation or for a part, with the specific plans complementing each other in a hierarchical arrangement. Thus a forest department may prepare management plans containing detailed prescriptions for particular forest areas which amplify the general statement of intent given in a regional or national plan.

A specific strategy may be a **ploy**, which is really just a manoeuvre to outwit an enemy or a competitor. Thus Philip and Alexander misled the Greeks at Chaeronea as described in Box 8.1. In a ploy, the strategy is based on the threat of action rather than the action itself, as when a corporation threatens to increase production to deter competitors from entering its markets. Ploys are used frequently to outwit opponents in bargaining situations.

Plans and ploys describe what is proposed, but do not include the resulting behaviour. As definitions, they are inadequate because they concentrate on the intended course of action but disregard its outcome. If we focus on the outcome instead of the intention, a different view of strategy becomes apparent. Strategy as **pattern** applies where there is consistency in behaviour, whether or not it is intended — it is the pattern in a stream of actions.

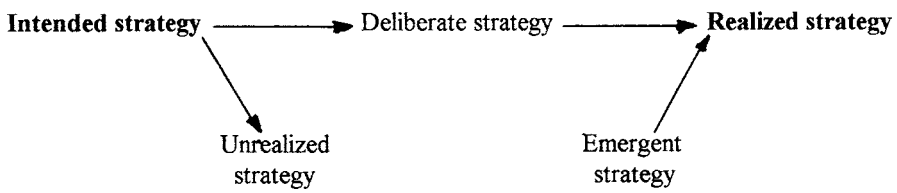


*Figure 8.2* Intended and realized strategies Source: Mintzberg & Waters (1985).

The pattern may or may not depend on a plan — the definitions are independent of one another. However, it is important to distinguish between *intended* strategy and *realized* strategy. An intended strategy, as in a plan, may or may not be realized. Conversely, a realized strategy may, or may not be preconceived. Mintzberg separates strategies into two groups: *deliberate* strategies where intentions exist which may then be implemented, and *emergent* strategies where patterns develop in the absence of intentions.

Strategy as **position** is the match between an organisation and its environment. From this point of view, strategy consists of creating a viable situation and sustaining it. It may be the position that a company occupies in the market place to avoid competition, or an army's position based on the disposition of its forces, which is designed to hold off the opposition. In ecological terms it is equivalent to a 'niche'; in economic terms it is a position that generates 'rent'. The relevance of this viewpoint to the forest sector is obvious when a forest strategy seeks to create and maintain a situation which will protect the forest resource base from depletion and enable it to be managed sustainably.

Whereas strategy as position looks outwards from the organisation to its environment, strategy as **perspective** looks inward to consider the organisation's way of doing things. Organisations develop customary practices and particular ways of looking at the world; they acquire distinctive characteristics. Each organisation produces an ideology or *culture* of its own, which influences its management decisions and activities. What personality is to an individual, culture is to an organisation. Culture provides a shared perspective amongst the organisation's employees which, in so far as it determines the behaviour of the organisation, amounts to an implicit strategy. Strategy as perspective is therefore derived from the shared intentions and actions of the members of an organisation; forest departments and forestry staff tend to have a strategic perspective based on their attitudes and training in relation to the management of forest resources.

These different ways of looking at strategy may be compatible with one another. A plan can be prepared in order to achieve a position; a perspective may give rise to a pattern of behaviour or a formal plan. The five definitions do not compete with one another and none of them takes precedence over the others. They represent different standpoints from which to look at the same concept and each of them enlarges our understanding of the idea itself.

Mintzberg and his associates developed empirical studies of how strategies form in organizations. Based on a definition of strategy as 'a pattern in a stream of decisions', they compared intended strategy with realized strategy (see Fig. 8.2). This allowed them to distinguish *deliberate* strategies — realized as intended — from *emergent* strategies — patterns or consistencies realized despite, or in the absence of, intentions[18].

They identified three conditions which needed to be satisfied if a strategy was to be perfectly deliberate, i.e. for the realized strategy to be exactly as intended: first, there must be precise intentions in the organization, second, these intentions must be accepted by virtually all the people in the organization, and third, no external force must interfere with the organization's collective intentions, in other words, the environment must be perfectly predictable. These three conditions constitute a tall order, so that in practice perfectly deliberate strategies are most unlikely. At the other extreme, perfectly emergent strategies are equally rare; they would require consistency in action over time without any stated intentions, a condition which is very difficult to imagine.

Perfectly deliberate and perfectly emergent strategies represent the ends of a continuum along which real-world strategies lie. Actual strategies exhibit tendencies towards one or other extreme, but occupy various intermediate positions throughout the range. As a result of this research, eight types of strategy were identified, which are summarized in Table 8.1.

Although forest policies and strategies for managing forest resources have generally been based on the presumption that they should be planned, this analysis indicates why so many forest policies and plans fail. The planned type of strategy only works if the organization's environment is stable and predictable. Often, the good intentions of forest departments are not realized because of their inability to control outside events. Where there is a high degree of uncertainty, as is so often the case in the forest sector, one of the other types nearer the emergent end of the spectrum might be more appropriate. The umbrella type would appear better suited to management of a conglomerate, such as the forest sector, and the process type offers advantages where leadership provided by the government is separated from the organizations and individuals who own and manage the land.

## Strategy, Tactics and Operations

These different types of strategy, with their various origins, serve to underline the difficulties that people have in comprehending the strategy concept. How does one recognize an emergent strategy when its purpose is not clearly stated? Mintzberg's definition of strategy as *the pattern in a stream of decisions* is helpful, but needs to be amplified by reference to the level at which decisions are taken and their subject matter. Strategy, viewed as a plan, ploy or pattern, is potentially about anything; the subject matter is not significant. A plan may refer to products or processes, responsibilities or interests, risk-taking or safety, or any other aspect of

*Table 8.1* Types of strategy

| Strategy | Major features |
|---|---|
| Planned | Strategies originate in formal plans: precise intentions exist, formulated and articulated by central leadership, backed up by formal controls to ensure surprise-free implementation in benign, controllable or predictable environment; strategies most deliberate. |
| Entrepreneurial | Strategies originate in central vision: intentions exist as personal, unarticulated vision of single leader, and so adaptable to new opportunities; organization under personal control of leader and located in protected niche in environment; strategies relatively deliberate but can emerge. |
| Ideological | Strategies originate in shared beliefs: intentions exist as collective vision of all actors, in inspirational form and relatively immutable, controlled normatively through indoctrination and/or socialization; organization often proactive *vis-a-vis* environment; strategies rather deliberate. |
| Umbrella | Strategies originate in constraints: leadership, in partial control of organizational actions, defines strategic boundaries or targets within which other actors respond to own forces or to complex, perhaps also unpredictable environment; strategies partly deliberate, partly emergent and deliberately emergent. |
| Process | Strategies originate in process: leadership controls process aspects of strategy (hiring, structure etc.), leaving content aspects to other actors; strategies partly deliberate, partly emergent (and, again, deliberately emergent). |
| Unconnected | Strategies originate in enclaves: actor(s) loosely coupled to rest of organization produce(s) patterns in own actions in absence of, or in contradiction to, central or common intentions; strategies organizationally emergent whether or not deliberate for actor(s). |
| Consensus | Strategies originate in consensus: through mutual adjustment, actors converge on patterns that become pervasive in absence of central or common intentions; strategies rather emergent. |
| Imposed | Strategies originate in environment: environment dictates patterns in actions either through direct imposition or through implicitly re-empting or bounding organizational choice; strategies most emergent, although may be internalized by organization and made deliberate. |

Source: Mintzberg and Waters (1985).

an organisation's activities. Similarly, any of the activities can produce a pattern. But what is distinctive about a strategy that sets it apart? Does a strategy have recognisable characteristics by which it can be identified?

Strategy in military usage refers to important things; less important matters are referred to as *tactics* and day-to-day activities are called *operations*. The difficulty with distinctions based on importance is how to measure it. Sometimes minor matters may be crucial to the successful outcome of the strategy; operations may have strategic significance. The scale of importance is relative. One person's strategy can be another person's tactics and what is called tactical in one situation may be called operational in another. It all depends on the circumstances.

Sometimes it is said that strategic decisions are concerned with long-term matters, while tactical and operational decisions relate to medium- and short-term considerations. This way of separating strategy from tactics and operations is also relative. A series of short-term decisions may add up to a long-term strategy and the time periods that define what is called strategy, tactics and operations also depends on circumstances; there can be no hard and fast rules based on their duration.

Another way is to distinguish strategy from a hierarchical standpoint. The uppermost layer in an organisation, which is responsible for the most important decisions about its long term future direction and shape, is concerned with strategy. Strategic decisions are made by the board of directors of a corporation or the top officials in a government department. Tactical decisions are taken lower down and usually have a shorter time horizon. A third level deals with operational decisions on a day-to-day basis. But this approach to strategy, based on the level of decision making, suffers from a similar objection to that in the previous paragraphs. In some cases, a series of lower level decisons may have sufficient influence on the future direction of an organisation's development that they add up to a strategy. In fact, there is no level in the hierarchy that is only concerned with strategic decision making; decisions which have strategic consequences may be taken at any level.

It is more helpful to look at the kinds of decisions that are taken and their context. Quinn offers a useful definition of strategy in a business setting[19]:-

"Strategic decisions are those that determine the overall direction of an enterprise and its ultimate viability in light of the predictable, the unpredictable, and the unknowable changes that may occur in its most important surrounding environments. They intimately shape the true goals of the enterprise. They help delineate the broad limits within which the enterprise operates. They dictate both the resources the enterprise will have accessible for its tasks and the principal patterns in which these resources will be allocated. And they determine the effectiveness of the enterprise — whether its major thrusts are in the right directions given its resource potentials — rather than whether individual tasks are performed efficiently. Management for efficiency, along with the myriad decisions necessary to maintain the daily life and services of the enterprise, is the domain of operations."

Strategic decisions determine the general direction that an organization's development will take, the scope of its activities and the way that its resources are to be deployed. These are the most important decisions, which are normally taken at the highest level, and have long-term consequences. Tactical decisions are more specific, relating to the use of resources that have already been allocated. At lower organizational levels, managers have to do the best they can with the people, materials and money that they are provided with; their management decisions are mainly about the deployment of resources. Strategic decisions provide a framework within which tactical and operational decisions are taken. They give guidance on the way the strategic objectives are to be achieved, while tactics and operations are associated with the implementation process. The strategic frame of reference sets limits on the freedom of action of the organizations and individuals that make up

the sector. Strategy performs a controlling function while tactics and operations are expected to comply with the guidance written in the strategy.

In practice, for the reasons given, the boundaries between strategy, tactics and operations are often blurred. It is more usual in the forest sector to describe the activities required to carry out the strategy in terms of programmes and projects, which are somewhat easier to define. *Programmes* specify the actions necessary to achieve major objectives and the sequence that these actions should follow. They ensure that resources are committed to achieve the goals set by the strategy and specify the time frame against which progress can be measured. *Projects* are the components of programmes, usually fulfilling a similar function, but generally having a shorter duration and more restricted scope. Sometimes, 'time slices' of ongoing, long-term programmes are treated as projects. Specific investment needs are usually met by means of projects. Projects and programmes, taken together, provide the means by which strategies are implemented.

Goals or objectives state *what* is to be achieved and *when* results are expected. They do not say *how* the results are to be attained. Multiple goals usually exist in a complex hierarchy in the forest sector. They range from broad value premises which guide sectoral development, through organisational objectives which establish the nature of the entities making up the sector and the direction they should move, to less permanent targets for each organisational unit and subunit. Major goals, i.e. those that affect the overall direction and viability of the sector or the entities within it, are called strategic goals.

Quinn defines *policies* as rules or guidelines that express the limits within which action should occur. Like the objectives they support, policies exist in a hierarchy. Major policies, i.e. those that guide the overall thrust or determine the viability of the sector and its parts, are called strategic policies. This interpretation of policy, which is usual in the business studies and management literature[20] (see Box 8.4), puts policy in a subordinate position to strategy — it separates them and makes policy dependent on strategy.

## 8.3 PUBLIC POLICY

We now turn to the third source of ideas about strategy — the writers on public policy. Policy in this context has a much wider meaning than policy as used in business strategies. Public policy is equivalent to strategy for public instead of private purposes. It deals with the formation of aims and courses of action by government departments and other agencies of the state. Ministries oversee what happens in their respective areas, such as health or agriculture, and they determine the policy which guides the future development of the sectors for which they are responsible. Thus the ministry which has authority over forestry matters is responsible for forest policy. The strategies adopted by organisations in the public sector, collectively, are called public policy.

The study of policy issues in government has been variously called policy analysis, policy studies and policy science. It has tended to focus on analysis in a

**Box 8.4 Objectives and policy**

"In accordance with its ideology or philosophy, the goals of the organisation are translated into objectives and policy. Terminology and the use of the two terms varies but objectives are seen here as the 'what', and policy as the 'how, 'where' and 'when' — the means that follow the objectives.

- **Objectives** set out more specifically the goals of the organisation, the aims to be achieved and the desired end-results.
- **Policy** is developed within the framework of objectives. It provides the basis for decision- making and the course of action to follow in order to achieve objectives."

" A policy is a guideline for organisational action and the implementation of goals and objectives. Policy is translated into rules, plans and procedures; it relates to all activities of the organisation, and to all levels of the organisation. Clearly stated policy can help reinforce the main functions of the organisation, make for consistency and reduce dependency on the actions of individual managers. Policy clarifies the roles and responsibilities of managers and other members of staff and provides guidelines for managerial behaviour. Securing agreement to a new or revised policy can help overcome reliance on outdated practices and aid the introduction of organisational change."

Source: Mullins (1996), pages 300–301.

political setting, the causes and consequences of government action and discussion of important sectoral concerns, such as education or the environment. There has been a tendency to concentrate on public sector aims, although the means by which these are achieved have also attracted some attention. Analysis of policy is distinguished from analysis for policy; the former dealing with description of goals, the policy making process and its results in particular situations, while the latter is prescriptive and involves choice of policies and their use to alleviate social problems[21]. The scope of the subject has been widened as it was realised that goal selection is only one step in a succession, covering all stages from the identification of issues, through choice of what should be done, to the evaluation of results after action has been taken. It is now generally recognised that public policy is best understood as a process.

## Views of Public Policy

Public policy, like business strategy, is not a precise concept and can be viewed in a variety of different ways. It has been likened to an elephant; you recognise it when you see it but cannot easily define it[22]. Hogwood & Gunn have listed the following different uses of the word policy[23]:-

- policy as a label for a field of activity: broad statements about a government's 'economic policy' or its 'social policy' or 'foreign policy'.
- policy as an expression of general purpose or desired state of affairs: anything meriting the title of policy must contain some element of purposiveness.
- policy as specific proposals: eg. curbing the legal immunity of trade unions to call strikes without the prior approval of members through a fair and secret ballot. Such proposals may be *ad hoc*, or related to other proposals, or may represent the means of achieving larger 'ends' or purposes.
- policy as decisions of government: decisions about particular issues, which may subsequently become embodied in legislation or otherwise receive formal authorization.
- policy as formal authorization: a specific law or statutory instrument which permits or requires an activity to take place.
- policy as a programme: a usage familiar to Americans; a programme is a defined and relatively specific sphere of government activity involving a particular package of legislation, organization and resources.
- policy as output: what government actually delivers as opposed to what it has promised or has authorized through legislation, eg. payment of cash benefits or delivery of services.
- policy as outcome: what is actually achieved, i.e. the impact of a policy as distinct from what it delivers.
- policy as a theory or model: assumptions are made about what governments can do and what the consequences of their actions will be; policy failure results if the causal chain fails or is disregarded.
- policy as a process: policies tend to unfold over time.

While it may be difficult to define public policy, there are some things that it is not. Clearly, it amounts to more than 'decision'; policies usually involve a series of choices, sometimes in a rational sequence, which are related to each other and may be taken by different people, in different places at different times. Nor is it synonymous with public administration, although managing the policy process is an administrative function. Policy involves behaviour as well as intentions and sometimes deliberate inaction as well as action. As with business strategy, the intended outcome of a policy may not be realized; the actual outcome may or may not have been foreseen.

The literature on public policy reveals two, very different orientations or implicit models of the policy process. As described in Box 8.5, public policy making can be seen as either a *rational system* or a *political activity*[24]. These contrasting views represent the ends of a range within which actual policies are likely to fall. This duality provides a parallel with the business management literature in the previous section in which two kinds of business strategy were distinguished — deliberate and emergent. There is an obvious affinity between the deliberate approach to business strategy and the rational approach to public policy. Similarly, just as business strategy may become apparent from a pattern of corporate behaviour, public policy may emerge as the outcome of a political process.

**Box 8.5 Assumptions about policy-making**

Policy researchers "may on the one hand adopt the assumption that policy-making is essentially a rational process based on the classic steps from problem formulation and evaluation of alternatives through to implementation. Conflicts over goals or perceptions of the situation may be admitted, but these are assumed to result in stable and determinate outcomes which do not interfere with the consistency of the system's operations. Typically the problem is seen as technical, the climate as consensual and the process as controlled. On the other hand, policy-making may be seen as an inescapably *political* activity into which the perceptions and interests of individual actors enter at all stages. In this case implementation becomes a problematic activity rather than something that can be taken for granted, as in the rational process model; policy is seen as a bargained outcome, the environment as conflictual and the process itself is characterised by diversity and constraint."

Source: Gordon, Lewis & Young (1977).

The authors comment that "the power and survival ability of the 'rational system' model is surprising, given that its assumptions have been undermined by empirical studies of the policy process, and that its predictive record is uneven". They suggest that the explanation lies in its status as a normative model and as a 'dignified' myth which is often shared by the policy-makers themselves. The myth corresponds with the conventional distinction between policy and implementation in public administration; civil servants are supposed to advise ministers on policy and then implement the policy that is handed down on their ministers' behalf. In reality, of course, policies based on such a simplistic, one-way model are doomed because they make no provision for public acceptance (except through the ballot box), the cooperation of those affected (without suitable inducements), or adaptation to unexpected events (unless the policy is revised). In the real world, the process by which public policy evolves is much more complicated and should provide for 'bottom-up' as well as 'top-down' communication.

The rational system model, in its extreme form, assumes either, that objectives are given and that the only question is what are the best means of achieving them, or that the objectives, if not properly established, can be clearly defined and related to specific means. In both instances, it is assumed that a rational relationship between ends and means exists. Its detractors argue that governmental organizations rarely have clear and precisely defined goals because there is conflict about what the objectives should be. They argue that, typically, decisions emerge from a complex process of bargaining in which it does not pay to show one's hand by specifying objectives too quickly. Another objection that is put forward concerns the assumption that, even if objectives are specified, these represent the real aims of the people taking part. Where there is competition for resources and power,

the means are likely to be much more important to them than the ends and the construction of a powerful organization takes precedence over other considerations. It is argued that objectives are the product of interaction between key participants, not the prime mover[25].

Those familiar with the workings of the forest sector would have difficulty in recognising the relevance of either model in its pure form to the situation as they see it. Undoubtedly there are features of both models present in most countries, which need to be recognized when analysing the situation for strategic purposes, but effective management of the sector in real life depends on being able to influence sectoral development in a way that conforms with the best interests of society, not with arbitrary directives from on high or the selfish desires of those engaged in playing power politics. It is necessary to look for a middle way.

The rationalist approach has also been criticised for other reasons and contrasted with what is termed the 'incrementalist' approach[26]. The former is based on widely held conceptions about how decisions are and should be made, whereas the latter purports to describe decision makers' actual behaviour. The rationalist view is regarded as: (i) too narrow, because it ignores practical limits which restrict the range of choices open to decision makers, (ii) Utopian, because it ignores unexpected consequences, (iii) biased, because rational solutions are not necessarily fair, (iv) too rigid in drawing distinctions between ends and means, values and decisions, and facts and values, which in practice are often ambiguous, and (v) impractical, because all possible solutions cannot be considered, even with the aid of computers. The incrementalist view, described by Lindblom[27] as 'muddling through', suggests that decision makers start not with some ideal goal but with the policies currently in force and evolve from there by small incremental changes made at the margins. The significant difference between these two positions is that the first is normative, describing how decisions ought to be made, while the second is realistic, based on what happens in real life. We have to look for ways of bridging the gap by bringing the two approaches closer together.

## The Policy Process

Whatever the blend of rationality with politics or incrementalism, the process by which policies are made can be analysed and its stages identified. Various versions of the process have been put forward. One well-known description, due to Hogwood and Gunn, divides it into nine steps:-

(1) Deciding to decide (issue search or agenda-setting)
(2) Deciding how to decide (or issue filtration)
(3) Issue definition
(4) Forecasting
(5) Setting objectives and priorities
(6) Options analysis
(7) Policy implementation, monitoring and control
(8) Evaluation and review.

(9) Policy maintenance, succession, or termination

The authors call this a 'framework' to assist our understanding of the process, rather than a straightforward account of what actually happens in every situation; the framework is useful for both description and prescription[28]. They also stress that the process is frequently iterative,with some stages being repeated as the process unfolds.

A six-step model (attributed to Patton and Sawicki), following a rather different logical progression, which is focussed on the way policies are chosen, is described by Hughes[29]:-

Step 1. Verify, define and detail the problem.
Step 2. Establish evaluation criteria.
Step 3. Identify alternative policies.
Step 4. Evaluate alternative policies.
Step 5. Display and select among alternative policies.
Step 6. Monitor policy outcomes.

This progression has affinities with the recommendations for strategic planning during preparation of national forest programmes, which have been drawn up by FAO[30], and the Merlo/Paveri model described in Chap. 6 (see Fig. 6.3).

The stages in the process can also be treated as a policy cycle, made up of a number of steps which are repeated at intervals. Howlet and Ramesh present a five step model[31], as shown in Fig. 8.3. *Agenda setting* refers to the process by which problems come to the attention of governments, *formulation* is the process by which policy options are prepared, *decision making* is the procedure by which

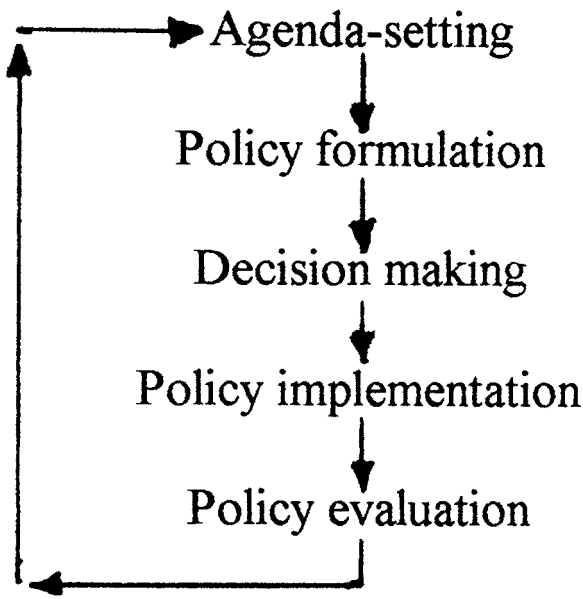


*Figure 8.3* Stages of the policy cycle

a particular course of action or non-action is adopted, *implementation* refers to the process by which policies are put into effect, and *evaluation* to the monitoring and reassessment of results of policies. It is claimed that this model facilitates understanding by breaking down the complexity of the policy process into logical steps which can be investigated separately.

The idea that the policy process is circular and repetitive brings it into line with the 3A improvement cycle (Analysis —> Aims —> Action) described in Chap. 6. Public policy-making and implementation can therefore be regarded as an elaboration of this simple model which is adapted to suit the circumstances in which public policy operates. The stages in the process are rational but the cyclical approach allows rationality to be combined with incremental changes, keeping the policy/strategy in line with changing social and political conditions and enabling it to respond to external events.

## Forest Policy

Forest policy is public policy as applied to the forest sector; it is a segment or subset of public policy. A national forest policy is therefore comparable to other sector policies, such as agriculture, industry or education. Just as public policy is equivalent to strategy for government organizations, forest policy should correspond with forest sector strategy. At the sector level, forest policy and forest strategy should amount to the same thing.

In practice forest policy and forest strategy are not equivalent. Forest policy usually refers to the policy of the government for the use and development of a country's forest resources, instead of covering the whole sector; this prevents holistic treatment of all the activities dependent on the forests. Furthermore, most forest policies cannot be described as strategies because they focus on aims rather than the action necessary to get results (see Box 8.6).

The way that forest policies have been formulated has generally concentrated on preparing statements of policy objectives rather than treating it as a process. The practice in most countries has tended to follow the rationalistic approach, whereby it is assumed that the definition of aims will lead to their achievement. While the identification of aims for the forest sector is a key element in the strategy/policy process, it is essential to consider also the stages that follow and the length of the cycle. It is also important to remember the shortcomings of the rationalistic approach and to allow for the alternative point of view which regards public policy as political in character, based on a series of negotiated solutions to perceived environmental and social problems.

The deliberate or rationalistic approach prevails and it is doubtful if the possibility of an alternative has been seriously contemplated by professional foresters. This is partly due to the long history and influential place of plans and planning in forest management. Timber growing is a long-term business and foresters have attempted to ensure continuity of purpose by reliance on written prescriptions which can be handed on from person to person, sometimes from one generation to the next.

**Box 8.6 Various definitions of forest policy**

Forest policy has been interpreted in different ways. The following meanings have been taken from forestry literature. They refer to forest resources rather than the forest sector and to aims or uses of the forest instead of the process which links development objectives with the achievement of sectoral change. Therefore, they all fall short of providing an acceptable definition of forest strategy.

"[forest policy] specifies certain principles regarding the use of society's forest resources which it is felt will contribute to the achievement of some of the objectives of that society."

"a settled course of action with regard to the use of forest resources which has been adopted and is followed by society."

Source: Worrel, A.C. (1970), pages 2 and 223.

"Overall and specific objectives indicating the interest and aims of the government for the use and development of the nation's forest resources".

"Presentation of the government's programme of activities in the field of forestry".

"Description of all public actions which significantly affect the use and management of forests, both publicly and privately owned".

Source: Husch (1987), page 4.

"A purposive course of action or inaction followed by an individual or group in dealing with a matter of concern regarding the use of forest resources. Forest policies guide how forests will be used, usually to achieve some stated or implicit objective".

Source: Cubbage et al (1993), page 18.

Forest working plans were introduced in Europe in the nineteenth century to control felling and regeneration rates in accordance with the principle of sustained yield. These plans provided management strategies for designated areas of forest, complete with written objectives and programmes designed to achieve their objectives. This common-sense approach, applied in the limited management context of a particular forest, apparently based on scientific method, at a time when ideas about the how best to run organizations were dominated by the Classical school and bureaucratic ideals, has had a major effect on foresters' attitudes.

Similar rationalist thinking was applied to forest policy-making in the twentieth century. This is evident in the national forest policy statements issued from time to time by many governments throughout the world. These are public expressions of government aims in relation to the future protection and management of forest

resources. In many countries, particularly among the developing nations, governments directly control large areas of forest land, which is owned by the state. Too often, the policy-making procedure has been bureaucratic and 'top down', with national aims formulated by the government ministry responsible for forestry, without adequate consultation with those affected or full consideration of their consequences. These old attitudes die hard and it is only recently that they have begun to be questioned.

Unfortunately, the achievements of the rational approach have often been disappointing. Many plans are found to be unworkable in practice for reasons beyond the planners' control and many policies fail to be implemented because of insufficient attention to their practicability. In spite of the professed good intentions of political leaders and the efforts of foresters at international level, the present state of the world's forests is causing widespread concern. Tropical forests are being destroyed at an unacceptable rate and temperate forests are exposed to risks of an unprecedented kind. Neither plans nor policies are producing the results expected of them. Old-style working plans have been abandoned and policy failure is a fact of life, as evident in the forest crisis described in Chap. 1. It is plain that the traditional approach needs an overhaul and new insights.

Changes in attitude need to be matched by changes in method. Instead of lists of aims, such as those in the old forest policy for Cyprus (Box 8.2), as a first step it is necessary to adopt a process approach, as advocated by Merlo and Paveri among others. Ellefson has presented a policy-making procedure for use in the USA[32], which corresponds to that used for public policy generally. This is based on seven steps, as shown in Fig. 8.4. He describes the process as "a sequence of political events leading to policy outcomes". Agenda setting commences with a fuzzy perception by someone or some organization that an important forestry problem or issue exists. Possible policy responses are formulated to address the issue and alternatives are specified. A selection is made, based on their merits. The chosen policy is given authority and provided with legitimacy by means of law or regulation. Implementation clarifies and interprets the policy, establishes the means of carrying out the policy and delivers the goods and services that are required. Evaluation is retrospective and either leads to termination of the policy or throws up new issues to be addressed in the next cycle of the policy. Ellefson's model clearly takes us beyond the rationalistic approach and envisages policy-making as an incremental procedure.

The transition from old-style forest policy to forest strategy highlights a paradox. The account of business strategy (in Section 8.2) separated policy from strategy and defined policy as the rules or guidelines for implementing strategy. Managers in the business world regard policy as dependent on strategy whereas government administrators have tended to put policy first and view strategy as the means by which public policies are carried out. The latter interpretation is common amongst foresters, who see goal-setting as the first step in a logical progression. For example, Hutsch[33] asserts that objectives are the basis of a forest policy. These conflicting perspectives can be avoided, if not reconciled, by referring to the whole process as

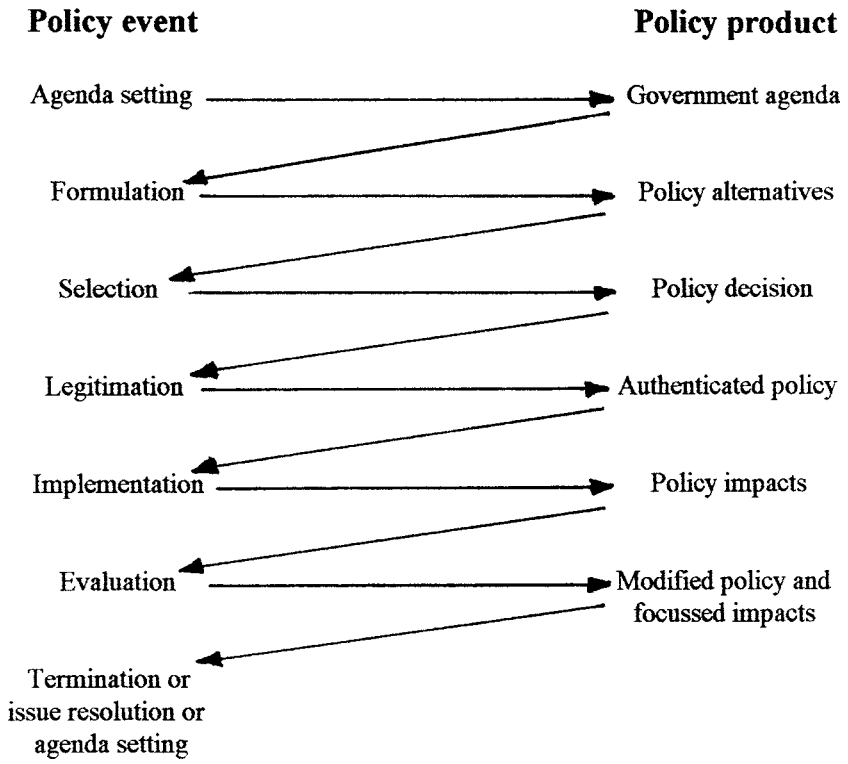


*Figure 8.4* Policy development and implementation process

'strategic planning', which includes goal-setting as well as drawing up programmes of activities. This terminology has been used by FAO in the advice it has issued for drawing up national forest programmes[34].

## 8.4 FOREST STRATEGY

It is apparent that strategy and policy are used rather loosely, according to the context in which they appear. Our first concern, when dealing with the forest sector, is to clarify their meaning in relation to its future development. What is needed at this point are appropriate definitions and descriptions that are suited to the situation in the forest sector and the task of prescribing the best way forward for the sector so that it can contribute the maximum possible to future welfare of the community.

We will follow business practice by separating strategy from policy. Forest policy has traditionally had a public relations function in addition to serving as a basis for forest management[35]. It has been used to promote and publicise the intentions of the government in relation to the use of forest resources. Therefore it is appropriate to continue to use forest policy for this purpose, while widening its scope to take in

the whole forest sector. Governments need to explain their strategies to the public by issuing policy statements which clarify the action to be taken and its likely consequences. After official adoption of the strategy by the government, the next step should be a forest policy declaration. Such declarations of intent — they have been called 'manifestos' — should be authoritative statements, which demonstrate the government's commitment to achieving the aims of the strategy, emphasize the importance attached to it and describe the measures to be taken to support it.

For our purposes, forest policy can therefore be defined as follows:-

A **forest policy** is a declaration announcing the strategy to be followed for developing the forest sector. It should say what the strategy is expected to achieve and the parts to be played by the principal organizations concerned with the development.The policy statement should represent a public commitment, supported by the government and influential interest groups, which has been authorized at the highest level, to achieve the aims of the development strategy, and an undertaking that the programme of work envisaged by the strategy will be carried out, so far as circumstances and the available resources permit.

This definition makes it clear that strategy is prescriptive while policy has an explanatory function; forest policy depends on and supports forest strategy. Having resolved this issue, we can move on to consider the characteristics which distinguish forest strategy. It is necessary to draw together the various ideas about the nature of strategy which have been discussed in the earlier parts of this chapter and attempt a synthesis. Forest strategy should emerge as a coherent concept, suited to the structure and special circumstances of the forest sector. The aim is to provide a particular interpretation of the strategy concept, based on general strategic principles and drawn from various sources, which is adapted to meet the needs of forest sector development. This interpretation, hopefully, will lead to more effective action to promote development and help to overcome some of the difficulties, described as policy failures, which have been the subject of unfavourable comment internationally. For practical purposes, forest strategy should prescribe a method for achieving results in the forest sector.

Forest strategy should establish a procedure for achieving development aims in the forest sector. Therefore it can be described as a process, depending on a series of decisions, which leads towards a specified result. These features of the procedural approach — process, decision sequence and result — correspond to the three ways of perceiving strategy which were identified previously in Section 8.1 of this chapter (i.e. a sense of direction, a basis for decision making and a grand design). The process itself should generate a sense of direction, the sequence of decisions should conform with the basis for decision making and its intended result can be represented as a grand design. These three aspects provide a set of tests of validity, which can be applied to all forest strategies. Any strategy which fails these tests is patently inadequate.

