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Smart Cities Atlas

Western and Eastern Intelligent
Communities

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Chapter 3

Smart Cities: Case Studies

Eleonora Riva Sanseverino, Raffaella Riva Sanseverino,
Valentina Vaccaro, **Ina Macaione** and Enrico Anello

Abstract This chapter shows some examples of smart cities. In the chapter, case studies have been divided into geographical categories (Middle East cities; North-European cities; Mediterranean cities and the Asian ones) which, macroscopically, refer to three different types of city and communities especially in relation to different levels of technological innovation and type of human capital, which are key factors in the achievement of a smart development. The chapter is divided into four main paragraphs. The newly built cities, in the Middle East paragraph, are cities where everything has been planned from scratch on white paper to limit emissions and increase the quality of life of citizens. In the paragraphs about the North-European cities and the Mediterranean cities, the cities with strong historic value are described. In this section, many European cities, which have specific features like limited possibility to apply technology, but still an adequate level of development to understand and correctly implement the ICT driven choices are described with reference to the smart city concept. The last paragraph shows some example of “developing city” that often are cities with low awareness about sustainable settlement issues, but with a great economic and social growth. These are, in most cases, eastern cities; they show a great potential and are gradually,

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the all the italian regions, a critical mass so as to give each region the possibility to compare and share experiences. The project follows the institutional objectives of the Milan City Council to increase the collection and recycling of waste and its optimization and control while minimizing illegal activities related to waste, especially considering the type of waste, treated by the project. The project also has potential impacts on economy creating new jobs opportunity and supporting local companies in crisis.

The Playful project aims to harness information and communication technologies to provide advanced tools for integration and development of communication skills of children in pre-school age. The aim is to provide each child and his family customized tools, both to allow the child to learn better and, if necessary, to follow specific therapies, as well as to allow families to interact with the context (school) and among them.

3.4 Asia

3.4.1 *A Smart City Horizon in China*⁴⁹

To reflect on environment means to reflect on history, so the progress of technology, the digital information revolution and the spread of mass communication with the great changes in the economic, financial and geopolitical and global rebalance call for a new approach to the city and new visions related to the urban environment.

Our knowledge of the city and its complexity needs to evolve in line with the growing importance of the cities all over the world.

Chinese cities are megacities that are re-invented every day by their residents, commuters, immigrants, civil society groups, planners, politicians, businesses, investors and visitors who bring with them their own identity, aspirations and demands for better urban quality. These “ideas of the city” developed in Asia transcend all conventional disciplines [99].

It is estimated that China’s urban population will grow from 527 million in 2005 to 926 million in 2025 [100]. Cities with a population exceeding 1 million are likely to increase from 153 to 226 in that same period. In 2011 the Chinese National Bureau of Statistics also announced that China’s urbanization rate had surpassed 50 percent.

⁴⁹By Ina Macaione, Professor at Dipartimento Culture Europee e del Mediterraneo: Architettura, Ambiente, Patrimoni Culturali (DICEM), University of Basilicata, Matera, Italy . ina-macaione@unibas.it and Enrico Anello, PhD student, Dipartimento Culture Europee e del Mediterraneo: Architettura, Ambiente, Patrimoni Culturali (DICEM), University of Basilicata, Matera, Italy enrico.anello@unibas.it.

In a recent article written on National Geographic Robert Kunzig states that smart cities could be the solution for our growing environmental and social pains [101]. As a matter of fact, high density cities tend to emit less greenhouse gas emissions than the national average. It is particularly true for the United States, consuming 25 tons of CO₂ equivalents per person on average compared to 10 tons in New York City. It is not the case for China, consuming 4 tons per person on average compared to 11 tons in Beijing.

China is experiencing an important phase of urbanization. Annually, twelve million Chinese people move from rural to urban areas. That is equivalent to a new city of the size of Beijing every year.⁵⁰ As a result, China has taken the lead in terms of cities with over one million inhabitants: 89 in China, 46 in India and 42 in US. However, this puts a lot of pressure on providing basic food and water services. If designing smarter cities makes sense, leaving rural development behind does not appear as a sustainable proposition.

Residential and industrial water usage, mainly in urban areas, represents 36 % of the consumption of fresh water reserves in China. In comparison, agriculture in rural areas accounts for 62 %. And the Chinese agriculture sector is challenged to meet an increasing food demand related to a higher standard of living in modern cities. With 90 % of its water reserves already in use, China is facing a complex water and urbanization nexus that cannot be considered without its impact on the rest of the country.

So among the priority objectives of the People Republic, to be achieved by 2020, expressed in the context of the XVIII National Congress, is to identify strategies for the definition of new models of development, specifically Chinese, on industrialization, informatization and urbanization issues, and above all the modernization of agricultural production, also using the principles expressed by the green economy. Within the same document of the XVIII Congress it has been underlined the concept of an “ecological civilization” that should be integrated in the whole process of urbanization, as expressed in the idea of Smart City, especially to solve the serious pollution problems. That is why, in China, Smart City is a model not only for strengthening urban planning, construction, maintenance, intelligent management services, promoting the sustainable operation of metropolitan areas through the integration of information resources and technologies, but also to give an economic model in the global market.

