



NAVAL FACILITIES ENGINEERING COMMAND

Sustainable Development Sustainable Design

Navy Pollution Prevention Conference

Crystal City, Virginia

21 June 2001

Michael Chapman



Sustainable Development



“The earth belongs to the living. No man may by natural right oblige the lands he owns or occupies to debts greater than those that may be paid during his own lifetime. Because if he could, then the world would belong to the dead and not the living.”



Sustainable Development

Law of the
Iroquois
Confederacy

“In our every deliberation, we shall consider the impacts of our decision upon the next seven generations.”



Sustainable Development

The
Brundtland
Commission

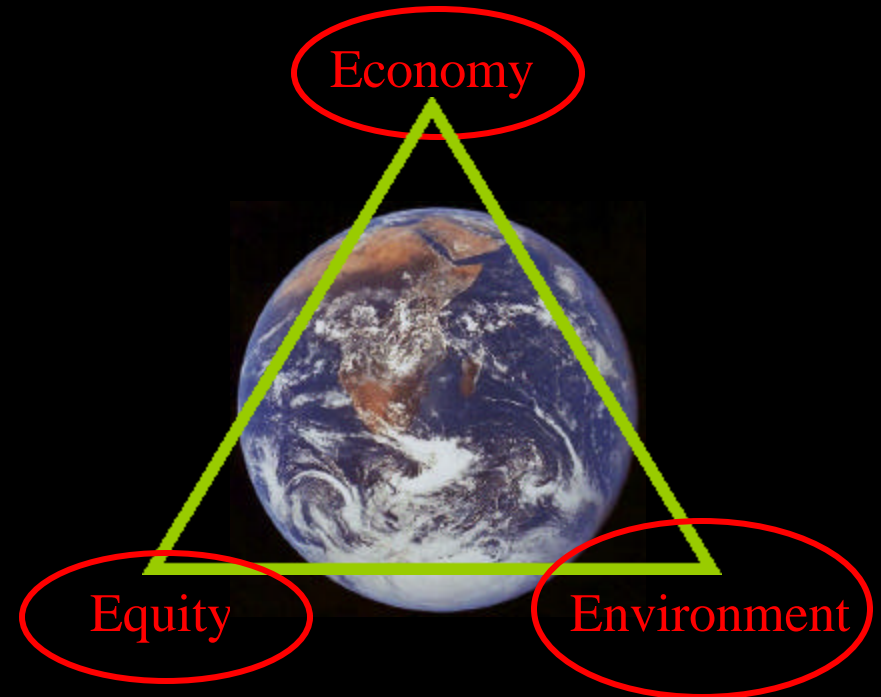
Sustainable development is
“development that meets the
needs of the present without
compromising the ability of
future generations to meet their
own needs.”



Sustainability

“Triple Bottom Line”

- ❑ **Economic Development**
- ❑ **Environment**
- ❑ **Social equity**





Sustainable Development Process

Holistic Theory:

The Whole is greater than the sum of its parts.



Sustainable Development Process

Holistic Theory:

Defining the Whole requires the involvement of all the identifiable stakeholders, and all the affected parts

Goals and objectives of the Whole should reflect consensus of the stakeholders



Environmental Impact of Buildings in the U.S.



Problems:

Global Warming: Emissions, Gases

Habitat Destruction

Uncontrolled Land Development

Air & Water Depletion and Pollution



Problems:

Expensive Energy & Limited Resources

- ❑ Buildings consume 60% of U.S. energy

Landfill Limitations

- ❑ Construction & demolition materials account for 30-35% of landfill



Development Challenges

Buildings consume huge amounts of materials, energy & water.

Buildings contribute to pollution, global warming and land-fill consumption.



Development Challenges

DOD is the largest consumer in the U.S.

Buildings can be designed to better optimize resources, and result in healthier environment.