A satisfactory definition of forest strategy should be capable of being applied to the forest sector in any country; it should have general validity. However, the differences between countries inevitably lead to distinctive forest strategies for each

country, which are different from one another. Therefore, the definition can only provide a framework, or set of conditions, within which each country can determine its own strategy. It is up to each country to formulate the particular development aims that are considered best, take appropriate decisions to further those aims and follow its own path to greater prosperity. Each nation needs a forest strategy which conforms with the general definition but is also specific to that country.

A general description of forest strategy, applicable everywhere, should explain what a strategy is, what it consists of, and the nature of the process that is to be followed. It should provide an outline or blueprint, which can be adapted to suit the needs of any country. All countries seek to improve the lot of their people, but the action necessary to achieve this general development aim depends on local circumstances; all forest strategies aim at some form of betterment, but exactly what this consists of varies from place to place. The task of a national forest strategy is to choose the development path that is expected to lead to the greatest improvement for the forest sector in that particular country. Development depends on the sector's resources, activities, outputs, organizations and institutions, and the way that these change over time. The sector's transformation matrix evolves in response to changing needs and the organizational dimension of sector activities responds to new challenges. The composition, capacity and potential of the sector varies from country to country and therefore each country's forest strategy needs to be adapted to its particular circumstances.

The function of a national forest strategy is to interpret general strategic principles in a way that is suited to the needs of that country. Development is promoted by interventions in the forest sector system which lead to change. There is unavoidable uncertainty about the future outcome of these interventions and always a possibility that unexpected events will upset plans and programmes, however carefully they have been prepared. The forest strategy process should follow a procedure that is sufficiently flexible to cope with unforeseen circumstances. Therefore, a cyclical process is prescribed that links the formulation of objectives to the achievement of results in an interactive way. This process is adaptable enough to be followed everywhere, with appropriate adjustments to meet country requirements. The timing and details of each stage can be altered to suit the government's timetable. If a country's forest programme is disrupted, it can be modified accordingly; if external events make the strategic objectives unattainable, they can be revised without abandoning the whole sequence.

A national forest strategy should interpret the general development aim of increased welfare of the community in the particular context to which it relates. Welfare stems from the flow of outputs of all kinds which are derived from forest resources and forest-based activities of the country. While it is desirable to add to the benefits by increasing the flow, its makeup, timing and continuity are also important. Welfare is affected by the way different outputs are distributed amongst the community, by the length of time that people wait to receive them, and by expectations of future outputs. The need for equity and sustainability influences forest strategy and may impose restrictions when strategies are prepared. In fact,

all forest strategies are affected, to a greater or lesser degree, by world opinion and international action; some restrictions are becoming treaty obligations. Constraints originating from outside the sector limit forest strategies in various ways and each country must identify where these limits lie in relation to its particular situation.

Based on these formative features, the following general definition and description of forest strategy is proposed:-

**Forest strategy** is defined as the cyclical process by which forest sector development is guided and promoted. In relation to each particular country or region covered by the strategy, it should provide a grand design, a basis for decision making and a sense of direction for the sector. The purpose of developing the sector, which forest strategies everywhere should strive for, is increased welfare for the community. National forest strategies need to interpret this general aim in ways that suit each country's circumstances, having regard to the resources, activities, outputs, organizations and institutions that make up the forest sector. The function of the strategy process is to establish the constraints and specific development objectives that are relevant to the situation and outline the means by which those objectives are to be pursued, within a flexible format. Programme and project preparation form part of the strategy process, supported by monitoring to record and measure progress and the subsequent evaluation of results.

Forest strategy is defined as a cyclical process. This process includes the identification of development aims, a step which is called 'strategy formulation'. The strategy process provides the framework within which objectives are considered and selected. We can now move on to discuss in more detail the nature of the aims and choices on which strategy is based, and the stages which constitute the strategy cycle.

## Aims and Choices

Forest strategy is expected to lead to increased welfare of the community. This general development aim, applicable in all countries, is also sometimes referred to as the 'greater public good' or 'serving the public interest'. This rather vague idea requires amplification, first, to clarify what is meant and how the idea can be usefully applied, second, to examine the features of the forest sector's contribution to welfare which distinguish it from the contributions of other sectors, and third, by reference to the forest sector of the particular country or region to which the strategy applies.

Welfare generation can be likened to adding to the perceived value of the outputs of the community, although 'value' in this context does not refer to money value but to the amount of the benefit that accrues to society. Benefits may be tangible or intangible, and may be provided by governments as social services, either subsidized or free to consumers. Moore[36], in his study of strategic management in government, calls this creating *public value*. He distinguishes between the aim of businesses in the private sector, which is to generate private value, and the aim of management in the public sector, which is the formation of public value. He contests the commonly-held view that all government activities are unproductive, pointing out that they

shield the country from foreign enemies, keep the streets safe and clean, educate the children, and insulate citizens from many man-made and natural disasters. It seems obvious to him that governments create value for society, even if this cannot be easily measured.

By the same argument, it is obvious that the forest sector also generates public value. It provides services for the community, such as environmental protection and scenic benefits, which are undoubtedly valued by the public even though they do not produce sales revenue directly. The sector contributes to welfare through the way that forest resources are protected and managed. Government forest departments, which directly control state-owned forests in many countries, therefore supply public value as defined by Moore. However, the same range of services may also be provided by private landowners and companies which own or manage forest resources; they can also generate public value even though not classified as part of the public sector. Therefore, public value cannot be attributed solely to the activities of public agencies. It needs a wider interpretation to suit the situation in the forest sector.

Forest departments also supply other outputs (such as timber), grown on a commercial basis, which fit Moore's description of private value, even though produced by a government agency. These outputs add value to the national economy (via the GNP) when they are sold and, clearly, are also valued by the community which is willing to pay for them. Labelling something as private value does not mean that it brings no benefit to society. Therefore the public value concept should be extended to include the outputs derived from commercial as well as non-commercial activities. In fact, the forest sector is a conglomerate, composed of a mixture of both public and private organizations, which all contribute in various ways to sector outputs. Public value, in the sense of satisfying the desires of citizens for both tangible and intangible outputs, is generated from all parts of the sector, regardless of whether they are government or non-government organizations.

The public value concept needs to be extended to cover all types of output and all kinds of organizations when applied to the forest sector. However, since it is the function of the government in each country to derive the maximum welfare from the forest sector and it is the responsibility of a government agency, usually the forestry department, to supervise forest strategy and national forest programme preparation, it is appropriate to call the forest sector's contribution public value, even though some of the benefits accrue from private sources. Therefore, the general purpose of forest strategy, can be conveniently restated as seeking the maximum public value that can be generated from forest sector outputs. Put another way, this means utilizing the resources of the sector and directing its activities to achieve the greatest amount of benefit for the public from its diverse outputs.

The richness of the forest sector's public value contribution is unmatched by other sectors and puts it in a class of its own. The sector also has an array of linkages to other sectors, the effects of which are not easy to assess, which add to the complexity. Strategy formulation therefore faces exceptional difficulties and entails intractable problems of choice. Among the important questions are the

relative strengths of peoples' desires for different outputs, the optimum mix of outputs and changes over time in the output flows. The preferred combination of outputs alters with changes in personal preferences and the availability of different outputs; as economic conditions improve (or get worse) the spending power of various sections of the population shifts demand and affects prices. The prevailing conditions in which sector activities take place are subject to endless change and, often, considerable uncertainty. Furthermore, the answers to these questions cannot be expressed in general terms because they are affected by the local situation in each country. National preferences and choices are involved and the output flow which will yield the maximum public value must be ascertained separately for each country.

One particular source of difficulty is the measurement of output value. Not all outputs have prices and the prices of some of those that do are unreliable guides to their value. Prices in competitive markets reflect what people are prepared to pay for the quantity on offer of that particular product or service. The prices of forest sector outputs frequently deviate from free market prices for various reasons and are not trustworthy indicators of public value. Price distortions may be caused by single or a small number of purchasers (or suppliers), exercising monopoly (or monopsony) power to control markets. Large, capital-intensive industrial plants, such as pulp and paper mills, are likely to be the principal buyers of raw material from extensive areas of forest and may also be able to influence the selling prices of their products. In many countries, the government owns a significant proportion of the forest land and could push up stumpage prices, although such power is seldom exploited; in developing countries, stumpage has often been sold cheaply in attempts to subsidize forest industry development, or simply because of administrative failure to update forest royalty rates. Other outputs from forest land may be sold at controlled prices, as with the supply of water from forest catchments which is regarded as an essential public service, and many non-wood products (e.g. wild honey and mushrooms) are taken free in accordance with local customs or traditional rights. There are also some types of output which have no discernable prices because they cannot be traded (e.g. biodiversity and expectation values), or can only be valued jointly with others because they form part of an ecosystem. Public value cannot be measured directly in these cases and the results from indirect methods of estimation, based on subjective value judgements, should be treated with caution.

Combinations of outputs are difficult to value, particularly when the individual outputs are so diverse and cannot be compared with one another. Estimates for strategic purposes need to be based on the public worth of total output flows. An example demonstrates what is involved in comparing the value derived from three alternative uses of the same piece of forest. Suppose there is a simple choice between producing (say) $1000\,m^3$ of logs, or protecting the forest for water supply purposes to maintain a specified minimum stream flow, or saving an endangered species. It might be possible to compare these alternative management regimes by using imputed or 'shadow' prices to measure their net economic benefits. However, in practice, the choices might not be mutually exclusive, so that some timber

production combined with a bit less water would be a possibility, or water plus species conservation and no timber production. Multiple outputs are the norm in forest management and appraisals are required which compare the total net benefit derived from various output combinations. Costs as well as benefits need to be taken into account because different forms of management entail different levels of expenditure; the comparison is unfair unless the excess of benefits over costs of the alternative output streams is considered, not just the total benefits. Choices between options at the strategic level, which produce different combinations of outputs, are therefore complex and beset with difficulties.

There is always uncertainty about future output flows because they may be affected by unforeseen events. Even when prices do correspond to the value put on the outputs by the community, the expectations on which appraisals are based may not be fulfilled. The difference between what is hoped for and what actually occurs is likely to be greater when outputs are difficult to value or can only be valued in combination with others. The assessment of public values is generally less reliable than private values and the results are more risky. Therefore, appraisals of strategic alternatives, based on estimates of public value, are subject to a high degree of uncertainty which should be allowed for when choices are made during the strategy process.

The pursuit of public value as a general aim for forest strategy is a convenient theoretical ideal, but difficult to apply in practice. Carefully used, economic appraisals offer some guidance for strategic decision making where the options can be clearly specified, but it is continually necessary to guard against comparisons between outputs of goods and services which can be easily quantified and intangible outputs which are intrinsically unmeasurable in money terms. A rational approach to strategy formulation demands that such comparisons be attempted, but how best to assess the preferences of the public or the 'national interest' in these circumstances presents serious, perhaps insurmountable problems. Conventional methods, such as cost-benefit analysis, may indicate the correct solution in specific situations, such as the example given above, when the options relate to a particular, limited portion of the forest sector, but fall far short of providing a satisfactory answer when applied to possible output combinations from the whole sector. Treating the sector as a system is important because it provides a holistic approach, but even simulation modelling does not cover all aspects of sectoral activity. Appraisal techniques, which are suitable for evaluating projects or sections of development programmes, have their place and are reviewed in the next chapter. However, dealing with choice of strategy for the whole sector is a rather different matter which needs to be tackled in stages by other means.

A staged approach is made possible by treating forest strategy as an ongoing process and looking for ways to progressively restrict the range of choice. The first step is to set limits to the kind of strategy that is to be selected. There are general constraints called imperatives, which apply to all forest strategies and have international implications. These impose conditions on scenario preparation and strategy formulation at country level. The subsequent choice of a particular scenario

for sector development curtails the scope and content of the national programme with which is intended to achieve the objectives of the strategy. In turn, the proposed subprogrammes and projects in the programme are designed for specific purposes, each making a particular contribution to the sectoral plan of action; they need to be evaluated separately, using appropriate criteria. The projects define the scope of the operations necessary to turn strategic aims into action. The strategy process starts with an expression of the general intent, which is then converted into a set of development objectives, each giving rise to specific, detailed and practical goals, supplemented by appropriate targets against which performance and progress can be measured. It is a hierarchical approach to decision making, with the choices made at each level prescribing the limits for the level below. In relation to aims and choices, the strategy process is a bit like a nested set of Russian dolls, one fitting inside the next.

This procedure conforms with the three perceptions of strategy identified earlier in this chapter. The process starts with a grand design for the sector, then identifies the route which development should follow, finally providing a basis for detailed decision making. It begins with an imaginative leap and proceeds to a prosaic concern with practical matters such as detailed project design, mobilization of resources and operational practices. At each stage the options are judged by their expected future results: scenarios represent alternative future states of the sector and describe what the sector might look like under particular sets of assumptions about its future development, the content of national forest programmes describes the main features of possible pathways leading to sectoral development, and the expected outcomes of the projects are used as the basis for appraisals. Forest strategy is a process of sequential assessment starting with different versions of the big picture, then considering alternative ways of getting there, and finally examining the consequences of the detailed decisions leading to strategy implementation.

## Imperatives, Constraints and Priorities

The purpose of imperatives, constraints and priorities is to restrict freedom of choice, at each stage, in order to be able to manage the strategy process effectively. If it was possible to consider every possible combination of outputs, fully assess the public value of their benefits, now and in future years, and gain access to unlimited resources with which to maximize the output flow in the optimum proportions, such progressive limitation might not be necessary. However, forest strategy does not function in such a Utopian world; we must be content with successive approximations leading towards a welfare goal which cannot be fully specified for practical reasons.

At the outset of the strategy process, it is necessary to specify general conditions, called *imperatives*,to which all possible strategies must conform; any which fail to meet these requirements are non-starters.They form a special class of constraints, which restrict freedom of choice at national level. They set prior conditions on the type of scenarios which can be considered during strategy formulation. In some

**Box 8.7 Imperatives**

"In some countries, forest policy can be likened to defence policy, in that the failure of either can result in effective loss of sovereignty over part of the country: in defence because of occupation by an invader; in forestry because of destruction of the vegetative cover or degradation of the soil, which renders part of the country as useless to the nation as if it had been occupied by an invader. If this sort of situation obtains, there are clearly points of policy which are not optional in political, planning or popular terms, but imperatives — and should be stated as such in very clear terms. If they are not singled out as imperatives, the reader may be forgiven for regarding them as options — particularly when the policy statement attempts to be comprehensive, as many of them do.

Source: Palin (1980), page 51.

cases they provide international standards to which national governments can aspire. For example, any scenario which disregarded the generally accepted criteria and indicators for sustainable use of forest resources would be considered unacceptable. Palin first distinguished imperatives in relation to forest policy statements[37]. He described them as prior conditions which must be respected, unlike other aims which are negotiable priorities as he makes clear in Box 8.7.

Three, fairly obvious imperatives have been identified. These were used in Cyprus, as described in the last part of Chap. 7, and are applicable to management of the forest sector everywhere. Management activities should be: (i) holistic, (ii) sustainable, and (iii) equitable. The first is a restriction on the strategy process itself, to ensure that the full consequences of options are considered when strategy is formulated. The second prevents the sector's resource base being destroyed and protects the future flow of benefits; it is a restriction on the activities which generate outputs in order to ensure their continuity. The third imperative is a restriction on the way benefits are distributed, aimed at preventing unfair treatment of sections of the community and inequitable treatment of later generations. It is possible to conceive other imperatives to suit the different conditions found in other countries. Thus, 'basic needs' and 'decentralization' were suggested in Papua New Guinea[38] and Nepal[39], both developing countries where the rural population depend on forests to maintain their subsistence economy, with poor communications and devolved systems of government. Meeting basic needs is really a special case of the equity imperative because it looks after the interests of the poorest sections of society; decentralization represents an organizational/institutional restriction, which specifies the manner in which the forest sector is to be administered.

Four distinct types of restriction can be distinguished. In addition to the three principal imperatives identified above, it is suggested that 'participation' should be added as a fourth, to cover the necessity to ensure that all those with a stake in forest sector prosperity share in its direction and activities. The sector is a conglomerate,

which cannot be held together without the agreement of its members; their willing cooperation can only be secured if the strategy process is designed to provide for their involvement. These four imperatives serve different purposes: they relate to strategy perspective, continuity of output, fairness in the distribution of benefits and style of administration for the sector. They appear to have general validity for all countries.

Imperatives should be clearly stated when strategy is formulated, in order to focus attention on them. However, they also need interpretation at national level, to adapt them to suit the conditions found in each country. Thus, the boundaries of the forest sector will be drawn differently from country to country to reflect variations in their resource endowments, the range of forest-based activities and the extent of their industrial development. A three-point recipe for sustainability was suggested in Chap. 5, based on safeguarding resources, maintaining sector activities and preserving output choices; as resources, activities and outputs are different in every country, national interpretation of this imperative involves a set of choices which is also specific to that country. The nature of the measures necessary to ensure fair treatment for sections of the community with a special interest in forest resources also depends on local circumstances; in Fiji for example, efforts have been made to spread the benefits of afforestation schemes more widely by encouraging local logging enterprises, and in Cyprus, the strategy involves special assistance for forest villages. Participatory forestry is evolving and is becoming established as a management ethos in a number of countries; In India, for example it has become widespread in response to the enormous problems of protecting and managing forests in the face of extreme population pressure and competition for land. Imperatives are usually interpreted implicitly rather than overtly, by describing the nature of the action to be taken in the national programme and projects. Imperatives need to be specified at the outset of the strategy process, but their interpretation and amplification follow when the NFP is prepared.

Other important constraints are imposed at the programme stage. Resource shortages restrict what can be achieved. Shortfalls of natural, capital and human resources inhibit development, but the most serious bottleneck is usually caused by inadequate finance. When the available funds are insufficient to carry out forest management, purchase machines and equipment, or employ labour, forest sector activities are slowed down or brought to a halt. Money problems may arise because of budget limitations or cash flow shortages; there is never enough to do all that managers would like. Some form of rationing of financial resources is therefore inevitable, which affects the content of NFPs. It is pointless to include a large number of projects with no hope of obtaining the money needed to carry them out; in this respect, NFPs should be based on realistic expectations. Conversely, it is not wise to unduly restrict their content as circumstances may change, more money may become available from domestic sources or international aid, and a larger programme than first envisaged may become possible. Some flexibility is essential.

The desired amount of flexibility can be achieved by regarding NFPs as frameworks for sectoral development, rather than elaborate plans made up of projects which have been fully worked out. The function of an NFP at the preparation stage should be to establish the parameters within which sectoral activities can be developed, leaving the details until later. The strategic objectives of an NFP are reflected in its subprogrammes, each aimed at a particular aspect of sectoral activity; subprogrammes contain projects which have been designed to achieve the strategic objectives. Some projects are likely to be ongoing activities which need to be continued, others are new projects, identified in the NFP so that they can be worked up, appraised and approved as the programme progresses, and then carried out when funds become available. Where an NFP relies on obtaining assistance from overseas sources, as in many developing countries, it is very difficult to ascertain how much help will be forthcoming; project identification followed later on by programme development then becomes a necessity because the amount of foreign aid that donors are willing to provide depends on their aid budgets, their priorities and meeting their conditions.

Problems over finance to carry out national programmes are inevitable. Managers seek greater certainty by preparing budgets and getting them approved in advance, so that they can plan their work with confidence. However, it is very difficult for either government or private sector agencies to forsee accurately how much money will be available five or more years ahead. Furthermore, even if there is budgetary provision for particular projects or operations, this is no guarantee that the funds will actually be forthcoming. Unexpected events may intervene, economic conditions may alter, or a disaster such as a hurricane may occur. Neither government revenue nor the income of private firms is sacrosanct; foreign trade may suffer recession, international assistance is unreliable and companies may go bankrupt. Financial planning is desirable, but in practice the forest sector must live with the possibility of forced cuts in budgets and find ways of dealing with the upset that they cause.

The forest sector has to cope with considerable financial uncertainty, which affects NFP preparation and subsequent programme development. A flow of funds is necessary for both operational purposes and investment. NFP implementation depends on an organized and timely flow of resources; without this, the programme and projects will be either delayed or disrupted. The prospect of carrying them out smoothly, according to plan, depends on reasonable certainty that the budgeted funds will be available when required. If unforseen events intervene, the programme may have to be rescheduled or modified. The only way of minimizing their effects is by flexibility built into the programme, so that resources can be redeployed without causing major disruption. One method is to allow for contingencies at the budget stage, another is to be able to vary the timing of individual projects without seriously disturbing the rest of the programme or undermining its aims.

To some extent it is possible to set priorities within an NFP so that the most urgent or most important parts receive attention first. While this may be helpful for choosing between projects when faced with inadequate resources, priorities may be very difficult to decide in advance and may be distorted by the sequence in which

projects are carried out, particularly those financed from external sources. In some cases projects are interdependent, so need to be implemented together, in other cases, projects are expected to generate different kinds and levels of benefit which are not comparable. A particular activity may be regarded as urgent in order to take advantage of an unexpected and unrepeatable opportunity, such as the availability at low cost of heavy machinery for road construction. However, the degree of urgency of a project is not the same as its importance in relation to the size of its impact on sectoral output flows or its significance compared with other projects. Often it is necessary to assess or reassess priorities as the programme develops, either on account of alterations in national economic policy or to conform with the wishes of aid donors. Flexibility is just as necessary when assigning priorities as with the composition of the programme and rate of project implementation.

## The Strategy Process

The strategy process faces a dilemma: on one hand, confidence about the future is needed when plans are prepared, on the other hand, in practice, it is likely that this confidence will be shown to be partially or wholly misplaced. The assumptions on which programmes are based seldom hold true for very long. Forecasting is notoriously difficult and strategy preparation must attempt to deal with a wide range of uncertainty; in extreme cases, planning can appear a somewhat pointless exercise. However, this does not justify a negative reaction, abandoning the strategy process and preparation of NFPs because they are thought to be worthless. There are several cogent reasons for adopting a strategic approach. First, the alternative is aimless drift, which is most unlikely to lead to sectoral development and social betterment. Second, human beings are not so devoid of hope for the future or so irrational that they have stopped trying to improve their lot, even though their efforts are not always successful. Third, because not all strategies are doomed to fail and, with care, the strategy process can be designed to cope with a reasonable amount of uncertainty. Strategy formulation is undoubtedly worthwhile, even if for no other reason than to assist people to clarify their ideas and intentions; many companies in the private sector now view strategy preparation as a useful management tool and some regard it as a necessity[40] (see Box 8.8).

There are other reasons for adopting a strategic approach. It has been argued that successful strategies result from a creative state of mind that combines analysis with insight and a drive for achievement[41]. Forest strategy undoubtedly requires creativity and imagination as well as analytical skills. Seeking a grand design for the sector implies envisaging a range of scenarios depicting what the sector might look like in years to come. Providing a basis for decision making involves setting standards by which to appraise and compare alternative courses of action; project costs and benefits must be assessed, including those that cannot be easily measured. Choosing a path for development requires inventiveness about possible routes to achieve strategic goals, while preserving the flexibility needed to cope with variations in the rate of progress. These three manifestations of the strategy

**Box 8.8 The necessity for strategy**

"There is a slightly odd notion in business today that things are moving so fast that strategy becomes an obsolete idea. That all you need is to be flexible or adaptable. This is a mistake. If you do not develop a strategy of your own, you become part of someone else's strategy. You become reactive to external circumstances. The absence of strategy is fine so long as you dont care where you are going. Strategy is not only an invaluable concept, but an absolute necessity. But that does not mean that you fix a goal of five years into the future, like the Soviets used to employ in Moscow, and march inexorably towards that goal. That was pretty dangerous."

Source: Interview with Alvin Toffler by James Daly in *Business 2.0*, November, 2000.

process call for technical expertise allied to insights that go beyond the reach of conscious analysis.

Flexibility in the strategy process is desirable to allow room for programme readjustment in response to unexpected events. Hirschman's classic study of development projects reveals that human adaptability and creativity tend to be underestimated; he proposed the principle of the Hiding Hand[42], by which hidden problems lead to innovative solutions. He cites the experience of the Karnaphuli pulp and paper mill in Bangladesh (then East Pakistan), which was started in 1953 to utilize the resources of the bamboo forests in the Chittagong Hills. After about six years the bamboo, which represented 85 percent of the mill's raw material supply, all flowered and died — an event known to occur once every 50 to 70 years. The dead bamboo proved to be unusable for pulp. This catastrophic event did not lead to closure of the mill, as might have been expected. Instead, human ingenuity intervened, pulp was imported as a temporary measure while collection of other species of bamboo from elsewhere was arranged and plans were started to plant other, fast growing species to replace the bamboo. Hirschman argues that this project (like the others he studied) would not have been started if its difficulty had been foreseen, but there was no allowance either for the human resourcefulness with which the crisis was overcome. In a sense, hidden difficulties helped to promote development. Programme flexibility, which assists in overcoming these difficulties, can therefore facilitate progress in the forest sector.

The strategy process also needs flexibility to cope with uncertainty due to other causes. Besides the difficulties over financial expectations, which affect project timing, and the possibility of unexpected events, which interfere with the way projects are implemented, two other major sources of uncertainty can be identified. Both are due to unforeseen changes in human attitudes and affect the scope and scale of sector activities. The first concerns people in their capacity as consumers or beneficiaries of sector outputs, who may change their preferences and spending patterns. Therefore, from time to time, the strategy procedure should allow for

revised estimates of output requirements and their supply/demand balances, accompanied by reassessment of the transformations involved in generating the outputs concerned. The second relates to the organizations and persons employed in the sector, who may alter their perception of the results of sector development, its impacts on their interests and even their willingness to participate further in sector activities. The strategy process should allow for uncertainty from whatever cause so that sectoral objectives and cohesion are not undermined; uncertainty needs to be countered by procedural flexibility at all stages.

Flexibility is achieved by loops in the strategy process, which provide opportunities for reconsideration of the situation and the injection of fresh ideas. Forest strategy has been defined as a circular process aimed at human betterment. The strategy process in its entirety is a single loop based on the 3A improvement cycle: analysis, followed by aims, leading to action. The sequence is repeated in cycles lasting five to ten years. Within the process are subsidiary cycles. One is necessary to provide feedback when alternative scenarios are considered and strategy is formulated; a second deals with the NFP and a third with projects, covering their preparation, appraisal, financing, implementation, evaluation and review. These are formalized loops. In exceptional circumstances, the cycle can also be broken elsewhere, to return to an earlier stage in the sequence. The strategy process therefore allows for scheduled and unscheduled change; it can deal with gradual adaptation and abrupt disruption. Table 8.2 shows the full sequence.

The strategy process consists of a sequence of 12 stages, which are grouped to correspond with the three phases of the 3A cycle. The analytical phase, which contains four stages, is intended to provide a complete assessment of the sector's present condition and projections of what is likely to happen to the sector in future years if there are no interventions in the system. The status quo forms the basis from which to work out the probable consequences of a range of possible interventions so that they can be appraised and compared during the second phase. Aims are considered during the second phase, which consists of five stages. They deal with the steps needed to formulate and select a strategy, and to prepare a programme designed to achieve the strategic objectives. The final phase, with three stages, is concerned with the action necessary for programme development and implementation; monitoring and evaluation of results are included in this phase. At the end of the sequence, a new cycle begins and the process restarts.

The **analytical** phase commences with a complete review of all aspects of the sector, to establish the facts on which sector strategy should be based. This covers the sector's resources, activities, outputs, organizations and institutions. It should also include input-output analysis (if data is available) and an assessment of sector capacity. Other aspects requiring attention at this stage are the influence of the country's internal geographical divisions on strategy and its external interactions with other countries. The sector review supplies the data for sector modelling (where this is feasible) and for preparing projections of the balances between output requirements and supply possibilities; similarly, it generates the information

*Table 8.2* The forest strategy process

| *3A cycle* | *Strategy process* | *Activities* |
|---|---|---|
| ANALYSIS | **Sector review** | Resources review: natural, capital and human<br>Activities analysis<br>Output assessment<br>Review of sector organizations<br>Institutional assessment |
| | | Input-output analysis<br>Sector capacity assessment<br>Regional/provincial/local characteristics and their influences on strategy<br>External interactions review:-<br>trade<br>overseas investment and financial flows<br>international aid and technical assistance<br>Contribution to gross domestic product and national income |
| | **Transformations and modelling** | Transformation analysis; modelling<br>Supply/demand projections and output balances |
| | **SWOT analysis** | Strengths, weaknesses, opportunities and threats identification/appraisal |
| | **Participation** | Roles of participants and their interests; public consultation<br>Sectoral cohesion: participatory arrangements, meetings, seminars etc.<br>Leadership function<br>Direction and control of sectoral affairs |
| AIMS | **Imperatives** | Identification and interpretation |
| | **Scenarios** | Preparation, assessment and presentation<br>Consultation |
| | **Strategy formulation** | Scenario revision and modification<br>Choice of strategy<br>Definition of strategic objectives and action areas<br>Regional/state/provincial strategies |
| | **NFP preparation** | Matrix of action areas and subprogrammes<br>Subprogramme definition and tactics<br>Project identification |
| | **Forest policy** | Preparation and approval of policy statement<br>Publicity for strategy and NFP |
| ACTION | **Programme development** | Project: preparation and design<br>participation and consultation<br>appraisal, approval and financing<br>implementation and operations |
| | **Monitoring** | Recording and measuring project progress |
| | **Evaluation** | Project evaluation and review<br>NFP evaluation and assessment |

*feedback loop*

*programme cycle*

*project cycle*

needed for study of the transformations taking place in the system. SWOT analysis follows to enable the sector's strengths, weaknesses, opportunities and threats to be assessed. The analytical phase ends by examining the extent of participation in sectoral matters by those with a direct interest and for consultation with the public. This stage covers studies of the roles and interests of member organizations, the ways in which sectoral cohesion can be maintained and enhanced, the leadership function, and the manner in which sectoral affairs are directed and controlled.

The **aims** phase begins by identifying and interpreting the general conditions governing the strategy and associated national programme. Alternative scenarios can then be assembled, assessed and put out for consultation; the views expressed lead to their revision and eventual choice of a strategy that attracts widespread support. This leads to the definition of strategic objectives and the particular activities necessary to achieve them, on which the NFP is based. NFP preparation includes project identification. This phase is completed by the preparation, ratification and dissemination of a forest policy statement by the government to support the strategy and NFP.

The **action** phase deals with programme development on a project basis. Each project is considered separately and elaborated as resources and priorities permit, following the steps in the project cycle from preparation and appraisal to implementation and operations. This procedure allows the NFP to be implemented flexibly in response to changing conditions, while preserving its objectives and sense of direction. During implementation, progress needs to be recorded and monitored for both the projects and the programme as a whole. Evaluation of results completes the project cycle and contributes to overall assessment of the success of the NFP.

In its entirety, the strategy process provides for all the steps required to promote and achieve forest sector development, on a time scale that is appropriate for decisions of this importance. The complete strategy cycle is usually repeated at intervals of 5–10 years — long enough to preserve continuity without creating rigidity from a policy point of view. Within the strategy cycle are subsidiary cycles for the NFP and projects; the length of the programme cycle is likely to coincide with the strategy cycle, although it can be less, and project cycles normally match the periods for which project funds are approved. Projects, usually grouped together in subprogrammes, represent the tactical level in the decision making hierarchy and the details of individual programmes represent the operational level. The 3A cycle of improvement is therefore repeated, with suitable modification, at the tactical and operational levels. The strategy process is designed to generate increased social welfare through action at all levels. The sectoral development path that it traces is determined by the incremental improvements created by projects, with any periodic re-routing that is deemed necessary when the strategy is revised or a crisis occurs. The twelve-stage process that is prescribed is expected to lead to more robust strategies, with less risk of policy failures and fewer impractical plans or unworkable projects. Grand designs for the forest sector need not lose their integrity and its managers need not lose their way. Hopefully, by employing this strategy process,

those responsible for guiding the forest sector along its development path may stumble less in future than they have in the past.

## SUMMARY

- Strategy is an important general concept, first conceived for military/diplomatic purposes and since applied during the last century in business organizations and the public sector.
- Strategy can be perceived as either a grand design, a basis for decision making, or a sense of direction, depending on the perspective (military/diplomatic, business or government) with which it is viewed.
- Effective strategies have four features: goals or objectives linked to action sequences or programmes, they develop round a few key ideas or thrusts, they deal with future events that are unknowable and therefore try to build a posture that is strong and flexible, and are hierarchical, composed of subordinate, mutually supporting strategies.
- Strategy is concerned with: the scope of an organization's activities, matching its activities to its environment and to its resource capability, the implications of major resource shifts, effects on operations, changes in the organization's values, expectations and mission, the long-term direction of the organization and complexity due to uncertainty.
- There are various types of strategy ranging from deliberate to emergent. At one extreme, strategy is based on precise intentions formulated by a central leadership, at the other, it is the result of circumstances and the way the organization reacts to change. Most strategies lie somewhere in between. Forest strategy needs both direction and responsiveness.
- Strategy can be distinguished from tactics and operations, according to the level and importance of decisions taken, although their boundaries are indistinct. It is more useful to describe the action necessary to carry out strategy in the forest sector in terms of programmes and projects.
- Public policy is equivalent to strategy for organizations in the public sector. It can be viewed as either a rational system, based on deliberate aims, or a political activity from which strategy emerges. There is general agreement that it should be treated as a circular process, beginning with agenda setting and ending with evaluation and review.
- Forest policy is a subset of public policy. A process approach to policy-making is replacing the lists of aims, which were usual in the past. For the sake of clarity, it is preferable to separate policy from strategy and retain the term 'forest policy' for public declarations of the government's intentions for developing the forest sector.
- Forest strategy is defined as the cyclical process by which forest sector development is guided and promoted. In relation to each particular country or region covered by the strategy, it should provide a grand design, a basis for decision making and a sense of direction for the sector. Its purpose is increased welfare

for the community. National forest strategies need to interpret this general aim in ways that suit each country's circumstances, having regard to the resources, activities, outputs, organizations and institutions that make up the forest sector. The function of the strategy process is to establish the constraints and specific development objectives that are relevant to the situation and outline the means by which those objectives are to be pursued, within a flexible format. Programme and project preparation form part of the strategy process, supported by monitoring to record and measure progress and the subsequent evaluation of results.

