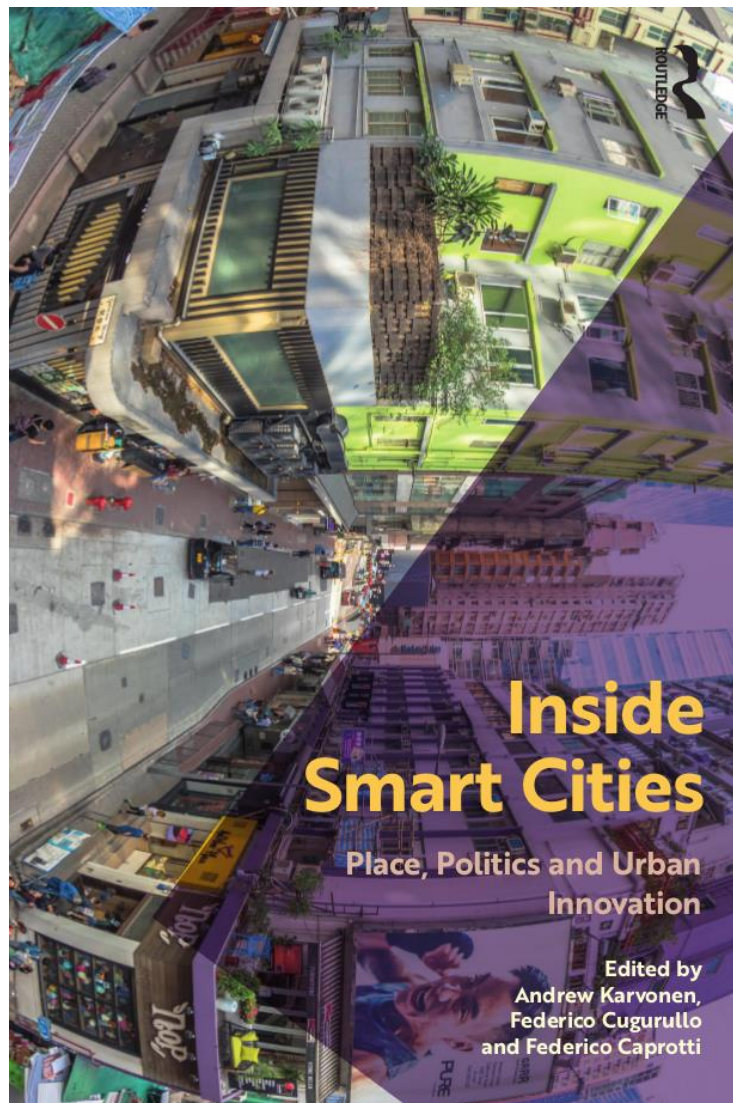


Ordinary Chinese Smart Cities: The Case of Wuhan

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Accepted manuscript

This manuscript was accepted on 15 March 2018 as a chapter for *Inside Smart Cities: Place, Politics and Urban Innovation* (eds. Andrew Karvonen, Federico Cugurullo and Federico Caprotti). In citing this work, please consult and refer to the final published version, published by Routledge in September 2018



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Abstract

Commentaries on future-oriented Chinese urban development tend to focus on showcase projects underway in wealthy coastal cities. This chapter instead sheds light on the way that the smart has been integrated into more 'ordinary' Chinese urban life, using the case of Wuhan, a 'Tier II' city in Central China. It explores the conditions of the emergence of Wuhan's smart city activities from three perspectives. First, it outlines a series of 'vertical' enabling factors, whereby an international body of discourse and practice has been 'translated' into national Chinese urban policies. Second, it considers the simultaneous significance of 'horizontal' links between Wuhan's local government, city governments abroad, local private enterprises, and foreign firms. Third, it relates Wuhan's smart credentials to a broader process of digitalisation of everyday life in the city. It concludes by reflecting on the distinctive characteristics of Chinese smart urbanism, as exemplified by Wuhan, and finally draws out some implications for future research into smart cities elsewhere. Specifically, it proposes that the smart city is most usefully approached as a shifting and locally inflected concept which not only channels multiple policy agendas, but also reflects broader changes to urban space and governance in particular contexts.

Final Published Version:

Cowley, R., Caprotti, F., Ferretti, M. and Zhong, C. (2018). Ordinary Chinese Smart Cities: The Case of Wuhan. In Karvonen, A., Cugurullo, F. and Caprotti, F. (eds) *Inside Smart Cities: Place, Politics and Urban Innovation*. London: Routledge, pp.45-64. ISBN: 978-0815348689.