- As reported in the EU-China Smart and Green City Cooperation “Comparative Study of Smart Cities in Europe and China”—White Paper, the urbanization process has accelerated in China, particularly during the past 10 years with the urbanization rate reaching 52.6 % in 2012. As reported it must be noted that

⁵⁰In 2013, the Chinese capital has exceeded twenty million inhabitants. It is estimated that the population is around 24 million.

urbanization is part of China's modernization process which provides a substantial latency for enlarging the domestic economy.

- The Structural hierarchy of the administrative divisions of the People's Republic of China comprises of 5 levels: Provincial, Prefecture, County, Township and Village. At present, the relevant government departments and various cities in China are positively promoting smart city development.⁵¹

In the year 2012 the Ministry of Housing and Urban-Rural Development (MoHURD), of the People's Republic of China, launched the programme China Smart City [102]. The core of the operation regards the "smart" urban management together with the implementation of the new urbanization strategies and business requirements. The construction, safe operation, urban management, and convenient service of smart city and municipal infrastructure should be combined to realize managing cities and serving the public in a smart way, so to explore a new urbanization progression mode. To gain this success the MoHURD has identified 193 cities in 2012 and 2013 in total, which include 76 provincial capital cities/prefecture-level cities, 75 county-level cities, 34 new districts, and 8 towns.

There are about 2600 projects that have already been approved, with a planned investment of over one trillion RMB. The government funding and bank loans represent the 50 % of the investment. The economic and political equilibrium requires private investment, including international ones. According to "National

⁵¹Hereby a short description on the achievements by the single departments: Ministry of Industry and Information Technology (MIIT), Since 2011, MIIT has formulated a number of plans associated with smart city development, including • The 12th Five-year Plan for the Development of Information Security Industry • The 12th Five-year Plan for the Development of Internet of Things • The 12th Five-year Plan for the Development of E-commerce; National Development and Reform Commission (NDRC), NDRC and MIIT, together with the Ministry of Science and Technology, the Ministry of Public Security, the Ministry of Finance, the Ministry of Land and Resources, MOHURD and the Ministry of Transport, are studying to draft Guiding Opinions on Promoting the Healthy Development of Smart Cities. The Opinions proposes to start smart transport, smart grids, smart water supplies, smart environmental protection, smart medical care, smart old age security, smart communities, smart homes, smart education, smart land administration, smart logistics and smart credit systems in order to provide enterprises and residents with more convenient, efficient and low-cost social services. The Opinions also proposes to select 100 cities of different sizes at different stages of development in the eastern, central and western regions as pilot and demonstrative cities for smart city development. After some experience has been acquired from the pilot and demonstrative cities, China will gradually encourage and support eligible regions to promote smart city development according to local conditions; The Ministry of Housing and Urban-Rural Development ("MOHURD"),The General Office of MOHURD officially released in 2012 the Notice on Carrying out National Pilot Smart Cities and issued the Interim Measures for the Administration of 11National Smart Cities and the Pilot Index System for National Smart Cities (District and Towns) (for Trial Implementation) to start the application for pilot cities. In addition, the Chinese Society for Urban Studies and China Development Bank have signed the Strategic Cooperation Agreement on the 12th Five-year Plan for Smart City Development, which requires that China Development Bank should provide an investment and financing amount of no less than 80 billion Yuan in 3 years after the 12th Five-year Plan Period to support smart city development in China which clearly proposes to develop pilot and demonstrative smart cities where conditions permit.

Smart City Pilots Index System” developed by MoHURD, the overall design of “smart governance and service” includes: the renewal of the “security system and infrastructure” (areas that absorb the bulk of the investment), urban governance, an innovative urban and rural planning, achieving a good level of energy efficiency and industrial development.

The China Smart City project fielded by the Chinese government is a systematic and immense project and for its implementation it will require resources of any kind and a process of wide participation.

The MoHURD coined the slogan “Government Guidance, Market Leading, Multiple Subjects, Global Participation”. To ensure the best functioning, the MoHURD has specially set up the Digital City Engineering Research Center of Chinese Society for Urban Studies, as the main center for promoting and guiding the development of China Smart City.⁵²

The China Smart City project—strongly supported by the Chinese government—has generated the activation experiments that invest the entire Republic with major economic achievements and investments in many regions and cities, as well as those pilot selected by the MoHURD, for governance, transport, security, health, social problems, education, construction etc. This process is giving a further acceleration to changes in Chinese society and that will have world wide influence.