- Imperatives are general conditions to which forest strategies should conform. Four are identified: all strategies should be (i) holistic, (ii) sustainable, (iii) equitable, and (iv) participatory. Imperatives require interpretation to meet national circumstances.
- Financial uncertainty affects programmes and projects. NFPs are best treated as frameworks for sectoral development, allowing flexibility for redeployment of resources and subsequent project development as circumstances permit. Priorities tend to be determined by the availability of funds for specified purposes, particularly if foreign aid is involved, and there is a distinction between a project's urgency and its importance.
- Uncertainty does not mean that strategies are pointless; the alternative is aimless drift, with no concern for the future. The strategy process can be designed to cope with unexpected events. Strategy formulation allows people to clarify their ideas and intentions.
- A strategy procedure is proposed which is based on the 3A improvement cycle: analysis, aims and action. The process is divided into twelve stages, four during the analytical phase, five in the aims phase and three in the action phase. The stages follow a logical sequence, after which the cycle restarts. The process allows for feedback at the strategy formulation stage, and includes subsidiary cycles covering NFP preparation, implementation and revue, and for developing and carrying out individual projects.
- The complete cycle is likely to be repeated every 5–10 years, long enough to preserve continuity without creating rigidity. Programme and project cycles are shorter. The twelve-stage process that is prescribed is expected to lead to more robust strategies, with less risk of policy failures and fewer impractical plans or unworkable projects.

## FURTHER READING

The military/diplomatic origins of strategy and strategic ideas in relation to business are covered by Mintzberg and Quinn in *The Strategy Process* (Prentice Hall). Another widely used text is *Exploring Corporate Strategy* by Johnson and Scholes, also published by Prentice Hall. A collection of readings on the subject, edited by Susan Segal-Horn, has been published by The Open University Business School in association with Blackwell.

Well known books on public policy include *Policy Analysis for the Real World* by Hogwood and Gunn (Oxford University Press) and *Public Policy* by Wayne Parsons (Edward Elgar Publishing). A collection of readings, edited by Ham and Hill, is contained in *The Policy Process: A Reader* (Harvester Wheatsheaf). *Creating Public Value* by Mark Moore deals with strategic management in government.

A recent book on forest policy, written from a North American standpoint, is *Forest Resources Policy* by Paul Ellefson (McGraw Hill). See also *Forest Resource Policy* by Cubbage, O'Laughlin and Bullock (Wiley).

## SOURCES


1 James Brian Quinn. 'Strategies for Change' in Chapter 1 of H. Mintzberg and J.B. Quinn. *The Strategy Process: Concepts, Contexts and Cases*. 2nd. ed. Prentice Hall: Englewood Cliffs (1991), page 7.
2 M.J. Stahl and D.W. Grigsby. (1992). *Strategic Management for Decision Making*. PWS-KENT Publishing Company: Boston (1992), page 5.
3 Frederick W. Cubbage, Jay O'Laughlin and Charles S. Bullock). *Forest Resource Policy*. Wiley: New York (1993), page 16.
4 A.C. Worrel. *Principles of Forest Policy*. McGraw Hill: New York (1970), page 2.
5 M. Gane. Forest policy making. *Commonwealth Forestry Review*, **62**(2), 85–92, 1983.
6 Government of Cyprus. *A Statement of Forest Policy*. Forest Department: Nicosia (1984).
7 Henry Mintzberg ' Five Ps for Strategy' in Chapter 1 of H. Mintzberg and J.B. Quinn. *The Strategy Process: Concepts, Contexts and Cases*. 2nd. edition, Prentice Hall: Englewood Cliffs, New Jersey (1991), page 17.
8 J. Harvey-Jones. *Making it Happen*. Collins: London (1988).
9 James Brian Quinn op cit, page 10.
10 G. Johnson and K. Scholes. *Exploring Corporate Strategy*. 2nd. edition Prentice Hall: Hemel Hempstead (1988), pages 5–8.
11 P. Dobson and K. Starkey. *The Strategic Management Blueprint*. Blackwell: Oxford (1993), page1.
12 J.I. Moore. *Writers on Strategy and Strategic Management*. Penguin Books: Harmondsworth (1992).
13 B. Burnes. *Managing Change: A Strategic Approach to Organisational Development and Renewal*. Pitman: London (1992).
14 Susan Segal-Horn. *The Strategy Reader*. Blackwell in association with The Open University: Oxford (1998), pages 11–12.
15 W. Schlich. *Schlich's Manual of Forestry, vol. III Forest Management*. 3rd. edition, Bradbury, Agnew & Co. Ltd: London (1905), pages 244–247.
16 Maurizio Merlo and Manuel Paveri. Formation and implementation of forest policies: a focus on the policy tools mix. Position Paper published in*Proceedings of the Ninth World Forestry Congress*, volume 5 (1997), pages 233–235.
17 Henry Mintzberg op cit, pages 12–19.
18 Henry Mintzberg and James A. Waters. Chapter 1 in *The Strategy Reader*, edited by Susan Segal-Horn. Blackwell in association with The Open University: Oxford (1998). Originally published in *Strategic Management Journal*, 6, 257–72, 1985.
19 James Brian Quinn, op cit, page 5.
20 Laurie J. Mullins. *Management and Organisational Behaviour*. Fourth edition. Pitman: London (1996), pages 300–302.
21 Christopher Hammond and Michael Hill. *The Policy Process in the Modern Capitalist State*. 2nd edition. Harvester Wheatsheaf (1993), Chapter 1.
22 Attributed to G. Cunningham. Policy and practice. *Public Administration*, 41, 1963. See Christopher Hammond and Michael Hill. *The Policy Process in the Modern Capitalist State*. 2nd edition. Harvester Wheatsheaf (1993), page 11.

23 Brian W. Hogwood and Lewis A. Gunn. *Policy Analysis for the Real World*. Oxford University Press (1984), Chapter 2.
24 Ian Gordon, Janet Lewis and KenYoung. Perspectives on policy analysis. *Public Administration Bulletin*, **25**, 1977, pages 26–30, reproduced in *The Policy Process: a Reader*, edited by Michael Hill. Harvester Wheatsheaf: Hemel Hempstead (1993), pages 5–9.
25 Martin Minogue. Theory and practice in public policy and administration. *Policy and Politics*, **11**, 1983, pages 63–85, reproduced in *The Policy Process: a Reader*. edited by Michael Hill. Harvester Wheatsheaf: Hemel Hempstead (1977), pages 10–33.
26 Gilbert Smith and David May. The artificial debate between rationalist and incrementalist models of decision making. *Policy and Politics*, **8**, pages 147–61, 1980, reproduced in *The Policy Process: a Reader*. edited by Michael Hill. Harvester Wheatsheaf: Hemel Hempstead (1993), pages 197–211.
27 C.E. Lindblom. The science of "muddling through". *Public Administration*, 19, pages 79–99, 1959.
28 Brian W. Hogwood and Lewis A. Gunn, op cit, Chapter 1.
29 Owen E. Hughes. *Public Management and Administration*. MacMillan (1994), Chapter 6.
30 FAO. *Formulation, Execution and Revision of National Forest Programmes: Basic Principles and Operational Guidelines*. Food and Agriculture Organization of the United Nations: Rome (1996).
31 Michael Howlet and M. Ramesh. *Studying Public Policy: Policy Cycles and Policy Subsystems*. Oxford University Press (1995).
32 Paul V. Ellefson. *Forest Resources Policy*. McGraw Hill (1992).
33 Bertram Husch. *Guidelines for Forest Policy Formulation*. FAO Forestry Paper 81, Food & Agriculture Organization of the United Nations, Rome (1987).
34 FAO, op cit, Part II.
35 The functions of forest policies were discussed in an article and subsequent correspondence with Jack Westoby; see M. Gane, op cit and "Forest policy: whose concern is it?", *Commonwealth Forestry Review*, **62**(3), 140–146, 1983.
36 Mark H. Moore. *Creating Public Value*. Harvard University Press (1995), Chapter 2.
37 David Palin. *Management of Development Forestry*. Food & Agriculture Organization of the United Nations, Rome (1980).
38 M. Gane. *Papua New Guinea: Preliminary Report on Forest Policy*. Food & Agriculture Organization of the United Nations, Rome (1985).
39 M. Gane, D.B. Thorud and G.R. Watt. *Nepal: Review of Forest Sector Master Plan*. Food & Agriculture Organization of the United Nations, Rome (1988).
40 See Interview with Alvin Toffler in *Business 2.0* Magazine, November, 2000, page 110.
41 Kenichi Ohmae. *The Mind of the Strategist*. McGraw Hill (1982).
42 Albert Hirschman. *Development Projects Observed*. The Brookings Institution, Washington (1967), Chapter 1.

CHAPTER 9

# STRATEGIC METHODS

The discussion of strategic ideas in the previous chapter leads on to consideration of the methods by which those ideas can be put into practice. Each stage of the forest strategy process, which was presented in outline, needs to be elaborated to describe what should be done. Various methods are available for use during the three phases of the process, which are suitable for the particular tasks specified by the twelve stages in the sequence shown in Table 8.2. Some of these methods are in use in the forest sector, though not necessarily so generally or as commonly as they should be; others deserve to be introduced, with or without modification, to tackle the issues on which the strategy process focusses attention. These methods have been applied in other fields, particularly in the business world and also for public administration. They make use of techniques, such as cost-benefit analysis, which have been developed in different disciplines. Forest strategy needs an appropriate armoury of methodological weapons if it is to succeed in avoiding the policy failures of the past. Part of that armoury is already available and part awaits development.

Attention is focussed particularly on the problems of choice that arise during strategy formulation and programme development. The analytical phase prepares for choice of strategy, by collecting and presenting the information on which alternative scenarios are based, the aims phase is concerned with choice of strategic objectives and selection of an appropriate programme to put them into effect, and the action phase deals with the consequential series of tactical and operational choices involved in programme development. All these choices are interconnected, with feedback and reconsideration as required, through the subsidiary cycles of the strategy procedure. The principle that governs strategic choice is the pursuit of improvements in the welfare of the community, i.e. social betterment, but the way in which this general aim should be interpreted in relation to the forest sector is a major obstacle. Innovative solutions are necessary.

Some of the problems arise because of uncertainty about the outcomes of the choices that are made and some are caused by appraisal difficulties. Alternatives are assessed by comparing their relative desirabilities, as judged from their probable consequences. If the expectations prove wrong, for any reason, the choices may also turn out to be faulty. Special attention must therefore be given to ways of

countering the effects of uncertainty. Lower output expectations may be traded off against increased reliability of future output flows.

This chapter is divided into three sections, corresponding to the three phases of the strategy cycle. The first section covers the manner and content of sector reviews, modelling in so far as this is feasible and SWOT analysis; it also includes the sector's participative and institutional aspects. The second section deals with imperatives and scenario preparation, leading to examination of the techniques for selecting a strategy and preparing a NFP. Programme development, monitoring and evaluation methods are discussed in the third section.

## 9.1 ANALYSIS

Facts underpin successful strategies. All the information about the forest sector that is relevant to strategy formulation and decision making should be collected during the analytical phase of the strategy process. A large amount of data about all aspects of the sector needs to be assembled and refined.This phase provides the basis for making informed choices during the later phases. It leads to a grand design for the sector and is the starting point for deciding which route its development should follow. It also provides the reference point from which to measure future progress.

Choice of strategy requires a full assessment of the present state of the forest sector and what is expected to happen to it under various assumptions. The four stages of the analytical phase serve this purpose. Evidence is collected at the *sector review* stage, which enables its existing condition to be described; it also indicates how the sector is likely to change over time in the absence of deliberate interventions. What exists and what is expected to happen if the present activities and pattern of resource allocation continue without alteration constitute a baseline with which alternative future states can be compared. The *modelling* stage provides projections of future outputs and changes in the balance between supply and demand; these projections enable a range of scenarios to be prepared. The sector's position relative to other sectors and its standing in relation to external events is revealed by *SWOT analysis*, which provides valuable pointers to the future; this stage influences the scenarios, strategy formulation and NFP preparation. Similarly, the present arrangements for *participation* in sectoral affairs set the scene for future changes in the sector's institutional framework.

### Sector Review

The sequence used to describe the forest sector in Part I provides a convenient systematic approach when reviewing the sector. The first five steps in the review process aim to establish the facts, the remainder are more concerned with their analysis and interpretation. The series consists of the following:-

(i) resources assessment, covering the sector's natural, capital and human resources,
(ii) analysis of activities by subsectors,

(iii) identification and, where possible, measurement of output flows of all kinds,
(iv) description of sector organizations, their activities, roles, interests and influence,
(v) examination of the institutional framework by functions.
(vi) input-output analysis and interactions with other sectors,
(vii) sector capacity assessment and identification of shortfalls,
(viii) characteristics of regions/provinces/districts in relation to strategy,
(ix) review of external interactions, including trade, investment and aid,
(x) contribution to gross domestic product and national income.

**Resources** assessment covers the sector's endowment of natural, capital and human resources, their allocation for different purposes and the provision made for resource renewal, as described in Chap. 3. As far as the available records permit, the assessment should be quantitative, supported by tables and backed by maps to show their distribution and accessibility. The most recent statistics should be used to describe the present situation and construct a baseline against which future changes can be measured; figures from earlier years may reveal significant historical trends which provide useful pointers to the future. The main sources of information are likely to be government departments and large organizations in the private sector, but the review should try to locate any relevant data, wherever it is stored. The reliability of the records and any serious inadequacies should be noted for future remedy. The person(s) carrying out the review need to be familiar with what is available and where it can be found.

Forests are important components of the sector's natural resources. Detailed examination is required of the range of forest ecosystems on land designated as forest, and of the trees and woody vegetation found elsewhere, on land which is not classed as forest. Forests are usually characterized as accessible or inaccessible, and divided into two categories according to their use for production or protective purposes. However, further breakdown by ecosystem, ownership, form of management and type of output is essential. Estimates of growing stock, species composition, density, age class distribution and growth rates are required for forests and trees being grown for timber; areas set aside for other purposes, such as water supply, wildlife or amenity, require other data sets to adequately describe their significance and potential. These range from streamflow measurements and seasonal variations in catchment areas, to species lists and populations in nature reserves, and visitor numbers and facilities in national parks. The precise nature of the information that is necessary varies according to circumstances, but the object of collecting it is to provide a foundation for decisions about future use and development of the available resources.

Capital resources consist of the physical capital, made up of buildings, machinery, vehicles and equipment, that is in use in the forest sector. The value of these assets is a measure of the investment that has taken place and the capital employed. Estimates of the capital resources available to the forest sector are difficult to assemble. National statistics may be helpful, although they seldom cover all aspects of sectoral activity. Surveys of industrial capacity may be undertaken from time

to time, but the capital employed in forest management activities is problematic. Asset registers, which record the details and quantities held, are usually maintained by large organizations, but small enterprises are less likely to keep reliable records. Company accounts normally show the value of their capital assets either at cost or after providing for depreciation; government agencies, such as forest departments, may not keep reliable records of the value of their assets. It is also possible for estimates of capital obtained from these sources to be misleading because organizations rely on hiring plant, vehicles and equipment from suppliers outside the sector. For strategic purposes, while it is important to investigate the sector's capital resources, accurate estimates assets may be less important than assessing the capacity of its member organizations to undertake programmes of capital works.

Human resources are also difficult to estimate. Employment statistics published by governments are unlikely to separate numbers in the forest sector from other industries and may not include all categories of workers; part-time employees or workers in small enterprises are sometimes left out. As with capital, a direct approach to organizations may be the easiest way to find out about the numbers, types and skills of those employed in the sector. The assessment should also take account of the employment potential available (seasonal or full-time) amongst farmers in areas adjacent to forests and tribal forest dwellers in some developing countries. It is important to identify capacity bottlenecks which might hinder future development of the sector. Other aspects of the human resources situation include educational standards, levels of skills and training facilities.

The pattern of resource allocation can be discerned through budgets and accounts. Investment is normally separated from recurrent or operational expenditure and payrolls are distinguished from purchases of goods and services. It is less easy to break down total spending according to types of output or to identify the marginal expenditure required to increase the flow of particular outputs, although this information is relevant to strategy formulation. Changes in strategy lead to redistribution of the available resources and both the extent and the speed with which resources can be reallocated are features which require attention. The resources review should indicate any misuse of resources or inefficiency in the way they are combined. It is important to make the best use of existing resources by reallocation before seeking funds to purchase additional resources.

Resource renewal should be addressed during the review to find out if stocks are being depleted or capacity diminished. It is important to avoid running down the existing stock of assets and consequent loss of productive capacity; sustainability depends on maintaining the size and quality of the resource base. Forest resources become depleted if the rate of output removal exceeds the replacement rate, for example, by felling more than the annual increment of timber or excessive hunting of game animals. Capital resources are kept up by ensuring that there is adequate provision for maintenance and depreciation to enable buildings, machines and equipment to be replaced at the end of their useful life. The productivity of human resources depends on educational standards and appropriate training to maintain and enhance the level of skills among the workforce. The review should identify

shortcomings in the renewal provisions which need to be remedied by the strategy and the NFP.

**Activities** analysis covers the range of activities undertaken in the sector. It can be undertaken coveniently by subsectors, following the classification described in Chap. 4. The various activities in each subsector should be described to build up a complete picture of what goes on in the sector as a whole.

It is desirable, if data can be obtained, to show the value added attributable to subsector activities. Additionally, the adjustments necessary to account for growing stock changes in the forest management subsector should be calculated and some indication given of the carbon sequestration effects of present management practices. It may be possible to indicate where there is scope for improvement.

Estimates of employment and capital formation should also be shown by subsectors. The significance of trade activities, such as subsector contributions to exports or dependence on imports of raw materials should be explained.

**Output** assessment consists of identifying and quantifying, as far as possible, the various types of output attributable to the forest sector, which were described in Chap. 5. They include those which are tradeable commodities, such as timber and non-wood products, and also other outputs which provide services to the community, such as water supply, environmental protection and amenity. The full range of benefits should be described, including intangible benefits such as option values.

**Organizations**, interest groups and stakeholders should be reviewed by subsectors. They can be classified according to ownership, primary purpose, type of activity and main beneficiaries as shown in Tables 6.1 to 6.4 in Chap. 6. The functions of government ministries and departments need to be stated; in particular, the role of the forest department or forest service should be spelled out. There may be divided responsibilities, overlaps or gaps between ministries and departments, in relation to environmental matters, industry and trade for example. Forest owned by the state is usually managed by a government agency, private landowners either look after their own holdings or employ specialist companies to manage them; fragmentation has organizational implications in relation to sustainability. Private businesses tend to be concentrated in the harvesting, manufacturing and distribution subsectors; their scale and type of activity may have strategic implications. Attention should also be paid to the growth of service enterprises, NGOs and cooperatives which may offer opportunities for greater participation in sector affairs.

The **institutional framework** of the sector binds the sector together and helps to make it a recognizable entity. It is best described by reference to the five groups of functions which have been described in Chap. 6. The existing institutional arrangements in each group should be reviewed and their adequacy assessed. Their performance has an important bearing on strategic possibilities and attention should be paid to shortcomings which will need to be addressed when the NFP is prepared. Institutional change is a vital ingredient in sector development. Sensitive interactions and relationships between organizations are involved. If these are not fully understood from the outset, attempts to induce changes can easily lead to difficulties which may undermine future development. Arrangements for participation

in sectoral affairs, the resolution of conflicts and leadership issues need particular attention in this connection. It is also important to cover the institutional links between the forest sector and other sectors, which provide channels of communication with them and, in some situations, a way of protecting the forest sector from adverse external influences.

**Input-output analysis** is a well-known economic technique for exploring the intersectoral transactions that take place in an economy. It is usually presented in the form of a table, with the value of inputs on one axis and outputs on the other. In many countries such tables are prepared from time to time by the government statistical services. The method's usefulness for forest sector analysis is its ability to reveal the interactions taking place between subsectors and with other sectors such as agriculture. An input-output table for the sector shows its dependency on external suppliers of goods and services of all kinds, including raw materials, energy and fuel; in an outward direction, it shows the destinations to which forest products are sent. Input-output analysis has obvious limitations because it can only deal with inputs and outputs that are traded and have money value; it needs to be supplemented by an account of the intangible outputs emanating from the sector. The analysis is partial, nevertheless, it is useful for strategy formulation in countries where forest products are important economic commodities. Elsewhere, a simpler approach may be sufficient. This consists of describing the size, range and type of interactions with other sectors and the environmental or other kinds of benefit which they receive.

**Sector capacity** assessment is important because the resources that are available limit future development and influence the kind of strategy that should be adopted. Output flows cannot be increased unless resources are either redeployed or supplemented from elsewhere. It is necessary to identify where bottlenecks occur that would prevent outputs being increased, so that appropriate remedial action can be included in the NFP. The most likely limitations are the availability of suitable land for tree crops, an adequate communications network to enable more intensive management systems to be introduced and shortages of skilled staff and labour. An adequate information system is also essential to enable shortfalls to be identified and remedied.

**Regional, provincial and local characteristics** may have a significant influence on strategy preparation if particular parts of a country are so unlike the rest that they need to be treated in a different way. It may be necessary to have sub-strategies for particular areas under the umbrella of a national strategy for the whole country. One of the functions of the sector review is to identify and explain major differences of this sort, so that they are taken into account when aims are formulated. Such differences may be created by topography; e.g. mountainous regions may need a form of forest development which is centred on environmental protection, while lowlands where agriculture predominates concentrate on agroforestry. Other possible causes include large disparities in industrial development, climatic features and the need to cater for distinctive ethnic or social groups such as shifting cultivators.

**External interactions** cover relationships with other countries and the international community. It is necessary to review the sector's trade with other countries by providing tables of imports and exports, showing the quantity and value of the main types of product, and the balance of trade. National trade statistics are the main source. FAO statistics published in the yearbooks are based on data supplied by countries; the figures from past years enable trends to be identified and their causes explored. These statistics reveal the extent of the country's reliance on imports to meet its demand for forest products and its main markets for exports. There may be opportunities for import substitution and export promotion. The sector's effect on the balance of payments can be seen and steps taken to avoid unsustainable deficits in future.

The extent to which overseas investment and financial flows from abroad contribute to forest sector activities should be investigated. Inward investment may be a significant and necessary condition for sector development where domestic sources of finance are insufficient or cannot be mobilized. Investment in forest industries may come from overseas companies, sometimes from multinational corporations. Care is necessary with figures obtained from the latter, however, because of the possibility of transfer pricing between subsidiaries, which is designed to increase the book value of capital assets and lower profits for tax purposes. With the exception of some commercial investment in fast-growing plantations, private finance from abroad tends to be attracted to harvesting, processing and manufacturing, where pay back periods are generally shorter and profitability is seen to be higher. Most investments by overseas governments in the forest sector come in the form of aid for forestry purposes. The developing countries are the main recipients. Some of this is routed through international agencies and an increasing amount is being allocated to NGOs in the hope that it will have a direct impact on field operations and the incomes of local communities in poor countries. Much overseas aid comes in the form of technical assistance rather than loans or gifts of money.

**Output and income contributions** to the national economy are derived from forest sector activities. Sector organizations generate value added which forms part of the GDP, as described in Chap. 4. Estimates of the size of this contribution should be included in the review, if possible with corrections for any changes in the growing stock. National income contributions correspond with the total value added after adjustment for foreign transactions. These statistics can be derived from the national statistics which are produced annually by government statistical services. Historical data can be used to show whether the proportion of GDP attributable to the forest sector has increased or decreased.

### Transformations and Modelling

The sector review provides data on which to base estimates of supply and demand. These are used to prepare the alternative sets of projections of future output flows on which decisions about strategic aims depend. It is necessary to match future supply possibilities to the expected levels of requirements for forest sector outputs.

Forecasting involves making assumptions about what may happen to the sector's resources, activities and outputs in the years to come and the likely responses of its organizations and institutions. They all interact and it is essential to treat the sector as a system. Therefore, the output projections should attempt to portray future system behaviour under clearly stated assumptions. This is a complex task. The methods available were outlined in Chap. 7. They include:-

- description and analysis of the *transformations* which take place in the sector,
- *gap analysis* to discover significant imbalances between the sector's capacity to provide outputs of all kinds and the requirements of consumers and society,
- *modelling*, using either simple conceptual models of parts of the system, or more complex representations which simulate system behaviour with the aid of a computer as with TIMPLAN and similar modelling system.

A comprehensive description of the forest sector as a system can be built up by analysing all the transformations that take place. Transformations can be listed and their characteristics summarized by means of a table (as in Table 7.1). A matrix showing the transformations according to the organizations that carry them out can also be prepared (as in Fig. 7.2). Each cell in the matrix portrays a particular input-output relationship and its interactions (see Fig. 7.3). Gap analysis and modelling depend on establishing the quantities involved in these transformations. For example, the conversion of logs into sawn timber can be expressed as the number of units of roundwood required to produce one unit of sawn timber. Gap analysis needs this conversion factor to compare the projections of roundwood supplied from the forest with the equivalent volume of sawn timber required to meet consumer's needs. Models such as TIMPLAN employ these conversion factors and also use data about the other resource inputs in the transformation process (e.g. labour and capital used to produce one unit of output). TIMPLAN also makes use of information about any utilizable by-products, such as offcuts, to enable a composite assessment of resource use to be built up. Transformation analysis is therefore the first step towards preparing projections of future supply and demand.

Gap analysis is based on estimates of future supply and demand which can be compared to discover shortfalls or excesses. A long term perspective is used, which disregards short-term market fluctuations in prices; it is customary to assume that real prices will remain the same and to ignore the effects of inflation on costs and returns. Supply projections depend on the quantities that can be harvested, collected or produced from the forest resources and demand projections are based on the amounts that consumers are expected to require in future years at constant prices. The supply of processed products is also affected by the capacity of the mills or factories to carry out the transformation processes, although this is generally overlooked in gap analysis.

Outputs of wood products, for example, depend firstly, on the quantity of standing timber which has reached a size fit for felling and secondly, on the industrial capacity to harvest, convert, manufacture and distribute the resulting products. Gap analysis concentrates on the former and involves the preparation of projections of future yields using data about the growing stock, its rate of growth and its age

class distribution, which change year by year. A growth model of some description is required[1]. Some sort of model of consumer preferences and demand is also necessary. Typically, it is assumed that requirements are a function of the number of consumers and their incomes; demand increases as the population grows and becomes wealthier. Comparison of the two sets of projections reveals whether shortfalls or surpluses are expected and indicate where remedial action (such as afforestation) is required to close the gap. A modelling system like TIMPLAN can generate sets of projections rapidly and also enable the effects of altering the assumptions on which they are based to be tested. Modelling facilitates sensitivity analysis.

A similar procedure can be used to reveal shortfalls for other types of output, although not all are easy to predict or easily quantifiable. The supply of tangible outputs, such as game meat, mushrooms and fruits is largely dependent on the extent and condition of the forest ecosystems from which they come; the requirements for these outputs can be ascertained from estimates of the amount consumed by local populations plus the quantities being marketed commercially. Changes can be anticipated on the supply side if, for any reason, alterations are expected in the area or productive capacity of the forest; changes on the demand side may arise if consumers' lifestyles change or new markets open up. In many countries forests play a vital role in water supply and projections of supply and demand for water are necessary, based on the permeability of the catchments and their storage capacity on the supply side, and the needs of the community on the demand side. Projections of service outputs such as carbon sequestration and biodiversity are more problematic. The supply of both depends on the composition and state of the forest, but society's future expectations are very difficult to pin down, although the consequences of climate change and threats to important species are dramatically altering public perceptions of their importance.

Difficult though it may be to assemble projections for some types of output, the task should be attempted even if the results are rudimentary. A strategy, which ignores or overlooks some outputs, cannot be described as comprehensive and may also be regarded as both unsustainable and inequitable. Actual or possible imbalances, between the sector's productive capacity and society's requirements for forest sector outputs of all kinds, need to be identified before developing a strategy that aims to close the forseeable gaps in future. The extent to which this aim can be achieved will determine the forest sector's contribution to future public welfare.

## SWOT Analysis

Analysis of the **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats that face an organization is a widely used tool of business management[2]. SWOT analysis, as it is commonly called (See Box 9.1), is used to determine a firm's strategic position in relation to the changes taking place in the business environment[3]. It provides a mechanism for systematically thinking through the extent to which an organization can cope with outside events[4]. It is applicable to companies operating within the forest

**Box 9.1 SWOT analysis in business organizations**

"SWOT analysis provides convenient headings under which to study an organization and may provide a basis for decision-making and problem-solving.

- **Strengths** are those positive aspects or distinct attributes or competencies which provide a significant market advantage or upon which the organisation can build, for example through the pursuit of diversification. These are characteristics of the organisation such as present market position, size, structure, managerial expertise, physical or financial resources, staffing, image or reputation. By searching out the opportunities which match its strengths the organization can optimise the effects of synergy.
- **Weaknesses** are those negative aspects or deficiencies in the present competencies or resources of the organisation, or its image or reputation, which limit its effectiveness and which need to be corrected or need action taken to minimize their effect. Examples of weaknesses could be operating within a particular narrow market, limited accommodation or outdated equipment, a high proportion of fixed costs, a bureaucratic structure, a high level of customer complaints or a shortage of key managerial staff.
- **Opportunities** are favourable conditions and usually arise from the nature of changes in the external environment. The organisation needs to be sensitive to the problems of business strategy and responsive to changes in, e.g. new markets, technology advances, improved economic factors, or failure of competitors. Opportunities provide the potential for the organisation to offer new, or to develop existing, products, facilities or services.
- **Threats** are the converse of opportunities and refer to unfavourable situations which arise from external developments likely to endanger the operations and effectiveness of the organisation. Examples could include changes in legislation, the introduction of a radically new product by competitors, political or economic unrest, changing social conditions and the actions of pressure groups. Organisations need to be responsive to changes that have already occurred and to plan for anticipated significant changes in the environment and to be prepared to meet them."

Source: Mullins (1996), pages 308–9.

sector. The method is equally useful for forest strategy, although some modification is necessary to cope with the situation in a conglomerate, composed of many diverse organizations, instead of a single enterprise.

The main differences between applying the SWOT concept to the forest sector instead of a company are due to their divergent aims and motivation. A firm's perception of its strengths and weaknesses is based mainly on its market advantages or disadvantages; threats and opportunities are seen in relation to the comparative abilities of its competitors. Strengths and weaknesses from the sectoral point of view

are judged by the significance of the sector's contribution to the national economy and welfare, and the extent to which society's requirements and aspirations can be satified; opportunities and threats come from its interactions with other sectors, government policies and patterns of resource allocation, international pressures and the dangers of disasters, such as fires and storms.

*Table 9.1* SWOT analysis of the forest sector in Cyprus

| Strengths | Weaknesses |
|---|---|
| 1. Cyprus has a *long forestry tradition* and the Forestry Department is one of the oldest government departments.<br>2. The Forest Policy has been in force since 1950 and *multiple use* is a well established principle, based on the policy.<br>3. There is a *pro-forestry attitude* among Cyprus people, the civil service and Parliament.<br>4. The beauty of the mountain scenery, local climate, wildlife, biological diversity, picturesque villages and facilities provided for visitors encourage *tourism and recreational use of the forests*.<br>5. Cyprus has an *exceptional natural environment*, due to its island position and the effects of separation from other countries on the flora and fauna.<br>6. The Forest Department possesses *technical know- how* in relation to forest management, afforestation and restoration of degraded land.<br>7. There is a well organised and effective *system of fire protection* covering the State forests and adjacent areas. | 1. *Low forest productivity* for timber and biomass due to adverse climatic conditions for tree growth.<br>2. *Natural regeneration* is a *slow and difficult* process, due to variable and unreliable rainfall.<br>3. A considerable part of the productive *pine forest is understocked and deteriorating*; up to 50% of area needs to be excluded from felling for 30–40 years.<br>4. The present policy and system of management, mainly concerned with lumber supply, is *out of step with public concern about environmental quality and the loss of competitive advantage* for domestic wood processing in relation to imported products, cased by the trend towards greater trade liberalisation.<br>5. *Slow progress in increasing the forest area* although private and State land suitable for afforestation is neglected, abandoned and becoming degraded.<br>6. *Wildfires* are destroying private forest and adversely affecting the countryside.<br>7. Slow progress in designating areas as *National Parks and Nature Reserves* and protecting features of special scientific, historical and cultural interest.<br>8. Serious problems with *insufficiently regulated and unsustainable hunting practices*, which conflict with the needs of nature conservation, national parks and recreation management.<br>9. *Forest policy* in need of revision.<br>10. *Institutions which need reexamination and restructuring* to cope with changing conditions; in particular the Forest College continues to teach traditional technical subjects unsuited to new socio-economic trends and the provision of environmental services. |

(*Continued*)

*Table 9.1* (*Continued*)

| Opportunities | Threats |
|---|---|
| 1. To *broaden the 'sustainability concept'* as applied to forest management in accordance with international obligations.<br>2. To *accelerate afforestation* of land that has been abandoned and is degrading with external assistance from the European Union, Global Environmental Fund and similar sources.<br>3. To extend the Forest Department *fire protection system* to non-State lands, possibly with external assistance from the European Union, by collaborating with other agencies to provide a national integrated system.<br>4. To protect and enhance *the quality of the environment* by conservation of sites which are important for heritage, scenery, wildlife and biodiversity.<br>5. To improve *general health and wellbeing* by providing opportunities for recreation and tourism.<br>6. To support *forest villages* and *village communities* more effectively.<br>7. To contribute more to *watershed protection, water storage and supplies*.<br>8. To use modern information technology to educate all sections of society about the role of forests in Cyprus and the benefits they confer.<br>9. To align forest strategy and development in Cyprus with the objectives of the European Union. | 1. *Inertia* in the Government prevents sensitive issues, such as the regulation of hunting and the release of land for afforestation, from being dealt with.<br>2. *Failure to redeploy domestic resources* of manpower and money to meet the needs of a new strategy.<br>3. *Supplementary assistance from abroad* may not be forthcoming.<br>4. *Organizational and institutional restructuring* fails to take place.<br>5. *Laws are not harmonized* to provide a comprehensive framework for dealing with environmental and conservation issues.<br>6. *Recreation and tourism is inadequately controlled or misdirected*, allowing visitors to destroy what they come to see, causing environmental deterioration leading to unsustainability. *Conservation and development need to be integrated* and related to carrying capacity through local plans. |

Source: *Strategy for Forest Sector Development in Cyprus*, pages 21–23.