Introduction

Although there is no shortage of international commentary on China's more ambitious urban development projects and policies, researchers have paid relatively little attention to the growing importance of smart city ideas within these. The current chapter therefore aims to add to our collective understanding of 'smart urbanism' in the Chinese context. However, rather than taking its cues from global cities in the international limelight (for example, Shanghai), or from new digital technologies in exemplar development projects (for example, Tianjin Eco-City), the chapter responds to Shelton and colleagues' (2015) call to investigate how the 'actually existing smart city' is rolling out in more 'ordinary' (Amin and Graham 1997, Robinson 2006) settings. Specifically, the case of Wuhan is used to illustrate the ways that the smart city concept has 'landed' in typical Chinese urban space, since the city is neither a high-profile coastal metropolis, nor a remote backwater. The case of Wuhan, and its national context, is potentially of empirical interest to readers more familiar with smart city development elsewhere; but it also has particular importance as one of several cities in which significant hope and resources are currently being invested as a model for future urban development in China. In this chapter, we address two research questions: What is distinctive about the Chinese smart city, as exemplified by Wuhan? And what does that tell us about smart city development elsewhere?

After providing brief contextual information about Wuhan, and sketching out its current smart city activities, we consider three interrelated dimensions of their recent emergence. First, from a 'vertical' perspective, they are enabled by national policies which adapt and frame the loose global discourse of the smart city to reflect particular Chinese agendas. In this sense, smart city activities on the ground may be understood as the contingent outcomes of policy transfer at the national level. Second, from a more 'horizontal', municipality-centric perspective, we explore the additional significance and more dispersed agency associated with a Chinese mode of 'urban entrepreneurialism'. Finally,

we suggest that the more obvious significance of the smart for daily life is embedded within a much broader embrace of everyday digital technology, which extends beyond the 'smart' label itself. The chapter concludes by summarising some of the distinctive characteristics of Wuhan as a Chinese smart city, and reflecting on what this tells us about smart city development and research in different geographical contexts.

The discussion draws on evidence from publicly available Chinese- and English-language textual sources (with data triangulated where necessary across different policy documents, local and international news stories, academic publications, and relevant reports and websites), as well as on observations of everyday life, and informal discussions with local contacts, during two site visits in February and April 2017.

Wuhan as an 'ordinary' Chinese city

Despite its relatively low international profile in urban scholarship and the popular media, Wuhan is central China's most populous city, with approximately 10 million residents in 2017. Historically known as the 'Center of the whole Empire' (Rowe 1984, cited in Han and Wu 2004: 349), the city is promoted by the Wuhan Bureau of Commerce (2010: 2) as the logistical 'heart of China', and the 'largest transportation hub for land, water and air travel. Its strategic location links the East with the West, and the South with the North'. The national State Council has formally recognized Wuhan as the most important shipping centre in the middle sections of the Yangtze river (van de Bovenkamp and Fei 2016: 2).

Chinese cities are grouped into four 'Tiers' – a hierarchy originally established by the central government to manage urban development, but also now used as an informal classification tool. Only a handful of cities (such as Beijing, Shanghai, Guangzhou, Tianjin and Shenzhen) are generally classified as Tier I: they have strong international profiles, and in many ways function as 'showcases' for China's economic development on the

international stage. Wuhan falls into Tier II, which – depending on the calculation used – accounts for around 30 cities with lower gross domestic productivity and smaller populations (typically 3 to 15 million residents in the metro area), and which are mostly provincial and sub-provincial capitals. It was once comparable to Shanghai and Beijing in its manufacturing output and educational levels, and as recently as 1981 served as China’s fourth largest centre of industry. However, the focus of earlier reforms on coastal regions and Tier I cities led to its relative (though not absolute) economic decline (Han and Wu 2004, French Consulate in Wuhan 2014: 4). Today, Wuhan’s continued reliance on state-controlled heavy industry (Yu 2014:26) leaves its per capita income not much higher than the national average, and significantly lower than that of similarly sized Tier I cities (Euromonitor International 2017). Revenues from key steel and automotive industries, furthermore, are declining (*The Economist* 2015).

Nevertheless, national development policies are increasingly being directed at Tier II cities because they are seen as key drivers for China’s future economic growth. The Wuhan city region has benefited from the national ‘Rise of Central China’ programme, launched in 2004 (*The Economist* 2015) and now in its second ten-year phase (van de Bovenkamp and Fei 2016: 7). Along with the ‘Go West’ policy initiative, the programme incentivises foreign companies to relocate from coastal regions (ibid: 16) while also attracting foreign banks to Wuhan (Wuhan Bureau of Commerce 2010). An often-cited indicator of investment in the city’s development is its ongoing expansion of the metro network (at the rate of one line per year) and the planned expansion of its international airport (*The Economist* 2015). Accordingly, Wuhan is one of two cities which the national State Council intends to upgrade to ‘national central city’ status (wh-china 2017) in recognition of its developmental prospects. This status was previously reserved for Beijing, Shanghai, Tianjin, Guangzhou, Chongqing, and Chengdu. Meanwhile, the city ranked 11th in *Foreign Policy’s* list of ‘Most Dynamic Cities of 2025’ and its GDP is forecasted to grow more than 400% between 2012 and 2025 (van de Bovenkamp and Fei 2016: 16).