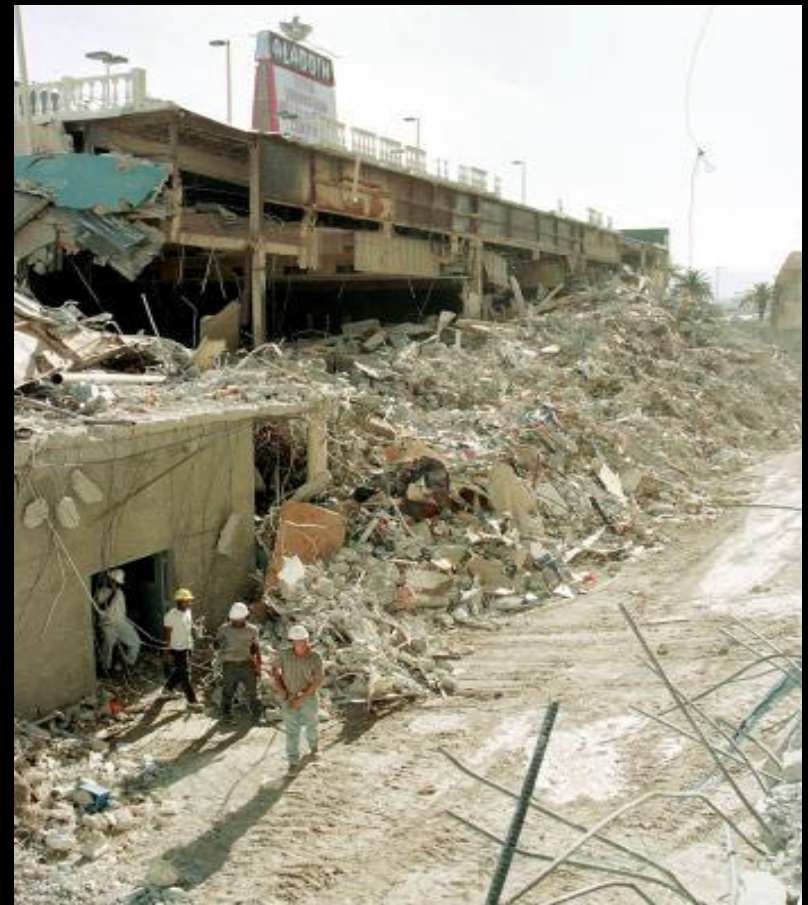
**30-40% of energy use &
atmospheric emissions**





35-40% of the municipal solid waste stream

- 150 million tons of construction and demolition waste
- 220 million tons for all other municipal solid waste





**25-30% of materials
and wood use**





Why Did We Go Green?



Customer Expectations

Faster

Cheaper

Better

Easier

MEANS

Reduce Work Backlog

Increase Cost Efficiency

Focus on Response Time

Ensure Quality

Deliver on Time



Challenges

Requirements increasing, dollars decreasing

Energy, operating expenses increasing

Changing business practices

Worker retention

Emerging maintenance and operation problems



“Sustainable Designs” - Best Business Practices

- ❑ Consideration of Life Cycle Costs**
- ❑ Energy Conservation**
- ❑ Water Conservation & Recycling**
- ❑ Recycling of Materials**
- ❑ Minimize Use of Chemicals/Emissions**
- ❑ Use of Passive Heat Sources & Natural Ventilation**
- ❑ Adaptive Reuse or Historical Structures**



Green Buildings...

Reduce the Impacts of Buildings in Five Broad Areas:

- ❑ Site Planning
- ❑ Water Use
- ❑ Energy Consumption & Atmospheric Emissions
- ❑ Material & Resource Consumption
- ❑ Indoor Environmental Quality



Green Building Costs are Reasonable

- ❑ **No additional first-cost**
- ❑ **Advanced energy efficiency for pennies**
- ❑ **Reduced site preparation & landscaping**
- ❑ **Lower construction waste costs**
- ❑ **Better design reduces change orders**
- ❑ **BUT, must pay “tuition” in learning**



Major Claimants & PWOs Respond To:

- ❑ **Annual operating costs**
- ❑ **Productivity**
- ❑ **Lower worker turnover**
- ❑ **Reduced Risk & Liability**
- ❑ **Things that work (no experiments, please!)**



Higher Productivity

- ❑ **94% of cost in life cycle of a building is in the salaries of the workers**
- ❑ **More than half of work-related productivity changes related to indoor environment**