SWOT analysis requires both an understanding of the environment and the capabilities of the sector. The sector's strengths and weaknesses are largely internal factors, whereas the opportunities and threats are more likely to come from outside[5]. Its strengths are what it is good at and its weaknesses are where it is at a disadvantage; opportunities are trends or circumstances that favour the sector, whereas threats are potentially dangerous to its resources or likely to obstruct its development. These four elements should be listed. The example in Table 9.1 shows the SWOT analysis carried out prior to scenario identification in Cyprus, as was previously described in Box 7.6.

**Participation**

Participation in sectoral affairs is an essential ingredient of strategy preparation. During the analytical phase of the cycle, the basis needs to be established from which to extend participation in the future. It is necessary to describe what arrangements exist for consultation with the various organizations and interest groups and the extent to which they are involved in joint action of any kind. An assessment is also required of the adequacy of these participative arrangements, including participants roles, procedures for their involvement, their community of interests, leadership functions and the direction and control of sectoral activities.

The starting point for this assessment is the list of organizations which was prepared during the sector review stage; this list provides information about the organizations, arranged by subsectors, describing their ownership, primary purpose, type of activity and main beneficiaries. Stakeholders need to be identified and their attributes of power, legitimacy and urgency assessed. The roles of the participants in sectoral development can then be compared with the formal or informal arrangements for meetings and consultation, in order to judge the extent to which their interests are adequately represented. The assessment should also take account of any general procedures for ascertaining public opinion, or for hearing the views of sections of the community on forestry matters. Channels of communication which are (or could be) used to explain policy and to educate the public about forest sector affairs should be explored. The extent to which there is a demonstrable sense of unity among participants and sectoral cohesion can be investigated.

A key question is where responsibility lies for conducting the forest strategy process. Who decides matters of forest policy? Which government ministry or department looks after forest resources? Is responsibility for the forest sector split between departments, with, say, forest industries forming part of the portfolio of a separate ministry for industry and trade? What other responsibilities are also covered by the ministry which handles forestry and do these reinforce or detract from the amount of attention that the forest sector receives? It is important to establish the power sharing arrangements within the public administration, in so far that they apply to the forest sector, and the means by which differences or disputes are resolved. There are sometimes committees or consultative arrangements, which have been set up to coordinate the work of departments or agencies, operating within a ministry or crossing ministerial boundaries. The final arbiter in all these matters must be the government, but it is necessary to identify the particular points in the administrative machinery where decisions are taken and power resides.

The form of government may influence the strategy process. Under a federal constitution power is shared between the centre and the states; forest strategy may be decided at either federal or state level. In some cases forest sector responsibilities are split between the federal and state governments, as in Pakistan and Malaysia where research is a national activity while forest management is done at state level. Unitary states are generally less complicated, although some responsibilities may be devolved to provincial or district level. Decentralized, local administration

is a feature in some countries, such as Nepal. Generally, forest strategy cannot be divorced from the structure and institutional realities of a country's system of government. Each country deals with forest sector affairs in its own way, hopefully in a manner that is suited to its needs.

Participatory arrangements vary greatly. Where a large proportion of the forest resources are owned by the state, their management is usually in the hands of a government department or forest service. These agencies are influential and tend to dominate debates about forest policy; sometimes they still behave dictatorially, although high-handed forms of administration are now outmoded. In countries with fragmented forest ownership by numerous individuals or groups, the role of government is more collaborative and tends to be focussed on maintaining management standards and the provision of services. A participatory approach is essential to secure cooperation and goodwill where agroforestry is being promoted. The extent to which participation by forest industries and users of forest products is encouraged or deliberately arranged is less clear, even though it concerns their future prosperity. Forest industries in corporate ownership are managed by their directors on behalf of shareholders; in some countries they are strong enough to influence governments directly, elsewhere, powerful trade associations negotiate with governments on behalf of their members. The role of NGOs in providing a voice for all those rural people, who have a stake in forest development but are otherwise unrepresented, is now recognised although not always listened to. Too often, participation by the beneficiaries of forest sector outputs is not well-organized. Generally, governments have tended to introduce participatory practices in response to particular pressures coming from interest groups or because policies based on direct action and legal sanctions have failed. Participation has yet to be widely adopted as the appropriate ideological approach, which is justified by the need for voluntary association in a conglomerate made up of independent organizations with a common interest. The participatory approach should be underpinned by a holistic view of the sector.

It is apparent that overall responsibility for supervising sectoral development and providing leadership should remain with the government. It is not appropriate to leave this duty to any of the individual organizations within the sector, which are concerned with the work of its parts rather than the complete picture. The common interest needs to be safeguarded. A broad view must be taken and the most appropriate place within the administrative system from which to see it needs to be identified. The most likely location is in the ministry responsible for forest resources. Often in practice, by design or default, the task of reviewing and analysing the forest sector for strategic purposes is passed to the agency responsible for managing state forests; other organizations usually lack the technical expertise required. The same department may also take charge of the administrative aspects of the subsequent phases in the strategy cycle, including procedures which provide for participation in the process. It may prepare scenarios, formulate strategy and draw up the NFP. It may also provide the direction, the drive and control required for the effective promotion of sectoral development. However, it is important to distinguish this

executive role from that of taking the key decisions about the strategy itself, which should not be delegated. As with all public policy issues, the government should have the last word.

## 9.2 AIMS

The second phase of the strategy process deals with the choice of suitable aims for forest sector development and selection of the means by which those aims can be converted into real changes in the sector. Its resources, activities and outputs, its organizations and institutional framework, are all subject to alteration as the result of the interventions prescribed in the NFP. These deliberate changes are designed to achieve the aims which have been selected. Consultation about the choice of aims is necessary and their endorsement by the government backs them with authority; support for the programme depends on participation by sectoral interest groups and public acceptance. The aims phase leads directly to the final phase in the 3A cycle, which is concerned with action to develop and implement the programme.

The aims phase contains five stages. First, it is necessary to identify and interpret the *imperatives* with which the strategy must comply. *Scenarios*, representing possible outcomes, can then be prepared, assessed and presented as a basis for consultation. The *strategy formulation* stage leads to choice of the course of action which is considered most advantageous for the community, having regard to the results of the consultation on scenarios. The fourth stage deals with the procedure for *NFP preparation*. Finally, the strategy and programme are endorsed and receive publicity by issuing a *forest policy* statement.

### Imperatives

The first stage in choosing a strategy is to identify the imperatives which narrow down the range of options, as described in the previous chapter. Imperatives are general restrictions to which the chosen strategy is expected to conform. Four global imperatives were proposed, applicable to the forest sector in all countries: all strategies must be holistic, sustainable, equitable and participatory. It is possible that others might sometimes be added, relating to particular places or relevant only in certain circumstances. Such limited imperatives would need to be fully justified before they were accepted; it is important not to undermine the validity and persuasive power attached to restrictions of this type. Within the country covered by the strategy, all imperatives impose obligations on the government, organizations and individuals to comply with specified standards of acceptable management. They represent a special class of aims which must not be flouted. Their significance sets them apart from other strategic objectives and they deserve to be explicitly recognised throughout the strategy process.

A clear statement of the imperatives is necessary. Then they require interpretation to apply them to the particular situation covered by the strategy. Different circumstances need different interpretations. Furthermore, when they are applied,

judgements and compromises of various kinds are necessary, which are specific to those circumstances. It is relatively easy to list and describe the imperatives in a general way, but there can be no hard and fast rules governing their compliance. Imperatives set standards of behaviour against which to test the strategy and the NFP; how successfully the tests are met depends, to some extent, on the perceptions of the people making the judgement. The manner in which the imperatives are interpreted provides the explanations and guidance that are required.

The amplification that is necessary for each of the four global imperatives is described below:-

- **holistic** treatment of the forest sector depends on knowing where its boundaries should be drawn, what activities are to be included in the sector system and what outputs should be regarded as dependent on forest resources. A brief description of the sector is necessary, based on the review, which defines its boundaries for strategic purposes.
- **sustainability** depends on following the recipe given in the last section of Chap. 5. Three conditions need to be observed: *safeguarding* the resource base, *maintaining sector activities* and preserving *output choices*. All scenarios and possible strategies should be tested to make sure that they satisfy these conditions as far as possible. Actual and latent threats to resources, particularly forest land, should be identified. Sector activities which are in decline, or likely to be discontinued for whatever reason, should be pointed out. Factors which may affect the continuity of output flows need examination. Complying with the internationally recognised lists of criteria and indicators for sustainable forest management is not, by itself, a sufficient check on the sustainability of the sector. An essential ingredient is to obtain the best possible match between future output flows of all kinds and the requirements of society. The present generation is likely to have different preferences to the next. A perfect match is impossible in practice and it is neither possible nor desirable to maintain the flows of all outputs at their existing levels. Therefore sustainability at sector level represents a balance between competing demands; it should result in the compromise which yields the most satisfaction.
- **equity** is expected to give fair treatment to disadvantaged groups and not to discriminate against future generations. What is regarded as equitable is a matter of judgement in both cases. Strategies are judged by their consequences in relation to future income distribution. Therefore the expected impact on incomes and livelihoods of alternative courses of action need to be revealed when scenarios are prepared. Scenarios should also indicate which sections of the population are likely to gain from the various outputs and which groups stand to lose benefits as a result of the proposed interventions. Groups which need special protection, such as forest dwellers whose whole way of life may be destroyed, can be singled out for appropriate action in the NFP. Output reductions which will have an undue impact on particular industries, including loss of the incomes and employment they generate, can be identified so that compensatory measures can be put in place.

- **participation** and the arrangements necessary to ensure that it takes place were discussed in the previous section. The task here is to define a satisfactory level of participation in the strategy process and the NFP. The scenarios should reveal how it is proposed to extend existing participatory arrangements to bring them up to an acceptable standard and to foster communication and sectoral cohesion. Specific measures should be included in the NFP. It may be possible to anticipate sensitive issues, likely to give rise to disputes, which could upset a participatory approach.

It may be noted that, in practice, compliance with the requirements of imperatives depends largely on the NFP and what is included in its subprogrammes and projects. The programme should be consistent with the general intentions represented by the imperatives and its components should contain the particular measures necessary to meet the conditions that have been specified.

### Scenarios

Scenarios identification and presentation is the next stage in the strategy process. Scenarios were briefly described in relation to modelling in Chap. 7. They are representations of the future state of the sector as a system, for which simulation modelling can provide much useful information. Where suitable models have been used in the past, or can be set up with the information collected during the review stage, they facilitate scenario preparation by supplying projections of future output based on a range of assumptions and indicating the likely consequences of alternative management regimes. Modelling enables the effects of modifications to be tested quickly and easily, so that scenarios can be created and developed progressively by a process of trial and improvement. Time and effort can be saved by using modelling systems such as TIMPLAN; they are a useful tool, although scenarios can be prepared without their aid.

The essential function of scenarios is their contribution to strategy formulation. Choice of strategy is based on consideration of alternative scenarios. Scenarios are analytical devices used to aid strategy preparation. They describe possible future forms of development and their logical consequences, so that it becomes possible to identify needs, clarify options, focus on priorities, formulate objectives and propose appropriate action. They represent imagined future states of the forest sector and provide alternative views of what the sector might look like.

The starting point for scenario preparation is description of the present condition of the sector[6]. From the existing situation, each scenario represents a different way forward or a fresh development path; scenarios describe alternative grand designs for the sector. One scenario should portray the results of not intervening. All need to be presented in a way that allows comparison of their relative merits, so that a rational selection can be made. Comparison of their advantages and disadvantages leads to identification of the strategy for future sectoral development that is judged to be most advantageous. In order to offer acceptable solutions, the scenarios

should comply with the imperatives and address the problems highlighted by the SWOT analysis.

On what basis should scenarios be selected? What kind of alternatives should be presented for comparison and assessment of their relative merits? There are several possibilities and it is probably unwise to be dogmatic about which method is preferable. It is sometimes suggested that scenarios should represent various levels of resource use[7]. This approach envisages a baseline scenario, which portrays the consequences of continuing to use existing resources in their present manner, and other scenarios representing the results from (say) low, medium and high levels of extra inputs. This has one serious difficulty; uncertainty about future resource availability is liable, in practice, to make the scenarios unattainable. Developing countries, in particular, which rely heavily on external sources of aid, require a more flexible approach. A preferable basis consists of distinguishing scenarios according to the way resources are used. This approach was used in Cyprus (see Box 7.6), where scenarios representing production, protection and recreational development were proposed. A variant of this is to use scenarios which focus on alternative output combinations, such as timber plus carbon sequestration or biodiversity plus water. Another possibility, which was suggested for Lithuania, a country in transition from communism to a market-based economic system, is to use scenarios based on institutional arrangements, according to where responsibility for forest sector affairs should be located and the extent of decentralization considered appropriate[8].

Scenario preparation calls for an open mind and gifts of imagination. The *status quo* should be challenged deliberately by encouraging radical ideas and considering new ways of getting things done. Resistance to change is to be expected, but should not be allowed to suppress constructive thinking and lively discussion of the issues. Full participation by interest groups in the strategy process can do much to open up the debate. It follows that scenarios need to be clearly presented to a wide audience so that the subsequent discussion is based on facts and reasonable expectations rather than prejudiced assertions. This is facilitated by presenting the alternatives in a format that enables them to be easily compared.

Whichever method of scenario preparation is employed, the first scenario always portrays the consequences of carrying on as at present, with no alterations to current practices or the way resources are used. This ‘no change’ or ‘nil’ scenario maintains output flows at existing rates or, where past afforestation has led to a build up of immature growing stock, at a rate that increases as the younger age classes reach maturity. It also assumes that afforestation and other activities will continue as at present. This scenario provides the baseline for comparison with others.

The essential features of the scenarios can be presented in tabular form, as shown in Table 9.2. The Baseline Scenario sets the standard against which other scenarios are judged. The other scenarios, called Options, represent alternative grand designs or routes that sectoral development might follow. The number of options depends on circumstances, but more than five would be unwieldy. Each option should

*Table 9.2* Comparison of scenarios

| **Features** | **Scenarios (as many as required)** | | |
|---|---|---|---|
| | **Baseline** | **Option 1** | **Option 2 etc** |
| 1. General description of scenario | | | |
| 2. Principal outputs (amounts and supply deficits):- | | | |
| timber | | | |
| non-wood products | | | |
| biodiversity | | | |
| water supply | | | |
| soil conservation | | | |
| carbon sequestration | | | |
| etc. | | | |
| 3. Advantages and disadvantages | | | |
| benefits | | | |
| costs | | | |
| 4. SWOT analysis | | | |
| strengths | | | |
| weaknesses | | | |
| opportunities | | | |
| threats | | | |
| 5. Justification and risks | | | |
| 6. Sustainability | | | |
| safeguarding resource base | | | |
| maintaining sector activities | | | |
| preserving output choices | | | |
| trade dependency | | | |
| 7. Equity | | | |
| winners | | | |
| losers | | | |
| groups at risk | | | |
| 8. Participation | | | |
| leadership and direction | | | |
| main actors | | | |
| 9. Administrative/institutional changes | | | |
| centralization/decentralization | | | |
| reorganization and new responsibilities | | | |
| 10. Strategic objectives | | | |
| 11. Action areas | | | |
| 12. NFP guidelines: subprogrammes | | | |
| key projects | | | |

have distinctive features and be easily distinguishable from the others; it is helpful to give them descriptive names. Their merits are assessed by the improvements that they are expected to generate for the community, compared with the level of benefits derived from leaving the sector in its existing state. Some of the outputs, which are measurable, can be shown as quantities or values. In other parts of the table, only descriptions or brief assessments of the relative advantages and

disadvantages of the various scenarios can be included. Taken as a whole, the table summarizes the essential features of the scenarios as a basis for consultation and choice.

Special significance is attached to the match between supply and requirements for each type of output. A scenario which fails to provide what consumers and society want, both now and in future, represents a less-than-ideal option. The table should indicate the future output flows and size of deficits/excesses (quantified as far as possible), based on gap analysis and assuming constant prices. In the event, various ways of closing the gaps are possible. Imbalances between supply and demand for marketable outputs, if not met by imports, will lead to adjustments in their prices. Some deficits can be avoided by importing, but other shortfalls of services, such as soil and water conservation, cannot be circumvented by relying on foreign trade. Generally, unsatisfied requirements of public goods, will remain unfulfilled unless the government or some other not-for-profit organization intervenes to increase their availability and meet the costs. The table should help to identify where remedial action is necessary.

Another basis on which to judge the relative advantages and disadvantages of scenarios is by their cost effectiveness. Each scenario is associated with a set of benefits and costs, the nature and scale of which should be indicated in the table; detailed costings are premature at this stage, but their order of magnitude is relevant to choice of strategy. In some cases, it may be possible to support this assessment by partial cost-benefit analysis, which reveals the returns expected from some of the investments associated with the scenarios. For example, in Cyprus, the annual net cost of managing the State forests was estimated at 58 Cyprus pounds per ha, while the social benefits obtained from water from boreholes and springs, recreational visits by tourists and residents, and soil conservation amounted to 303 Cyprus pounds per ha; this compared with only about 4 pounds per ha annually from timber sales[9]. The big differential between these returns influenced the selection of a rural betterment strategy, which combined forest protection with recreation.

The SWOT analysis already undertaken reveals the sector's ability to cope with external and internal eventualities. This can be extended in the table to show the resilience and vulnerability of the other scenarios by comparing the particular strengths, weaknesses, opportunities and threats associated with each possible course of action. The table also points up the features which support and justify each scenario, and the level of risk that it might fail to deliver the scale of benefits expected from its adoption.

Other cells in the table assess the extent to which the scenarios comply with the imperatives and indicate the major institutional changes that would need to take place. The table should also identify the objectives and main types of action associated with each scenario.

Consultation & feedback based on the scenarios is an important part of the decision process. The criticisms expressed are likely to lead to modification to

improve the scenarios. Revised versions can be presented for re-consideration by the participants, if necessary several times, until a preferred option emerges.

**Strategy Formulation**

The repetitive consultation procedure continues until a strategy is selected that is considered to be the best possible under the circumstances. It is likely to represent a compromise between the scale of expected advantages and the risk that they might not be achieved. The public value criterion, as discussed in Chap. 8, should determine the strategy that is chosen. Its final approval and authorization is a matter for the government.

The basis on which strategy is selected is a value judgement because it is impossible to calculate precisely the net benefits expected from each option. There are too many outputs, many of which are not measurable, and too many factors to take into consideration. Whichever option is selected should meet the tests set by the imperatives and should balance supply with demand. The table assembles all these factors to facilitate comparison of the options, but the final decision is influenced by personal opinions, imagination and confidence that the desired outcome can be achieved. By definition, a grand design is based on vision as much as calculation and those guiding the path of sectoral development must have faith that, with effort and determination, its goals can be reached.

Choice of strategy leads to definition of more precise strategic objectives. In Cyprus for example, the Rural Betterment Strategy aimed at "safeguarding forest resources for the benefit of the whole community while capturing the advantages of development based on tourism". This general strategy called for:-

- better conservation of natural resources,
- better facilities for visitors,
- better forest villages,
- better rural environment.

These objectives enabled five *action areas* to be distinguished: (i) the State forests, (ii) the wider countryside, (iii) national parks, nature reserves and protected areas, (iv) local development plans, and (v) provision of information and publicity. These represented the target areas on which activities in the NFP were to be concentrated. They included both areas distinguished by geography and areas of interest connected with particular functions.

In some countries, particularly federal states or countries with marked regional differences, a single general strategy may be incapable of accommodating all the diverse interests that are present. Separate sub-strategies may then be needed for different parts of the country under the umbrella of an enveloping federal strategy. Where there are significant variations in forest resources and the way they are used or administered, one national strategy may lack the flexibility to cope; different approaches may be required to deal with the problems in particular zones. These regional differences should be identified at the sector review stage, so that the

development aims that are subsequently formulated suit the special needs of each particular area.

### NFP Preparation

Definition of strategic objectives is followed by preparation of the NFP. This stage marks the start of the programme cycle, lasting 5–10 years, which covers the successive steps of building, developing and reviewing the plan of action designed to implement the strategy. The NFP links the aims phase with the action phase of the strategy process.

The first step in NFP preparation is to identify subprogrammes. Each subprogramme covers a group of related activities or set of associated interventions in the system. These may cut across the action areas identified during strategy formulation, so that projects included in one subprogramme may cover more than one action area. A matrix can be constructed to show how the subprogrammes interact with the action areas, as was done for Cyprus in Table 9.3. By this means the components of the programme are related to the strategic objectives which they are intended to achieve. The matrix also indicates the importance or priority to be attached to each set of interactions.

Each subprogramme consists of projects, which can be listed in separate tables as shown in the example in Table 9.4. Each project is identified by its distinctive contribution to the subprogramme of which it forms part. Projects are essential components of subprogrammes and necessary parts of the NFP as a whole. They are often interdependent and mutually reinforcing. They contribute jointly to the strategy and sector development depends on all of them. Each has a specific role to play in bringing about the capacity changes and expanding the range of outputs that the strategy is expected to provide.

Projects may be classified according to the type of activity required, such as investment or research, and the action area in which they are expected to make an impact. A brief outline should be included for each project, showing its purpose, approximate cost, likely duration and the principal organizations involved. At the NFP preparation stage, the emphasis is on project identification rather than detailed description; each project should undergo searching scrutiny and thorough assessment later on as the programme develops. However, NFP preparation does not take place in a vacuum. Projects that are ongoing at the time are included as well as new project proposals for which additional resources will need to be sought during the duration of the programme. A NFP is based on the existing situation and information available when it is prepared; at the same time, it is necessary to recognise that circumstances will change as the programme progresses. It should be regarded as a flexible document, capable of being added to and elaborated throughout its expected life.

The decisions about future development of the forest sector, which are taken at the highest or strategic level (see Fig. 7.9), refer to the choice of a particular strategy and its interpretation through the NFP. The strategy describes the broad picture that

*Table 9.3* National Forest Programme matrix for Cyprus

| **Action areas** | **Subprogrammes** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Afforestation and silviculture (A) | Production of timber and non-wood products (B) | Protection against fires and other hazards (C) | Conservation of ecosystems, flora, fauna and heritage (D) | Water (E) | Local plans and village development (F) | Institutional reform, modernization and capacity building (G) |
| I State forests and surrounding areas | XXX | XX | XXX | XXX | XXX | XXX | XXX |
| II Wider countryside | XXX | X | XXX | XX | X | X | X |
| III Special sites | - | - | XX | XXX | - | XX | XX |
| IV Ecotourism promotion | X | - | X | XXX | - | XXX | XXX |
| V Information, publicity and education | X | - | XXX | XXX | - | X | X |

Note: Crosses indicate the importance of types of activity in relation to action areas, i.e. xxx: high, xx: medium, x: low.
Source: *Final draft National Forest Programme*. Forestry Department, Nicosia, October 1999.

*Table 9.4* NFP for Cyprus: Projects in Subprogramme G. Institutional reform, modernization and capacity building

| Activities and Projects | Type | Details | Action areas | Organizations involved | Total cost (CY £000) | Duration |
|---|---|---|---|---|---|---|
| 1. Harmonization of law, regulations and procedures | Administrative | Revision of forest legislation to accord with Acquis Communitaire and harmonization with laws relating to environment, town & country planning, game, shooting, fires etc. | I, III, IV | FD, ES, MI, TPHD, GF, DO | 50 | 1 year |
| 2. Forestry Department reorganization and capacity building | Administrative | Review of organizational changes necessary to implement the new strategy. | I, II, III, IV,V | FD | — | 1–2 years |
| | | Training and retraining of staff. | | FD | 500 | |
| | | Project preparation and planning unit. | | FD | 250 | |
| 3. New technology | Investment | Improvement and upgrading of communication system and information technology | I, II, III, IV, V | FD | 250 | 10 years |
| 4. Forestry education | Administrative | New curriculum and courses to provide a wider range of training at the Forestry College | V | FD | 4,000 | 10 years |
| | Investment | Buildings and facilities | | | 1,000 | |
| 5. Forestry extension | Administrative | Technical assistance and incentives for private owners | II | FD, AD, LA, PO | 100 | 10 years |

Source: *Final draft National Forest Programme*. Forestry Department, Nicosia, October 1999.

the programme aims to achieve; this is amplified by means of the strategic objectives and elaborated through the action areas. The subsequent development of the subprogrammes and projects, which comprise the NFP, represent the tactical level in the decision making hierarchy. The NFP provides no more than a framework for future development, made up of subprogrammes and projects which are described in outline. It is not a detailed plan supported by schedules and budgets. Elaboration of the programme, within the bounds set by the NFP, comes later as the result of tactical decisions. Operational decisions take place on a day-to-day basis and relate to project implementation.

NFP preparation forms the first stage in the programme cycle. The duration of this cycle is determined by the length of time between successive NFPs. It covers subprogramme definition and project identification, which are included within the 'aims' phase of the 3A cycle, and the more detailed work of appraising and carrying out projects, which is part of the 'action' phase. Monitoring and evaluation of the progress made by individual projects and the programme as a whole also form part of the programme cycle.

## Forest Policy

Preparation and approval of an authoritative declaration of forest policy is a necessary adjunct to strategy formulation and the NFP. A forest policy statement makes clear to all concerned with forest sector affairs and the general public the intentions of the government, as explained in Section 8.4 of the previous chapter. It confers legitimacy on the strategy while exposing it to general scrutiny. The document puts on record, for all to see, a concise statement of the objectives to be pursued and an outline of the programme by which it is expected that they will be achieved. Its preparation is therefore a public relations exercise, requiring care with both the form of the statement and the manner of its presentation.

The strategy formulation and consultation process is intended to identify the best possible course of action for the sector and to obtain widespread support for it. Preparation of a forest policy statement carries the process forward by securing commitment to the strategy at national level. Its approval in the higher echelons of government, ratification by the legislature and support within the civil service are necessary to give weight to the statement. The administrative procedures by which this is achieved depend on the system of government and vary from country to country, but it is important that formal adoption of the strategy and NFP is widely publicised.

The designated lead agency is responsible for the task of preparing and securing approval for the policy statement. This function is closely associated with the administrative procedure by which strategic options are examined and one particular course of action is chosen. It is linked to the wider decision making process, involving the political hierarchy, which is used to settle matters of public policy. It also involves the government ministry or agency responsible for resource allocation and investment planning at national level, from whom advance commitments must

be sought for the resources required for NFP implementation. The sectoral objectives of the strategy should correspond with national aims. In countries which produce national development plans at regular intervals, it is necessary to coordinate and synchronize NFP preparation with the national planning cycle. Forest policy statements need to be integrated with policies in other sectors and contribute to public policy for the nation as a whole. They should reveal the contribution to national development that is expected from the forest sector and help to pin down the corresponding national responsibility to provide adequate resources for this purpose, in so far as they can be foreseen and the prevailing circumstances allow. The lead agency's role includes steering the strategy and NFP through the machinery of government; preparation of a formal statement of forest policy marks the end of this process and encapsulates its results as a binding public declaration to which the government, sectoral interests and the public are expected to conform.

Forest policy declarations need to be clear and concise. They should contain a brief exposition of the strategy and an outline of the NFP. No standardized format exists and it is unlikely — probably undesirable — to attempt to devize one layout to suit all countries. However, it is possible to suggest some headings, covering the aspects which ought to be included to make the statement comprehensible and complete. The following sections are proposed:-

- **Preamble** to explain the scope and purpose of the forest policy statement. It should describe the historical context and outline the procedure that was followed, including sector review, formulation of the new strategy and the NFP designed to implement it.
- **Strategic aims** to define the strategy and set out its aims.
- **Imperatives** to clearly identify the overriding general conditions (holistic approach, sustainability, equity, participation etc.), which apply to the strategy and NFP.
- **Action areas** to indicate the particular areas (either geographical or subject) on which action to achieve the strategic aims will be concentrated.
- **Implementation** to explain how it is intended to achieve the strategic aims by means of the NFP. An outline of the programme should be given, including the main activities that are envisaged and the principal agencies who will carry them out; necessary changes in the sector's organizations, structure and institutions should be indicated.
- **Subprogrammes** to describe the NFP's main components and their specific objectives. The NFP and its subprogrammes provide a framework for subsequent elaboration and project development as implementation proceeds.
- **Resources** to identify the main resource providers and any major reallocation of existing resources that is required. The timing of individual projects and priorities depend on the availability of financial resources from domestic and foreign sources; the programme is flexible within the limits set by the NFP framework.
- **Monitoring and evaluation** to indicate how it is intended to record and measure progress, and to evaluate results. The statement should say who will be responsible for doing this and the reports necessary to ensure public accountability.

Policy statements in this format, generally not more than 10 pages long, should be adequate to satisfy the needs of the legislature, ministers, private sector interests and the general public. They should be readily available for all to see. The policy can be expected to last until the strategy is revised (maybe about 10 years), after which it will be time to update and reissue the document.

Formal declarations of forest policy need to be supported by additional information and public relations campaigns aimed at particular sections of the population. Their content and form of presentation should be suited to the target audience or group. Publicity for the strategy and NFP can be disseminated through radio, television and the press, and modern information technology can be used to maintain data bases and set up websites accessible to the public. Sections of the community may be drawn into collaborative ventures, which involve their active participation in parts of the programme and also raise general awareness of forest sector issues. Examples of such initiatives, which involve members of the public, range from tree planting ceremonies and Arbor Day celebrations to practical conservation management work done by volunteers organized by NGOs. The strategy also depends on sector organizations and institutions. Many forms of participation in forest sector activities are possible, involving government agencies, companies and interest groups, working alone or with others. Support for the strategy from all sections of the community needs to be mobilized by the lead agency, using any means at its disposal.

## 9.3 ACTION

The action phase of the 3A cycle consists of three stages: *programme development*, *monitoring* its progress and *evaluation* of results. As the projects which make up the programme are converted from ideas into reality, the strategy unfolds and interventions occur, which affect the forest sector's resources, activities, outputs and organizational infrastructure. These changes can be recorded and measured, both at project level and in relation to the programme as a whole. The success (or failures) achieved by each project and the extent to which the strategy achieves its aims need to be evaluated. From the results it is possible to learn the lessons of experience and improve sectoral performance; progress is made by a series of adjustments in response to unexpected events and the continually altering situation in the sector. Forest sector development is a dynamic process based on responses to new knowledge in a constantly changing environment.

### Programme Development

The NFP and its subprogrammes form a plan of action aimed at sectoral development. The plan describes, in general terms, the action to be taken to achieve the objectives of the strategy, whether this is visualized as a grand design, a path for sectoral development or a guide to decision making. However, it lacks the detail necessary to make it fully operational. The NFP provides a broad outline of the

interventions in the system that are required, while leaving until later the tactical follow up that is needed to put the plan into practice. Each component of the plan has to be made to work. This procedural approach ensures that the programme can be easily adapted to unforseen events and new knowledge, while maintaining continuity of purpose; it also provides flexibility in relation to the availability of resources for sector development.

Projects of various kinds are the components which make up the NFP. Some involve investment in sectoral infrastructure or raising future productivity levels, while others are concerned with institutional changes or supporting ongoing operations, such as fire protection, on which the sector depends. Each project consists of a set of related activities intended to achieve a particular purpose. The NFP identifies the projects which it is intended to carry out, with brief summaries of their main features, aims and significance; it is a collection of project proposals, each requiring further investigation and in-depth examination of its implications. Occasionally, additional projects may be identified during programme development.

The detail for programme development is provided by elaborating the project proposals. For each project there is a project cycle, which consists of steps leading from project identification to its implementation, assessment and (if it is to continue) its revision, before the start of a new cycle. Baum's original project cycle, proposed for lending institutions such as the World Bank, contained six steps, as described in Chap. 7 (Fig. 7.7). They follow an orderly progression and the cycle allows for learning and improvement. This sequence of steps can be adapted to fit the NFP situation. After identification and inclusion as part of a subprogramme in the NFP, the project proposal needs to be worked up, fully costed and then carried out. The steps in this process are as follows:-

1. project preparation and design,
2. participation and consultation,
3. appraisal and choice,
4. approval and financing,
5. implementation and operations,
6. recording and measuring progress,
7. project evaluation.

Supervision and control of programme development is the responsibility of the lead agency. The work of preparing projects and steering them through the project cycle, which is vital to the success of the NFP, requires special expertise and undivided attention. It is usually best done by a small *project planning unit*, dedicated to the task, set up under the auspices of the lead agency and supporting all organizations within the sector. This unit needs freedom from beaurocratic interference and may be associated conveniently with a data collection and processing service, which meets technical and general needs for forest sector information.

**Project preparation and design** consists of turning the proposal from an imaginative idea into an operational scheme. The project's aims should be clearly set out, its proposed activities described and its outputs defined. This involves preparing estimates of the expected costs and benefits, budgets and cash flow statements under

*Table 9.5* Basic Logframe matrix

| **Summary of objectives/activities** | **Objectively verifiable indicators** | **Means of verification** | **Important assumptions** |
|---|---|---|---|
| Overall goal | Measures of goal achievement | | Assumptions for achieving goal |
| Project purpose | Indicators that purpose has been achieved | | Assumptions for achieving purpose |
| Results/outputs | Indicators/measures of outputs | | Assumptions for achieving outputs |
| Activities/inputs | Specification of quantities and costs | | Assumptions about activities and inputs |

a range of assumptions. Project activities need to be scheduled. Alternative ways of achieving the aims or design options should also be explored to see which is likely to produce the best results for the least cost. Risk assessment and the assumptions upon which project success depends also form part of the preparatory procedure.