Figure 1 Ongoing construction at Optics Valley roundabout, the gateway to Wuhan's East Lake Hi-Tech Development Zone (Photo: Robert Cowley)

Promotional campaigns for Wuhan often emphasise the city's educational credentials and its ambitions plans to diversify the local economy. Its smart city vision is at least discursively legitimised through the valorisation of well-educated and entrepreneurial 'smart people' (Kitchin 2015) in the post-industrial, creative and hi-tech sectors. Wuhan is home to 120 higher education institutions (van de Bovenkamp and Fei 2016), with students accounting for more than one in ten of the city's population (Wuhan Bureau of Commerce 2010). It has been officially ranked as China's most important university cluster outside Beijing and Shanghai (French Consulate in Wuhan 2014: 4). Recent university rankings published by both *Times Higher Education* (2017) and QS (2017) place Wuhan University among China's top ten higher education institutions. Active efforts to move Wuhan's manufacturing base away from its dependence on heavy industry, have focused on Wuhan East Lake Hi-Tech Development Zone, one of Wuhan's three 'state-level development zones', where incentives are provided by central government to encourage investment by Chinese and foreign companies (**Figure 1**). Following its

designation by the State Council as a strategic ‘Independent Innovation Model Area’ in 2009, the zone has attracted a wide range of hi-tech companies in opto-electronics, renewable energy, bio-engineering, pharmaceuticals, and agriculture (Wuhan Bureau of Commerce 2010, WEHDZ 2012). The national Ministry of Science and Technology ranks East Lake as China’s third most important hi-tech industrial zone (French Consulate in Wuhan 2014: 4).

Our intention here is not to reproduce the optimistic tone of official policy proclamations and promotional documents about Wuhan, but rather simply to highlight that it is earmarked as having significant unfulfilled economic potential. A 2015 ‘photo essay’ in the *Guardian* newspaper (Bollen 2015) suggested that Wuhan’s appearance as a ‘typical second-tier Chinese city’ belies its significance in the country’s history and contrasts with contemporary policy ambitions to transform it into ‘a world-class cosmopolitan metropolis comparable to New York, Paris and Tokyo’. An only slightly less grandiose ambition is stated in the *Plan Wuhan 2049* document, published in 2013 by the China Academy of Urban Planning and Design, for the city to become a world-ranking metropolis comparable to Rome, Chicago, or Munich (French Consulate in Wuhan 2014). Rhetoric aside, the future success of Wuhan is intended to be a ‘blueprint’ for other second-tier cities (Euromonitor International 2017). Thus, Wuhan is an ‘ordinary’ Chinese city but also serves as an indicator of planned future development at a national level. It provides intriguing insights on how the actually existing smart city is emerging in China.

Overview of Smart City Activity in Wuhan

There is convincing evidence that Wuhan has actively embraced the use of smart technology across a wide range of areas of urban life, even though implementation is at a pilot stage in many cases. In this respect, the city is a relative pioneer. As long ago as 2010, its Municipal Science & Technology Bureau announced the intention to invest 10 million yuan (€1.3m) in smart city projects. China Aerospace & Industry Corporation was

chosen to draw up the plans, which were approved in 2012 (Fan *et al.* 2016). Implementation has been coordinated by the Wuhan Research Institute for Smarter Cities (WRISC), established in 2012 by Wuhan Information Industry Office (a government agency) and the city's Land Resources and Planning Bureau, with a remit to distribute funding, provide consultancy, and assist in the development of industrial parks (WRISC undated). In 2016, 30 demonstrator projects had been implemented under this smart city pilot umbrella (*Changjiang Daily News* 2016).

Many of the pilot projects are described on WRISC's website. They include various industrial applications, including the distribution of pharmaceuticals, the management of agricultural production, and a platform allowing producers to sell food boxes directly to households. A new barcode system provides information on the methods used to grow fresh food and its provenance (Chien 2017), and RFID chips track meat production from slaughterhouse to point of sale.

The projects also address traditional and digital infrastructure. An integrated real-time data system for sewage management has been trialled. Meanwhile, electronic toll collection was introduced to some of the city's bridges and tunnels and will contribute to a wider roll-out of a smart parking scheme, with possible further uses of the collected mobility data being explored. WiFi is being extended on the bus network to enable real-time service information. Investment into the city's cloud-based GIS information platform has facilitated administrative decision-making and supported the development of smartphone apps. Integrated online administrative public services were introduced alongside a platform for residents to report problems and register complaints. Meanwhile, video cameras across the city feed into a centralised traffic information system and a surveillance system connected to all the city's police stations, to improve public safety. The local government has introduced a free public WiFi network with over 1,000 hotspots and significantly expanded the city's fibreoptic broadband coverage. Plans

are underway to digitally monitor the safety of construction sites and passenger lifts, and to roll out smart traffic management more widely (*Changjiang Daily News* 2016).