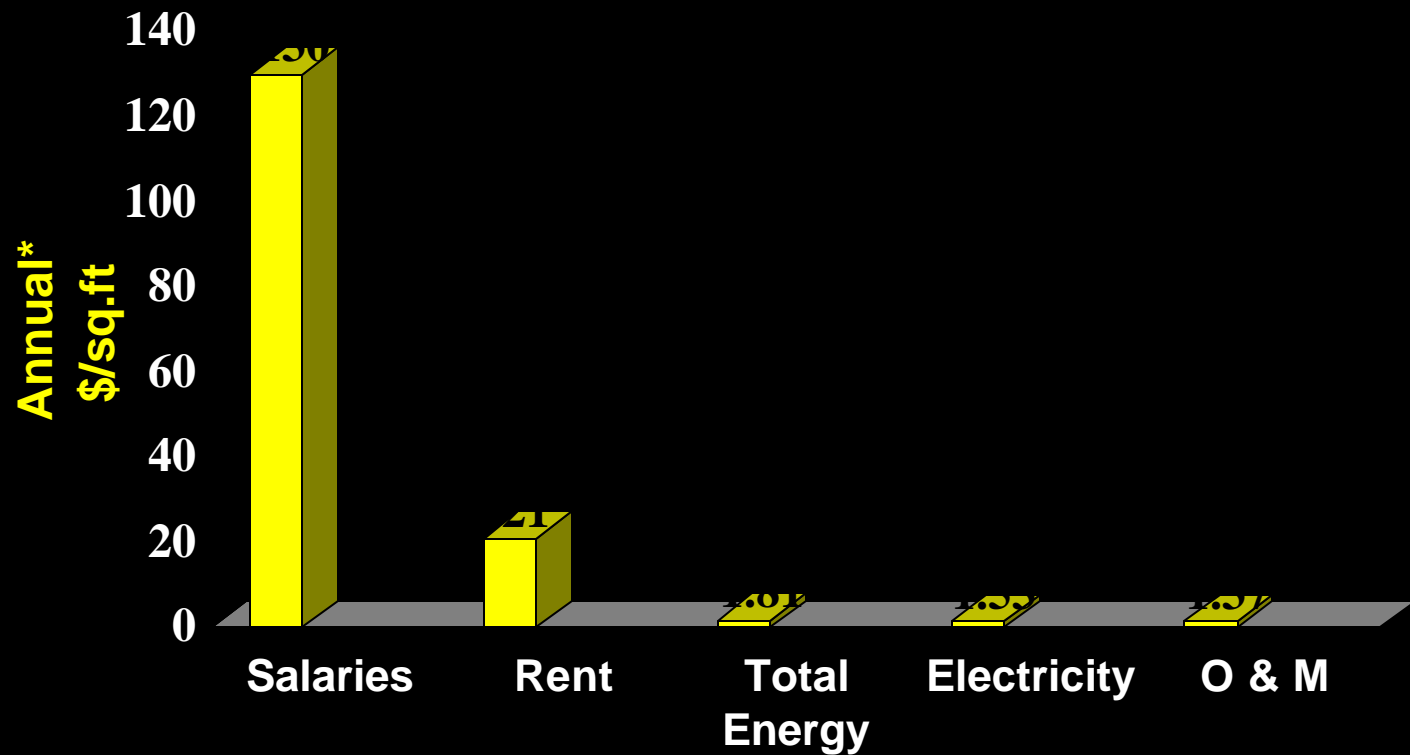


Higher Productivity

- ❑ **Healthier Indoor Environment**
- ❑ **Better Worker Retention**
- ❑ **Lower Satisfaction in A/C Building vs. Naturally Ventilated Building**



Comparison of Building Costs





Benefits of Green Design

Reduced Operating Costs

- **Lower Utility costs: \$0.50-\$0.60 per square foot vs. \$1.00-\$1.50**
- **Reduced maintenance costs**