A technique that is now widely used to assist project preparation and for assessing project proposals is known as the Project Logical Framework or Logframe matrix. This was first adopted by USAID in the early 1970s and has subsequently been modified and applied by other bilateral aid agencies, including the British, Canadian and German; it has also been taken up by international organizations such as the European Community[10]. The typical matrix consists of four rows x four columns, as shown in Table 9.5. The vertical axis relates to the levels of planning and the horizontal axis to the objectives, their verification and assumptions, at each level. Logframes provide convenient project summaries and reveal whether projects have been fully thought through; they test projects for their internal consistency and whether they are likely to deliver the benefits that are claimed. The technique is still being developed and improved. Integrated computer software is now available that links the Logframe approach to other aspects of project planning, including Gantt charts and budgeting procedures.

Project design alternatives need to be carefully assessed. It is important to consider other possible ways of achieving the desired ends, perhaps by using different technology, equipment, human resources or management methods. The cheapest alternative is not necessarily the best as the risks associated with each option also need to be considered. Safety and the degree of certainty about the outcome are significant factors in projects aimed at improving environmental quality, such as protecting endangered species or vital water supplies. The assessment should consider the impacts of alternative designs on the sector system as a whole. Project appraisal techniques, such as cost-benefit analysis, do not always look beyond the immediate measurable outputs and it is preferable, if a suitable model is available, to investigate the wider effects of the alternatives. For example, various methods of expanding the output of timber are likely to affect ecosystems, biodiversity

and scenery differently and also affect the subsectors concerned with harvesting, processing and trade in different ways.

**Participation and consultation** take place in parallel with project preparation. The organization or groups responsible for carrying out the project need to be involved closely with its design; persons whose interests are affected by the project should have an opportunity to influence what is going to happen and the extent of their participation in it. Just as there is a feedback loop in relation to scenarios at programme level, project options need to be formulated and explained to all those concerned so that they can contribute meaningfully before final decisions are made. Project consultation and feedback is an iterative process which may have to be repeated several times before a satisfactory scheme emerges.

**Appraisal and choice** apply to project alternatives at the design stage and to the project as a whole. It is necessary to discover a project's optimum design and also decide whether the project in that form is an effective and efficient way of using scarce resources. Sometimes it is also necessary to choose between competing projects when total resources are inadequate to undertake the whole programme. Two types of question are relevant: which design or project is the best, compared with others, and whether the design/project is intrinsically worthwhile? Comparisons are made by ranking the options in order of preference and selecting the one considered most desirable. The intrinsic worth of a project depends on its benefits exceeding its costs, difficult though it may be to define these satisfactorily. Judgements of relative merit are required and careful weighing up of advantages and disadvantages, some of which are impossible to quantify. Making choices cannot be avoided, even though they depend on value judgements. Appraisals are based on assessments of costs and benefits, which may not be directly comparable with each other, and not comprehensive or fully worked out. Decision making for programme development in the forest sector is not an exact science.

Cost-benefit analysis is commonly used as an aid to decision making (See Box 9.2). It is undoubtedly useful for estimating those costs and benefits which can be measured, but the value of the technique is limited by its inability to cope satisfactorily with inputs and outputs which have no prices or are intangible. For example, some projects depend on voluntary assistance and the goodwill of the community, or produce conservation benefits based on existence values which accrue to future generations. In its simplest form, as used by commercial undertakings, it consists of a financial appraisal. Estimates are made of costs and returns at their market prices and the difference between them represents profit to the enterprise. Profits are used to compare options, as indicators of their relative desirability, and any project which is unprofitable is unacceptable. The yardstick is a project's net worth. The worth of public projects, when prices are often distorted, cannot be measured so easily. For these, economic and social appraisals are used.

There are technical difficulties with cost-benefit analysis, even at its simplest. First, the costs and receipts occur at different times and investment costs incurred at the start of a project are not directly comparable with the subsequent flow of annual sales returns. It is conventional to adjust cash flows for timing differences by

**Box 9.2 Cost-benefit analysis**

"Cost-benefit analysis has been defined as an economic appraisal of the costs and benefits of alternative courses of action, whether these costs and benefits are marketed or not, to whomsoever they accrue, both in present and future time, the costs and benefits being measured as far as possible in a common unit of value. Far from being a modern technique, cost-benefit analysis originated in the nineteenth century, as deficiencies of profit-maximization were pinpointed. The literature of the subject is largely concerned with correcting these deficiencies.

Cost-benefit analysis (CBA) is ambitious and all-embracing, attempting to aggregate costs and benefits of many kinds, to all people, in every generation. Its key distinguishing feature is its attempt to translate all costs and benefits (or all objectives) into a common (commensurable) unit of (cardinal) value. It is in this translation, while maintaining truthful and equitable representation of value, that technical problems arise. Given the definition, it would be unreasonable to oppose CBA in theory: the problem is, in practice can it be done."

Source: Colin Price. *The Theory and Application of Forest Economics*. Blackwell: Oxford (1989).

discounting them to obtain their net present value (NPV); NPVs are then compared to find the most profitable option. However, the discount rate used affects the outcome; low rates tend to assist projects with distant time horizons, such as timber growing, whereas high rates favour rapid paybacks and a short-term outlook. The rate that is chosen has important consequences in relation to inter-generational equity. Choice of the appropriate time preference rate in different circumstances, particularly for public projects, is a complex question about which there is dispute; it has even been argued that discounting has no justification[11].

Cost-benefit analysis is mainly used to appraise projects from the point of view of society rather than an enterprise, in situations where private profit is not an appropriate measure of their net worth. For this, the cash flow at market prices needs to be adjusted. The first step consists of removing taxes and subsidies to obtain an economic instead of a financial appraisal; after that, where prices are distorted because of imperfect competition or outputs are not tradeable, imputed or 'shadow' prices are substituted, representing the opportunity costs of the factors of production and the value of the outputs to the nation. The unit of value or 'numeraire' used for these calculations[12] is the present value of consumption measured at either local or international (border) prices. It is possible to carry the analysis even further, into the social realm, by weighting costs and benefits according to their distributional impacts on different sections of the community. On equitable grounds, projects which favour the poorer sections of society can then be given priority over those which mainly help the rich.

Cost-benefit analysis is now used widely in both advanced and developing countries. A very large body of literature has grown up, dealing with its technical aspects, which goes far beyond the scope of this study. FAO have produced a series of manuals which describe its application to forestry[13]. They cover the assessment of project impacts of all kinds. The technique is undoubtedly useful for appraising projects in the forest sector, but needs to be used with care and understanding of its limitations. It provides guidance for decision makers but cannot supply definitive answers to suit all situations. Valuation problems are usually the main cause of concern.

The shortcomings of cost-benefit analysis are most apparent in relation to outputs which cannot be measured or valued except by making heroic assumptions. What is the value to the community of preserving an endangered species that survives in a particular forest ecosystem, for example? Some species, such as tigers, can be valued indirectly through the expenditure of tourists wishing to see them; the benefits from tourism may be considerable. But what of an insignificant plant at the bottom of the food chain on which an ecosystem depends, which attracts no visitors, even though it may be equally at risk? The value of the whole ecosystem, its species and the genetic material that it supports, are all at stake if the plant is threatened; if the tiger is exterminated the ecosystem of which it forms part is likely to continue to exist. Is a single species worth more than an entire ecosystem? Both tiger and plant have existence values, but how should they be assessed? Different aspects of biodiversity are involved in each case. Attempts have been made to value biodiversity in some tropical forests, but the methodology used was complex, the results vary widely and they are unlikely to be transferable to other places[14]. They do not provide a secure foundation for making project choices for NFPs generally. It is necessary to look for a simpler approach.

Of the mixture of outputs that come from forests, some are saleable and can be valued directly, while others challenge the credibility of the cost-benefit approach if they are measurable at all. When, as is often the case, a project affects the flow of several types of output, they all need to be valued on the same basis before being added together to obtain the total net value of the project. The confidence placed on these valuations will depend on the reliability of the various output estimates of which they are composed; the weakest estimate may govern the choice of option and discredit the whole exercise. This is a serious objection where environmental benefits such as biodiversity form a large proportion of the total. Cost-benefit analysis may be appropriate for projects which have a low impact on the environment (e.g. building a new sawmill) but are much less easily applied to most forest management decisions.

Cost-effectiveness analysis is a simplified variant of cost benefit analysis. It may be used when either all options produce the same set of outputs or outputs are ignored because they cannot be valued. In these circumstances the outputs have no effect on choice and costs alone determine which should be selected. Least-cost solutions are suitable for design options which produce similar outputs, but not for deciding whether a project uses resources efficiently. The method may also be useful

where outputs are considered essential or obligatory. The projects which produce them are then unavoidable but it is still desirable to spend as little as possible to obtain their benefits. Some environmental protection projects fall into this category. The natural environment represents more than the user benefits derived from it; it is something that has primary value in itself, which is held in trusteeship for future generations. It has been suggested that some environmental outputs should be treated as a 'merit' goods. A merit good is defined as having intrinsic worth and being necessary whether we want it or not[15]. It is a social or public product that is paid for out of general taxation, not by individual purchasers, and there is no direct link between the cost of provision and consumers. Cost-effectiveness analysis is applicable to merit goods.

The systems approach to the forest sector that underlies strategy formulation suggests that in a NFP every project is there to fulfill an essential role. The programme would lose coherence without all the projects and the strategy would be undermined if any are omitted. Projects which are unnecessary have no place in the NFP. By this argument, taken to its logical conclusion, projects do not need to be justified by carrying out detailed cost-benefit analyses; their merits are based on their contributions to the programme as a whole. As with merit goods, cost-effectiveness analysis is appropriate to justify the best use of resources at the tactical level. Provided the strategy has been well-chosen, project appraisal should be aimed at finding the best way of implementing the strategy rather than being concerned with whether, standing on its own, a project is worthwhile. Attention should be focussed on the contribution that each project makes to the achievement of strategic goals. Compliance with the imperatives also depends on the results of the projects. The primary purpose of undertaking project appraisals in this context is therefore tactical rather than strategic.

In practice, detailed project appraisals are often required by financing agencies, either at home or abroad. Ministries of finance and others responsible for allocating resources wish to assure themselves that the money will not be wasted. Aid agencies like to make their own assessments to satisfy their sponsers and critics that funds will be used to relieve poverty and promote development. It is therefore important for lead agencies and the project planning units they control to emphasize project complementarity; they should show how each project fits into the general plan and the contribution that it is expected to make to sectoral development. The appraisal should also demonstrate that the recommended way of proceeding is both effective and efficient. Each request should be supported by a log frame matrix based on the design option that achieves its objectives at the lowest cost to society. Financial appraisals may be undertaken for investment projects to discover their NPVs at appropriate discount rates, their internal rates of return (IRR) and break-even points. Economic/social appraisals may be required for projects which make large impacts on the national economy or which are of special public interest. Projects that are not suitable for cost-benefit treatment, or depend on value judgements and unmeasurable benefits, need to be presented in a simplified manner designed to assist financial decision makers.

For those projects where cost-benefit analysis is attempted, all the impacts should be clearly identified. Those that cannot be evaluated must not be overlooked. Some types of project produce a few, easily measurable outputs, while others have diverse impacts which defy proper assessment. Partial appraisals, which take account of some outputs but omit others, may still be useful for establishing a 'bottom line' below which the total benefits are not expected to fall, even though the full effect of the project is unknown. Institutional projects, such as those included in Table 9.4, are not well-suited to cost-benefit analysis, although their significance in relation to future development may be very great. Where priorities or comparisons are required, ordinal values, which rank the alternatives in relation to one another, instead of cardinal values, which provide absolute estimates of worth, are sufficient.

It should also be appreciated that all valuations, whatever units they are measured in, are estimates subject to risk and uncertainty. In some cases costs and benefits can be expressed as ranges with various probabilities attached to their values. If a model is used to estimate inputs and outputs, sensitivity analysis is normally employed to provide a range of outcomes within which the result is likely to fall. Uncertainty due to unexpected causes, such as storms, floods, market failures or social turmoil, may be simulated in computer models to discover their effects on the system. In all cases value judgements are unavoidable. Project appraisals are subject to errors and it is highly unlikely that the actual results achieved will match the projections made in advance. The choice of project options depends on the level of risk that is considered acceptable in each case and decisions are influenced by the type of project.

**Approval and financing** of projects normally takes place outside the sector. Government endorsement of the strategy and NFP is unlikely to be accompanied by automatic authorization of projects. The lead agency submits proposals, in their final form after appraisal, seeking approval by external authority for projects that depend on government finance. To some extent, a lead agency may be able to act directly and implement projects on its own initiative if existing budgets are adequate and allow sufficient flexibility to provide the resources required, but extra resources are likely to need special approval from whoever provides them. Projects to be financed by the private sector depend on companies and banks. For government projects and forests owned by the nation, the ministry of finance is usually the arbiter. Projects likely to attract aid are usually submitted by the government to foreign donors. Budgeting and authorisation procedures vary from country to country and depend on the administrative arrangements that are in force.

**Implementation and operations** follow after a project has been approved and the necessary resources are in place to carry it out. Day to day project management takes over to decide the operational details for each scheme as outlined in the project logframe. Implementation is subject to the imperatives and other constraints set by the strategy and the limitations contained in the project specifications.

**Monitoring**

This stage of the action phase involves recording and measuring progress. Monitoring forms part of both the project and the programme cycles, enabling managers to keep track of each project and direct the implementation of the NFP as a whole. It is necessary to have an adequate data base and to make arrangements for measuring and recording the changes taking place. The system should provide information, as required, for project managers to direct operations at their level and meet their responsibilities. It should also provide periodic reports to enable the lead agency to supervise the programme as a whole. A satisfactory information system is a necessity for institutional accountability. The public, the government, forest sector organizations and international agencies all depend on reliable information and periodic reports to understand what is going on. Transparency is the best antidote to maladministration and mismanagement.

Information technology has an important part to play. It is desirable to create a data base covering information requirements at several levels that meets the needs of different users. It is necessary to have access to information relating to development of the forest sector, the strategy and the projects in a form suitable for monitoring progress and subsequent evaluation of the results achieved. How and where the information is stored is of less importance than the ability to exchange data between different parts of the system; compatibility of computers and software is necessary if facilities are dispersed. A suitable structure for the information system is shown diagramatically in Fig. 9.1. It caters for the needs of strategy formulation and NFP preparation as well as programme and project monitoring, evaluation and reporting.

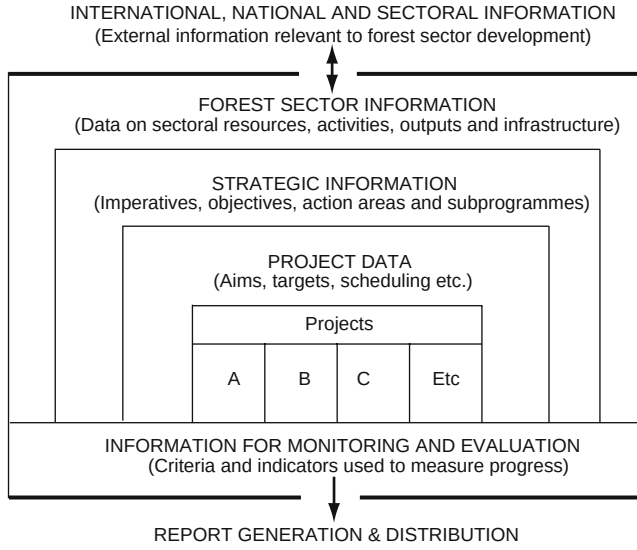


*Figure 9.1* Data base structure

Criteria, indicators and targets set the standards and bench marks against which progress is measured. Important criteria relate to compliance with the imperatives in the strategy. Project logframes include targets against which progress can be measured and project schedules specify the time frame within which the results should be achieved. These need to be built in to the information system, so that attention is focussed on the most significant events from the point of view of supervision and managerial control. It should allow the lead agency to see the stage reached by each project at any time. Ideally, the information system should serve as an early warning system. Reporting arrangements can be built into the system, which direct the right information to the right people at the right time.

The information system should be the responsibility of the lead agency. Setting up and maintaining a suitable system is an appropriate function for the project planning unit to undertake. It should be a collaborative exercise. The system is likely to make use of existing data facilities within the sector, enabling different agencies to cooperate in the provision of the necessary information. Much of the information already held in data bases, although important for management purposes, is unlikely to be in the form required for supervision and progress chasing. The particular items of data required for monitoring need to be extracted, processed and compiled. The output from the information system required for periodic reporting should be summarized and presented in a manner that facilitates comparisons between the objectives of the strategy and projects, and the results that are actually achieved.

## Evaluation

The final stage in the strategy process consists of reviewing what has occurred, assessing the success of the strategy in meeting its objectives and examining the progress made by the projects. Evaluation is based on monitoring, although it is a separate exercise with its own remit. Evaluation is described as an *ex post* activity, which looks backwards in time, whereas strategy formulation and programme preparation are forward looking (*ex ante*), based on projections and assumptions about the future. By comparing and contrasting the programme from these opposing standpoints, success can be judged and lessons learned to improve future performance. A similar sequence is used to review the achievements of each project. Generally, evaluation makes an important contribution to the acquired stock of sectoral knowledge.

Evaluation is the last step in the project cycle. Project evaluation and review normally take place when a project is completed, though intermediate assessments may also take place; aid donors frequently insist on mid-term reviews for example. Appraisals of projects which are ‘time slices’ of long-term, ongoing activities (such as an afforestation programme), are generally timed to fit in with the timetables of financing departments for periodic budgetary appropriations. Similarly, programme evaluation is the last step in the programme cycle and precedes review of the strategy and preparation of a new NFP.

Ideally, the criteria, indicators, targets and other measures of performance should be identified at the time the programme or project is prepared. Subsequently, they are included in the information system to provide the basis for monitoring and subsequent evaluation of results. The restrictions imposed by the imperatives also need to be included to enable their observance to be checked at the same time as the progress in achieving objectives is monitored and evaluated. Project design and effectiveness should also be scrutinized during evaluation, using appropriate standards built into the data system.

It is important that the persons who carry out evaluations should be independent, so that they can give an unbiased assessment of the progress made. It is unreasonable to expect either the administrators in the lead agency responsible for implementing the NFP or the managers controlling projects to sit in judgement on their own performance, although it is natural that they should have an opportunity to express their views on the methods used and the results. Where evaluations are team-efforts, the team leader should come from outside the sector.

Review of the strategy and programme marks the end of the strategy process and the 3A cycle. It leads to the beginning of another round, a revised set of strategic objectives and a new NFP.

## SUMMARY

- Strategic methods describe the means which can be used to carry out the strategy process and choose between alternatives at various stages in the sequence.
- The strategy process is cyclical and arranged in three phases: analysis, aims and action. Each phase contains several stages which are interdependent and may overlap.
- The *analytical phase* consists of four stages. First, a thorough review of the forest sector is carried out; this leads to study of the transformations taking place and system modelling where possible; SWOT analysis (strengths, weaknesses, opportunities and threats) follows; in the final stage the arrangements for participation in sectoral affairs are examined.
- Sector review establishes the baseline for comparison of alternative strategies; it provides a description of the present state of the sector and how it is expected to change. It consists of a systematic assessment of the sector's resources, activities, outputs, organizational structure, institutional framework, external interactions, sector capacity and contributions to trade, investment and the national economy.
- Future supply possibilities are matched to the requirements of consumers and society by study of the transformations which take place, gap analysis and modelling. SWOT analysis is used to determine the sector's strategic position and ability to cope with change. Participatory arrangements are examined with the aim of increasing sector organizations' and interest groups' involvement and commitment to future development.

- The *aims phase* covers the identification of imperatives, scenario presentation, strategy formulation, NFP preparation and procedure for dealing with forest policy statements.
- Four global imperatives (holistic approach, sustainability, equity and participation) are proposed, which narrow down the range of strategic options; they need to be clearly stated and interpreted to suit local conditions..
- Scenarios depict imaginary future states of the forest sector, presented for consultation, which serve as a basis for comparing options and choosing a strategy.
- National Forest Programme (NFP) preparation is based on 'action areas', which target the activities necessary to achieve the strategic objectives, and 'subprogrammes' covering groups of related activities. The subprogrammes consist of outline project proposals.
- A format is proposed for formal declarations of forest policy, which contains the following sections: preamble, strategic aims, imperatives, action areas, implementation, subprogrammes, resources, and monitoring and evaluation.
- The *action phase* deals with programme development, monitoring progress and evaluation of results.
- The NFP provides a framework for subsequent elaboration, by developing detailed project proposals, getting them approved, financed and implemented. The steps follow a project cycle which allows for consultation and participation.
- NFP and project performance need to be recorded and monitored. Evaluation of results when the programmme is completed leads to reformulation of the strategy and preparation of a new NFP; projects are reviewed and revised (or terminated) at the end of each project cycle. A suitable information system is essential.

## FURTHER READING

Management techniques such as SWOT analysis are described in most of the well-known business strategy textbooks, including Dobson & Starkey (*The Strategic Management Blueprint*.Blackwell: Oxford, 1993) and Johnson & Scholes (*Exploring Corporate Strategy*. Prentice Hall, 1988). Freeman explores stakeholder concepts (*Strategic Management: a Stakeholder Approach*. Pitman, 1984).

For information on Logical Frameworks see Analoui, F. (editor) (1994). *The Realities of Managing Development Projects*. Avebury: Aldershot; several Aid Agencies, including CIDA, Norad and GTZ have produced their own versions in handbooks.

There is a very large quantity of literature on cost-benefit analysis, often highly technical. A major landmark in its evolution was the *Manual of Industrial Project Analysis* published by OECD in two volumes: vol. I *Methodology and Case Studies* (1968) and vol. II *Social Cost Benefit Analysis* (1969) by Little and Mirlees. A forestry manual from the same era was FAO Forestry Paper 17. *Economic Analysis of Forestry Projects*. FAO: Rome (1979). Recent guidelines specially written to meet forestry needs are available in two FAO Forestry Papers, No.106. *Economic Assessment of Forestry Project Impacts*, published in 1992, and No.114.

*Assessing Forestry Project Impacts: Issues and Strategies*, published in 1996. Colin Price provides a helpful critique, *The Theory and Application of Forest Economics*, Blackwell (1989)

## SOURCES


1 M. Gane. Modelling growth with TIMPLAN. *Lesnictvi-Forestry*, **41** (4), pages 163–172, 1995.
2 Michael J. Stahl and David W. Grigsby. *Strategic Management for Decision Making*. PWS-Kent Publishing Company:Boston (1992), Chapter 2.
3 Paul Dobson and Ken Starkey. *The Strategic Management Blueprint*. Blackwell: Oxford (1993), pages 44–47.
4 Gerry Johnson and Kevin Scholes. *Exploring Corporate Strategy*. 2nd edition. Prentice Hall (1988), pages 76–79.
5 Des Dearlove. *Key Management Decisions*. Pitman: London (1998), pages 60–61.
6 *Strategy for Forest Sector Development in Cyprus*. Forestry Department of Ministry of Agriculture, Natural Resources and Environment: Nicosia, Cyprus (1999), pages 21–23.
7 FAO. *Formulation, Execution and Revision of National Forest Programmes: Basic Principles and Operational Guidelines*. Food and Agriculture Organization of the United Nations, Rome (1996), pages 40–41.
8 Michael Gane. *Notes on Strategy and Policy for Forest Sector Development in Lithuania*. Mission Report for FAO and Department of Forest and Protected Areas in Lithuania, September, 1999.
9 *Final Draft National Forest Programme and National Forest Policy Statement*. Forestry Department of Ministry of Agriculture, Natural Resources and Environment: Nicosia, Cyprus (1999), page 33.
10 John D. MacArthur. Logical frameworks today — increasing diversification of a very valuable planning tool. Paper for University of Bradford Development and Project Planning Centre's 25th. Anniversary Conference *Development Projects: Issues for the 1990s*. April, 1995. See also J.D. MacArthur. The logical framework: a tool for the management of project planning and evaluation. *DPPC New Series Discussion Paper No. 42*, University of Bradford, Bradford, UK. (1994), also reproduced in F. Analoui (editor). *The Realities of Managing Development Projects*. Avebury: Aldershot (1994).
11 Colin Price. *Time, Discounting and Value*. Blackwell: Oxford (1993).
12 Colin Price. *The Theory and Application of Forest Economics*. Blackwell: Oxford (1989).
13 See: FAO Forestry Paper 17. *Economic Analysis of Forestry Projects*. FAO: Rome (1979). FAO Forestry Paper 106. *Economic Assessment of Forestry Project Impacts*. FAO: Rome (1992). FAO Forestry Paper 114. *Assessing Forestry Project Impacts: Issues and Strategies*. FAO: Rome (1996).
14 David Pearce and Dominic Moran. *The Economic Value of Biodiversity*. IUSCN/Earthscan: London (1994), Chapter 6.
15 Jonathan Warner. The environment as a merit good. Paper for University of Bradford Development and Project Planning Centre's 25th. Anniversary Conference *Development Projects: Issues for the 1990s*. April, 1995.

CHAPTER 10

# STRATEGY IN ACTION

Previous chapters have described the forest sector and explored ideas about strategy. The sector is a holistic concept and strategy is concerned with deliberate interventions in the system designed to achieve specific ends. These disparate subjects have been brought together by presenting forest strategy as a cyclical process. The purpose of this concluding chapter is to focus on some significant aspects of sectoral behaviour and strategic procedure which have particular practical importance. Three important problems need to be highlighted — obstacles which should be tackled — if strategic management of the forest sector is to work.

Strategic management principles, when applied to the forest sector, resulted in a process approach based on the 3A cycle: analysis leading to aims, followed by action. The function of the aims phase is to define the strategic objectives, which it is intended to implement by means of a national forest programme; the activities prescribed in the NFP are carried out during the action phase. The process connects the stated intentions with their achievement, which is the defining characteristic of strategy as described in Chap. 1. It leads to development of the sector, more or less according to plan and subject to the exigencies of the prevailing situation. The general purpose underlying the promotion of sectoral development by means of the NFP, as stated in Chap. 8, is increased public value. While it is difficult to quarrel with the pursuit of this broad social welfare aim, it is also obvious that it requires interpretation and elucidation to turn it into an operationally useful concept. This is the first major obstacle to be confronted. The general criterion needs to be applied to the particular circumstances of the forest sector which the strategy seeks to address. We will call this specific derivative *strategic impact*.

The second problem to be tackled is managerial; one of creating effective administrative machinery for promoting development and securing compliance with its stated objectives. The aims phase of the strategy process involves scenario preparation and choice of the course of action that is judged likely to generate the greatest addition to public value. Whether the strategy that is selected is portrayed as a grand design, a basis for decision making or a path for development, does not affect the necessity for leadership and continuing supervision of the strategy process throughout all its stages from conception to implementation. The imperatives (holistic treatment of the sector, sustainability, equity and participation), which help to shape the strategy,

need to be interpreted to suit local conditions, applied realistically and continually observed. The success of the strategy depends on joint action. While the NFP is being implemented, it is necessary to stimulate and coordinate the contributions of all the participants in sector activities, supporting their common interest against sectional advantage and maintaining sectoral cohesion. The strategy process requires a framework of formalized relationships, based on consent, which is durable although adaptable enough to evolve to meet changing circumstances and capable of resisting unforseen shocks. Devising a suitable set of *institutional arrangements* is the challenge which faces those responsible for managing sectoral affairs.

How best to change prevailing attitudes is the third major issue to be addressed. The present policy orientation, characterized by a history of ineffectualness and failure, needs to be converted into a dynamic, forward looking ethos. Instead of talk of policy failures and a forestry crisis, as described in Chap. 1, attention should be focussed on strategic opportunities and development possibilities. Mayers & Bass have identified some of the policy problems (see Box 10.1) and suggested solutions

**Box 10.1 Typical features of the policy problem for forests and people**

1. Perceptions of forest 'crisis' and resource scarcity lead to normative government statements of policy and the imposition of cumulative layers of formal control
2. Policy mechanisms are too complex and incoherent to function well, i.e. to seek, analyse and respond to information on multiple values, problems and opportunities; to be responsive; to be equitable; and to set a long-term vision
3. Sectoralism and polarisation of views increase with uncertainty and complexity of forest issues
4. Pro-timber emphasis has concentrated wealth in some actors and retarded the development of democratic institutions connected to forest use
5. Those who have captured the benefits of industrial forestry have not paid the full costs — financial, social and environmental
6. There is a gulf in communications and perceptions between local forest actors and national 'policy-makers'
7. 'Informal' policy, i.e. decisions and actions reflecting power structures and domination by certain actors and interests, is more often significant than formal policy.
8. Much centralised, formal forest policy is, in practice, disintegrating as locally-controlled, multiple-use forestry rises in importance
9. Policies from outside the forest sector have more influence than 'forest sector' policy. Yet most efforts to deal with forest problems do not acknowledge this reality. They remain 'forestry solutions'. Thus they are limited in their effectiveness.

Source: Mayers & Bass (1999), page 15.

based on "a reinvention of policy in the current context of forestry and land use"[1]. They stress the significance of policy processes that work and call for a more people-centred approach. The shift in perceptions that they advocate corresponds with the strategic approach to forest sector development elaborated in these pages. A new *style* of management is necessary, based on sector strategy instead of forest policy. As with strategic value and institutional arrangements, the choice of an appropriate style depends on local conditions.

These three issues, strategic impact, institutional arrangements and style, require practical solutions. They are inter-related and affect the strategy process as a whole. Their importance means they should not be side-stepped. However, in each case, the appropriate response is determined by the situation that prevails; there are no universal answers. The forest sector differs from country to country, varying in composition, endowments and potential. It follows that the solutions must also vary according to local circumstances. There is no panacea.

Specific answers need to be determined for each case. The forest sector is a conglomerate composed of diverse organizations whose activities and aspirations must be reconciled. What constitutes strategic impact on a particular community emerges as a compromise between competing outputs and activities. What balances conflicting interests decides the form of the most suitable institutional arrangements. What is perceived as a sound strategy sets the style of sector management that is desired. Compromise, balance and perception should govern strategic management, not the pursuit of any preconceived, idealised state.

This chapter is divided into four parts. Strategic impact, viewed as a compromise, institutional arrangements, seen as a balance, and style, dependent on perceptions, are discussed in turn in the first three sections. The chapter concludes with an assessment of the way ahead.

## 10.1 STRATEGIC IMPACT

Public value, as described in Chap. 8, represents the additional social welfare generated for the nation as the result of public and private activities. The idea of strategic impact, as developed here, refers to the public value generated by alternative strategies for forest sector development. It is a specific interpretation of the public value concept which relates to particular places and sets of circumstances. Strategy is based on choice and strategic impact provides the basis for making those choices in the forest sector of a specified country or region. One strategy is preferred to other options because it is expected to generate more public value — have a greater impact on welfare — than the alternatives. The sector is treated as a system and one future state of the system is judged to be 'better' than others if it is anticipated that it can make a larger impact on the welfare of society than the others.

The sector supplies multiple outputs and the system is capable of providing various combinations of outputs, governed by the development strategy that is selected. Consumers' requirements are reconciled to productive capacity through

the flow of outputs. The flow may vary over time and the composition of the output mixture may alter. Public value depends on both the size of the flow and the quality of the outputs. The output stream consists of both tangible and intangible benefits; some are measurable and can be traded, while others cannot be counted or valued convincingly in money terms. Comparison of the output streams generated by strategic alternatives is therefore impossible using an absolute (cardinal) scale; it is not possible to add cubic metres of timber to biodiversity or existence values. Instead, a relative (ordinal) approach must be used, based on preferences, which compares alternative output streams by their desirability compared with others. Such judgements are obviously subjective. Choices depend on compromises about the mixture of outputs and the expectations of different social groups.

Choice of strategy does not depend solely on the expected flows of outputs. Streams of outputs are the result of sector activities — different sets of outputs come from different combinations of transformations in the system, using a variety of inputs with different costs. Forest resources may be used in many ways to obtain alternative output streams. Sector activities generate employment, incomes, profits etc., distributed in various ways among sections of the community. The pattern of activities influences organizational behaviour and the sector's institutional framework. Some activity combinations have economic and social consequences which are preferable to others. Public value is derived from activities as well as outputs; both are pertinent to strategic choices.

A third aspect of strategic choice is the effect of imperatives. These restrict the range of possible strategies in an obvious way by ruling out those that fail the four tests of holistic treatment, sustainability, equity and participation. Less-obviously, the imperatives interact and are themselves subject to interpretation to suit specific situations. What is holistic depends on where sector boundaries are drawn; what is sustainable reflects a balance between safeguarding resources and the continuity of output flows; what is equitable depends on decisions about who should get what; and participation can take many different forms, with different consequences for the outcome of the strategy. Furthermore, the imperatives contribute to the strategy by imposing standards which are themselves based on welfare considerations. Sustainability, for example, is believed to be a socially desirable state of the system and therefore represents a form of public good, even though it is not measurable on any quantifiable scale as are the outputs of forest products. Similarly, the other imperatives represent conditions, which confer public benefit if they are complied with; non-observance can be regarded as a disbenefit, which is associated with reduced public value.

Judgements are required about outputs, activities and the interpretation of imperatives in the specific situation for which the strategy is being devised. Scenarios represent the consequences of alternative sets of interventions in the system. Public value cannot be measured on a cardinal scale so choice must depend on general impressions of their probable outcomes. The results of implementing strategic decisions are never certain. Therefore, choices are also influenced by risk assessments and the consequences of failure. Decision makers may be more- or

less-sure about achieving the desired results; the outcome represents a trade-off between their confidence in the expectations and their assessment of the relative public value of each option.

Strategic impact is a derivative based on expectations. The analysis shows that it has three components: outputs, activities and imperatives. Alternative states of the sector as a system produce different public value combinations derived from these components. They influence the nature of the impact and consequently the choice of scenario.

Assessments of strategic impact are based on compromise and judgement. They lack precision and depend on how individuals perceive the public value resulting from alternative scenarios. The personal nature of decision making is unavoidable, but the final selection of a strategy is the climax of a process that involves or affects many participants. Consequently, the type of consultation procedure that is employed is an important consideration. Views about the desirability of the strategic impact of each scenario need to be sought from a range of interests in the hope that a collective opinion will emerge on which to base a final choice. Participants in the process can benefit from a clear presentation of the principal features of each option, so that their contributions to public value can be compared and judged. Simplification of the issues is also desirable; where possible, the complexity of impact assessments should be reduced. The preceding analysis has shown that compromises or reconciliations of one sort or another lie at the heart of strategy selection. Focussing on these sharpens the decision process. Three significant features which represent vital compromises can be identified. These features are inherent in every scenario and affect its public value. They may be used as general indicators of public value when comparing options.