Other activities are more oriented towards social needs and public education. A ‘smart campus’ demonstrator project sends alerts to parents’ phones to confirm children’s arrival at school and facilitates communication with teachers (Chien 2017). The ‘Smart Television Bookstore’ project allows people to read books, magazines and newspapers through their televisions. Information about historical architecture is provided via QR codes displayed on buildings. Online services have been developed to support the elderly, including telemedicine and home care, and to facilitate food delivery, domestic maintenance, and emergency services. The local government has been particularly keen to develop its ‘Smart Health’ information programme. Medical records are available from a specially constructed cloud platform (Fan *et al.* 2016) and smart wristbands are being used in hospitals to collate individual medical files for patients from different departments (Chien 2017).

Taken as a whole, then, these officially sanctioned smart city activities display the potential to have tangible impacts on a broad variety of aspects of everyday life. One important reason for their emergence, as discussed in the next section, is the role of policy-making ‘from above’.

Vertical enabling factors

To understand how the smart city is being manifested on the ground in different locations, it is useful to draw on contemporary debates regarding international ‘policy transfer’. While political scientists have long been interested in the factors enabling or hindering the implementation of ideas and initiatives imported from different contexts, the notion of ‘fast policy transfer’ (Peck & Theodore 2001; 2010; Peck 2011) describes the tendency for ideas across diverse fields of governance to circulate more rapidly and

extensively than was previously the case, as a result of contemporary processes of globalisation. Relatedly, examples of 'best practice' in urban development are widely emulated in different cities around the world: the tendency for contemporary urban sustainability projects, for example, to draw on the expertise of international firms of consultants and masterplanners (Joss *et al.* 2013, Rapoport 2015, Rapoport and Hult 2017) means that the same ideas and designs are often replicated in a wide range of contexts. Yet this process does not necessarily have homogenising effects on urban landscapes around the world. As Rapoport (2015) observes, ideas are frequently modified for local use, and what gets built may sometimes diverge radically from the masterplan or design. Accordingly, we follow Stone (2017) in conceptualising contemporary policy transfers as processes of hybridisation, whereby ideas from elsewhere inevitably get 'translated' into local contexts, rather than straightforwardly imposed in linear fashion. The recent spread of 'smart city' ideas into *national* policy-making invites more detailed exploration of how these are variously transformed as they become enrolled into pre-existing policy agendas, and, in turn, of their roles in constraining and enabling what actually emerges at the local level. This approach departs from critiques of the smart city concept which variously highlight its technocratic characteristics as a potentially problematic one-size-fits-all imposition onto urban space (see, for example, Halpern *et al.* 2013, Söderström *et al.* 2014, Vanolo 2014).

Our discussion of Wuhan's smart city activities begins by interpreting them through the lens of national policy, as a particular 'translation' of a global policy discourse. The case for considering the influential effects of national policy on urban development may seem self-evident – and yet its role is often underemphasised or overlooked in discussions of city-specific initiatives (Joss and Cowley 2017) that are not 'top-down' flagship projects, such as Masdar City in the United Arab Emirates (Cugurullo 2016). As discussed below, Chinese smart city development is not solely determined by the national government, but is nevertheless more clearly driven from the centre than is typically the case in, for example, European cities.

Wuhan's smart city funding announcement in 2010 (mentioned earlier) directly resulted from the national Ministry of Science and Technology's selection of Wuhan as a pilot location in the China-wide '863 Smart Cities' programme (High-Tech Development & Industrialization Office 2012). More recently, a wider enabling national policy landscape has emerged. Significantly, the new National Urbanisation Plan (2014-2020), which aims primarily to 'convert the rural population into urban residents in an orderly manner' (China.org.cn 2014), also envisions a series of specific 'directions' to 'drive forward the building of smart cities' (CAICT/EU-China PDSF 2016: ix). These include proposed improvements to broadband networks, the digitalisation of urban planning and management, smart infrastructure, and more convenient public services (Tan-Mullins *et al.* 2017). A report by the China Academy of Information and Communications (CAICT/EU-China PDSF 2016: 41-45), lists a raft of recent national policies directly relevant to smart city development. These include:

- Two strategic documents issued by the State Council in 2012 (primarily aimed at improving and integrating data use across different urban public services); and in 2013 (encouraging municipalities to develop demonstrator projects in collaboration with the private sector);
- Three 5-year plans issued by the Ministry of Industry and Information Technology (MIIT) in 2011, relating to information security, e-commerce, and the Internet of Things (the latter encouraging smart city demonstrator projects across fields including logistics, transport, security, and medical care);
- A *Special Action Plan* issued by MIIT to encourage wider use of digital information across different industrial sectors, covering the period 2013-2018;
- A call by the Ministry of Housing and Urban-Rural Development (MOHURD) in 2012 for cities to apply to a national pilot smart cities scheme, relating to fields including security, construction, municipal administration, and industry;

- A strategic agreement made between the Chinese Society for Urban Studies and China Development Bank (CDB), whereby CDB will finance smart city development following the end of the 12th Five-Year Plan;
- Proposals made by the National Administration of Surveying, Mapping and Geoinformation in 2012 (to enhance digital mapping support for smart city development), and 2013 (to link local databases and geographical information to cloud platforms); and
- A cross-Ministry strategic document, released in 2014 (Tan-Mullins *et al.* 2017), on *Promoting the Healthy Development of Smart Cities*, aiming to provide clear guidelines for the smart city as a new model of sustainable urban development, and to introduce more convenient, efficient and environmentally friendly public services, with 100 pilot cities to be selected.