Benefits of Green Design

Reduced Insurance & Risk of Liability

- ❑ Healthy occupants reduce absenteeism, exposure to workplace related lawsuits

Lower Environmental Impact

- ❑ Reduced Permitting, Costs



Implementing Sustainable Development



Implementing Sustainable Design

Executive Orders

- ❑ **EO #13101**, Greening the Government Through Waste Prevention, Recycling and Federal Acquisition
- ❑ **EO #13123**, Greening the Government Through Efficient Energy Management
- ❑ **EO #13148**, Greening the Government through Leadership in Environmental Management



Implementing Sustainable Design

NAVFAC's

Sustainable Development Program

- ❑ Initiated in 1993 -- ASN Desire to be More Environmentally Responsible
- ❑ Industry Involvement and Cooperation
- ❑ Field-Based Workshops Started in 1995
- ❑ Pilot Project Program Starter in 1995



Implementing Sustainable Design

NAVFAC's

Sustainable Development Program

- Revolutionary Changes in NAVFAC's Policies, Criteria and Procurement Practices:
 - Policy on Design
 - Policy on Criteria
 - Policy on Procurement of A-E Services
 - Policy on Design-Build



Implementing Sustainable Design

BEQ Complex - NTC Great Lakes, IL

\$60.1 Million Budgeted Construction Cost

- ❑ \$600,000 Reduction in First Cost
- ❑ Estimated Energy Savings -- \$110,000/year
- ❑ Improvements to Life-Cycle Cost
- ❑ Improved Interior Environment Leading to Increased Productivity
- ❑ Significant Number of Additional “Greening” Initiatives
- ❑ Certified Level Under US Green Building Council’s LEED Criteria



Implementing Sustainable Design

BEQ Complex - NTC Great Lakes, IL





Implementing Sustainable Design

Conclusions Drawn from Pilot Projects - Leading to NAVFAC's Position on Sustainable Design

- ❑ Significant energy savings can be realized through use of an **“Integrated Design”** approach, or **“Whole Building” design approach**
- ❑ Lower life-cycle cost can be realized
- ❑ Improved interior environments can be created
- ❑ This can occur without increases in first cost



Implementing Sustainable Design

Conclusions Drawn from Pilot Projects - Leading to NAVFAC's Position on Sustainable Design

- ❑ A significant number of additional **“Greening”** initiatives can also be accommodated in most projects
- ❑ Increased level of strategies may increase cost



Paradigm Shift



Traditional Design

Typical planning and design process relies on the expertise of specialists who work somewhat isolated to focus on the program needs during the development of a building design.

- ❑ Linear process from architect to engineering consultants.
- ❑ Periodic design meetings to coordinate efforts.



Whole Building Design

“Synergy is the only word in our language that means behavior of whole systems unpredicted by the separately observed behavior of the system’s parts or any subassembly of the system’s parts. There is nothing in the chemistry of a toenail that predicts the existence of a human being.”

R. Buckminster Fuller.

Operating Manual for Spaceship Earth (1969)



Whole Building Design

A successful "Whole Buildings" design is a solution that is greater than the sum of its parts. The fundamental challenge of 'whole buildings' design is to understand that all building systems are interdependent.

- ❑ Looks at how materials, systems and products of a building connect and overlap.
- ❑ Looks at how the building and its systems can be integrated with supporting systems on its site and in its community.



Whole Building Design

The fundamental challenge of 'whole buildings' design is to understand that all building systems are interdependent.

Through a systematic analysis of these interdependencies, a much more efficient and cost-effective building can be produced.