3.4.1.1 China Climate Change

On 30 June 2015, China submitted its Intended Nationally Determined Contribution (INDC), including the target to peak CO₂ emissions by 2030 at the latest, lower the carbon intensity of GDP by 60 to 65 % below 2005 levels by 2030, increase the share of non-fossil energy carriers of the total primary energy supply to around 20 % by that time, and increase its forest stock volume by 4.5 billion cubic metres, compared to 2005 levels. The emission levels estimated for 2025 and 2030 resulting from all aspects of the INDC, except the carbon intensity target, are rated medium. However, the emissions resulting from the 2030 carbon intensity targets if taken in isolation are significantly higher and would be rated as “Inadequate.” The weak INDC carbon intensity targets would only be reached at the expense of important national policies and actions, including in relation to reduced air pollution. This means China’s INDC (and its national actions) are not consistent with limiting

⁵²The Digital City Engineering Research Center is also developing investment models and innovative ways to attract international investments. The boom of Smart City projects in China has a huge market potential for technology and foreign capital. One can imagine that there will be great demand for advanced foreign technologies and foreign funds. According to Gartner and other consulting firms, implementation of Smart City projects in China is a growing trend. However, the Chinese government is cautious about working with foreign companies for reasons of financial security and information ser-vices. Who will invest in the Chinese market, however, you will need to put in place a sophisticated strategies to build trust with the various levels of the Chinese government (source PRNewswire, March 2014).

warming to below 2 °C unless other countries make much deeper reductions and comparably greater effort than China. Setting aside the carbon intensity target, China's INDC's actions and non-fossil energy target lead to greenhouse gas (GHG) emission levels of around 13.6 GtCO₂e in 2030 and to an improvement of carbon intensity of 70 %. China is implementing significant policies to address climate change, most recently aiming to restrict coal consumption. However, total GHG emissions are likely to continue increasing until 2030, as China has not yet implemented sufficient policies addressing non-CO₂ GHG emissions (methane, nitrous oxide, HFCs etc.). This indicates a need for further action in this area, and it is encouraging that the INDC acknowledges that addressing these gases is important. An issue of significant concern, with Chinese emissions still far from a 2 °C pathway in 2030, is the time span of the INDC commitment. As with other countries, the 2030 time-frame could effectively lock-in warming above 2 °C based on the current levels of ambition.

The announcement that China will peak its CO₂ emissions will have a significant impact on global CO₂ emissions in the period after 2030, as most projections foresee increasing emissions for decades after that. As the target consists of changes in the energy mix, additional energy efficiency measures reducing the absolute energy use could decrease emissions even further [103].

In November 2015 a report by The National Development and Reform Commission on "China's Policies and Actions on Climate Change" states that "Climate change is a common challenge facing human society today. As the largest developing country with a large population, China has complex and diverse terrain conditions, faces unbalanced, uncoordinated and unsustainable problems in the economic development, and is vulnerable to the adverse effects of climate change". Since 2014, China has actively taken measures in various fields to tackle climate change and achieved remarkable outcomes. China issued the National Climate Change Plan (2014–2020) putting forward China's main objectives and key tasks to address climate change before 2020. China submitted the Intended Nationally Determined Contribution (INDC) to the Secretariat of United Nations Framework Convention on Climate Change (UNFCCC). By adjusting industrial structure, improving energy conservation and energy efficiency, optimizing energy structure, controlling non-energy GHG emissions and increasing forest carbon sinks and taking other efforts to control GHG emissions, China lowered its carbon dioxide emissions per unit of GDP by 6.1 % in 2014, with a cumulative decline of 15.8 % over 2010, completing 92.3 % of its carbon intensity decline target during the 12th Five-Year Plan period. At the same time, China actively promoted international exchanges and cooperation on climate change, issued joint statements on climate change with India, Brazil, UK, EU, US and France and prepared South-South Cooperation Fund for climate change; it actively participated in international negotiations on climate change in a constructive manner for 2015 Paris Agreement and follow-up system construction. This annual report has been issued to help the comprehensive understanding of China's policies and actions on climate change, and the progress made since 2014 [104].

As officially released by the Ministry of Science and Technology (MOST) the authoritative and comprehensive report on climate change and its impacts in China, shows that annual average air temperature of China has increased by 0.9–1.5 °C during the past century since 1909, which was larger than the average global temperature rise. The rate of sea level rise along China's coasts from 1980 to 2012 was 2.9 mm/a, higher than the global average. The glaciers in China have retreated, and the trend is accelerating. From 1970s to this early century, the area of glaciers and frozen earth have shrunk 10.1 and 18.6 %, respectively. The trend of regional climate warming in China will further intensify in the future, and temperatures are projected to rise another 1.3 to 5 in most areas of China by the end of this century. This report is the result of a more than 3-year analytical effort by a team of over 500 experts from MOST, China Meteorological Administration (CMA) and Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE). The 42-chapter National Climate Assessment assesses the science of climate change and its impacts across China, now and throughout this century. It documents climate change related impacts and responses for various sectors and regions, with the goal of better informing public and private decision-making at all levels.