It is difficult to place a precise figure on the resulting number of smart city projects currently taking place in China. Some sources report small numbers and suggest that Wuhan is one of ten cities chosen to participate in a national programme of pilot smart schemes to promote low carbon development (Min *et al.* 2015). Elsewhere, it is reported that several hundred smart city initiatives were launched across the country between 2013 and 2015 (Tan-Mullins *et al.* 2017, CAICT/EU-China PDSF 2016). This variation mirrors the challenges in quantifying 'eco-city' schemes in China (Joss 2015), for which estimates range from 'more than 100' (Wu 2012) to 'more than 1,000' (Ren 2013: 112), depending on the sources and the definition used. For both smart and eco city projects, this variation and imprecision reflects a broader symptom of 'fragmented authoritarianism' (Lieberthal and Oksenberg 1988). As Tan-Mullins and colleagues (2017: 3) note, 'different central government Ministries may stipulate various related but different...policies, creating greater political space for sub-national local governments to apply or compete. This is one important reason why most Chinese cities have more than one type of smart and eco project'.

Conversely, the last document in the above list suggests that a process of 'standardisation' is underway at the national level. Again, however, this is only part of the story: while a shift towards standardisation may be interpreted as an attempt to strengthen the role of central government, there is a parallel emphasis on the private sector to deliver smart cities. While local governments have played a dominant role in procuring smart technology in China, it is expected that their role in future will be increasingly restricted to regulatory oversight, with wider roll-out of public-private partnership arrangements (Li *et al.* 2015). A more complete picture of the smart city agenda in Wuhan is revealed by accounting for the distinct roles of local actors. In the next section, we consider Wuhan's smart city development through the lens of 'urban entrepreneurialism'.

Horizontal enabling factors

In their review of the early literature around the shift towards 'urban entrepreneurialism' in Western cities, Hall and Hubbard (1996) picked out a series of defining characteristics. These include a shift from primary concern with providing local welfare and services, to a more outward-looking focus on economic development; the use of 'place marketing' as part of wider conscious attempts to attract inward investment, underpinned by an understanding of the ongoing globalisation of production, and consequently the more pressing need to compete with other cities internationally; and the growing use of temporary multi-sectoral partnerships and coalitions in the service of 'piecemeal' urban development based on speculative projects. Wu (2003: 1675) distinguishes contemporary and more active 'attempts to pursue entrepreneurial advantages' from the 'conventional city which is merely a location where entrepreneurial activities occur'. Wu mobilises Jessop and Sum's (2000) model of the definitive characteristics of the entrepreneurial city that include the use of entrepreneurial *strategies* within a recognisable entrepreneurial *discourse* to promote particular entrepreneurial *images* of the city.

There are various problems with applying the idea of urban entrepreneurialism to Chinese cities. Perhaps most obviously, such tendencies in 'post-socialist' cities (Wu 2003) address neither a 'post-Fordist' crisis (Jessop 1994) nor the perceived failure of the social-democratic Keynesian welfare state (Jessop 1999). But neither can direct parallels be made with Eastern European 'post-socialist' economies, which were already significantly more industrialised and urbanised than China before 1979 (Wu *et al.* 2016). In China, market reforms are not related to a 'roll-back' (Peck and Tickell 2002) of the state, but rather are intended to support the centrally planned economy and consolidate state power (de Rambures 2015). Although Chinese municipal entrepreneurialism is encouraged by the ongoing process of market reforms, it is also constrained by a prioritised requirement for 'social stability' (Yu and Zhu 2009: 217). China differs from the West, furthermore, in its national government's financial and political ability to impose 'megaprojects' with significant consequences for individual cities, its lack of strong horizontal networks of associations between local governments, and limited institutionalised coordination of large projects across city-regions (Ren 2013: 76).

Nevertheless, certain surface features of contemporary Chinese urban governance are at least analogous with those of Western urban entrepreneurialism (Yu and Zhu 2009: 202), if only because particular aspects of 'marketisation' have been borrowed from the Western experience (Wu 2003: 1674). Below the surface, furthermore, Yu and Zhu (2009) argue against the assumption that local 'entrepreneurialism' in China describes a straightforward implementation of policy directions imposed by central government. Rather, both local government and local enterprises have significant agency (and may be the key factors) in shaping its precise forms (*ibid.*). Certain cities, such as Shanghai (Wu 2003), clearly display entrepreneurial strategising and agency which, in line with Jessop and Sum's (2000) model, extend beyond the presence of activities 'simply resulting from market-oriented reform' (Wu 2003: 1675).