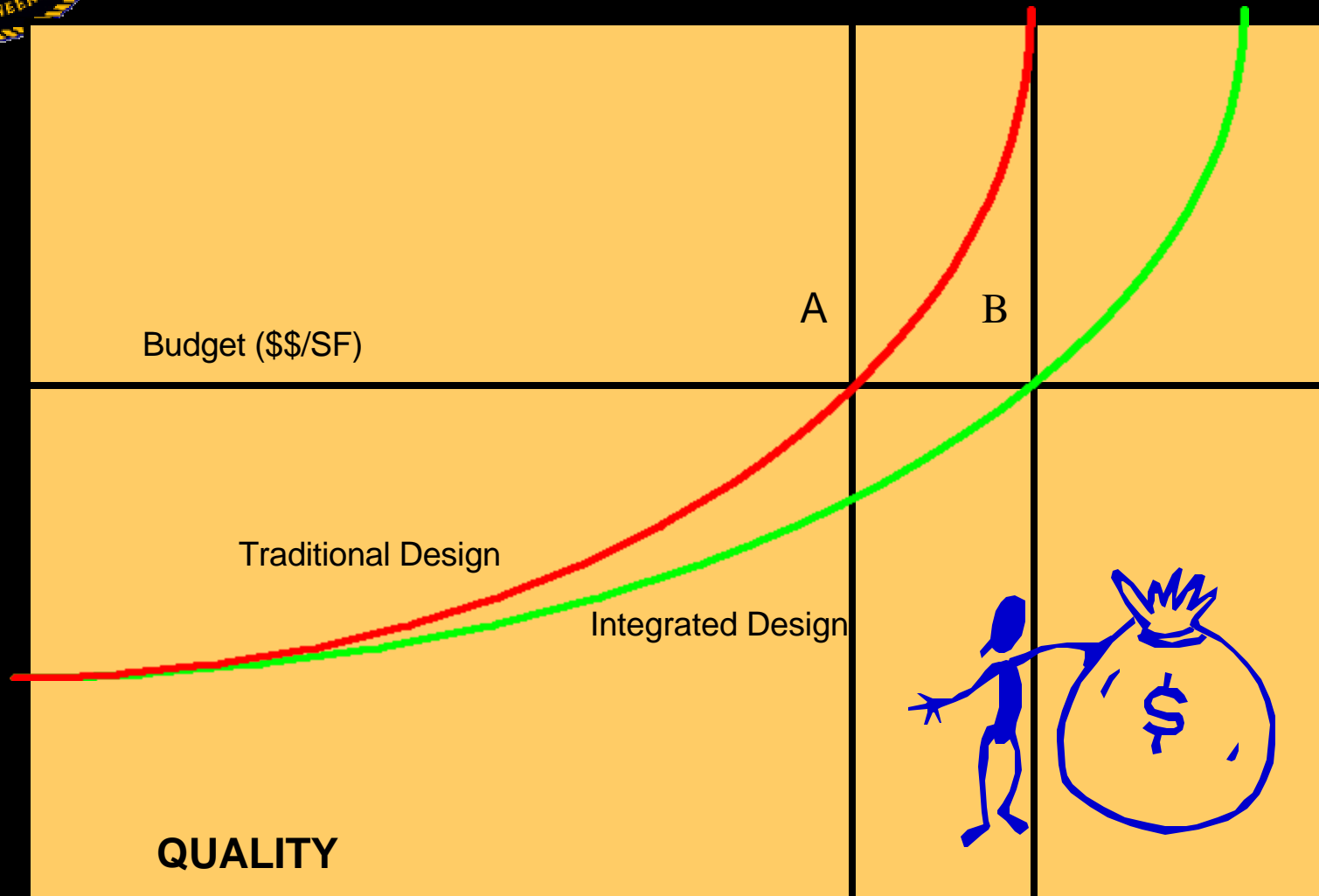
Collaborative Approach

Paradigms of the traditional design process need to be altered for a heavier focus on collaborative interaction and goal defining.

- ❑ **Comprehensive Stakeholder Involvement**
- ❑ **Materials, systems and assemblies reviewed from many different perspectives.**
- ❑ **Evaluation for cost, quality-of-life, future flexibility, energy efficiency, overall environmental impact, productivity, creativity, and how the occupants will be enlivened.**



Cost Effective Design





Criteria



NAVFAC Criteria


http://www.efdlant.navfac.navy.mil/lantops_15

Engineering Innovation of LANTOPS - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address http://www.efdlant.navfac.navy.mil/lantops_15/ Go Links



