Smart City – Good Practice

Sustainable economic growth

Qingdao - China's sailing city goes low carbon

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Qingdao, China's sailing city has great determination to solve problems as growing population and increasing emissions from transportation and energy consumption sectors [1]. Following the "one industry, one industrial park, one enterprise and one district" concept as pilot promotion and absorbing excellent foreign experiences and good practices, the city is progressing steadily on its way to low carbon and sustainable development [2].

Country/ City Profile

Country		City	
Population (2014)	1.364 billion [3]	Population (2014)	4.8759 million (city) [4] 9.0462 million (total) [4]
Land area (km²)	9.6 million [3]	Land area (km²)	3,293 (city) [4] 10,654 (total) [4]
GDP per capita (2014, current international $, at purchasing power parity)	13,216 [5]	GDP per capita (2014, US$, at purchasing power parity)	n/a (city) 23,281 (total) [6]
Region	Asia	Region	Coastal

City's physical geography	Location	✓ Qingdao is situated in the south of Shandong Peninsula (35°35'-37°09'N latitude,119°30'-121°00'E longitude) [4] ✓ Located on the shore of the Yellow Sea, with a coastline of 730.64 km, the city has jurisdiction over sea area of 13,800 km^2 [4] **(Eutrophication of the sea has gradually become a problem of the city in recent years)**
	Climate	✓ monsoon climate (average temperature: 12.7 C°) [7] ✓ 664.4 mm/year annual rainfall, 2,434.5 hr/year annual sunshine hours [7]

General info for Qingdao City

Qingdao, situated in the south of Shandong Peninsula and on the shore of the Yellow Sea, is one of the 70 large and medium-sized cities of China. Qingdao has witnessed rapid economic development in the past 30 years, as it opened up as one of the first 14 Chinese coastal cities in 1984. In 2014, the total GDP of Qingdao ranked 12th among all the cities of China. The city is home to many famous brands, like Tsingtao Beer, Haier and Hisense [8].

Qingdao is known as the "sailing city of China" due to its long history of yachting starting in 1904 and its successful organization of the sailing competition of the 29th Olympic Games in 2008 [9]. As a result, however also due to many other factors, Qingdao is a famous tourist attraction in China. The city had won the first prize of "the most desirable Chinese cities in public opinion" in 2005. "Sitting by the sea, eating clams while drinking the Tsingtao Beer" has become an enchanting lifestyle. Qingdao is also a centre of marine research in China.

Low carbon city construction

The total GDP of Qingdao ranked 9th among all the cities of China in 2008 (12th in 2014), however, the great pressure from more and more serious environmental pollution called for industrial restructuring, despite its potential for slowing-down economic development. Since then, industries with heavy pollution have been closed gradually; a specific fund has been set up to encourage companies to implement energy conservation projects; cleaner power generation like wind power is promoted; "Energy Saving Regulation for Qingdao Civil Constructions" was enforced in 2010 and newly constructed buildings are required to satisfy the 65% energy saving standard [10].

At the same time, Qingdao put great effort on international cooperation regarding low carbon economic development. In May 2010 for example: Qingdao City came to an agreement with the Asian Development Bank to implement a strategic research project on the city's low-carbon development [11]. In June 2010, the city signed an agreement with the Mizuho Bank of Japan for establishing an experimental low carbon economy park [12]. In July 2010, a Memorandum of Understanding (MOU) for a Sino-German Ecopark construction (the first sustainable construction project cooperated between Chinese and German government) was signed [13] and the city reached agreement with General Electric (GE) and AECOM (a global provider of technological and management support services) for establishing a low carbon economy park in August 2010 [14].

In November 2012, the Chinese NDRC (National Development and Reform Commission) issued the second batch of 29 low carbon development pilot cities and included Qingdao City on the list. Since then, Qingdao has set up its primary 3-year-goal for low carbon city construction to reduce the per unit GDP CO_2 emission intensity by the end of 2015, by 18% as compared to the year 2010. The city also set up a greenhouse gas (GHG) emission inventory and calculation system and the framework for a carbon trading system. Qingdao chose the concept: "one industry, one industrial park, one enterprise and one district" as a pilot program to start towards low carbon development [15].

One industry - transportation industry

In 2010, transportation was the second largest GHG emission source in Qingdao City; accounting for 23.3% of total GHG emissions [16]. The steadily increasing number of private cars caused excessive air pollution and congestion. In February 2012, Qingdao was selected as one of the 16 pilot cities in China for realizing a low carbon transportation system. The city's project implementation plan for the period 2012-2014 included 33 different measures with a total investment volume of 18.6 billion RMB (~ 2.6 billion EUR) [17]. The measures targeted changes in key areas such as urban public transportation, an upgrade of port facilities, road network optimization, intelligent transportation, etc. By the end of March 2015, 1,520 new energy vehicles are in use in Qingdao, of which 968 vehicles are electric buses [18].