At least in the superficial sense, Wuhan displays clear evidence of urban entrepreneurialism. It has developed a ‘brand logo’ for its place-marketing agenda (Figure 2) that is prominently displayed on billboards all over the city and in promotional materials. The inclusion of an English-language strapline suggests the outward orientation of the message; and its wording (‘Wuhan, Different Every Day!’) consciously taps into entrepreneurial discourses around flexibility and the ability to manage continual change (Yu and Zhu 2009) while also promoting the city as an interesting destination for visitors and businesses.



Figure 2 Place marketing on billboards in Wuhan (Photo: Haiyu Zhang)

Wuhan’s ongoing growth and increasing importance within national policy-making has attracted the interest of the outside world, and the active role played by foreign interests further disrupts a model of hierarchical national planning emanating from Beijing. Its most well-established ties are with France, which reopened its consulate in the city in 1998. Three other countries now have consulates in Wuhan: South Korea (established in 2010), the US (2008), and the UK (2015); Russia is also considering opening a consulate in

the near future. While the Netherlands opened a trade office in Wuhan as early as 1996, several other countries have followed suit since 2010, including Singapore, Japan, Canada and Australia. The development of smart city activities in Wuhan, then, has paralleled a wider opening up of direct links with the outside world, and the growing number of foreign residents in the region is a source of pride for the city (see for example Hubei Government undated).

The connections with France have had the most tangible impact on Wuhan's spatial development, including a strong French industrial presence (French Consulate in Wuhan 2014; UbiFrance – SE de Wuhan 2014), and the planned 30-square-kilometre 'Sino-French Ecological Demonstration City' in the Caidan district to the west of the city (Chien 2017). However, Wuhan's smart city agenda is directly influenced by a longstanding and active 'twin city' arrangement with Manchester (Jayne *et al.* 2013) – one of 22 twinning arrangements established since 1979 (CIFCA undated). The planned Qingshan Riverside business development explicitly aims to learn from 'Manchester's very own flagship smart city area – 'Corridor Manchester'', and one of the Memorandums of Understanding signed to coincide with the opening of the British Consulate in 2015 intended to 'boost co-operation and exchange between the two cities to identify smart city solutions. The cities will work together to highlight the challenges each city faces in tackling smart city issues and find ways the cities and their companies can collaborate' (UK Government 2015).

Wuhan's 2010 smart city funding announcement and competition indicate how the actions of the local authorities are extending beyond procedures laid down by Beijing: Fan and colleagues (2016: 2) observe that, while the design and planning processes were 'typical' for China, the 'open and global project bidding' process was ground-breaking in the Chinese context. Equally, it would be limiting to interpret the prominent Wuhan Smart Health initiative (mentioned above) as an example of a local government enacting strategic directions set from above. This enacts a longstanding national government

interest in using new technologies to reduce health inequalities and improve services (Zheng and Rodríguez-Monroy 2015). However, its implementation has depended on the synergetic agency of ‘hundreds’ of local private companies (Fan *et al.* 2016: 62), suggesting a networked and dispersed mode of governance rather than a ‘firm-handed’ command-and-control approach.

Many of the local private companies are based in Wuhan’s ‘Optics Valley’, mentioned above. This development zone, dubbed the city’s ‘Silicon Valley’, is also home to IBM, which first established a branch in Wuhan in 1996 (IBM undated), and has collaborated closely with the Wuhan government at the ‘platform’ level to develop cloud computing to enable smart technology (Hao *et al.* 2012). The Wuhan East Lake High-tech Development Zone reaches out horizontally in its active appeals to foreign investors ‘as the only approved ‘future science and technology town’ in central and western regions’ (WEHDZ 2012).

It is possible, then, to narrate the emergence of smart city initiatives in Wuhan as the result of policies and incentives introduced by Beijing, in reflection of a body of global discourse, but translated into and constrained by a particular set of national development agendas. To do so, however, misses the equally important influence of, and more dispersed agency implied by, dynamic entrepreneurial connections among Wuhan’s local government, city governments abroad, local private enterprises, and foreign firms.

Wuhan as ‘everyday’ smart city

The fact that our story so far might reasonably have been told based only on secondary sources raises various methodological questions in relation to the smart city. In particular, there is a risk that investigations based solely on published documents will produce distorted pictures. The researcher discovers a variety of official documents, nested at different scales of governance, and designed to present achievements and plans in the

best possible light. Glossy promotional websites and brochures illustrate activities ranging from city-wide infrastructural upgrades, radical improvements to services, and newly-built whole districts of a city, through to small-scale experiments in digitalisation, and one-off educational schemes. And one might surmise that the smart city is not only a centrally important global policy phenomenon, but also has a significant impact on the daily lives of the city's residents. On arriving in the city, however, the expectation of finding – for better or worse – a glistening, digitalised, ultra-efficient metropolis of the future remains unfulfilled. Instead, it is difficult to find visible or tangible evidence of the 'smart'. The championed flagship initiatives are relatively insignificant within the space of the city of the whole and go largely unnoticed by local residents. Certain widely-touted and innovative sounding urban improvements in fact predate their packaging as smart, and other schemes never go beyond their planning stages. In our collective research experience of investigating related policies and practices internationally, even policy-makers themselves are sometimes only vaguely aware of their city's smart ambition when interviewed, while other key actors view it primarily as a passing fad mobilised instrumentally to attract funding.