China's goals to cut emissions from its coal power plants by 60 % by 2020, announced by Chinese government during the world Paris Climate Conference (COP21) will become an initiative that would help save some 100 million tons of raw coal and prevent the discharge of about 180 million tons of CO₂ each year, according to an official communiqué quoted by the New China Press Agency.

But China is still struggling with fossil fuels: more than 70 % of Chinese electricity is generated from coal, of which the Asian giant consumed 4.2 billion tons in 2013. China, which is the biggest coal producer and consumer in the world, moreover recently acknowledged that it had massively underestimated its consumption and in recent years had burnt hundreds of millions of tons more than initially announced. China, which is the second-largest global economy and the world's biggest polluter, pledged that its CO₂ emissions would peak “around 2030”. China's Basic Position on the Paris 2015 UN Climate Change Conference is to strengthen actions on climate change after 2020. China is willing to work actively and constructively with all parties to promote negotiating process under the principles of “common but differentiated responsibilities”, equity and respective capabilities so as to ensure to reach agreement and build an equitable and justified international climate arrangement [105].

3.4.1.2 Airpocalypse—Red Alert

In response to the above premises and intentions, on Monday 7 December 2015 Beijing has issued its first pollution red alert as smog had engulfed the capital with millions of vehicles forced off the roads, factories and construction sites shut down and schools and nurseries advised to close. The notice, issued after days of heavy smog imposed restrictions on certain types of vehicles in the city of 22.5 million people and Chinese authorities faced fierce criticism.

AS reported by BBC News at 07:00 local time on Tuesday (23:00 GMT on Monday), when the alert came into effect, the US Embassy's air pollution monitor in Beijing reported that the intensity of the tiny particles known as PM 2.5 was at 291 micrograms per cubic metre producing.

By 11:00 it had dropped very slightly to 250—still a level described as “very unhealthy”. Levels of the poisonous particles in the suburbs were reported at several times that number for which “The World Health Organization” recommends 25 micrograms per cubic metre as the maximum safe level. This means that the quantity of dangerous particulate matter (PM 2.5) surged to around 40 times the World Health Organisation's maximum guideline. Coal-powered industries and heating systems, as well as vehicle emissions and dust from construction sites, all contribute to the smog which has been exacerbated by humidity and a lack of wind [106].

Greenpeace complained that the government's insufficient alerting system compounded the effects of Beijing's latest “airpocalypse”, in which readings of the hazardous airborne particle PM2.5 exceed 900 micrograms per cubic metre in some parts of the city. China's leadership has vowed to crack down on environmental degradation, including the air pollution that blankets many major cities, following decades of unbridled economic growth. The move comes as U.N. Secretary-General Ban Ki-moon warned a Paris summit of nearly 200 nations against a “climate catastrophe”, urging governments to reach a strong deal to limit global warming. The warning was an upgrade from an orange alert issued over the weekend, part of China's four-color warning system that includes yellow and blue levels for less polluted conditions. Environmental Protection Minister Chen Jining on Sunday vowed to punish agencies and officials for any failure to quickly implement a pollution emergency response plan, the state-run Global Times tabloid [107].

Last year the Chinese premier, Li Keqiang, vowed to declare war on pollution, but despite such pledges smog continues to blight cities right across the country. Scientists blame air pollution for about 4000 deaths a day. Ma Jun, director of the Institute of Public and Environmental Affairs in Beijing, said that the capital first red alert underlined how serious the smog problem remained. “It just shows that air pollution is still a very big challenge to the city of Beijing and that the government has paid greater attention to this issue,” he said. Ma Jun said it would have been a “very tough decision” for China's leaders to declare the red alert in a city of about 23 million inhabitants.

The crisis is even more severe in the regions surrounding Beijing, where 100 of millions of tons of coal are still being burned each year even as the capital tries to slash its use of the fossil fuel [108].

3.4.1.3 Shenzhen as a Pilot Low Carbon Eco-City

In the geography of globalization and Delta dreams we can assume that the cities of Asia have indeed come to dominate the world becoming global, with their infrastructure, [109] and their global level associated with globalization have contributed to a demand for new forms of territorial centralization of top-level management and control functions, but its agreeable the reflection that “the most important thing enabling these cities to enjoy their success is the people who call them home”.⁵³

The big question now facing China is that it is a prosperous country with a rapid economic growth that faces at the same time a deteriorated social and ecological environment.

The Shenzhen 2015 Bi-City Biennale of Urbanism/Architecture (UABBA) has been titled “Re-living the City”, which in the official catalogue concerns re-use and recycling of the city fabric, as well as “the return of memory”: looking back to origins, drawing on existing and past conditions before looking to the future [110].

