Smart City - Good Practice

Sustainable economic growth

Low-carbon and sustainable development

Shenzhen, China

Shenzhen City's low-carbon and sustainable development

Shenzhen City, established as "New Town"[1] in 1979, was the first Special Economic Zone and opening-up window of China. In the past 35 years, the city has witnessed a continuous and amazingly fast economic development. In 2014, the per capita GDP of Shenzhen exceeded 24,000 USD while the total population was approaching 11 million. On the other hand, since 2010, Shenzhen has put more and more great efforts into low-carbon city construction. Clear and achievable goals were set up and all kinds of effective measures indented to reach these goals were taken, including the foundation of a carbon trading system in 2013.

Country/ City Profile

	Country		City	
	Population (2014)	1.364 billion [1]	Population (2014)	10.7789 million (city) [2]
	Land area (km²)	9.6 million [1]	Land area (km²)	1,996.85 (city) [3]
	GDP per capita (2014, current international $, at purchasing power parity)	13, 216 [9]	GDP per capita (2014, US$)	24,337 (city) [2]
			GDP per capita (2014, US$, at purchasing power parity)	33,731 (city) [8]
	Region	Asia	Region	Coastal
City's physical geography	Location	✓ Its longitude lies between 113.46°~114.37° E, and latitude between 22.27°~22.52° N ✓ Adjacent to the South China Sea, with a cost line of 229.96 km **(easy to be affected by typhoon and saline intrusion)** ✓ Relatively low altitude		
	Climate	✓ Subtropical oceanic climate (average temperature: 22.4 C°) [3] ✓ 1,933 mm/year annual rainfall [3] ✓ 2,120hr/year annual sunshine hours [3]		

General info of Shenzhen City

Shenzhen City, neighboring Hong Kong, is located at the southern tip of Guangdong Province and the Chinese mainland. Shenzhen has more than 310 rivers and streams, which are associated with the hydrographic systems of the Dongjiang River, the Pearl River and coastal bays. There are 172 water reservoirs in the city, storing a total volume of 611 million cubic meters. The Shenzhen Reservoir in the east has a total volume of 44.96 million cubic meters, and is the main drinking water source for Shenzhen and Hong Kong [3].

The earliest-known records bearing the name "Shenzhen" are dated from the year 1410, and Shenzhen became a township at the beginning of the Qing Dynasty. However, the City of Shenzhen as known today was first established in 1979 with original permanent residents of around 314,100. In August 1980, it became the first Special Economic Zone of China and a stepping stone for China's reform and opening-up policy. In the year 2004, Shenzhen became the first city in China without rural population [4]. By the end of 2014, there were about 10.7789 million permanent residents in Shenzhen. As one of China's first gateways to the world, Shenzhen is also one of the country's most developed cities. The city is the high-tech and manufacturing hub of Southern China and home to the world's third-busiest container port. The high-tech, financial services, modern logistics and cultural industries are mainstays of the city.

[1] "New Town": planned city/ planned city development

Low carbon city construction

In Novmber 2009, just before the climate conference in Copenhagen, the Chinese government committed to its greenhouse gas emission reduction target, i.e. to achieve a 40%-45% reduction in carbon intensity (greenhouse gas emissions per GDP output) by 2020, compared with the year 2005. In July 2010, the Chinese NDRC (National Development and Reform Commission) issued the first batch of low carbon development pilot provinces/cities, including 5 provinces and 8 cities, one of them Shenzhen City [5].

To facilitate the low-carbon city construction, the Shenzhen city government issued the "Shenzhen City Low-carbon Development Medium and Long Term Plan (2011-2020)" in May 2012 [6]. The document sets out the detailed targets for low-carbon city construction; the main targets are listed in the table below:

Main targets of Shenzhen low-carbon city construction

Items	2015[2]	2020
CO_2 emission reduction rate per unit GDP (%)[3]	39	＞45
CO_2 emission per unit GDP (ton/10,000 RMB GDP)	0.90	0.81
Energy consumption per unit GDP (ton standard coal/10,000 RMB GDP)	0.398	0.366
The added value of high-tech industry as a share in GDP (%)	35	40
The added value of modern service industry as a share in tertiary industry (%)	60	65
The added value of strategic emerging industries as a share in GDP (%)	40	50
Energy consumption per unit industrial added value (ton standard coal/10,000 RMB GDP)	0.394	0.355
The proportion of green buildings in new buildings (%)	40	80
The proportion of public transportation in urban transportation (%)	56	65
New energy car ownership	50,000	100,000
The proportion of non-fossil energy in primary energy (%)	15	＞15
The proportion of renewable energy in energy consumption (%)	50	60
Forest coverage rate (%)	41.2	≥41.2
Green road mileage per unit area (km/km^2)	1.0	≥1.0
Park and green land area per capita (m^2/capita)	16.9	17.4
The proportion of R & D investment in GDP (%)	4.0	4.5
The proportion of low-carbon technology investment in R & D investment (%)	10	15
Carbon emission statistic, calculation and evaluation system	basically setup	near completion
Citizens' awareness of low-carbon conception (%)	80	90