The influences which combine to produce strategic impacts and the three indicators used to judge them are shown in Fig. 10.1. The influences roughly correspond to the indicators, although the latter are more general in scope. The first concerns the nature of the output mix, the second is the balance between the rate that forest resources and other assets are created and the rate that they are used up, and the third tests the extent of correspondence between activities or strategic fit. The proportions in which outputs are combined affects public value directly and via the activities of the organizations which generate them, the flow balance (in so far

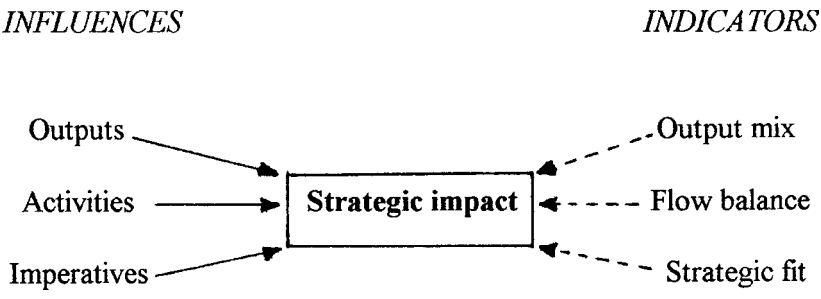


*Figure 10.1* Influences and indicators of strategic impact

as it is measurable) is an important indicator of sustainability in relation to forest sector activities, and the best fit criterion considers sectoral interactions and the benefits obtained from synergy which affect all aspects of sectoral development. In the previous chapter Table 9.2 was proposed as a basis for comparing scenarios. These indicators are intended to supplement that table.

The **output mix** indicator is concerned first, with the combination of outputs that is expected from each scenario and second, with their organizational implications. Output combinations can be described by indicating the relative weight or degree of importance attached to each of the goods and services obtained from the sector, even though environmental and social benefits are difficult to quantify. For example, a scenario based on increasing timber production would give a high rating to wood products and a relatively low one to, say, landscape or biodiversity, whereas these ratings would be reversed for a scenario that concentrated on environmental improvement. In some cases, it may be possible to show the proportions of the major outputs as percentages, as with processing alternatives (e.g. plywood production versus pulp and paper). The nature of the output combinations affects the activities of the organizations that carry out the transformations that lead to the outputs; emphasis on sawn timber production leads to increases in logging and sawmill capacity, for example. Conservation activities are likely to be carried out by different groups of people, in different locations, to industrially based developments. Similarly, employment opportunities and income generation tend to follow the sources of the different outputs. A comparative presentation in the form of a matrix, as shown in Table 10.1, can be used to summarize the main features of the scenarios to aid decision making. Outputs are listed vertically and scenarios horizontally; each option has separate columns to separate the proportional aspect of the mix from their organizational consequences.

**Flow balances** indicate what is expected to happen to the various types of assets in the forest sector under alternative scenarios as shown in Table 10.2. They compare the rates at which the stocks of natural resources and man-made capital are accumulated or run down. Thus, standing timber in the forests is increased each

*Table 10.1* Output mix assessment table

| Outputs | Baseline scenario | | Option 1 | Option 2 etc. |
|---|---|---|---|---|
| | Weight or importance | Organizational consequences | | |
| Timber: | | | | |
| sawn timber | | | | |
| plywood | | | | |
| pulp and paper etc. | | | | |
| Non-wood products | | | | |
| Water | | | | |
| Carbon sequestration | | | | |
| Biodiversity | | | | |
| Landscape etc. | | | | |

*Table 10.2* Flow balances in the forest sector

| Assets | Baseline scenario | | Option 1 | Option 2 etc. |
|---|---|---|---|---|
| | Additions to stocks | Reductions in stocks | | |
| Forest resources: | | | | |
| standing timber | | | | |
| carbon sequestration | | | | |
| water storage capacity | | | | |
| populations of selected species | | | | |
| effects on biodiversity etc. | | | | |
| Man-made capital resources: | | | | |
| logging | | | | |
| primary processing | | | | |
| manufacturing etc. | | | | |
| Human resources: | | | | |
| numbers employed | | | | |
| output per employee etc. | | | | |

year by the addition of natural growth and reduced by the quantity removed as fellings or through natural causes; the annual net gains or losses measure the changes in the capital stock. Similarly, the build-up of man-made capital, in the form of buildings, vehicles and equipment, is shown by the difference between investment and depreciation rates; each year, new capital formation takes place which is offset by the amount used up as assets wear out and need to be replaced. Human capital alters as the numbers employed change and their productivity increases; it may also be possible to measure changes in the levels of training and skills.

Flow balances should be measured over the period covered by the strategy and NFP. The units of measurement may be either quantities or values, as appropriate. The types of balance chosen for inclusion in the left-hand column should match the significant characteristics of the scenarios. The table indicates whether capital is being kept intact and represents a reconciliation between development and stewardship of resources, which has a direct bearing on sustainability. The recipe for sustainability given in Chap. 5 is based on safeguarding the resource base, maintaining sector activities and preserving output choices. The table indicates the extent to which the various development options comply with these requirements; it also shows where investment is expected to occur, which forms the basis for future development.

The **strategic fit** concept features in the literature on corporate strategy. Strategy regarded as 'position' is one of Mintzberg's five Ps described in Chap. 8. It represents the match between an organization and its environment; it can also be interpreted as the compatibility between an organization's activities and its resources. The idea has been developed further by Porter[2], who regards strategy, in the context of a firm's competitiveness, as "the creation of a unique and valuable

position, involving a different set of activities" from those of its rivals. He points out that strategy is about *combining* activities and competitive advantage grows out of the whole system. He distinguishes three categories of fit:-

- first-order fit consists of *simple consistency* between activities and the overall strategy,
- second-order fit occurs when *activities are reinforcing*,
- third-order fit goes beyond reinforcement to produce *optimization of effort.*

This concept can be applied internally to the forest sector to ensure that its proposed activities are consistent with one another, mutually reinforcing and lead to optimum results. It can also be extended externally, to ensure compatibility with other sectors and national policies, and internationally, to comply with the terms of treaties with foreign countries, regional agreements and global conventions. The strategy that is chosen should represent the best fit at all levels. A simple example demonstrates why strategic fit is important: first, the output of timber and other forest products should match the productive capacity of sawmills and other primary processing plants, second, the strategy should correspond with any national policy there may be for industrial development, third, it should conform with any regional criteria for sustainable forest management that have been adopted and fourth, if the timber is exported, it should comply with agreements on world trade. Discrepancies at any level could undermine the success of the strategy.

Strategic fit relates to compliance with the imperatives. A holistic approach, which treats the sector as a system, implies that its activities should be consistent with each other; if they are mutually reinforcing and optimize the effort put into them, synergy will result. This enables the sector to become more than the sum of its parts. Sustainability depends on strategic fit because a strategy that does not fit, internally, nationally and internationally, is most unlikely to survive for long. Similarly, a misfit is unlikely to produce equitable results for stakeholders or meet the conditions necessary for effective participation in sectoral affairs.

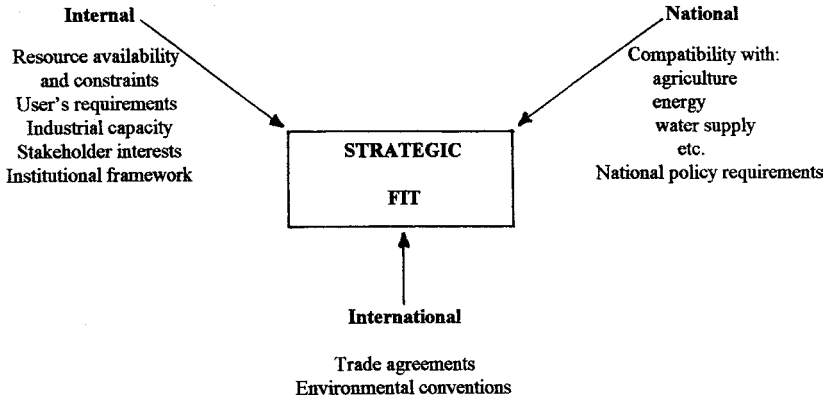


*Figure 10.2* Components of strategic fit in the forest sector

Some of the important components of strategic fit, which need to be considered during scenario preparation, are shown in Fig. 10.2. They comprise three groups or levels of compatibility.

## 10.2 INSTITUTIONAL ARRANGEMENTS

We turn now from the manifestation of public value in the form of strategic impact to the institutional arrangements which help to generate that impact. The strategy process provides a natural focus for these arrangements. Strategies are chosen after their expected impacts are revealed and compared. There is no single or simple scale on which to measure their relative worth and decisions are made by reconciling the various influences and indicators involved. They depend on judgement. Assessments of strategic impact are based on compromise and administrative procedures are necessary, which facilitate agreement and cooperation during the aims phase of the strategy process. The action phase of the process also depends on willingness to work together. This requires a set of institutional arrangements designed to achieve an appropriate balance amongst the various stakeholders, regulating and encouraging their contributions, and fostering sectoral development in the interests of all.

From an organizational standpoint, as described in Chap. 6, the forest sector is a conglomerate whose members tend to pursue their sectional interests. Their divergent objectives need to be harmonized by agreement. Therefore the sector can only function satisfactorily by consensus and the sector's institutional arrangements must be based on voluntary association. They should foster a common purpose and promote a positive approach to change. The way that aim is achieved in each country depends on the characteristics of the sector, the nature of the interests and the form of sectoral development that is chosen. Like the public value compromises discussed in the previous section, institutional arrangements are specific to the countries and regions to which they apply. Some general principles can be pointed out, but the actual solutions adopted in each case must fit the national circumstances and be suited to its problems.

The administrative procedures necessary to make the strategy process work should address four main issues. First, the roles of the various participants need to be sorted out, particularly the general responsibility of the state for overseeing the process and the contributions to come from government departments, private sector enterprises and NGOs. Secondly, a suitable forum is required to bring together and balance the diverse interests that are represented, thus enabling participants to contribute effectively at each stage in the process. The third main function consists of providing leadership and direction; it involves selecting the organization that is best suited to guide the process as it progresses and the person(s) most capable of imbuing it with confidence, drive and vision. Building up the sector's capacity to generate public value and to cope with disruptive influences represents the fourth purpose. Competition between stakeholders can lead to disputes which need to be resolved and unforseen events may require crisis management if sector strategy is not to lose its way.

**The Role of Government**

The state has a dual role in relation to the forest sector. In Chap. 6, it was noted that government functions could be divided into 'forest authority' and 'forest enterprise'. The former refers to its institutional responsibilities, whereas the latter covers the activities of government ministries and departments engaged in managing forest resources. In many countries the distinction is blurred, particularly where the government owns and administers a high proportion of the forest land. The institutional responsibility is regulatory and wide-ranging; it applies to all sectoral activities and represents the national interest. In relation to strategy and NFP preparation, the government clearly has a duty to oversee the strategy process and to foster the sector's development. But this does not necessarily mean that it must own forest resources or directly undertake forest management activities. Public value can be generated by private interests as well as public enterprise, as was shown in Chap. 8.

In relation to the enterprise function, there is a strategic balance to be struck between the extent to which government agencies themselves supply goods and services from forest resources or leave their provision to others. The regulatory responsibility of the state is not affected, in principle, by who owns the resources or carries out sector activities. Regardless of ownership, the strategy process is aimed at delivering the maximum possible public value. The issue of 'who does what' should be decided using the strategic impact criterion, having regard to local circumstances and the ability of various organizations or groups to deliver the goods and services that society requires. There is a range of possibilities: at one extreme is the situation where the state attempts to provide almost everything; at the other, almost all sectoral activities are undertaken by the private sector, with some degree of interference by the government. In reality, where the dividing line between public and private is drawn, is too often a doctrinaire decision instead of a pragmatic choice.

Emphasis on the ability of market forces to meet consumers' needs became an article of faith in the 1980s, replacing previous reliance on public enterprise to meet the need for many essential services. Public provision of these services was widely presented as inefficient. This general trend, based on an uncritical belief in the superiority of private enterprise, affected the forest sector in several countries, leading to the disposal of some state forests to the private sector, as in New Zealand and Great Britain. In the former communist countries of Eastern Europe, large areas have been returned to private hands. Fortunately, 20 years later, there is reason to hope that the "extremes of the market paradigm have begun to give way to a more balanced approach which recognises a legitimate role for public investment"[3]. It is recognized that more attention needs to be paid to issues of market failure.

The allegation of inefficiency in public enterprises is largely based on procedural or administrative shortcomings as Box 10.2 shows. The objections may be justified in large-scale industries dominated by one type of product (such as steel or electricity), for which consumers' requirements are determined by market forces

**Box 10.2 Criticism of public enterprises**

"The everyday criticism of public efficiency tends to focus on four main shortcomings and ascribe them to four main causes. Public enterprises are thought to neglect their customers' wants, to allocate resources inefficiently, to produce inefficiently at unnecessary cost, and often to be stuck in their ways, resisting necessary modernization or replacement. These inefficiencies arise because administrative planning is a poor substitute for the customers' market demands; public investors and managers lack profit-seeking discipline and incentives; public employees can use industrial muscle to get more pay for less work than market-disciplined employers could afford; and governments can and do finance inefficient and unnecessary activities to continue when market discipline would reform or close them down."

Source: Stretton & Orchard, 1994, page 48.

and prices. The strength of the case for public enterprise in such circumstances appears to depend on the possibility that a privately-owned corporation with unfettered monopoly power might control the market and exploit the public by extracting excessive profits. However, this is a far cry from the situation in forest industries, where most processing and manufacturing is done by small or medium sized firms, products are diverse and markets are usually open to competition. Generally, since the demise of the former communist regimes in Eastern Europe and Russia, direct participation by governments in the forest sector's industrial activities is no longer common. It is recognised that these activities are usually better carried out by the private sector.

Government involvement in the ownership and management of forest resources is quite a different matter; it is widely believed that 70–80 percent of the world's forest area is under state control[4]. Although the historical reasons for this are complex, it is apparent that state forestry has been viewed favourably for a long time. The justification for this appears to rest on the belief that governments must provide certain types of goods and services that the private sector cannot be relied on to supply in appropriate amounts. Many of the outputs from the forest sector fall into this category[5]. However, it should be pointed out that state ownership of the resource is not the only way to ensure their provision; in some cases it may be possible to achieve the same result by regulating operations in privately-owned forests or offering suitable inducements to their owners.

Many forest sector outputs are classed as public goods. They "are called 'public' because they can't be supplied to anybody without being available to everybody, and their individual users can't be made to pay for them"[6]. The provision of these goods has to be determined by collective political choice, not by individual market demand. National defence, lighthouses and street lighting are examples; in the forest sector, biodiversity and carbon sequestration are included. In fact, most types of output derived from forest resources fall into the public goods category.

Using the classification in Table 5.3, the most notable exceptions are those tangible products (such as timber) which generate direct use value; all the rest, including some intangibles in the direct value category and all those in the indirect, option and existence value categories, fit the description of public goods. It is also evident that most of the benefits associated with conservation and environmental activities generally, whether inside or outside forests, are public goods. Left to itself, the private sector cannot be expected to provide them. In fact, it is the desire for an assured supply of public goods that justifies the involvement of the state in the management and control of natural resources, whether through ownership or regulation or incentives. This applies to forest reserves, national parks, nature reserves and other comparable designated areas.

Much of the criticism of public enterprise, in so far as it has been applied to the forest sector, therefore fails to stand up to scrutiny. Organizations of any kind, public or private, may suffer from maladministration or inefficiency for which the remedies are institutional and managerial. Transferring ownership of forest resources to the private sector might or might not improve their management, but surely makes it more difficult (and probably more costly) to guarantee the flow of public goods that they provide. With the possible exception of those forests where timber production is paramount and the environmental/conservation benefits are insignificant, privatization of forest resources appears to be a doctrinaire and somewhat risky policy, which can easily lead to welfare losses for the community. In most cases, it is not necessary and other cures for administrative shortcomings are preferable, which confront the real issues directly.

The balance between the activities of government agencies and private sector organizations in relation to achieving the strategic objectives for the sector and implementing the NFP represents a national political choice. If approached sensibly, it should aim for the maximum public value at the least cost to society. The balance depends on a range of features, which include the political system, the stage of development reached, ownership and land tenure, customary usage and the output mix. In some countries large areas of forest land are national assets which are directly managed by forest departments or comparable government agencies. In others, participatory management regimes combine public and private interests in various forms of joint endeavour. Where private ownership predominates, as in many European countries, this is often associated with government restrictions on felling accompanied by environmental safeguards and subsidies. Ownership, cooperation, regulation and inducements are blended together to produce a mixture of public and private ownership that varies from place to place. There is more than one route towards enhanced public value.

The public/private blend that suits one nation may be quite wrong for others and there is no simple formula for finding the best combination. The mixture of ‘sticks’ and ‘carrots’ that is employed is also country-specific with no discernible rules to follow. Public value is best sought pragmatically, continually seeking improvements according to the prevailing situation at the time. Furthermore, the optimum solution in any particular country is unlikely to remain the same because public attitudes,

stakeholders capabilities and output requirements are dynamic influences which continually change while time passes. The part played by the state in forest sector activities should be viewed against a background of change and development. This applies to its role as landowner and manager of state enterprises and also to its institutional functions in relation to the management of forest resources generally.

## A Forest Forum

Participation in sectoral affairs takes two forms: most obviously, all those who take part in its activities are sectoral participants; less obviously, participants may contribute in various ways to the strategy process which determines what the sector does and its future development. Organizations of all kinds, government and non-government, groups and individuals, participate in the sense that they contribute to the output of goods and services derived from forest resources. The other form of participation is institutional and concerned with arrangements to enable stakeholders to assist in the formulation and implementation of strategy. Participation in the latter sense is an imperative as defined in Chap. 8.

The state is the ultimate authority on all matters to do with the sector. Consequently, it should be responsible for establishing a suitable institutional framework and deciding the kind of administrative arrangements required to deal with the strategy process. It can include or exclude particular groups, regulate their involvement and determine who should provide leadership. Control of the process can be retained centrally or delegated within prescribed limits. The framework's main features may either be specified by law or codified in administrative guidelines, the latter being less binding but easier to modify and keep up-to-date as circumstances change. The nature of the participatory arrangements determines the scope for individuals to contribute and the responsibilities that they are expected to take on. As the prime mover in the strategy process, the government can encourage or discourage participation and set the sector's style.

Facilities are needed which enable participation to take place. A consultative assembly for the sector at national level or *forest forum* is envisaged. It is essential to develop ways of bringing together the various sectoral interests and encouraging them to interact constructively. The sector was described in Chap. 6 as a loose conglomerate composed of organizations and groups dependent on forest resources. Stakeholders have a mutual interest in strategy formulation and the promotion of sectoral development, from which all stand to benefit. The purpose of creating a forum is to reinforce the links between them and to encourage participants to contribute effectively to all stages of the process. A forum can serve as a focal point which helps to bind together the various interests and foster unity of purpose. It can harmonize relationships and assist in dealing with disputes. Externally, it can provide an authoritative voice, representing the interests of the sector, and influence public opinion.

Several modes of operation with varying degrees of participation are possible. At its most basic the forum provides a meeting place for exchange of views and

discussion of sectoral affairs; it serves as a safety valve for expressing participants' concerns, disagreements and discontent. This represents a first step in participation, but does not go far enough to fully satisfy the imperative. The next step involves a more active role, based on consultation, with members able to influence the decisions which affect their interests and thereby gain some control over what happens in the future. It gives them the right to be heard but only limited powers to intervene; the procedure remains basically authoritarian with the participants in a subordinate role. Full participation involves members in strategy formulation and NFP preparation as equal partners with the government. However, power goes with responsibility and members must be willing to support a sectoral approach. Therefore, a forum can evolve, starting as a communications device and progressively becoming more powerful and energetic. A fully-developed forum would enable the sector to control its own affairs within broad limits approved by ministers and the legislature.

The administrative arrangements may be informal at first, later specified in written terms of reference. A formal constitution to define the forum's role becomes essential when it takes on substantial delegated powers. The forum must be imbued with sufficient authority to carry out the tasks it is given and may need to be supported by enabling legislation. The provision of support services to enable it to function properly is likely to fall on the government; in many countries, by default or by virtue of its dominant position, the government department responsible for forest management is the obvious choice. However, if the forum is to be truly participatory, the government must refrain from trying to dictate how it should behave or the conclusions it comes to. Its members should feel they are in control. Public sector organizations (such as the forestry department or national park authorities) should take part on the same terms as private interests (including landowners, firms and NGOs). Representation of the interests of stakeholders needs to be balanced and reflect the relative importance of their contributions to sectoral activities.

Constitutional matters to be addressed include:-

1. The forum's purpose, aims and scope of activities; definition of its powers and responsibilities.
2. Its membership and the way representatives from the various interest groups are to be selected; there may be problems of balance due to inequalities of power, lack of organization, conflicts of interest etc.
3. Office bearers, method of appointment, elections and terms.
4. Conducts of its business and frequency of meetings; committees and working groups; administrative and technical support arrangements.
5. Functions in relation to the stages of the strategy process; the forum's role in providing feedback during strategy formulation and the programme cycle is particularly important; the full range of contributions is set out in Table 10.3.
6. External relations, liaison with other sectors and public role.
7. Funding and accountability.

The functions of the forum are described in Table 10.3. In the first place, they bring participants together, enable them to exchange views and to cooperate.

*Table 10.3* Contributions to the strategy process from a forest forum

| 3A cycle | Strategy process | Role of forest forum participants |
|---|---|---|
| ANALYSIS | **Sector review** | Provision of information |
| | **Transformations and modelling** | Provision of information for modelling |
| | **SWOT analysis** | Identification of strengths, weaknesses, opportunities and threats |
| | **Participation** | Data on participants sectoral roles and interests |
| AIMS | **Imperatives** | Identification and interpretation |
| | **Scenarios** | Assistance with presentation and publicity<br>Consultation — *feedback* |
| | **Strategy formulation** | Assistance with scenario revision and modification — *loop*<br>Recommendations on choice of strategy<br>Consultation on strategic objectives and action areas<br>Views on regional/state/provincial strategies |
| | **NFP preparation** | Matrix and subprogrammes preparation<br>Tactical advice<br>Assistance with project identification — *programme* |
| | **Forest policy** | Consultation on policy statement — *cycle*<br>Publicity for strategy and NFP |
| ACTION | **Programme development** | Projects: assistance with preparation<br>joint ventures<br>financing<br>liason and consultation — *project* |
| | **Monitoring** | Assessing progress — *cycle* |
| | **Evaluation** | Assistance with project evaluation and review<br>NFP evaluation and assessment |

Sectoral cohesion takes time to build up. By communicating with each other, members get opportunities to understand what others are doing and gain insights into the interactions between their activities; participation leads to appreciation of their interdependence and the holistic nature of the forest sector. Their contributions to strategy formulation and NFP preparation may be expected to generate a proprietary interest in sectoral development and the benefits expected from it, both for them and for the community generally. Even if the forum does not have the last word in determining the programme, which is the prerogative of the government, participation in the aims phase of the strategy process is likely to generate a broader appreciation of the interests of others and the sector's public role. During the action phase of the process, decisions are required about who does what; participants roles need to be worked out and agreed to implement the programme. It is necessary

to reconcile conflicts and avoid manipulation by sectional interests. When projects are proposed and designed, the limitations of available finance cannot be avoided. Hopefully, the forum may give access to previously untapped resources which members individually could not reach. Enthusiasm for the forum's role can be proclaimed by drawing up a mission statement which publicises the forum's role and draws attention to its contribution to national development.

Although the government retains overall responsibility for overseeing the strategy process and promoting development, a forest forum can provide invaluable assistance. It allows all stakeholders to participate in the process, whether they are government agencies, profit-seeking organizations in the private sector or NGOs. It enables forest sector affairs to be arranged democratically, while reserving to the state the power to intervene to safeguard forest resources and the national interest if this should become necessary. It is also adaptable, as the forum's role can be suited to the stage of development reached. A strong forum can provide leadership and direction for the sector, but if participants are unable or unwilling to take on such responsibility, these vital functions can be injected directly by the government through the provision of supporting services. Similarly, a forum can contribute to sector capacity, enabling strategy implementation to proceed faster, and provide cohesion by facilitating the settlement of disputes. In the event of natural or man-made disasters, such as economic upheaval, fires or floods, a forum may be able to bring relief to those worst affected and mutal support for its members.

### Leadership

Leadership supplies the driving force behind the strategy process. It operates in two ways. At a personal level, it provides enthusiasm, energy, motivation and direction to enable the strategic objectives to be achieved; at the institutional level, a *lead agency* is required to manage the process and arrange for each of its stages to be carried out effectively in the proper sequence. Personal leadership may come from any of the main players or dominant groups in the forum. The most likely lead agency is the government department responsible for managing forest resources.

This duality is a feature of leadership in the forest sector. It is less pronounced in a single organization, such as a business enterprise where the managerial aspect of leadership is carried out internally, within the firm. In a conglomerate, such as the forest sector, it is possible to separate personal leadership from the institutional arrangements that provide support for the strategy process. A lead agency can be set up that is specially equipped to perform the essential functions of organizing, coordinating and controlling the process. Leadership skills need to be embedded in the agency for this purpose. Where, in the first instance, the government allocates responsibility for formulating strategy and preparing a national forest programme to the forest department, it is a natural step for that department to take on the role of lead agency, as happened in Cyprus[7]. If no forum yet exists, or it is at an early stage of development, the lead agency function passes to the forest department by

default. In any event the expertise needed to provide administrative and technical support for the strategy process is unlikely to be available elsewhere in the sector. In these circumstances the person in charge of the lead agency will also be expected to provide personal leadership.

The subject of leadership has received attention in the business studies literature, although usually from the point of view of a single organization and mostly in terms of the personal qualities required. Thus Buchanan & Huczynsky[8] offer two definitions of leadership:-

- leadership is the creation of a vision about a desired future state which seeks to enmesh all members of an organization in its net,
- leadership is a social process in which one individual influences the behaviour of others without the use or threat of violence.

Both interpretations are relevant to the personal qualities necessary for forest sector leadership, whether the leader comes from the forest department or a forest forum. Strategy, particularly in the sense of a grand design, is certainly about creating a vision; it is also necessary to influence the attitudes and behaviour of others in order to choose and implement a suitable course of action.

The literature distinguishes between leadership and management, although they are closely related. Leadership tends to emphasize interpersonal behaviour and does not necessarily take place within an organization's hierarchical structure; not all leaders are managers, nor the reverse. The 7-S organizational framework shown in Fig. 6.2 identifies seven elements. Four of these (style, staff, skills and shared goals) are people-centered attributes, the other three (strategy, structure and systems) tend to be associated with managerial functions. The strategy process in the forest sector is clearly concerned with all seven: the first four 'soft' Ss relate particularly to the personal aspect of leadership, whereas the remaining three correspond with lead agency functions.

A number of different analytical approaches to leadership can be identified[9]. The personal qualities or *traits* approach assumes that leaders are born, not made. However, even if this was true, natural talents need encouragement and development. Leadership in the forest sector certainly does not depend on personality alone. It is more useful to examine the *functions* of leadership. Box 10.3 lists fourteen which show their wide range. These apply to a single organization or 'group' of people, although most are also relevant to the forest sector; some are obviously more important than others. Another approach is based on *behavioural categories*. Leadership is viewed as a combination of two independent dimensions, which have been labelled 'consideration' and 'structure'; the former corresponds to the human relations aspect, the latter to the organization of group activities. This approach fits the dual circumstances of the forest sector. *Contingency theories* are based on the belief that there is no single style of leadership that fits all situations. This is obviously true of the forest sector which differs widely in composition from country to country. Leadership is undoubtedly a key factor in the strategy process, but it is not possible to prescribe a set of optimum leadership arrangements for

**Box 10.3 Functions of leadership**

- The leader as *executive* — top co-ordinator of the group activities and overseer of the execution of policies.
- The leader as *planner* — deciding the ways and means by which the group achieves its ends. This may involve both short-term and long-term planning.
- The leader as *policy maker* — the establishment of group goals and policies.
- The leader as *expert* — a source of readily available information and skills, although there will be some reliance on technical expertise and advice from other members of the group.
- The leader as *external group representative* — the official spokesperson for the group, the representative of the group and the channel for both outgoing and incoming communication.
- The leader as *controller of internal relations* — determines specific aspects of the group structure.
- The leader as *purveyor of rewards and punishments* — control over group members by the power to provide rewards and apply punishments.
- The leader as *arbitrator and mediator* — controls interpersonal conflict within the group.
- The leader as *exemplar* — a model of behaviour for members of the group, setting an example of what is expected.
- The leader as *symbol of the group* — enhancing group unity by providing some kind of cognitive focus and establishing the group as a distinct entity.
- The leader as *substitute for individual responsibility* — relieves the individual member of the group from the necessity of, and responsibility for, personal decision.
- The leader as *ideologist* — serving as the source of beliefs, values and standards of behaviour for individual members of the group.
- The leader as *father figure* — serving as a focus for the positive emotional feelings of individual members and the objective for identification and transference.
- The leader as *scapegoat* — serving as a target for aggression and hostility of the group, accepting blame in the case of failure.

Source: Mullins (1996), page 245.

the sector which are universally applicable. Each country has to work out its own solution to the leadership problem.

Leadership has an important cultural dimension which these analytical approaches fail to bring out. The style of leadership that suits the forest sector in different countries is influenced by the social values of people associated with the sector and the customs of the communities in which they live. National cultures affect leadership style and the prevailing organizational culture in the sector is likely to

alter in response to changes taking place outside. Leadership also creates cultural change within the sector by introducing and encouraging new attitudes and ways of working. As was pointed out in Chap. 6, all theories of organization are based on implicit images or metaphors and foresters' preconceptions about management are frequently out of date. It is essential to get away from the authoritarian image of the leader as the 'boss' and to envisage him as a culture builder and shaper of organizational evolution. Organizational learning and adaptability have become important concerns which foresters and conservationists need to address. This calls for additions to the list of functions in Table 10.3; the leader should also be seen as *designer*, *teacher* and s*teward*[10]. Leadership involves the acquisition, spread and commitment to knowledge-based skills and the sector's mission.

Within the sector there are cultural differences between public and private sector organizations[11]. Motivation based on the public interest in the former and pursuit of profit in the latter inevitably affects their leadership styles. It is sometimes argued that private firms are more innovative because change is necessary for survival, whereas government agencies tend to offer a more stable operational environment for their leaders. Public sector administrators are more open to political influence than the managers of commercial enterprises. Sector leadership must deal with these stylistic differences in order to maintain harmony within the sector; at the same time they represent a source of strength on which to draw. By participating in the strategy process sector organizations can support the leadership, contribute new ideas and strengthen the sector's political position. Their diversity helps to generate momentum for development.

Are there significant differences between leadership in a unitary organization, such as a firm or government department, and leadership of a conglomerate like the forest sector? The style of leadership is likely to differ because the director of a single group may be able to apply sanctions to his employees that are not available to the leader of a voluntary association of organizations. It is not possible to compel organizations in the sector to comply with the strategy and programme. That limitation apart, the tasks performed by the leadership are much the same in both cases. The same list of functions applies, although the relative importance of particular items on the list may vary. The most obvious distinguishing feature of leadership in the forest sector is its pronounced duality. This arises because it is possible (but not necessary) to separate personal leadership from management of the strategy process by a lead agency. Whether the leadership functions are united or split, the complexity and dynamic nature of the forest strategy process make it essential to provide strong technical support for its managerial aspect. Forest sector leadership demands strategic know-how as well as personality and charisma.

Forest strategy aims to bring about change and development. Development of the forest sector can be promoted most effectively by combining leadership with the strategy process through the medium of a forest forum. Leadership interacts with the forum on one hand and the strategy process on the other in a three-cornered relationship (see Fig. 10.3). The forum facilitates participation in the strategy process and may provide leadership; leadership organizes the strategy process and guides

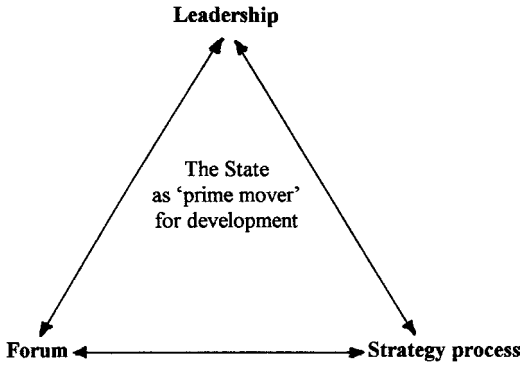


*Figure 10.3* The development triangle

the forum; the strategy process gives direction to the leadership and influences the work of the forum. Overall responsibility for the working of the triangle remains with the government.

Leadership, the forum and the strategy process all need to evolve in harmony. Leaders may be elected or appointed to take charge of the process; they may come from the forum or the lead agency, from the private or the public sector. When strategic management is first introduced, the lead agency is likely to be in the driving seat and therefore responsible for generating the vision and cohesion necessary to move the sector forward. Later, when the forum has become well-established and capable of acting in a non-partisan spirit, a person with the required personal qualities and force of character may emerge from elsewhere. A well-developed, influential and relatively independent forum is needed before sufficient confidence is built up to enable control of the strategy process to pass out of state hands. The development triangle is therefore a dynamic relationship which changes as sector development proceeds.

Leadership functions are concerned with the management of change. In an open system like the forest sector this requires an understanding of the interactions between its parts; it is essential to treat the sector holistically. The interplay between organizations in the sector complicates the task of the leader. Some are government agencies, some are profit-seeking enterprises and others represent the interests of particular groups. They are a diverse bunch with various motives and agendas of their own, which must be encouraged to cooperate in the interests of the sector as a whole. Conflicts are inevitable which the leader must seek to resolve, using the limited powers available to him. He can conciliate and arbitrate, he may be able to offer inducements of one kind or another and in the last resort, he can call on the government to force the issue by legislating or bringing sanctions to bear on organizations or groups in order to bring them into line. In the event of a crisis the leader is expected to take charge. The leader may be forced by circumstances to instigate alterations to the programme and, in extreme circumstances, to revise the existing strategy. The leadership requires support to carry out these functions.