To better understand the diversity, innovation and adaptability of the Chinese model it could be useful to take a particular example in which one of the declination of the Smart City concerns the food urbanism.

Shenzhen is one of the districts “laboratory” of the program China Smart City.⁵⁴ Among the various actions the municipality has integrated agriculture within the urban environment.

Originally Shenzhen was a fishing village, and after more than three decades of reform and opening up, it has developed into a modern metropolis, becoming an icon of the reform, the representation of the “opening of China towards the building of a more modern country”.

Shenzhen the first Special Economic Zone (SEZ) in China is located in the southern part of Guangdong, facing the Daya Bay to the east, Pearl River Estuary to the west, and Hong Kong Special Administrative Region (SAR) to the south. In 2012, with an area of 2050 km² the city had a permanent population of 10.54 million and its GDP, reaching 1.295 billion RMB, it ranked fourth among the first cities in China.

Shenzhen (Chinese: 深圳) is part of a paradigm shift in the construction and adaptation of new urban forms. Cities like Shenzhen are the face of urbanization in the 21st century. Shenzhen’s Special Economic Zone (SEZ) was originally developed as an area for trade and industry, dominated by factories, warehouses and dormitories, fed by foreign investment. Shenzhen grew rapidly in and around the SEZ to become a dense urban fabric. As Shenzhen’s skyline has filled with skyscrapers, its business districts and high-end residential areas have continuously evolved, replacing existing parts of the city.

It currently also holds sub-provincial administrative status, with powers slightly less than a province. According to the Government report for 2014, Shenzhen had a

⁵³Ibid, 330.

⁵⁴The second smart city was closed at Shenzhen on September 3rd 2015 Convention & Exhibition center with great success.

population of 10,628,900 and a metropolitan area population of over 18 million Shenzhen's modern cityscape is the result of its vibrant economy made possible by rapid foreign investment since the institution of the policy of "reform and opening" establishment of the SEZ in late 1979, before which it was only a market town called Sham Chun Hui (深圳墟, literally Shenzhen Market) which the Kowloon-Canton Railway passes through. Significant sums of finance have been invested into the SEZ by both Chinese citizens and foreign nationals. More than US \$30 billion in foreign investment has gone into both foreign-owned and joint ventures, at first mainly in manufacturing but more recently in the service industries as well. Shenzhen was one of the fastest-growing cities in the world during the 1990s and the 2000s with a breathtaking growth its urbanization pace is unique. It's population boom slowed down to less than one percent per year by 2013 as the manufacturing boom ebbed in favor of other industries. Shenzhen is a major financial center in southern China. The city is home to the Shenzhen Stock Exchange as well as the headquarters of numerous high-tech companies. It was dubbed as China's Silicon Valley due to this high concentration of technology companies. Shenzhen ranks 22nd in the 2015 edition of the Global Financial Centres Index published by the Z/Yen Group and Qatar Financial Centre Authority. It also has one of the busiest container ports in the world. In 2007, Shenzhen was named one of China's ten most livable cities by Chinese Cities Brand Value Report [111].

Today's Shenzhen consists of six districts, Yantian, Luohu, Futian, Nanshan, Bao'an and Longgang. The former four districts are located within the SEZ which occupies 329 km². And the outside are the two districts Bao'an and Longgang, they were turned into districts and formally became part of Shenzhen in 1993. Under this rapid urbanization, the urban village issue is rather phenomenal in Shenzhen. The first urban village in China appeared in Shenzhen at the beginning of 1980s. At present, there are 320 urban villages with 350 thousand private dwelling buildings in Shenzhen [112].

In response to the sharp increase in population, the Chinese government has supported self-sufficiency in food production within the district. Urbanization and population growth has put real pressure on the Chinese planning process and has made sustainable urban development more urgent than ever.⁵⁵

⁵⁵In November 11st, 2010, the "3rd International Conference on Next Generation Infrastructure Systems for Eco-cities" was held in Shenzhen and Vice mayor Tang Jie of Shenzhen and Mr. Van Zeeland, Consul General of Consulate General of the Netherlands in Guangzhou suggested the initial idea of promoting G-G cooperation China and Prime Minister Li Keqiang and European Commission President José Manuel Barroso signed "Joint Declaration on The EU-China Partnership on Urbanization" on May 3, 2012 Xu Qin, mayor of Shenzhen, spoke on EU-China Urbanization Partnership High Level Conference 21 August 2012, Shenzhen International low-carbon city launched. Secretary Wang Rong, Mayor Xu Qin Attend launching ceremony As an important part of China's first National Low-carbon Day, the first Shenzhen International Low-carbon City Forum was launched on Jun 17th, 2013. Shenzhen International Low-Carbon City Forum is hosted by NDRC, MOHURD, and Shenzhen government Dr. Baoxing Qiu, Deputy Minister of MOHURD Mr. Rong Wang, Shenzhen Municipal Party Committee