The document also introduces general ways intended to achieve the goals: 1) adjust the industry structure, and construct a new industry system characterized by low-carbon; 2) optimize the energy structure, and construct a low-carbon cleaner energy system; 3) emphasize the work on energy saving and consumption reduction, improving the efficiency of resource utilization, including industrial energy efficiency upgrading, low-carbon transportation system construction, green building promotion, etc.; 4) promote low-carbon technology innovation; 5) promote low-carbon policy and management mechanism innovation; 6) enhance forest carbon sequestration; 7) advocate green consumption and low-carbon life; 8) optimize the space layout, incorporate the low-carbon conception into urban planning and land use planning; 9) implement pilot demonstrations, including low-carbon governmental procurement, enterprise low-carbon operation transition, low-carbon industrial zone and communities, low-carbon demonstration city-zone (especially the Shenzhen International Low Carbon City, Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone, Guangming New District and Pingshan New District).

Actual measures and results (using the year 2013 as an example)

In 2013, Shenzhen's economy maintained a healthy momentum of growth, the GDP grew by 10.5%, while the energy consumption per 10,000 RMB (~1,568 USD)[4] GDP production dropped by 5.12% compared with the previous year, and the volume of water consumption dropped by 13.2%. Moreover, the city has overfulfilled its goal reducing sulphur

[2] 12 of the targets have been achieved by the end of 2014, http://sztqb.sznews.com/html/2015-05/04/content_3213625.htm
[3] Change rate compared with the year 2005.
[4] Rate of exchange, August 2015

dioxide, nitrogen oxide and ammonia nitrogen emissions. Following the low-carbon development plan, there were many effective measures taken by the city in 2013, some examples are described below [7].

Industry upgrade: In 2013, Shenzhen closed 3,000 enterprises with high energy consumption and heavy polluting effects. Meanwhile, high-tech industry had an increase rate of 12.4%.

Transportation: The national stardard No. IV diesel is widely used in Shenzhen. About 30,000 seriously polluting vehicles were phased out in 2013. At the same time, there were 6,363 new energy vehicles in use in Shenzhen by the end of 2013, including 3,050 new energy buses and 850 electric powered taxis. The number of new energy vechicles in use beeing ahead of all the other cities in China. 13 pilot projects were completed in 2013 for "green and low-carbon port construction".

Building industry: In 2013, 13.7 million square meters of energy-efficient buildings were completed in Shenzhen, while 4.53 million square meters of environmentally-friendly buildings were constructed in the same year. Energy savings through energy-efficient buildings were up to 3.57 million tons standard coal, equivalent to 11.04 billion kWh electricity. There were 4 comprehensive projects on construction waste completed in 2013, and the recyling rate of construction waste reached 35%.

Cleaner energy: Shenzhen city kept promoting cleaner power generation in 2013, including wind power, solar power and power generation from waste. The 10 MW solar power generation project of Shenzhen Airport was put into operation in March 2013. The natural gas network covered 65% of the city by the end of 2013, with 110,00 new households connected.

Afforestation: Afforestation of 124 kilometers (about 2,373 hectares) of landscape was completed in 2013.

Carbon trading: On June 18th 2013, Shenzhen became the first Chinese city to launch a carbon trade market in China. By the end of 2013, the trading volume was about 200,000 tons of CO_2, with a transation value of more then 13 million RMB (~ 2.039 million USD)[5].

International communication: On June 17th 2013, the first Shenzhen International Carbon City Forum was held in the Shenzhen International Low Carbon City. During the forum, the Shenzhen Green Book "The Report of Low-carbon Development in Shenzhen" was issued. The Shenzhen International Low Carbon City is a very successful low-carbon demonstration city-zone, where construction has absorbed good examples from Japan, Germany, Holland and the USA, and has become the pilot project of EU-China Sustainable Urbanization Project.

Lessons learned

Several factors are seen as important in Shenzhen's success:

a) Government policy support and comprehensive planning, with detailed and achievable goals;
b) Technology innovation and pilot demonstration;
c) Marketing methods for promotion;
d) Citizen awareness and public participation;
e) International advanced experience communication.

Source: http://203.91.45.61:7001/_english/aboutSZ.jsp

[5] Rate of exchange, August 2015

References

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[3] Statistical bulletin for national economy and social development of Shenzhen City in 2014: http://www.sztj.gov.cn/xxgk/tjsj/tjgb/201504/t20150424_2862885.htm

[4] http://www.people.com.cn/GB/shizheng/14562/2605584.html

[5] http://www.gov.cn/zwgk/2010-08/10/content_1675733.htm

[6] http://govinfo.nlc.gov.cn/gdsszfz/xxgk/szsfzhggwyh/201310/t20131018_4071973.shtml?classid=416

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[8] 2014 Global Metro Monitor Map, Shenzhen: http://www.brookings.edu/research/reports2/2015/01/22-global-metro-monitor

[9] World Bank: GDP per capita, PPP: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD

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