Naval Facilities Engineering Command Engineering Innovation & Criteria Office

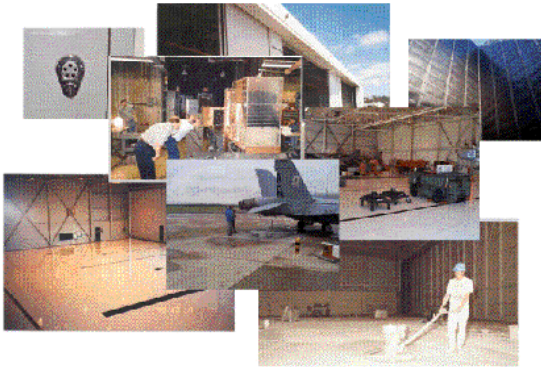
Home Feedback Search

From the Director

- News
- Publications
- Topics
- Tools
- POC
- Links
- FAQs
- Location

Date Last Updated
June 02, 2001
13:47

[webmaster](#)



[From the Director](#) [News](#) [Publications](#) [Topics](#)
[Tools](#) [POC](#) [Links](#) [FAQS](#) [Location](#)

Done Internet

Start Inbox - Microsoft Out... Microsoft PowerPoint... Engineering Inno... 3:49 PM



Whole Building Design Guide

<http://www.wbdg.org>

WBDG



**Your Complete
Internet Resource to
Building-Related
Design Guidance,
Criteria, and Technology**



US Green Building Council



Green Building Rating System

<http://www.usgbc.org>



Foundation Knowledge

FoundationKnowledge.NET (BETA) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address <http://166.82.35.212/> Go Links »

Home **KM Center** e-Learning Business Lines Library

Portal Home | Portal Documentation

CADD GIS Technology Center

Foundation Knowledge

The Knowledge Management Portal for facilities, infrastructure and the environment

Base Development | Real Property | Capital Improvements | Environmental Support | Housing | Base Ops. | Military Ops.

Account Login

Email:

Password:

Remember Login

[sign-in](#)

[register](#)

Welcome to FoundationKnowledge



Welcome to the **Foundation Knowledge Portal**. Knowledge Management!!! (KM) is the leveraging of collective wisdom to increase responsiveness and innovation. It is the integration of people, process, tacit and explicit knowledge, and social capital enhanced with technology that empower the organization for success. Foundation Knowledge is KM applied to facilities management (FM) through applying KM principles and associated supporting technology tools to design, build, operate, and maintain today's facilities. The object of this Portal, which is sponsored by the CADD/GIS Technology Center, is to leverage the strengths of KM into better management of the built environment.

News and Features

Upcoming Events

Quick Links

- [KM Consortium International](#)
- [KM Magazine](#)
- [FM Link](#)
- [Navy Website Portal](#)
- [Army Knowledge Online](#)
- [ASCE KM](#)

Communities of Practice

CADD Operators, GIS Specialists, more



Knowledge Management Center

E-Learning, Corporate Knowledge, Individual Knowledge



The Technology

CADD, GIS, CMMS, CAFM/CIFM



The Vendors

CADD Vendors, GIS Vendors



Government Resources

TSC, NSDI, FGDC



News Content

Sustainable Development



Done Internet

Start | Inbox - Microsoft Out... | Microsoft PowerPoint | FoundationKnowl... | 3:38 PM



Sustainable Development

Sustainable Development - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address http://www.foundationknowledge.com/beta1/KM%20Center/sustainable_development/sustainable_devopment.htm Go Links

Home KM Center e-Learning Business Lines Library

CADD GIS Technology Center

Foundation Knowledge


The Knowledge Management Portal for facilities, infrastructure and the environment

Base Development | Real Property | Capital Improvements | Environmental Support | Housing | Base Ops | Military Ops

Sustainable Development

Sustainable Development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

-- The Brundtland Commission



Planning Design Government Resources Misc. Links

Planning Tools and guidelines to develop planning strategies for successful Sustainable Development.

Design Resources and tools for considering the design strategies of Sustainable Development

- Construction

http://www.foundationknowledge.com/beta1/KM Center/sustainable_development/sustdevresources.htm Internet

Start Inbox - Microsoft Out... Microsoft PowerPoint... Sustainable Deve... 3:43 PM



Sustainable America

Domestically, Sustainable Development *presumes* security and freedom from external interference.

**Navy cannot make this presumption...
mission is to provide this security.**

***Security supports
economic development and equity.***



The American Dream





Sustainable Readiness





The End