Such disappointment need not mean that the smart city is only chimerical. Reflecting on a visit to Wuhan, a participant in a delegation from Manchester City Council concluded that 'Smart cities should be felt, not seen' (Oliviera 2015). By this, he meant that the smart city is not revealed by the visible presence of particular innovative technologies and processes on display. Rather, a 'Smart City is one where all the technology is for the most part hidden from view, working in the background, sensing, listening, reacting and predicting' (ibid.). This conclusion has similarities with Weiser's (1991) influential predictions around the project of ubiquitous computing. Here, the smart city feeds into long-standing ambitions to 'enhance the world already in existence by making computing an invisible force that runs through the background of everyday life' (Gabrys 2016: 6). An alternative search for the everyday smart city leads us to those digital technologies whose use has become normalised in, and which co-constitute, daily life,

and are already 'embedded into the fabric of cities' (Kitchin 2016: 24). The big picture may elude us if definitional work focuses only on the content of smart city policy documents and visions, or on cataloguing particular 'smart' activities rendered visible through institutional ratification. This is not to deny the importance of the 'official' smart city but to position it as a reflection, or at best a catalyst, of the more invasive and invisible digitisation of everyday life.

No attempt is made here to provide a detailed survey of the take-up of digital technologies in Wuhan, or to compare this systematically with cities elsewhere. Impressionistically, however, certain differences are immediately apparent when comparing Wuhan to Western cities. The visitor is struck by the widespread use of mobile payment services, provided through services such as Alipay, WeChat Pay, and Baidu. This is in stark contrast with European or North American cities, where mobile payments are a nascent activity. Services such as Alipay allow for rapid transfer of funds, via 'QR' codes, which are commonplace in shops, restaurants and elsewhere. *The Economist* (2017) reports that mobile payments in China as a whole are now 'more than 50 times the size of the American market'. Similarly, one is struck by the prevalence and *variety* of bike-sharing schemes in operation (**Figure 3**). Innovative Chinese approaches to such technology, relying on QR codes and GPS technology, have recently made international headlines - notably including the rise of 'Mobike', which has recently extended its operations to Manchester.

While the smart city is not coterminous with the internet, the infrastructure of the latter clearly has an important enabling role. Internet connection speeds in Wuhan are slow by Western standards but the city is a leader in overall internet usage relative to its urban peers. The city has the fourth highest level of internet use among all Chinese cities (Wei 2016) and the 2016 *China Internet + Index* ranks Wuhan as one of the top ten cities in China (Chien 2017: 58). It is arguably through smartphone technology that the 'real' smart city is evolving most significantly in everyday China. Data from the China Internet Network



Figure 3 One of Wuhan's many bike-sharing schemes, enabled by QR codes, smartphones and GPS technology (Photo: Haiyu Zhang)

Information Center showed that 90% of Chinese internet users (who account for just over half of the population) access it via smartphones (*Wall Street Journal* 2016). The *South China Morning Post* estimates smartphone usage in China at 62%, compared with an average of 55% in European countries (Perez 2015). More recent survey data (Poushter 2017) suggests that 68% of Chinese adults now own a smartphone, rising as high as 94% among 18- to 34-year-olds, and marginally higher in urban than rural areas. This compares with only 18% for India, a 'developing' country of similar size. In Wuhan specifically, based on our own observations of everyday life, smartphone use is at least as visible as in most European cities, and is certainly not the exclusive domain of the young and affluent.

This suggests that there are different ‘spheres of action’ in Chinese (and broader) smart urbanism. The spheres of international and national policy discourse, and the municipal strategy sphere, are clearly not recognisable at the level of the urban resident. More accurately, the impact of today’s policies and strategies is likely to be visible, and felt, only when concrete is poured, digital fibre is laid, and ways of governing and organising the city change. Nonetheless, it is clear from our research in Wuhan that the smart city exists at the level of the street, and of the individual citizen. At this level, the smart city is accessed and rendered visible through interfaces such as the smartphone, and is experientially felt and performed through technologies and practices such as shared bike schemes, mobile payment services, and smart transport solutions. This underlines the point that studies of the smart city can usefully move from the more static world of policy documents and glossy reports (Kitchin 2015) to the messy and at times more playful performance of smart urbanism as lived practice.

Conclusions: The Ordinary Chinese Smart City

Whether we trace the implementation of smart city technology in Wuhan back to national policy drives, see it as more directly catalysed by local multi-sectoral actors, or speculate on the way it dovetails comfortably with a broader embrace of digital technology, the smart agenda is revealed as less of a discrete phenomenon, and more of a repackaging or rechanneling of the broader currents of urban development. With this in mind, we return to our original questions: what is distinctive about the Chinese smart city, as exemplified by Wuhan? And what does that tell us about smart city development elsewhere?