Reducing emissions of greenhouse gases in the production of transport and energy is still a critical issue. Shenzhen is now the first mega-region with over 120 million people living in an continuing urban area, going from Hong Kong to Guanzhou. The model of Shenzhen might be a paradigmatic example since it is the largest urban region in order to preserve the agricultural production within its borders.⁵⁶

In 2006, the Shenzhen government began to compile “The Master Plan of Shenzhen 2010–2020” after the approval of The Ministry of Construction (now The Ministry of Housing and Urban-Rural Development). After 10-years of construction guided by “The Master Plan of Shenzhen 1996–2010”, the urban structure of Shenzhen has been generally formed. The land use in the SEZ has been relatively arranged as planned; however, the non-SEZ has confronted a serious problem of extensive land use. Therefore, this plan pays more attention to urban intensification in the non-SEZ and an enhancement of the urban structure proposed in the 1996 master plan. A significant feature of this plan is the highlighting of the three hierarchical levels: municipal level, district level, and cluster level and correspondingly, three levels of the development poles are distinguished [113].

Since 2014, the Chinese government has been deepening national low-carbon province and low-carbon city pilot, and promoting low-carbon industrial park, low-carbon community, low-carbon city (town) and green transportation pilot in order to explore low-carbon development pathways and patterns at different levels and indifferent fields.

Each low-carbon pilot area further strengthened by the peak-target-forced mechanism and management system, established the target-oriented responsibility system to achieve emissions control targets, built the low-carbon industrial system, actively promoted low-carbon green lifestyles and consumption patterns, and reinforced low-carbon development capabilities and support. Of 42 pilot provinces and cities in two batches, 13 established low-carbon development funds, and 36 set up developed carbon reduction target decomposition and assessment mechanisms.

(Footnote 55 continued)

Secretary. More than 1400 guests participated the forum to explore new low-carbon development within the context of new urbanization. Shenzhen signed a number of projects with Eindhoven in the Netherlands, Low Impact Development Center in the United States, Auckland in the New Zealand as well as Beijing Energy Investment Co., LTD, etc. Shenzhen and Amsterdam signed the cooperation letter of intent about Shenzhen international low-carbon city project In November 2013 Participated in the kick-off meeting of promotion activity for APEC low carbon model town held by National Energy Administration in July. Participated in high-end conference of China’s low carbon urban development held in Singapore in November 2013.

⁵⁶The city of Hong Kong and Shenzhen are also collaborating in the realization of a large area in a central part of the city for the high-yield agricultural production, called Langrab City, commissioned by the Shenzhen/Hong Kong Biennale of Architecture and Urbanism. The model of the Smart City is definitely the way to ensure a sustainable population growth. But the limitations of common goods such as water and other resources require innovation efforts and greater attention to the relationship between built soil and soil for agricultural use. It’s never a good investment for the future to leave the rural poor and socially backward areas in the long term, as they often host important resources.

All the pilot provinces and cities have clearly put forward peak targets or are studying the issue, and the peak year proposed by most pilot provinces and cities 2025 or before. Each pilot area started from their realities and worked out many well-established low-carbon development patterns, including urban carbon emissions accounting and management platform, carbon emissions impact assessment, carbon emissions trading, corporate carbon emissions accounting reporting, low-carbon product certification. In September 2015, Beijing, Hainan, Shenzhen and other 7 pilot provinces and cities demonstrated China's outstanding achievements in low-carbon urban construction and response to climate change on the First Session of the U.S.-China Climate-Smart/Low-Carbon Cities Summit.

In June 2014, the Ministry of Industry and Information Technology (MIIT) and the National Development and Reform Commission (NDRC) reviewed and published the first list of 55 national low-carbon industrial park pilots, and approved implementation program of 39 low-carbon industrial park pilots in 2015. Each pilot witnessed a substantial decline in carbon emissions per unit of industrial added value by promoting renewable energies, accelerating the low-carbon transformation of traditional industries and developing new low-carbon industries. In about 3 years, China plans to create a number of low-carbon enterprises mastering core low-carbon technologies and advanced low-carbon management, and to explore the low-carbon management mode suitable for China's industrial parks to lead the low-carbon development of industrial sector.

By the end of 2014, the 7 carbon emissions trading pilot provinces and cities including Beijing, Shanghai, Tianjin, Chongqing, Guangdong, Shenzhen and Hubei issued local carbon emissions trading management measures, covering more than 1900 emission-control enterprises and units and allocating about 1.2 billion tons of carbon emissions quota. Pilot areas reinforced compliance monitoring and enforcement, with the compliance rate hitting 96 and 98 % in 2014 and 2015 respectively. As of the end of August 2015, the 7 pilot provinces and cities saw accumulated transactions of local quota up to about 40.24 billion tons, with a turnover of about 1.2 billion Yuan, and the accumulated auction quota reached about 16.64 billion tons, with a turnover of about 800 million Yuan.