**Programme Support**

It is evident that effective leadership can contribute significantly to the achievements and pace of development. However, to generate the maximum momentum, the sector's institutional arrangements should also provide technical and administrative back up for programme implementation. It is necessary to set up a programme support section under the auspices of the lead agency. The section should concentrate on three features: projects, performance and precautions. It would consist of a small project planning unit as proposed in the last chapter and an information unit using computers and a data base; measures intended to protect the strategy against failure should permeate the projects and programme at all stages.

**Projects** are the building blocks of development. A NFP consists of numerous projects arranged in subprogrammes, as described in Chap. 9. The capacity of the sector to provide a sustained flow of goods and services depends on projects; capacity building to increase the flow is achieved by adding new projects within the framework established by the strategy and programme. Each project follows the steps in the project cycle. It needs to be prepared, appraised, approved, financed and implemented. Technical assistance is needed to promote and assist each project throughout its life.

The skills necessary at the preparation and design stage include an understanding of logframes (see Table 9.5) and investigation of design alternatives. Appraisal, both of alternatives and entire projects, involves discounted cash flow and cost-benefit analysis; these methods may be associated with systems analysis, modelling and shadow pricing. Financial assessment examines costs and returns, budgets, payback periods, profitability and markets. Implementation is based on the scheduling of operations and may make use of project network techniques such as critical path analysis [12]. It is sensible to retain trained personnel with the necessary expertise in a small project unit to which sector organizations have access. If the project unit's workload becomes too great, assistance can be sought as needed from external consultants. Additional technical help can usually be easily purchased, but the unit needs one (or more) people capable of supervising their work and assessing their results.

The promotion of project proposals, including approaches to possible investors and securing the funds to carry them out, requires a network of external contacts which the leadership can help to build up. Members of the forum with commercial and other links with organizations elsewhere can contribute to the network. Sources of finance that may be tapped include loans from banks and credit institutions for revenue generating projects; in some instances firms in the forest sector may join forces with enterprises in other sectors to undertake new ventures. Projects which are not commercially viable depend on resources provided by the government, NGOs, or assistance obtained through bilateral and multilateral aid agencies. They are justified by their contribution to the flow of public goods and services and the case for undertaking them must be carefully substantiated by showing how the community will benefit, both directly and indirectly. Cost-effectiveness analysis is appropriate where benefits cannot be measured. The role of the project unit is

to provide well-prepared proposals, backed by thorough appraisals, which can be submitted to financiers and aid donors. The unit may also represent the sector in subsequent negotiations.

**Performance** during the implementation stage needs to be monitored and periodically reviewed. This applies to both the projects and the programme as a whole. Each project needs to be observed to see how well it is proceeding and the progress made by the programme towards the strategic objectives needs to be recorded for scrutiny by the lead agency and reporting to the forum. A carefully designed monitoring system is necessary, using the facilities of a substantial data base and up-to-date computing technology. Appropriate methods have been described by Casley & Kumar[13]. Performance monitoring is a vital function of the sectoral information system.

The information unit's responsibility needs to be wider than project and programme monitoring and should cover the information of all kinds that is necessary to support forest sector activities. A comprehensive system is required, as described in Fig. 9.1, which is capable of supplying the data for all stages of the strategy process. The analysis, aims and action phases of the process all generate data, some of which may be useful for monitoring progress. Project and programme data form a vital part of the information system; most of this is produced during the action phase. However, the baseline and standards by which programme performance is judged are mainly derived from the earlier stages of the process.

The information system should be designed to cover monitoring needs and to generate progress reports at suitable intervals. Appropriate criteria and indicators for measuring performance can be identified and stored in the data base when the programme and projects are prepared. As implementation proceeds, actual events are recorded for comparison with what has been planned. The monitoring system should reveal when and where significant differences occur so that corrective action can be taken before they distort the purpose of the strategy. The system should enable the rate of progress to be assessed against project schedules and bench marks. Project budgets need to be compared with actual costs and outputs. Programme implementation can be judged partly from the progress made in preparing, financing and carrying out individual projects and partly from the total contribution of the programme to the national economy. Monitoring is necessary to check that the programme does not stray from the objectives set by the strategy. It should also cover the sector's stewardship of resources and ensure that there is compliance with the imperatives. Evidence is needed to demonstrate that the criteria & indicators of sustainability set by international agreements are being observed and the system should contribute data about the effects of world trade, biodiversity losses and global climate change to international agencies preparing global statistics.

The information unit requires appropriate expertise, equipment and computer software. Data needs to be collected and stored in convenient locations, using a network of compatible computers, which allows it to be processed, transferred and accessed as required. Report generation facilities can be built into the system, so that the needs of the leadership and the forum can be met. Effective management of the sector depends on the provision of information to make people aware of what is

happening. A satisfactory data system is a prerequisite for establishing an attitude of openness and accountability to the government and the public.

**Precautions** against project and programme failure need to permeate the strategy process. Future development intentions are liable to be upset by unforseen events. The environment in which the sector functions is liable to change in unexpected ways and changes within the sector cannot always be anticipated. As Drucker[14] has said, "the one predictable thing about an organization is the crisis" and an important task of an organization's leader is to anticipate crisis. Uncertainty pervades forest sector development planning; events are unlikely to happen exactly as intended even if the discrepancies do not reach disaster proportions. Therefore the question that should be asked is what precautions can be taken to minimize risks and avoid crises? They fall into three groups: risk analysis, contingency planning and crisis management. It is possible to reduce the dangers by adopting suitable precautions as standard practice, so that they become institutionalized. It is also possible to avoid crises by designing programmes that are flexible and capable of adjustment to meet unexpected events.

Risk analysis applies at the preparatory stage, when projects are being designed and appraised. There are limited possibilities of using statistical methods to work out the probability of a desired outcome being achieved, or of calculating the range of results within which the result is expected to lie. Some inputs and outputs can be measured with confidence, but others defy quantitative analysis of this sort. It is more helpful to apply *sensitivity analysis* to project proposals to discover the effect of varying the assumptions on which the project depends. One may ask, for example, if the project will still be viable if actual costs exceed their estimates by, say, fifty percent. Questions of this kind can be used to test project proposals to discover whether they are likely to fail under pressure when they are executed. In general, it is vital is to subject every proposal to a searching examination of the risks it faces and to assess its flexibility for coping with unexpected events. Adaptability in the face of unforseen circumstances is highly desirable.

Contingency planning anticipates the action to be taken if particular circumstances arise or specified events occur. It applies in cases where a particular situation can be envisaged and stipulates what is to be done if it should occur. Sometimes an event may be predictable, but its timing is uncertain, as with the bamboo flowering which suddenly destroyed the raw material supply for the Karnaphuli pulp and paper mill referred to in Chap. 8. Hirschman's description of this[15] applauds the ingenuity with which disaster was averted, but omits to point out that the project could have had a contingency plan ready to deal with such an emergency. Other kinds of 'what if' situations, such as market decline or the impact of new technology, can be more difficult to cope with. They may be tackled imaginatively with a modified SWOT analysis which speculates about ways of strengthening the project to cope with such eventualities. A precautionary attitude is the most significant feature of contingency planning.

Crisis management is about dealing with the situation when a catastrophic event is about to happen or has already occurred. Damage control is concerned with minimizing adverse consequences and correcting the resulting situation. Unfortu-

nately, 'management by perpetual crisis' is fairly common. Contingency planning spills over into crisis management when policies and procedures are put in place beforehand, enabling an organization to react rapidly when faced with an emergency. Teams can be trained, responsibilities defined and authority delegated in readiness, should a crisis arise. Recently, crisis management has attracted attention in the business literature. Crises are commonplace and it is widely accepted that special skills are required to deal with them[16]. An event, such as an escape of toxic chemicals or the collapse of an oil rig, calls for a quick response for which the organization needs to be well-prepared in advance.

According to the Institute for Crisis Management, the causes of crises fall into four categories[17], the last of which is said to account for more than 60 per cent of such events:-

- Acts of God (storms, earthquakes etc.)
- Mechanical problems (metal fatigue etc.)
- Human errors (mistakes by operators of equipment, miscommunication etc.)
- Management decisions/indecision (underestimating problems, assuming nobody will find out)

This classification is applicable to the forest sector, although it is incomplete. There may be unawareness of what is happening internally, or ignorance or dismissal of events occuring externally. It does not cover economic causes, such as the balance of payments difficulties which arose during the 1980s in several Pacific countries and led to suspension of the log export restrictions intended to foster domestic wood processing. The first category also needs to be widened to cover conflicts caused by people, such as wars, and environmental catastrophes, such as fires, floods and famines, which often result from or are aggravated by human intervention. In fact, the arrangements for forest fire protection, which are commonplace in most forest services, demonstrate crisis management principles. Fire plans are prepared in advance to deal with outbreaks when they occur. Such plans lay down the procedures to be followed when assessing fire risk, reporting outbreaks and fighting the fires; they also specify the command structure and lay down how the available resources are to be used. Similar arrangements can be developed for other contingencies.

Crises may be brought about by conflicts of interest and disputes between organizations within the forest sector or between the sector and external agencies. Conflicts may be managed through conciliation proceedings and arbitration. Ideally, breakdowns in relations are averted by good leadership and management before they become crises, although this is not always possible if the people concerned adopt inflexible positions or do not wish to be reconciled. Up to a point it is possible to anticipate danger areas or sources of conflict, as with changes which have an impact on the customary practices of rural people and the livelihoods of local communities. Some kind of early warning system can be set up and procedures put in place to deal with disputes should they arise. Once a crisis has developed, however, it may lead to challenges in the courts or even the use of force by governments to quell disturbances. Crisis management based on the precautionary principle is obviously desirable, but there are limits to human adaptability and foresight. If a crisis is

unavoidable, emergency action must be taken and its consequences dealt with in the best way possible at the time. Some adjustment of the programme is likely to follow.

Programme flexibility is achieved by separating subprogrammes and projects so that, as far as possible, their timing is independent of each other. As explained in Chap. 9, the rate at which project proposals can be developed and financed usually depends on factors outside forest sector control. It is desirable to have as much flexibility as possible at project level, so that a delay in one part of the programme does not upset the NFP as a whole. The strategy process needs elasticity to cope with uncertainty of this kind; it is liable to break down if the institutional arrangements which control its progress are unduly rigid.

Forest sector development depends on creating a balanced set of institutional arrangements which are suited to national conditions. The role of the government, the composition of the forest forum, providing effective leadership and programme support are all important ingredients in a recipe for success that is country-specific. These ingredients are interdependent and each country needs to vary the composition of the recipe to suit the tastes of its inhabitants. However, the arrangements cannot work on their own. They need to be accompanied by appropriate attitudes among sector personnel, which foster cooperation and unity of purpose. The aim should be to establish a distinctive style for the sector based on strategic management.

## 10.3 STYLE

Many of the difficulties in the forest sector are due to its prevailing culture; it is necessary to establish a new ethos or paradigm governing forest sector management and behaviour. In Chap. 6 the influence of mental images or metaphors on management ideas was described and the shift from a machine model view of forest management to a perspective based on an organic model was illustrated in Table 6.5. Chambers[18] has gone further and recognised the emergence of a 'new' development paradigm (see Box 10.4), by which he means "a coherent and mutually supporting pattern of concepts, values, methods and action, amenable to wide application". This relates particularly to social and economic development in rural areas of the Third World, but is applicable more widely. He views this as a challenge to the professions. It challenges prevailing attitudes in forestry as in other specializations concerned with rural development. Applied to development of the forest sector and the forest strategy process, the paradigm involves a reversal in the way that managers of sectoral resources behave and the approach adopted by the leadership.

Chamber's new paradigm corresponds with some forestry ideas which have become fashionable, particularly in relation to forest-dependent communities and village forestry. It is recognised that the subsistence needs of the weaker members of society living in or near forests deserve special consideration. The role of women now receives attention. The contribution to the rural economy and significance of non-wood forest products for shelter, food, medicine, incomes and traditional

**Box 10.4 The New Development Paradigm and professionalism**

"Though development realities and fashions change fast, normal professionalism — the thinking, values, methods and behaviour dominant in a profession or discipline — is stable and conservative. It is linked with core-periphery structures of power and knowledge, reproduced through teaching and defended by specialization. It values and rewards 'first' biases which are urban, industrial, high technology, male, quantifying, and concerned with things and the needs and interests of the rich.

The new professionalism reverses the values, roles and power relations of normal professionalism. It puts people first and poor people first of all. The 'last-first' paradigm includes learning from the poor, decentralization, empowerment, local initiative, and diversity. Development is not a blueprint but a flexible and adaptive learning process. To achieve reversals on a massive scale is now perhaps the greatest challenge facing the development professions."

Source: Chambers (1993), page 1.

lifestyles is no longer neglected. It is also apparent that rural people often possess a potentially valuable stock of local knowledge about the forests and the flora and fauna living in them that scientifically trained forestry professionals should not be too proud to listen to and learn from. Greater participation in decision-making and management by communities is called for by The World Commission on Forests and Sustainable Development[19]. However, this collection of ideas does not amount to the emergence of a new paradigm or professionalism for forest sector development, as envisaged by Chambers. It changes foresters' attitudes in relation to participation but is not radical enough to reverse their perception of their role in society.

The professional remit of foresters has expanded to include ecosystem conservation, biodiversity, environmental quality and the relationship between forests and climate change. There is now widespread debate and international concern about these topics. Forestry's outdated primary focus on timber and sustained yield is giving way to multipurpose management and a wider interpretation of sustainability. However, this enlargement of forestry horizons is also inadequate to provide a new professional ethos; it still tends to put things rather than people first and assumes that old values, bureaucratic roles and power relations will continue.

These new insights are important but insufficient. They fall short of providing an adequate paradigm for forest sector development in the twenty first Century. Chamber's contribution lacks a processing and industrial dimension, and does not refer to sustainability or cover adequately the other imperatives identified in Chap. 8. Too often, foresters' ideas and aspirations have not led to action, as is evident from the 'policy failures' referred to in Chap. 1. The persistence of a set of outdated beliefs may account for this, no doubt professional attitudes need to change, but foresters also deserve better guidance on the best way to manage sectoral affairs. Five major

conceptual shifts are proposed to create a dynamic and effective approach and alter the culture.

Table 10.4 indicates the extent to which professional attitudes need to be re-aligned to conform to the requirements of strategic management. These changes, which are associated with adoption of the strategy process, lead to a similar transformation in sector style. The beliefs and behaviour of those involved in sectoral activities play an important part in creating a distinctive style for the sector. When they change, the way the sector conducts its affairs also alters.

However, sector style depends on more than professionalism; it is also characterized by the type of aims and development activities that take place in the sector. It reflects the way that the forest sector is managed and influences the way that it is perceived by other sectors, the government and the public. Sector style is specific to the country concerned and portrays an image of its forests and their contribution to society. The impression that is created, provided it is favourable, can encourage investment from national and international sources, provide public support for the strategy and promote development. Therefore, it is worthwhile publicising and promoting a distinctive style for the sector which clarifies its role, emphasizes its strengths and attracts external attention.

Sector style is reflected to some extent in the official declarations of forest policy that governments endorse. Policies that only list aims do not reveal much about style, but public statements which explain the relationship between strategic objectives and programmes are likely to be more informative about the kind of action that is intended and the expectations of those taking part. However, style is better expressed through vision and mission statements.

Vision or mission statements (see Box 10.5) are usually prepared for organizations or particular groups such as NGOs, although a vision for the forest sector would certainly be an appropriate way of conveying the strategic intentions of its leaders and the government. There is an overlap (and some confusion) between them. 'Vision' is described as an expression of aspirations, whereas 'mission' focusses more directly on an organization and its purposes[20]. It is desirable to encapsulate the sector's image of its intended future in a brief vision statement. Mission statements are necessary to describe and motivate organizations within the sector by setting out their objectives and specifying how it is intended to achieve them. Four elements have been identified[21] on which they should be based: strategy, purpose, values and behaviour standards. Statements should be clear, brief, memorable and to the point. Organizations within the sector need mission statements and one should also be written to define the role of the forest forum. Where a government department is responsible for managing significant areas of forest and performs the lead agency functions in the strategy process, as happened in Cyprus, a mission statement is indispensable.

However, sector style is not solely a matter of professional attitudes and mission statements. The prevailing culture in the sector is strongly influenced from outside, particularly by the manner in which the country is governed and the attitudes of those who govern. Sector style in federal countries, such as the USA or Malaysia,

*Table 10.4* Changes in attitude required for forest strategy to work

| Feature | Altered perception | Implications |
|---|---|---|
| 1. Sector thinking | Adoption of a holistic instead of a piecemeal approach to development. | Sector treated as a dynamic open system instead of a collection of separate parts.<br>Internal interactions and linkages to other sectors considered when assessing impacts. All types of output included.<br>Resource capacity related to processing activities and consumers' requirements.<br>Sector viewed as a conglomerate held together voluntarily by mutual advantage and a common purpose. |
| 2. Development | Development seen as a continuous, adaptive learning process instead of a set of predetermined changes. | Sectoral change achieved by series of interventions in the system, aimed at generating increased public value. Process based on sustainable and equitable changes in output flows benefitting all sections of the community.<br>Participation essential for learning and adaptation to occur. |
| 3. Strategy | Strategy instead of policy. | Passive statements of good intentions, replaced by strategy which actively promotes forest sector development.<br>Adoption of a democratic procedure which links sectoral aims with action intended to achieve those aims.<br>Formulation of strategic objectives combined with preparation of a programme for their implementation.<br>Policy statements used to authorize, inform and explain the strategy and programme. |
| 4. Options | Rational choice of alternatives instead of jumping to 'obvious' conclusions and guesswork. | Informed decision making based on expected consequences.<br>Scenarios used to describe expectations and select strategy.<br>NFP, subprogramme and project selection guided by strategic objectives.<br>Choice of optimum project design. |
| 5. Preparedness | Anticipation of possible (but unlikely) events rather than reacting to crises. | Deviation from project expectations regarded as likely rather than exceptional and programme adjusted accordingly.<br>Monitoring and data system to reveal what is happening.<br>Need for openness and freedom of information.<br>Contingency planning and emergency procedures.<br>Programme flexibility. |

**Box 10.5 Vision and mission statements**

"In contrast to a mission statement which says what kind of business we are in or compares our ranking aganist competitors, vision aims to capture our imagination and 'turn us on'. It will not contain numbers, complicated words, too many sentences, or be forgettable.

- Vision is about *values* — or what really matters.
- Mission is about *purpose* — or what business we are in.
- Objectives is about *strategy* — or how we will get there."

Source: Leigh & Walters (1998), page 42.

"A mission statement is an organization's vision translated into written form. It makes concrete (for all to see and read) the leaders' view of the direction and purpose of the organization. For many corporate leaders it is a vital element in any attempt to motivate employees and to give them a sense of priorities. Mission statements generally address a number of important questions.

- What is the purpose of the organization?
- What is unique about the organization?
- What are its principal products and markets?
- What are its values?
- Where is it hoping to be in five or ten years' time?

Source: Hindle (2000), pages 154–6.

is likely to differ from the style in unitary states because, under their constitutions, power and authority are exercised in different ways. In a federation, forestry may be a national or a state responsibility, or undertaken at both levels; sometimes, particular functions (e.g. research) are carried out centrally, while the states look after the forests, as in Pakistan. Professional staff may be employed at either level, or be seconded from a national service to work in particular states (as with the Indian Forest Service). Such institutional differences lead to variations in professional standards and diverse sector styles.

Whatever the form of government, if political prejudices, instability and short-termism prevail, so that the sector is buffeted by threats to its resources, lack of continuity and uncertainty about future priorities, the strategy process will inevitably be disrupted. Sector confidence is based on the expectation that the agreed programme will not be discarded without good reason. Stability and sustainability go together. Similarly, a government that disregards the welfare of minority groups or rides roughshod over legitimate sectoral interests is likely to breach the equitable and participatory imperatives. Therefore respect for these obligations is important; governments influence sector attitudes by adopting the imperatives andensuring that

they are put into practice. Imperatives are the foundations on which the strategy rests and the extent to which they are observed is an important determinant of sector style.

Another distinctive stylistic feature is the extent to which sector organizations have freedom to determine their own future or are pinned down by directions and interference from outside. The way the sector is administered depends on the authority delegated to it and the amount of control it has over resources. The institutional framework of the sector may be positive, encouraging initiative and promoting development in conformity with defined standards, or negative, seeking to prevent activities unless they have received prior approval. Different governments adopt different regulatory norms. They also display a range of attitudes to external interventions which may affect sector activities. The style of the sector may be defensive and isolationist, viewing outside assistance and internationally agreed standards of behaviour as threats to a nation's right of self-determination, or opportunistic, open to change and anxious to respond constructively to international concerns. Style has an international dimension.

## 10.4 THE WAY AHEAD

This chapter, so far, has focussed on three aspects of forest strategy: strategic impact, institutional arrangements and sector style. It proposes various ways of strengthening sector performance, based on the analysis in earlier chapters, some of which are innovative, at least in the context of the forest sector. The proposals are intended to assist the strategy process to work effectively. They aim to increase the sector's impact on social welfare, improve its internal administrative arrangements and encourage a more positive attitude to change and development. These methods can be adapted to suit particular national circumstances and can be easily put into general use. However, they do not stand alone. They are expected to operate in situations which are generally favourable to the ideas and procedures that constitute the strategic approach to forest sector development. Strategy in action requires a supportive environment.

As prescriptions for curing the past and present ills of the sector, these strategic methods are 'necessary' but not 'sufficient'. They tackle internal problems and suggest sectoral solutions, whereas many of the difficulties originate outside and should be addressed through action at national and international levels. The physical problems of the sector include declining quantity and quality of the forest resources, loss of biodiversity and climate change; they have led to talk of a 'forest crisis' as described in Chap. 1. However, this is a challenge to the whole community and it is obvious that the forest sector cannot be expected to solve these problems on its own.

Adoption of the forest strategy methodology represents the way ahead for the forest sector. This is designed to tackle the sector's difficulties, both from within and without. Past emphasis on forest policy and its failures, to which attention was drawn in Chap. 1, needs to be replaced by a process approach to forest sector

development which allows for the interplay between the sector and its institutional, political and social sorroundings. Mayers & Bass have analysed the sector's policy problems, as revealed in Box 10.1 at the start of this chapter. This identifies many of the important issues but misses the vital link between aims and action on which the remedy depends. A procedural solution is necessary, which treats development in an evolutionary way. The forest strategy methodology, as progressively elaborated in earlier chapters, is intended to meet this need. It provides a conceptual approach and a way of working capable of overcoming the practical limitations of policy-based attempts to address the sector's problems. The strategic approach connects the formulation of objectives with their implementation, including resource procurement and the organizational changes required to achieve the desired results.

The strategic approach seeks to promote forest sector development. This is achieved by adding public value, even if what constitutes public value in particular situations is open to interpretation. Development does not necessarily mean growth; it may involve enlargement of the output stream over time to match rising levels of consumer requirements, or be achieved without expansion by altering the mix of outputs to more desirable proportions. The productivity of forest resources, including their capacity to provide services of all kinds, may be increased by appropriate investment. Intangible outputs, such as biodiversity, contribute to development even if they do not count towards value added for gross national product calculations. Public value is generated by conserving forest resources as well as harvesting them and development depends on qualitative as well as quantitive judgements of value.

The strategy process reveals the range of choices that are possible and the limits within which they are deemed to be acceptable. The imperatives impose restrictive conditions on the strategic options, as described in Chap. 8, and scenarios which do not comply with them are ruled out. Thus a course of action likely to lead to resource depletion, which is unsustainable, would be excluded; similarly inequitable proposals would not be considered, particularly if they caused hardship for particular groups in society or loss of human rights. Non-compliance with the imperatives indicates a loss of public value. Within these limits, choices are judged by their anticipated outcomes. Uncertainty about the future consequences of interventions in the forest sector system is unavoidable and therefore, as far as possible, the selection of strategic objectives should allow for flexibility when programmes are prepared and implemented. Forest strategy attempts to pick out the best route for development in an ever-changing environment. It does not purport to show the way to Utopia.

Those who control or have influence over the forest sector need to have confidence in the soundness of the strategy process as a method of managing its affairs. A convincing methodology is necessary if it is to be adopted for general use. The principles on which the process is based must be acceptable to those who use it. These were worked out as a series of interdependent propositions during the course of previous chapters. Taken together, they amount to a general formula for promoting sectoral development which is open to scrutiny. The validity of each

proposition can be assessed and the adequacy of the whole construct can be judged by considering the key steps in the argument, as summarized in Box 10.6.

This series of propositions underpins the forest strategy theme on which the book is based. The sector, perceived as a system in Part I, is related to the strategy concept as set out in Part II. The process approach that is described is an application of strategic ideas to the special needs of the forest sector. It provides a general formula for developing the sector, which can be easily adapted to suit the wide range of conditions found in different countries. The strategic approach offers a fresh

**Box 10.6 Propositions on which the strategy process is based**

**The forest sector**

- The forest sector is perceived as an entity, based on its dependence on forest resources; the term is usually used to describe the forests and associated features of a nation or state.
- The sector is composed of resources, activities and outputs; from a human point of view it forms an organizational conglomerate functioning within an institutional framework.
- The sector is best understood as a dynamic open system, characterised by the transformations taking place within it; interventions in the system induce changes to its composition and functions; development results from a series of interventions over time.

**Strategy**

- Strategy, as a concept, is viewed in three ways: as a grand design, a guide for decision making and a path for development. Forest strategy refers to the application of strategic ideas to the forest sector.
- Forest strategy is conceived as a purposive process, not a premeditated plan; the process is cyclical, with analysis leading to definition of aims followed by a programme of action.
- The strategy process aims at promoting sector development by additions to public value.
- Public value is a consequence of sector activities which lead to a flow of outputs of all kinds, tangible and intangible; the proportions and timing of the outputs affects their value; changes in public value cannot be measured directly and depend on value judgements.
- Imperatives limit the range of choice of possible strategies in given situations.
- Strategies are selected from alternative scenarios by comparing their likely consequences.
- Strategic objectives are pursued by means of national forest programmes; NFPs are implemented through projects which are worked up, financed and carried out as resources become available; reviews of progress lead to plan revision and rethinking of strategy.

perspective for forest sector management that is quite different in character from the forest policy approach associated with poor results in the past. Forest policy is aims-centred, while strategy is action-oriented; whereas forest policies are often catalogues of good intentions unrelated to their implications, the strategy process allows precise objectives to be selected according to their impacts on public welfare. The former consists of unsupported assumptions about what is the best policy while the latter is characterized by deliberate choices based on their consequences for society and the environment. Forest strategy can be depicted as positive, realistic and forward-looking, while forest policy tends to be defensive, impractical and idealistic. Strategy embraces vision but also faces up to the difficulties of turning wishes into reality.

The contrast between policy and strategy has been deliberately sharpened to emphasize the gap in attitudes that separates them. A shift from policy to strategy is most likely to be initiated by those responsible for managing forest sector affairs. The change of style that is required for the strategy process to be adopted for general use within the sector involves a different way of working and alterations to the institutional arrangements, as described previously. However, such internal transformation also affects the way the sector is perceived externally. The sector needs to present a new image to the outside world, in order to promote a more supportive attitude amongst national leaders, politicians and officials. Image is a reflection of style. If the sector is seen to be well-managed, it is likely to attract a greater share of the available resources, both nationally and internationally. In the long run, unless the sector is more effectively managed than in the past, respect for the forests themselves and approval for forest-based activities will not be forthcoming. The sector is too vulnerable to outside influences to disregard what others think of it. It must take responsibility for projecting a better public image.

Conservation plays an important part in the sector's public image. In Chap. 1 the progression of ideas from preservation of resources to their conservation and strategic management was described (see Fig. 1.1). It was pointed out that assertions of a forest crisis are rooted in a wider failure to protect global life support systems, climate, biodiversity, water and landscape. Because the outputs which meet these needs are public goods for which consumers do not pay directly, there is no market mechanism at work to match their supply to demand; requirements for these services are met, adequately or inadequately, by action by the state in response to political and social pressure. Strategic management of the forest sector provides an administrative procedure which enables all types of output (tangible and intangible) to be taken into account and their proportions balanced with the aim of maximizing social welfare. The process relates the productive or carrying capacity of forest resources to the flow of benefits received by people as consumers. Similar public unease affects the management of other natural resource-based sectors, such as fisheries. For example, fish stocks need to be conserved, fishing regulated to provide sustainable catches, marine ecosystems protected and the wide range of benefits derived from marine resources shared out in an equitable manner. Therefore the forest strategy propositions in Box 10.6 might be applied, with some modification,

to other sectors. It seems likely that the strategic approach could serve as a model for tackling resource conservation and development problems generally, in preference to the present policy orientation.

The strategy approach has to contend with the difficulty of reconciling conflicting interests. Individuals and groups within the forest sector pursue different objectives based on their self-interest. Thus, industrial enterprises have a different point of view to that of NGOs concerned with environmental conservation; sawmillers compete with other forest industries for access to raw materials and landowners may be at odds with forest squatters. Some conflicts arise because short-term gains are sought at the expense of long-term stability and sustainability. In other cases, benefits in one part of the country are set against losses elsewhere. Many disputes are due to the divergence between private profit-seeking and the pursuit of public value by the state. Profit maximising behaviour may have to be restricted if it leads to breaches of the imperatives, as with unsustainable harvesting rates or unjust treatment of minority groups. Freedom of action within the sector cannot be unlimited and development requires compromises, either achieved voluntarily through consultation and negotiation or imposed by higher authority. There are also conflicts with other sectors over such matters as land use and budget shares, which may curtail forest sector opportunities. At international level, controversy can arise between countries and also lead to disputes with environmental and human rights groups; conservation issues and trade restrictions, including international trade in forest products, have caused a number of confrontations. At all levels there are disputes to be resolved and compromises to be worked out.

This raises wider questions about freedom of choice. The forest sector illustrates very well the difficulties associated with the concept of liberty as discussed by Isaiah Berlin[22]. He argues that liberty has to be restrained because of the claims of other ultimate ends of life, such as security, happiness, justice, knowledge, order, social solidarity and peace. There is no avoiding compromises because some of the ultimate values by which men live cannot be reconciled: thus full liberty cannot be combined with full equality; careful planning and total spontaneity cannot co-exist. He points out that hard choices have to be made and it is irrational to believe in the possibility of perfect solutions. He also warns against perversions of freedom such as unbridled 'laissez faire' and so-called 'democratic' decisions by which the majority does whatever it wants, no matter how cruel, unjust or irrational. In the context of forest sector development, liberty is an issue that affects how far people and organizations within the sector should have freedom to pursue their selfish interests at others expense, the extent to which the government should intervene in sectoral affairs and the amount of influence that international agencies and world opinion can have on the management of national forest resources.

Unless these questions are recognised and there is willingness to accommodate the genuine concerns of others, whether they affect groups within the sector, national interests or global fears, no recipe for forest development is likely to succeed in the long run. The forest strategy process provides opportunities at each stage for consultation, negotiation, compromise and conflict resolution; it has sufficient

flexibility to cope with different forms of government, legal systems and social norms. Some safeguards against the abuse of power, whether economic or political, are built into the process in the form of the imperatives, which set standards of acceptable behaviour and create obligations to stick to them. Some obligations, such as compliance with the criteria and indicators of sustainability or respect for the rights of forest tribes, have the backing of international protocols; others may be covered and enforced under national legislation, as with regulations designed to protect species, ecosystems and landscapes against detrimental exploitation. National forest programmes set priorities which are not easily disregarded. The strategy process also provides for monitoring and reporting, which enable breaches of undertakings to be detected and corrected. Openness is an important safeguard.

Attention has been drawn to the persistence of outdated and outmoded attitudes which present a major obstacle to progress in the forest sector. The emergence of a new paradigm for public administration was pointed out in Chap. 6 and Table 6.5 contrasts the machine model of forest management with the organic model that is displacing it. The professions responsible for administering the forest sector have not yet fully come to terms with the implications of this shift in organizational culture. In particular, the management of sector resources to supply a mixture of outputs, some of which are public goods, has far-reaching consequences. Public goods are not tradeable and market mechanisms can no longer be relied on to provide the flow of goods and services that people require.

Foresters' traditional focus on wood production lingers on, although other outputs, particularly those relating to environmental services, are overtaking timber as the predominent concern of some forest managers and sections of the public. In some parts of the world, instead of treating timber as the dominant output and others as secondary, there is now a strong case for regarding wood production as a by-product, at least in many 'natural' forests managed by the state. The primary function of some national forests is now seen as the provision of essential public goods and, everywhere, more attention is being paid to non-timber outputs. This realignment cannot be achieved without corresponding changes to administrative and financial arrangements. The treatment of non-marketable outputs, such as biodiversity and carbon sequestration, needs to be put on level terms with wood and other tradeable products, even though this involves a break with free-market dogma and the pursuit of profits. Whereas timber production and trade are primarily motivated by profits, the flows of public goods depend on non-market incentives. The costs of producing public goods cannot be recovered from sales revenue and returns to investors must come from other sources. The usual expectation is that governments will provide the necessary funds, either from taxes or borrowing, possibly with help from foreign countries or international sources. In practice, the supply of environmental services has tended to be underfinanced because of other more pressing budgetary priorities and the difficulty that foresters have in justifying their claims in economic terms. The difficulty is compounded in poor developing countries where, from their point of view, natural forests can generate cash quickly from timber exploitation and conversion to agricultural use, whereas environmental benefits tend to be regarded

as less urgent and more the concern of richer countries; such benefits should be paid for by those in the global community who stand to gain most. Forest resource managers have to come to terms with the genuine difficulties of obtaining finance for public goods and work out how best to redress this imbalance during the strategy process.