One industrial park - Sino-German Ecopark

In July 2010, the MOU for developing the Sino-German Ecopark was signed between the Ministry of Commerce of China and German Federal Ministry of Economics and Technology. It is the first ecological project collaboration between the two countries [13]. The development of the Ecopark was incorporated into the "Development Plan of Blue Economic Zone in Shandong Peninsula" in January 2011. In July 2013, the construction of the Sino-German Ecopark was formally started, with ten key projects implemented at the very beginning. The Ecopark adheres to the low carbon and sustainable development concepts and includes new energy equipment and its supporting facilities, high-end equipment manufacturing and biology & pharmaceutical industry as its three major industries. It has won the Germany DGNB Gold Award and the "Three-star Green Building Design Identity Certificate" of the Chinese Ministry of Housing and Urban-Rural Development (MOHURD) for its sustainable buildings [13].

One enterprise - Haier Group

The Haier Group was founded in 1984 and developed during the reforms in China's recent history. Currently, Haier is a leading brand of appliances globally. In 2014, the annual turnover of Haier amounted 200.7 billion RMB (~27.9 billion EUR), with a profit of 15 billion RMB (~ 2.1 billion EUR). Today (2015) the company has five R&D centres, 21 industrial parks, 66 trading companies and users across 100 countries and regions. Committed to establish a globally famous and reputable brand, Haier also spent great efforts on low carbon development: In May 2000, Haier Refrigerator was awarded the "Global Climate Award" by the United Nations Development Program and the U.S. Environmental Protection Agency [19]. In March 2010, Haier Air Conditioning implemented a greenhouse gas accounting and verification system based on ISO 14064. Moreover, Haier has taken the low carbon conception seriously in consideration through the whole product lifecycle, from raw material supplier selection, production process energy saving, environmental friendly product development, to the recycling of waste electrical appliances [20].

One district - Nancun Town

Nancun Town, located in the North of Qingdao City, has an area of 312 km^2 and a total population of around 132,000 (21). In March 2012, Nancun Town was listed in the third batch of the "national development and reform of

pilot small towns" register, which is why the town hired the Tsinghua Urban Planning & Design Institute to establish a comprehensive development plan. This plan includes economic and social development, urban construction, new rural community construction, land utilization planning etc., to determine main developing areas. Three main developing areas have been chosen to highlight environmental protection and energy savings: comprehensive industry, Dagu River tourism and delicate agriculture [22].

In September 2014, following the primary 3-year-plan, Qingdao City government issued the "Qingdao City Low-carbon Development Plan (2014-2020)" [23]. This document sets out more detailed and ambitious requirements for low-carbon city construction. The main targets are listed in the table below:

Main targets of "Qingdao City Low-carbon Development Plan"

Items		Unit	2010	2015	2020
Comprehensive	Per GDP CO_2 emission intensity	tonne CO_2/10,000 RMB GDP	1.56	1.25	0.97
	Per GDP CO_2 emission intensity reduction compared with 2010	%	/	20	37.8
	Per GDP CO_2 emission intensity reduction compared with 2005	%	20	36	50
Industry restructuring	The added value of tertiary industry as a share in GDP	%	46	52	58
	The added value of strategic emerging industries as a share in GDP	%	6	15	25
Energy saving	Per GDP energy consumption reduction compared with 2010	%	/	19	32
	Energy consumption reduction for the added value of industries that above a designated scale compared with 2010	%	/	20	35
None-fossil fuel energy	The proportion of non-fossil fuel energy in primary energy	%	1	3	8
Low carbon transportation	The proportion of public transportation utilization in central urban area	%	31	40	60
Carbon sink (forest)	Forest coverage rate	%	37	40	45
	Forest growing stock	10,000 m^3	950	1082	1200

Following the plan, each related government department has developed its own action plan accordingly.

Lessons learned

As per the "Report on Chinese Low-carbon City Construction" prepared by Chinese Academy of Sciences in November 2014, Qingdao ranked amongst the top 10 cities in China [24]. Several factors are seen as important in Qingdao's success:

a) Government policy support, determination to sacrifice the economic development;
b) Comprehensive and step by step planning;
c) Pilot promotion; and
d) International cooperation.

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