In February 2015, NDRC issued Guidelines for Low-Carbon Community Pilot Construction, which provided a category-based guidance for the selection standards, construction targets, construction contents and construction standards for newly-built urban communities, existing urban communities and rural communities. It also started the studies on Evaluation Indicator System for Low-Carbon Communities Pilot and the carbon emissions accounting methods for low-carbon communities.

In August 2015, NDRC issued the Notice of NDRC on Accelerating National Low-Carbon City (Town) Pilot, which proposed, within about 3 years, to build a number of national low-carbon model cities (towns) characteristic of integration between industrial development and urban construction, rational space layout, intensive resources utilization, low-carbon and environment-friendly infrastructure, low-carbon and efficient production, and low-carbon and livable life. Shenzhen International Low-Carbon City (Guangdong), ZhuhaiHengqin New District (Guangdong), Qingdao Sino-GermanyEco-Park (Shandong), Zhenjiang Guantang

Low-Carbon New City(Jiangsu), Wuxi Sino-Sweden Low-Carbon Eco-City (Jiangsu), Kunming Chenggong Low-Carbon New District (Yunan), WuhanHuashan New Eco-City (Hubei) and Sanming New Eco-City(Fujian) were selected as the first national low-carbon city (town)pilots.

NDRC together with relevant departments organized National Low Carbon Day and National Energy Conservation Week activities in 2015, held the Third Shenzhen International Forum on Low Carbon City, sub-forum “Global Low-Carbon Transformation and Green Industry Opportunities” of International Forum on Ecological Civilization in Guiyang, the First US-China Climate-Smart/Low-Carbon Cities Summit, Forum on Low-Carbon Energy Cities and other activities, which achieved good publicity effects. The Ministry of Transport (MOT) organized the Bus Travel Week activity, and announced the first batch of 30 green recycling low-carbon demonstration projects in transportation industry. The Ministry of Housing and Urban-Rural Development (MHRUD) organized the Ninth China Car Free Day in Cities event in 2015 to call on people to reduce car travels, attracting the participation of a total of 188 cities and counties. The Ministry of Education implemented energy-saving renovation in 18 colleges and universities, carried out such theme activities as “Water and Electricity Saving Week”, and organized college students to undertake social practice and science and technology competitions in energy conservation and emission reduction themed “Energy Conservation, Green Energy”. Civil Aviation Administration took industry institutions as a platform and held the first training and seminars on quantified management of airline energy conservation and emission reduction [114].

1. Chinese Urban Informality and the redevelopment of urban villages

Shenzhen has been one of the cities receiving large amount of migrants over the last 30 years due to opportunities in the new industries and since the municipal government was unable to meet the demand for housing for these migrants the informal development in communally owned villages became the solution to this housing problem [115].

‘...The urban development in Shenzhen is characterized by a dual-track development between regional-based informal process of the urban villages and city-based state-led development of well planned new urban areas. The original villagers are the landlords of the land and buildings. Most of the inhabitants are Chinese migrants coming from inner China. This group is better known as the floating population because of the lack of social security and access to public services in the city, thus leaving them floating between city and countryside.

The economic success of the Shenzhen SEZ has to do with a number of different factors. Shenzhen’s location as a neighbor to Hong Kong makes Shenzhen a relatively easy place to invest. The relation between the two cities is often described as ‘front dock, back factory’.

But the connection to Hong Kong is not the only factor for its success. In the 2030 strategic plan for Shenzhen that was launched in 2004, Shenzhen attempts to adopt the polycentric urban development model. The employment of the

polycentric model in Shenzhen means that different parts of the city will specialize in economic clusters. One of these new sub-centers is the Guangming new district that will focus on high-technology with an emphasis on green technology and ecology. The municipal government states that Guangming new town is ‘a pilot project for scientific urban development by 21st century standards and post-modern concepts’.

Therefore assuming the key role that the urban villages play in the city—making it is useful to analyze the phases of their development.

“...The subject, urban village redevelopment, has received increasing attentions from official and academics since 1990s (Yang 2005). Recently, most Chinese cities urbanized further, urban village and its following issues are more remarkable and deteriorated than before. Urban villages impact urban development on physical aspect in one hand, such as, impact improvement of city imagination, impact enhancement of urban land use efficiency, impact optimization of urban structure and etc. On the other hand, urban village generate series of potential social problems, such as, safety issues by lots of criminal gangs, dual-polarization issues between the landlords and renters and so on. These issues are hidden troubles for social security and stability.

The development of Shenzhen’s urban village can be subdivided into the following four phases. The initial phase was from 1980 to 1985. At the beginning period of establishing the special economic zone, the central government did not have enough capitals and capacities to support and patronize Shenzhen’s city construction. In that time, Shenzhen local government had to construct the city depending on foreign investment, so it was nearly impossible to compensate the loss of transformation from collective land to state-owned land. So without any formal administration, the farmers of urban villages built large-scale private dwelling houses as a new form of securing their livelihood.