Proper recognition of the forest sector's role as a provider of public goods, with all that this implies about the provision of adequate resources for sectoral development, will only be achieved if the sector makes its case publicly and forcibly. Instead of ineffectual talk of policy failures and a forest crisis at international level, it is the professional responsibility of the leaders in each country to do all in their power to maintain the forest sector's capacity to supply outputs of non-market services. The strategy process provides the means and the supporting arguments with which they can make their case; international assistance has a supporting role to play. The steps in the process enable the mixture of outputs to be balanced, both in terms of its composition and in relation to the match between supply and demand for each type of component. Scenarios display the choices and their consequences for presentation to the government and ministers. The NFP supplies the plan of action with which to implement the strategy. It is up to the national leadership to convince others and make the forest strategy process work.

## SUMMARY

- Strategy in action faces three important practical problems: assessing the impacts of alternative strategies, making appropriate institutional arrangements and creating a new and distinctive style for the sector.
- Strategic impact refers to the public value generated by alternative strategies for forest sector development. Three influences (outputs, activities and imperatives) combine to produce strategic impacts and three indicators (the output mix, the flow balance and strategic fit), which roughly correspond to these influences, can be used to judge their effects.
- The output mix indicator is concerned with the combinations of outputs generated by different scenarios and their organizational implications; alternative mixes can be assessed by tables which compare their importance and consequences. Flow balances show what is expected to happen to the various categories of sector resources (forest, capital and human) by comparing additions and reductions to stocks under alternative scenarios. Strategic fit ensures that sector activities are (i) internally consistent with one another and mutually reinforcing, (ii) compatible with other sectors and national policies, and (iii) in accord with international treaty obligations, regional agreements and global conventions.
- The institutional arrangements relate to the roles of the various participants in sectoral affairs, particularly the responsibilities of the state and the balance between the activities of public and private organizations. Setting up a forest forum enables them to participate effectively, by providing a focal point for meetings and discussion, helping bind together the various interests represented

and fostering unity of purpose; its functions include overseeing and contributing to all stages of the strategy process. Leadership is necessary to supply the driving force behind the strategy process, both at a personal level by providing enthusiasm, energy, motivation and direction, and at institutional level, in the form of a lead agency to manage the strategy process and provide technical services at each stage. Programme support includes project preparation and design, appraisal, financial arrangements, recording and monitoring; it also involves controlling and reviewing the progress of the programme as a whole.

- Style relates to the prevailing culture and beliefs of the sector. Forest managers, who are strongly influenced by professional ideas and attitudes derived from their training and past experience, need to change their perceptions and methods. They should demonstrate that the principles of strategic management are being followed in order to tackle sector problems. Style is characterized by the way the sector is managed, the extent to which decision-making is decentralized, the nature of the development activities that take place and the type of benefits that are generated. It is reflected in official declarations of forest policy and also expressed through vision and mission statements.
- The way ahead lies in accepting the propositions and adopting the methodology of strategic management in order to improve sector performance. Development is achieved by adding public value; this involves enlarging the flow of sector outputs of all kinds by increasing productivity and investment and improving the quality of the output mixture.
- The public image of the sector is strongly influenced by perceptions of its failure to safeguard forest resources and the benefits associated with them. The strategic approach, which is action-oriented, contrasts with the prevailing management ethos based on forest policy, which is aims-centered. A new style and image for the forest sector, based on forest strategy, is required to tackle past policy failures. It is necessary to find ways of reconciling private interests with those of the nation and the public. Success in the long run can only be achieved if those concerned with sector affairs are willing to compromise and accommodate the genuine concerns of others.

## FURTHER READING

A critical analysis of forest policy failures and lessons to be learnt from them is contained in *Policy that works for forests and people* by James Mayers and Stephen Bass. Report No 7. Series Overview. International Institute for Environment & Development: London (1999).

Hugh Stretton and Lionel Orchard discuss the issues concerned with public ownership and privatization in *Public Goods, Public Enterprise, Public Choice*. St. Martin's Press: New York (1994).

Leadership and style are covered from a business point of view in most management textbooks, such as Mullins (*Management and Organisational Behaviour*, Pitman, 1996). Jan-Eric Lane (*The Public Sector*. 2nd edition. Sage

Publications, 1995), discusses some of the differences in emphasis between the way these functions are carried out in the private and public sectors.

## SOURCES


1 James Mayers and Stephen Bass. *Policy that works for forests and people*. Report No 7. Series Overview. International Institute for Environment & Development: London (1999).
2 Michael E. Porter. What is Strategy? Chapter 4 in *The Strategy Reader*, edited by Susan Segal-Horn. Blackwell in association with The Open University: Oxford (1998).
3 Colin Kirkpatrick. The rise and fall of cost benefit analysis: the role of project appraisal in managing development projects. Chapter 14 in *The Realities of Managing Development Projects*. Edited by Farhad Analoui. Avebury: Aldershot (1994).
4 Alexander S. Mather. *Global Forest Resources*. Belhaven Press: London (1990), page 93.
5 A.J. Leslie. *The Managerial Economics of State Forestry*. Draft manuscript intended for publication; personal communication.
6 Hugh Stretton and Lionel Orchard. *Public Goods, Public Enterprise, Public Choice*. St. Martin's Press: New York (1994), page 54.
7 *Final Draft National Forest Programme and National Forest Policy Statement*. Forestry Department of Ministry of Agriculture, Natural Resources and Environment: Nicosia, Cyprus (1999), page 38.
8 David Buchanan and Andrzej Huczynski. *Organizational Behaviour*, 3rd edition, Prentice Hall (1997), Chapter 20.
9 Laurie J. Mullins. *Management and Organisational Behaviour*, Pitman (1996), Chapter **??**.
10 Peter M. Senge. The leader's new work: building learning organizations. Chapter 15 in *The Strategy Reader*, edited by Susan Segal-Horn. Blackwell in association with The Open University: Oxford (1998).
11 Jan-Eric Lane. *The Public Sector*. 2nd edition. Sage Publications (1995), pages 182–183.
12 Keith Lockyer and James Gordon. *Critical Path Analysis and other Project Network Techniques*. 5th. Edition, Pitman: London (1991) describes the various techniques available.
13 Dennis J. Casley and Krishna Kumar. *The Collection, Analysis and Use of Monitoring and Evaluation Data*. Published for World Bank by John Hopkins Press (1988).
14 Peter F. Drucker. *Managing the Non-profit Organization*. Butterworth-Heinemann: Oxford (1990), page 7.
15 Albert Hirschman. *Development Projects Observed*. The Brookings Institution, Washington (1967), Chapter 1.
16 Des Dearlove. *Key Management Decisions*. Pitman: London (1998), pages 87–90.
17 Tim Hindle. *Guide to Management Ideas*. The Economist in Association with Profile Books: London (2000), pages 45–47.
18 Robert Chambers. *Challenging the Professions*. Intermediate Technology Publications: London (1993).
19 *Our Forests, Our Future*. Report of the World Commission on Forests and Sustainable Development. Cambridge University Press (1999), page 24.
20 Andrew Leigh and Mike Walters. *Effective Change*. 2nd edition. Institute of Personnel Management: London (1998).
21 Andrew Campbell and Sally Yeung. Creating a Sense of Mission. Chapter 14 in *The Strategy Reader*. Edited by Susan Segal-Horn. Blackwell in association with the Open University: Oxford (1998).
22 Ramin Jahanbegloo. *Conversations with Isaiah Berlin*. Peter Halban: London (1992).

# REFERENCES


Adamowicz, W.L., White, W. and Phillips, W.E. (eds) (1993). *Forestry and the Environment: Economic Perspectives*, CAB International, Wallingford, UK.

Analoui, F. (ed.) (1994). *The Realities of Managing Development Projects*. Avebury, Aldershot.

Anderson, J., Clemént, J. and Crowder, L.V. (1998). Accomodating conflicting interests in forestry — concepts emerging from pluralism. *Unasylva*, **194**, 3–10.

Arnold, J.E.M. (1997). Framing the Issues. Part I in *Farms, Trees and Farmers*. Edited by J.E.M. Arnold and Peter A.D. Earthscan: London.

Baum, W.C. (1978). The World Bank Project Cycle. *Finance and Development* **15**, 4.

Barbier, E.B. (1995). Trade in Timber-based Forest Products and the Implications of the Uruguay Round. *Unasylva* **183**, vol. 46, 3–10.

Barbier, E.B. (1996). *Impact of the Uruguay Round on International Trade in Forest Products*. Food & Agriculture Organization of the United Nations, Rome.

Barbier, E.B., Burgess, J.C., Bishop, J. and Aylward, B. (1994). *The Economics of the Tropical Timber Trade*. Earthscan: London.

Bengston, D.N. and Gregersen, H.M. (1992). *Technical Change in the Forest-based Sector*. Chapter 8 in *Emerging Issues in Forest Policy*. Edited by P.N. Nemetz. University of British Columbia Press: Vancouver.

Benham, F. (1955). *Economics: a General Introduction*. Pitman & Sons: London.

Bignell, V. and Fortune, J. (eds) (1984). Understanding Systems Failure. Manchester University Press.

Bigsby, H. (1995). National Accounts and Forestry. *New Zealand Forestry*, May, 15–18.

Bird, P. (1997). Funder or founder: the role of development agencies in shared forest management. *Commonwealth Forestry Review*, **76** (3), 179–181.

Blau, P.M. and Scott, W.R. (1996). *Formal Organizations*, Routledge & Kegan Paul.

Bourke, I.J. (1988). Trade in Forest Products: a Study of the Barriers faced by the Developing Countries. *FAO Forestry Paper **83***. Food & Agriculture Organization of the United Nations: Rome.

Browder, J.O. (1989). Development Alternatives for Tropical Rain Forests. Chapter 3 in Leonard, H. Jeffrey and contributors, *Environment and the Poor: Development Strategies for a Common Agenda*. Transaction Books: New Brunswick (USA) and Oxford (UK).

Brown. C.L. and Valentine, J. (1994). The process and implications of privatization for forestry institutions: focus on New Zealand. *Unasylva*, **178**, 11–19.

Buchanan, D. and Huczynski, A. (1997). *Organizational Behaviour*, 3rd edition, Prentice Hall.

Burnes, B. (1992). *Managing Change: A Strategic Approach to Organisational Development and Renewal*. Pitman: London.

Byron, N. and Sayer, J. (1999). Organising forestry research to meet the challenges of the Information Age. *International Forestry Review*, **1** (1), 4–10.

Campbell, A. and Yeung, S. (1998). Creating a Sense of Mission. Chapter 14 in *The Strategy Reader*. Edited by S. Segal-Horn. Blackwell in association with the Open University: Oxford.

Carino, J. (1997). Indigenous peoples, forest dwellers, women and local communities. Special Paper prepared for Section F, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, volume 5, pages 143–153.

Casley, D.J. and Kumar, K. (1988). *The Collection, Analysis and Use of Monitoring and Evaluation Data*. Published for World Bank by John Hopkins Press.

Cavana, R.Y. and Coyle, R.G. (1982). *Dysmap User Manual*. System Dynamics Research Group, University of Bradford.

Chambers, R. (1993). *Challenging the Professions*. Intermediate Technology Publications: London.

Checkland, P. (1981). *Systems Thinking, Systems Practice*. Wiley, Chichester.

Clayton, A.M.H. and Radcliffe, N.J. (1996). *Sustainability: A Systems Approach*. Earthscan Publications: London.

Common, M. (1995). *Sustainability and Policy: Limits to Economics*. Cambridge University Press: Cambridge, New York and Melbourne.

Cubbage, F.W., O'Laughlin, J. and Bullock, C.S. III (1993). *Forest Resource Policy*. Wiley: New York.

Dearlove, D. (1998). *Key Management Decisions*. Pitman: London.

Deming, W.E. (1986). *Out of Crisis*. MIT: Cambridge, Mass.

Dewar, J. (1997). The contribution of research to the sustainable management of forests. Address given to mark the Golden Jubilee of Alice Holt Research Station, reported in *Commonwealth Forestry Review*, **76** (3), 222.

Dobson, P. and Starkey, K. (1993). *The Strategic Management Blueprint*. Blackwell: Oxford.

Drucker, P.F. (1990). *Managing the Non-profit Organization*. Butterworth-Heinemann: Oxford.

Duinker, P.N. (1998). Public participation's promising progress: advances in forest decision-making in Canada. *Commonwealth Forestry Review*, **77** (2), 107–112.

Ellefson, P.V. (1992). *Forest Resources Policy*. McGraw-Hill.

Emery, F.E. (ed.) (1969). *Systems Thinking*. Penguin Books: Harmondsworth.

FAO (1974). *An Introduction to Planning Forestry Development*. Paper Ref. FAO/SWE/TF 118, Food & Agriculture Organization of the United Nations: Rome.

FAO (1979). *Economic Analysis of Forestry Projects*. Forestry Paper 17. Food & Agriculture Organization of the United Nations: Rome.

FAO (1982). *Classification and definitions of forest products*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1982). *Yearbook of Forest Products, 1969–1980*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1985). Tree Growing by Local People. *FAO Forestry Paper* 64, Food & Agriculture Organization of the United Nations: Rome.

FAO (1986). *The Outlook for Pulp and Paper to 1995*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1987). *Report of the Mission to Malaysia on the Tropical Forestry Action Plan, November, 1986*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1988). *Forestry Policies in Europe*. Forestry Paper 86 . Food & Agriculture Organization of the United Nations: Rome.

FAO (1990). *Tropical Forestry Action Plan: Report of the Independent Review*. Food & Agriculture Organization of the United Nations: Kuala Lumpur, Malaysia.

FAO (1991). Editorial for *Unasylva*, **42** (165), 2.

FAO (1992). *Economic Assessment of Forestry Project Impacts*. Forestry Paper 106. Food & Agriculture Organization of the United Nations: Rome.

FAO (1993). *Forestry Statistics Today for Tomorrow: 1961–1991..... 2010*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1993). *The Challenge of Sustainable Forest Management*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1995). *Forestry Statistics Today for Tomorrow: 1945–1993.... 2010*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1995). *Forest Resources Assessment 1990: Global Synthesis*. Forestry Paper 124. Food & Agriculture Organization of the United Nations: Rome.

FAO (1995). *Terminology, definition and classification of forest products other than wood*. Paper presented at the FAO/Government of Indonesia Expert Consultation on Non-Wood Forest Products. Yogyakarta, Indonesia, 17–27 January, 1995.

FAO (1996). *Pulp and Paper Capacities 1995–2000*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1996). *Yearbook of Forest Products, 1983–1994*. Food & Agriculture Organization of the United Nations: Rome.

FAO (2001). *Yearbook of Forest Products, 2001*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1996). *Formulation, Execution and Revision of National Forest Programmes: Basic Principles and Guidelines*. Food & Agriculture Organization of the United Nations: Rome.

FAO (1996). *Assessing Forestry Project Impacts: Issues and Strategies*. Forestry Paper 114. Food & Agriculture Organization of the United Nations: Rome.

FAO (1998). Accommodating multiple interests in forestry. Editorial in *Unasylva*, 49/3, 194, 2.

FAO (2005). *Global Forest Resources Assessment 2005*. Forestry Paper 147. Food & Agriculture Organization of the United Nations: Rome.

Fisher, W.R. (1908). *Forest Utilization*. Schlich's *Manual of Forestry*, volume 5, 2nd. edition, Bradbury, Agnew & Co: London.

Forester, J.W. (1961). *Industrial Dynamics*, M.I.T. Press.

Forester, J.W. (1968). *Principles of Systems*, Wright Allen Press.

Forestry Department of Ministry of Agriculture, Natural Resources and Environment, Cypress (1999). *Strategy for Forest Sector Development in Cyprus*. Paper prepared with assistance of FAO under Project TCP/CYP/6712, Nicosia, Cypress.

Forestry Department of Ministry of Agriculture, Natural Resources and Environment, Cypress (1999). Final Draft *National Forest Programme and National Forest Policy Statement*, prepared with assistance of FAO under Project TCP/CYP/6712, Nicosia, Cypress.

Foy, T.J. and Pitcher, M.J. (1999). Private sector/community partnerships for commercial forestry development: recent experiences from South Africa. *International Forestry Review*, **1** (4), 222–227.

Freeman, R.E. (1984). *Strategic Management: A Stakeholder Approach*. Pitman Publishing.

Gane, M. (1966). Forest Harvesting in Trinidad. *Commonwealth Forestry Review*, **45** (3), 248–252.

Gane, M. (1968). Introduction to *Martin Faustmann and the Evolution of Discounted Cash Flow*, Commonwealth Forestry Institute Paper No. 42, Oxford.

Gane, M. (1969). Priorities in Planning. *Commonwealth Forestry Institute Paper No*. **43**, University of Oxford.

Gane, M. (1983). Forest policy-making. *Commonwealth Forestry Review*, **62** (2), 85–92.

Gane, M. (1983). Forest policy: whose concern is it?. *Commonwealth Forestry Review*, **62** (3), 140–146.

Gane, M. *Papua New Guinea: Preliminary Report on Forest Policy*. Food & Agriculture Organization of the United Nations: Rome.

Gane, M. (1986). TIMPLAN: a planning system for industrial timber-based development. *Commonwealth Forestry Review*, **65** (1), pages 41–49.

Gane, M., Thorud, D.B. and Watt, G.R. (1988). *Nepal: Review of Forest Sector Master Plan*. Food & Agriculture Organization of the United Nations: Rome.

Gane, M. (1993). *TIMPLAN User Guide*.

Gane, M. (1995). Modelling growth with TIMPLAN. *Lesnictvi-Forestry*, **41** (4), 163–172

Gane, M. (1999). *Notes on Strategy and Policy for Forest Sector Development in Lithuania*. Mission Report for FAO and Department of Forest and Protected Areas in Lithuania.

Gordon, I., Lewis, J. and Young, K. (1977). Perspectives on policy analysis. *Public Administration Bulletin*, **25**, 1977, pages 26–30, reproduced in *The Policy Process: a Reader*, Edited by Michael Hill. Harvester Wheatsheaf: Hemel Hempstead (1993), pages 5–9.

Government of Cyprus (1984). *A Statement of Forest Policy*. Forest Department: Nicosia.

Grayson, A.J. and Maynard, W.B. (1997). *The World's Forests — Rio + 5: International Initiatives towards Sustainable Management*. Commonwealth Forestry Association: Oxford.

Gregerson, H.M. (1973). The use of sector accounting methodology in forest-based sector planning. In *Report on the FAO/SIDA Seminar on Forestry Development Planning for selected English-speaking Countries in the Near East, Asia and the Far East*. FAO: Rome.

Guevara, R. (1997). Human resources development: education, training, research and extension for sustainable forestry. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, volume 5, pages 305–323.

Hall, J.E. (1997). Canada's Model Forest Program: a participatory approach to sustainable forest management in Canada. *Commonwealth Forestry Review*, **76** (4), 261–263.

Hair, D. (1963). *The Economic Importance of Timber in the United States*. Miscellaneous Publication 941. Forest Service, U.S. Department of Agriculture: Washington, D.C.

Ham, C. and Hill, M. (1993). *The Policy Process in the Modern Capitalist State*. 2nd. edition, Harvester Wheatsheaf: Hemel Hempstead, Herts.

Handy, C. (1992). *The Age of Unreason*, Century Business.

Handy, C. (1994). *The Empty Raincoat*. Hutchinson: London.

Harou, P.A. (1992). Minimal review of the forest sector. In *Forestry Sector Analysis for Developing Countries*. Proceeding of IUFRO Working Groups, S6.12-03 and S6.11-00 Meetings at 10th Forestry World Congress, Paris, compiled by Richard Haynes, Richard, Harou, Patrice and Mikowski, Judy. Portland, Oregon, March, 1992.

Hart, C. (1991). *Practical Forestry for the Agent and Surveyor*, 3rd. edition, Alan Sutton Publishing Ltd.: Stroud.

Harvey-Jones, J. (1988). *Making it Happen*. Collins: London.

Hildyard, N., Hegde, P., Wolvekamp, P. and Reddy, S. (1998). Same platform, different train: the politics of participation. *Unasylva*, **194**, 26–34.

Hindle, T. (2000). *Guide to Management Ideas*. The Economist in Association with Profile Books: London.

Hirschman, A.O. (1967). *Development Projects Observed*. The Brookings Institution:Washington.

Hoen, H.F. (1993). Forestry and National Accounting. *Scandinavian Forest Economics*, **34**, 134–147.

Hoganson, H.M. and Burk, T.E. (1997). Models as tools for forest management planning. *Commonwealth Forestry Review*, **76** (1), pages 11–17.

Hogwood, B.W. and Gunn, L.A. (1984). *Policy Analysis for the Real World*. Oxford University Press.

Howlet, M. and Ramesh, M. (1995). *Studying Public Policy: Policy Cycles and Policy Subsystems*. Oxford University Press.

Hughes, O.E. (1994). *Public Management and Administration*. Macmillan.

Humphreys, D. (1996). *Forest Politics*. Earthscan, London.

Husch, B. (1987). Guidelines for Forest Policy Formulation. *FAO Forestry Paper 81*, Food & Agriculture Organization of the United Nations: Rome.

International Union for Conservation of Nature and Natural Resources (IUCN) (1980). *World Conservation Strategy*. Prepared by IUCN with advice, cooperation and financial assistance from United Nations Environment Programme (UNEP) and World Wildlife Fund (WWF), in collaboration with Food & Agriculture Organization of the United Nations (FAO) and United Nations Educational, Scientific and Cultural Organization (UNESCO).

Jahanbegloo, R. (1992). *Conversations with Isaiah Berlin*. Peter Halban: London.

Jepma, C.J. (1995). *Tropical Deforestation*, Earthscan.

Johnson, G. and Scholes, K. (1988). *Exploring Corporate Strategy*. 2nd. edition, Prentice Hall: Hemel Hempstead.

Kaufman, H. (1960). *The Forest Ranger: a Study in Administrative Behaviour*. Resources for the Future, John Hopkins: Baltimore.

Kennedy, J.J, Dombeck, M.P. and Koch, N.E. (1998). Values, beliefs and management of public forests in the Western world at the close of the twentieth century. *Unasylva*, 192, 16–26.

Katz, D. and Khan, R.L. (1978). *The Social Psychology of Organizations*, 2nd. edition, Wiley.

Kimmins, H. (1992). *Balancing Act: Environmental Issues in Forestry*. UBC Press: Vancouver.

Kirkpatrick, C. (1994). The rise and fall of cost benefit analysis: the role of project appraisal in managing development projects. Chapter 14 in *The Realities of Managing Development Projects*. Edited by Farhad Analoui. Avebury: Aldershot.

Korten, F.F. (1992). NGOs and the forestry sector: an overview. *Unasylva*, **171**, 3–10.

Kumar, R. (1986). *The Forest Resources of Malaysia*. Oxford University Press: Singapore.

Kunnas, H.J. (1971). Forestry in National Accounts. *Folia Forestalia* **121**, Institutum Forestale Fennia: Helsinki.

Laarman, J.G. and Sedjo, R. A. (1992), *Global Forests: Issues for Six Billion People*. McGraw Hill.

Lane, J.-E. (1995). *The Public Sector*. 2nd edition. Sage Publications.

Leigh, A. and Walters, M. (1998). *Effective Change*. 2nd edition, Institute of Personnel Management: London.

Leonard, H.J. (1989). *Environment and the Poor: Development Strategies for a Common Agenda*. Transaction Books: New Brunswick (USA) and Oxford (UK).

Leslie, A.J. (2001). *The Managerial Economics of State Forestry*. Draft manuscript intended for publication; personal communication.

Lindblom, C.E. (1959). The science of "muddling through". *Public Administration*, **19**, pages 79–99.

Lintu, L. (1995). Marketing non-wood forest products in developing countries. *Unasylva*, **46** (183), 37–41.

Little, I.M.D. and Mirlees, J.A. (1969). *Manual of Industrial Project Analysis*, volume II, *Social Cost Benefit Analysis*. Development Centre of Organisation for Economic Cooperation and Development: Paris.

Lockyer, K. and Gordon, J. (1991). *Critical Path Analysis and other Project Network Techniques*. 5th. Edition, Pitman: London.

MacArthur, J.D. (1994). The logical framework: a tool for the management of project planning and evaluation. *DPPC New Series Discussion Paper No. 42*, University of Bradford, Bradford, UK.

MacArthur, J.D. (1995). Logical frameworks today — increasing diversification of a very valuable planning tool. Paper for University of Bradford Development and Project Planning Centre's 25th. Anniversary Conference *Development Projects: Issues for the 1990s*. April, 1995.

Markandya, A. and Richardson, J. (eds.) (1992). *Environmental Economics*. Earthscan: London.

Mather, A. (1990). *Global Forest Resources*. Belhaven Press: London.

Mayers, J. and Bass, S. (1999). *Policy that works for forests and people*. Report No 7. Series Overview. International Institute for Environment & Development: London.

McKillop, W. (1967). Supply and demand for forest products, an econometric study. *Hilgardia*, **38** (1), 1–132.

Meadows, D.H., Meadows D.L. et al. (1972). *The Limits to Growth*. Earth Island: London

Merlo, M. and Paveri, M. (1997). Formation and implementation of forest policies: a focus on the policy tools mix. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, volume 5, pages 233–254.

Minogue, M. (1983). Theory and practice in public policy and administration. *Policy and Politics*, **11**, 1983, pages 63–85, reproduced in *The Policy Process: a Reader*. edited by Michael Hill. Harvester Wheatsheaf: Hemel Hempstead (1977), pages 10–33.

Mintzberg, H. and Quinn, J.B. (1991). *The Strategy Process*, 2nd edition, Prentice Hall.

Mintzberg, H. and Waters, J.A. (1985). *Strategic Management Journal*, **6**, 257–72, reproduced as Chapter 1 in *The Strategy Reader*, Edited by S. Segal-Horn (1998). Blackwell in association with The Open University : Oxford.

Moore, J.I. (1992). *Writers on Strategy and Strategic Management*. Penguin Books: Harmondsworth.

Moore, M.H. (1995). *Creating Public Value*. Harvard University Press: Cambridge, Massachusetts.

Morgan, G. (1997). *Images of Organization*, Sage Publications.

Mullins, L.J. (1996). *Management and Organisational Behaviour*. Pitman.

Nabuurs, G.J. and Päivinen, R. (1996). Large scale forestry scenario models — a compilation and revue. *EFI Working Paper **10***. European Forest Institute, Joensuu, Finland.

Natural Resources Canada (1995). *The State of Canada's Forests 1994*. Canadian Forest Service:Ottowa.

Ohmae, K. (1982). *The Mind of the Strategist*. McGraw Hill.

Organisation for Economic Cooperation and Development (1968). *Manual of Industrial Project Analysis*, volume 1, *Methodology and Case Studies*. Development Centre of OECD: Paris.

Palin, D. (1980). *Management of Development Forestry*. Food & Agriculture Organization of the United Nations: Rome.

Pass, C., Lowes, B. and Davies, L. (1993). Collins Dictionary of Economics. 2nd ed. HarperCollins: Glasqow.

Pearce, D., Markandya, A. and Barbier, E. B. (1989). *Blueprint for a Green Economy*. Earthscan Publications: London.

Pearce, D. (1991). An economic approach to saving the tropical forests. Chapter 9 in *Economic Policy towards the Environment*. Edited by Dieter Helm. Blackwell: Oxford.

Pearce, D. (1995). *Blueprint 4: Capturing Global Environmental Value*. Earthscan: London.

Pearce, D. and Moran, D. (1994). *The Economic Value of Biodiversity*. IUSCN/Earthscan: London.

Pearse, P.H. (1993). Forest Tenure, Management Incentives and the Search for Sustainable Development Policies. Chapter 5 in Adamowicz, W.L., White, W. and W.E. Phillips, W.E (eds.). *Forestry and the Environment: Economic Perspectives*, CAB International, Wallingford, UK.

Pettenella, D. (1997). New trends in public forestry administration. Special Paper prepared for XI World Forestry Congress, Antalya, Turkey.

Pinchot, G. (1947). *Breaking New Ground*. Harcourt, Brace & Co: New York.

Porter, M.E. (1998). What is Strategy? Chapter 4 in *The Strategy Reader*, edited by Susan Segal-Horn. Blackwell in association with The Open University: Oxford.

Prabhu, R. (1997). CIFOR's research on criteria and indicators for sustainable forest management. *European Tropical Forest Research Network News* 21, September-October.

Price, C. (1989). *The Theory and Application of Forest Economics*. Blackwell: Oxford.

Price, C. (1993). *Time, Discounting and Value*. Blackwell: Oxford.

Pugh, D.S. (ed.) (1971). *Organization theory; Selected Readings.* Penguin Books: Harmondsworth.

Quaile, G. and Smith, P. (1997). An aboriginal perspective on Canada's progress towards meeting its national committments to improve aboriginal participation in sustainable forest management. Special Paper prepared for Section F, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, volume 5, pages 154–161.

Ranson, S. and Stewart, J. (1994). *Management for the Public Domain*. MacMillan.

Rees, J.A. (1990). *Natural Resources: Allocation, Economics and Policy*. 2nd. edition, Routledge: London.

Repetto, R. (1988). *The Forest for the Trees? Government Policies and the Misuse of Forest Resources*. World Resources Institute: Washington.

Reppeto, R., Magrath, W., Wells, M., Beer, C. and Rossini, F. (1989). *Wasting Assets: Natural Resources in the National Income Accounts*. World Resources Institute: Washington, D.C. Reproduced as Chapter 25 of *Environmental Economics*. Edited by A. Markandya and J. Richardson (1992). Earthscan: London.

Richards, M. (1993). The potential of non-timber forest products in sustainable natural forest management in Amazonia. *Commonwealth Forestry Review*, **72** (1), 21–27.

Roche, L. (1992). The profession of forestry now and in the year 2000. *Commonwealth Forestry Review*, **71** (1), 13–19.

Rollinson, D., Aysen, B. and Edwards, D.J. (1998). *Organisational Behaviour and Analysis*. Addison Wesley Longman: Harlow, Essex.

Rostow, W.W. (1971). *The Stages of Economic Growth*. 2nd. edition, Cambridge University Press: London.

Ross, M.S. (1985). The Development and Current Status of Land Clearing for Transmigration in Indonesia. *Journal of World Forest Resource Management*, **1** (2), 163–176.

Runte, A. (1979). *National Parks: The American Experience*. University of Nebraska Press:Lincoln and London.

Salim, E. and Ullsten, O. (1999). *Our Forests, Our Future*. Report of the World Commission on Forests and Sustainable Development. Cambridge University Press.

Saulei, S. M. and Aruga, J.A. (1994). The status and prospects of non-timber forest products development in Papua New Guinea. *Commonwealth Forestry Review*, **73** (2), 97–105.

Sayer, J.A., Vanclay, J.K. and Byron, N. Technologies for sustainable forest management: challenges for the 21st Century. *Commonwealth Forestry Review*, **76** (3), 162–170.

Schlich, W. (1905). *Schlich's Manual of Forestry*, vol. III*Forest Management*. 3rd. edition, Bradbury, Agnew & Co. Ltd: London.

Segal-Horn, S. (1998). *The Strategy Reader*. Blackwell in association with The Open University : Oxford.

Senge, P.M. (1998). The leader's new work: building learning organizations. Chapter 15 in *The Strategy Reader*, Edited by S. Segal-Horn. Blackwell in association with The Open University : Oxford.

Seppälä, R. (1983). The Forest Sector Project of the International Institute for Applied Systems Analysis. Part I in R. Seppälä, C. Row and A. Morgan (eds.) (1983). *Forest Sector Models*, A B Academic Publishers: Berkhamsted.

Sinden, J. A. and Worrel, A. C. (1979). *Unpriced Values*. John Wiley & Sons: New York.

Smith, G. and May, D. (1980). The artificial debate between rationalist and incrementalist models of decision making. *Policy and Politics*, **8**, pages 147–61, 1980, reproduced in *The Policy Process: a Reader*. edited by Michael Hill. Harvester Wheatsheaf: Hemel Hempstead (1993), pages 197–33.

Solbrig, O.T. (ed.) (1984). Forests and Woodlands. Contribution to vol. 4 of State of Knowledge Report on Andean Ecosystems. *Mountain Research and Development*, **4** (2), 163–173.

Stahl, M.J. and Grigsby, D.W. (1992). *Strategic Management for Decision Making*. PWS-KENT Publishing Company: Boston.

Stott, P. (1997). Dynamic tropical forestry in an unstable world. *Commonwealth Forestry Review*, **76** (3), 207–9.

Stretton, H. and Orchard, L. (1994). *Public Goods, Public Enterprise, Public Choice*. St. Martin's Press: New York.

Thirgood, J.V. (1981). *Man and the Mediterranean Forest*. Academic Press: London.

Upton, C. and Bass, S. (1995). *The Forest Certification Handbook*. Earthscan: London.

USDA (1980). *Timber in the United States Economy 1963, 1967 and 1972*. Forest Service General Technical Report WO-21.

USDA (1982). An Analysis of the Timber Situation in the United States 1952–2030. *Forest Service Report No 23*.

Valentine, J. (1993). Private Forest Development: Experiences from New Zealand. *Commonwealth Forestry Review*, **72** (2), 92–94.

Von Bertalanffy, L. (1950). The theory of open systems in physics and biology. *Science*, **111**, 23–9.

Warner, J. (1995). The environment as a merit good. Paper for University of Bradford Development and Project Planning Centre's 25th. Anniversary Conference *Development Projects: Issues for the 1990s*. April, 1995.

Warner, K. (1997). The vision and role of community forestry in sustainable development. Special Paper prepared for Section G, Proceedings of the XI World Forestry Congress, held at Antalya, Turkey, volume 5, pages 57–68.

Waterman, R.H., Peters, T.J. and Phillips, J.R. (1991). The 7-S Framework. Pages 309–314 in Chapter 6 of Mintzberg, Henry and Quinn, James Brian (1991). *The Strategy Process*, 2nd edition, Prentice Hall.

Westoby, J. (1987). *The Purpose of Forests*. Blackwell: Oxford.

Westoby, J. (1989). *Introduction to World Forestry*. Blackwell: Oxford.

World Commission on Environment & Development (1987). *Our Common Future*. Oxford University Press: Oxford.

Worrel, A.C. (1970). *Principles of Forest Policy*. McGraw Hill: New York.

# INDEX