The search for distinctiveness is difficult at first, since none of the specific technologies and aspirations embodied within official local smart schemes are unique to Wuhan. In using digital technology, for example, to improve the efficiency of public services and infrastructure, update the administration of healthcare, or rationalise the allocation of parking spaces, Wuhan’s activities mirror those of any number of cities around the world.

Importing technological solutions in this way need not imply a naivety about their social implications. Rather, Chinese authorities have traditionally professed adherence to the adage of 'Western technology, Chinese wisdom' (de Rambures 2015: 11). But what characterises these smart activities, taken as a whole, is that they conjure up a rather passive sense of the public. The focus on efficiency is not accompanied by parallel attempts to encourage digital participation in decision-making, co-create the smart city, or address a public sphere beyond those dimensions of urban life which are institutionally sanctioned or associated with consumer activity. To adapt a model of smart city 'publicness' recently developed in relation to the UK (Cowley *et al.* 2017), smart city activities in Wuhan are oriented towards a public envisioned as a collectivity of service users, rather than designed to appeal to the more creative, political or civic dimensions of its residents' lives.

This outcome is not unique to China. It might be predicted, however, by the particular combination of broader agendas into which enabling smart city policies are subsumed, namely supporting economic development, improving the efficiency of public services, managing urban growth, and supporting social stability. Since the national government does appear to have a significant role in the emergence of local smart city activities, it is likely to continue influencing future developments. This is unlikely to be in the direction of democratising cities, nor guided by a broad 'neoliberalising' belief in the efficacy of markets at the expense of 'big government' – but rather by the desire to strengthen the state further.

Relatedly, we see significance in the fact that Chinese smart city development is advocated within national *planning* documents (CAICT/EU-China PDSF 2016). Even though this chapter has specifically argued that the Chinese smart city goes beyond national policy directives, its mobilisation as a national planning concept suggests a more centralised mode of development than in Europe. In the UK, for example, national policy-makers appear to view smart technology primarily in terms of its potential for exports;

local authorities are not required to include smart ambitions in their strategic plans. In the Netherlands, similarly, the smart city is unfolding through very networked governance at local level, but suffers from a lack of national coordination (Sengers 2016: 3).

The Chinese approach also diverges from the Indian programme of smart cities: it is being pushed forwards on multiple policy fronts, rather than through a single policy drive. The simultaneous mobilisation of various smart city concepts by different national government agencies appears to be a characteristic example of Chinese ‘institutional bricolage’, whereby ideas and practices from elsewhere in the world are borrowed selectively and ‘reassembled onto existing institutional frameworks’ (de Jong 2013: 89). This, in turn, may be an outcome of the fragmented approach to national policy-making (Chien 2017), which not only suggests agentive space for local authorities to ‘pick and choose’ to some extent, but also reflects smart city development elsewhere. One methodological implication, especially in cross-comparative work, is that approaching the smart city as a body of practices resulting from policy discourse should not involve expectations of linearity between particular policies and outcomes. Rather, the flexibility of the concept allows it to derive legitimacy from multiple agendas – and, consequently, attempts to delineate and define its contents at different scales, are likely to be frustrated. Instead, while it is fruitful to trace the various policy influences, the local smart city is best understood as a rather open-ended idea which channels these broader agendas in shifting place-specific ways.

The last point may appear to privilege the ‘vertical’ effects of smart city discourse on particular places. But we have proposed that this should go hand in hand with analysis of the horizontal agency exerted by local actors and institutions, as well as a more open-ended reading of its everyday lived experiences and materiality. This broad, three-way framework for analysing and comparing smart city activity internationally is currently being developed further within a wider research project looking at a variety of European

and Chinese cities (for a preliminary discussion, see Sengers *et al.* 2017). This resonates with the call by Hodson and colleagues (2017) to approach socio-technical urban sustainability transitions as varied ‘reconfigurations’ of loose bodies of ideas and practices, which are constituted simultaneously by discourse, particular forms of governance, and technical innovations.

Such an approach, in the case of Wuhan, positions the ordinary, ‘actually existing’ smart city as neither an object of study which can be definitively pinned down to a particular set of innovations, nor merely an empty policy signifier. More satisfactorily, it may be approached as a locally inflected symptom of a broader set of changes to urban space and governance, and it is these, rather than their superficial and more readily visible manifestations labelled as ‘smart’, which should be the focus for future investigations.

Acknowledgements

This chapter draws on a research project funded by the Economic and Social Research Council (grant number ES/L015978/1) 'Smart eco-cities for a green economy: a comparative study of Europe and China'. We are indebted to Richard Elliott at Manchester City Council for providing useful background information on Wuhan, and particularly grateful for the hospitality and assistance provided by Mark Crowley, Ying Zhang, and Chen Shidan at Wuhan University, and by Mark Watchorn at the British Consulate in Wuhan.

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