The second phase was from 1986 to 1991. Local government realized large amount of informal settlements that emerged. Thus, municipality drew a red line to restrict the further development of urban villages in 1986. The area within the red line was called new urban villages which were planned by the government, so the living environment was usually better than in the original urban villages. In terms of negotiation, after new villages were built up, the local government took charge of the original villages. And the land of the original village turned into state-owned land, the local government granted the right to rebuild this area. However, due to the absence of capital and policies, the original villages did not develop in accordance to the government plan but continue to deterioration. That means the red line strategy was a complete failure.

The third phase from 1992 to 1998 was an important stage for urban villages’ development in Shenzhen. In 1992, Shenzhen government urbanized all the urban villages within SEZ. Original residents got the city “hukou” who were formally ‘declared’ as urban citizens from that time onwards. All the collective land was transformed into state-owned land. In 1993, Bao’an and Longgang transformed from a county to district, so the villages in these two districts were formally been

transformed to urban villages. Since then, the spatial pattern of urban villages in Shenzhen has been formed.

The last phase is counted from 1999 to present. After rapid development for a long time, Shenzhen has been one of biggest metropolis in coastal region. The investment from domestic and overseas are countless and continues, however, Shenzhen do not have more construction land for further development. Especially, there is no more vacant land for any new constructions in the inner SEZ.

Under this context, the local government has to adjust the internal urban structure, to be emphasized frequently in the municipal agendas.

After 1993, the two counties in the outer SEZ formally changed their administrative level to districts. From that time, the basic pattern and spatial distribution of urban villages in Shenzhen gradually was shaped. There are three figures which reflect the changes from 1999 to 2004 by two indexes, footprint and building area.

That means this district represents Shenzhen' image and would be functioned as an example for the other districts' development" [116].

Within Shenzhen today many urban villages are enclaves that provide an alternate urban realty to that of the generic city [117] an they use their rural vestiges to co-produce the city being "villages in the city" whith a rural-urban distinction which continues to shape identity and politics in postsocialist China [118].

3.4.2 South Korea and Songdo City

South Korea, Republic of Korea, is an East Asian state, which stretches along the southern half of the Korean Peninsula. It is bordered to the north by North Korea, on the west by the Yellow Sea (and then China), on the south by the Korea Strait and to the east by the Sea of Japan (and then Japan). Its capital, the city of Seoul with more than 20 million inhabitants in the metropolitan area, is one of the most populous cities in the world. The landscape is mountainous predominantly, but with 50 million inhabitants, South Korea is the twentieth most populous country in the world (the third after Bangladesh and Taiwan). South Korea is certainly among the first countries to have developed a grandiose project of Smart City. As early as 2009, in fact, the planning of the city of Songdo by a famous New York studio (Kohn Pedersen Fox) started and, on August 7th 2009, were opened the shipyards for the construction of Songdo International Business District.

Besides being one of the urban projects with higher technological content, Songdo is also now one of the largest private real estate investments in the world. The site www.songo.com shows the grandiose project in all its details. Located 40 miles away from Seoul and built on 6 km² of reclaimed land in a strategic point, Songdo City is located just 15 min driving from Incheon International Airport to which it is connected by the fifth longest (12.5 km) bridge in the world realised with a tensile structure. Songdo can thus be considered one of the aerotropolises that are rising in the world in these times. Thanks to the presence of the airport, Songdo is just 3 and a half hour flight from economic powers such as Russia, China

cars to buses and trains, from second-by-second to year-by-year simulations, across entire countries.

“LIVE Singapore!”, a project developed with the Senseable City Lab at MIT, provides people with access to a range of useful real-time information about the city through an open platform for the collection, elaboration and distribution of real-time data reflecting urban life. Giving people visual and tangible access to real-time information about their city enables them to take their decisions more in synchronism with their environment, with what is actually happening around them. The idea is to provide people information that reflect the actual state of systems and dynamics in their city (think of printed transportation time tables, static opening hours, driving to stores to find a product out of stock,...). Multiple networks collect and organize the data to provide such information. It gives the data back to the people who themselves generate it through their actions, allowing them to be more in sync with the city as well as to taking decisions on the basis of information that reflect the actual state of their city.

Singapore and Esri: agreement for the development of a smart city 3D technology for urban planners

The Singapore municipality and ESRI have signed an agreement in 2013 for the development of a 3D technology. Esri CityEngine is a conceptual design and modelling solution which lets you create 3D buildings and cities in seconds. CityEngine improves urban planning, architecture and design. Use its 3D visualisation power to see the relationships between different projects, assess their feasibility and plan their implementation. CityEngine helps you make quality decisions that will benefit your community for decades. The technology allows comparing and analysing building proposals from every angle and seeing how they fit into the city’s overall vision for the future in different scenarios.

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