Smart City – Good Practice

Water, public services and infrastructures, waste

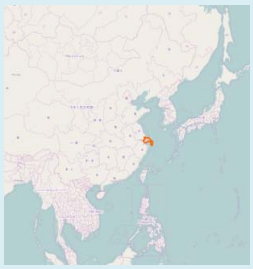
Waterway Restoration Urban & Water

Shanghai, China

Shanghai Municipal Government and Asian Development Bank's project to clean up a heavily polluted waterway

Suzhou Creek flows through Shanghai, one of the world's largest megacities. Starting in the early 1900s, the creek had fallen victim to rapid urbanization and industrialization, carrying most of the city's waste water. In 1996, the 'Economic and Social Development Plan for Shanghai' was adopted which kicked off the 12-year-long Suzhou Creek Rehabilitation Project. Since then, water quality has been substantially improved through the implementation of a combination of measures such as flushing, environmental dredging, re-aeration and interception of wastewater, elimination of wastewater disposal, wastewater treatment, the relocation of solid waste processing wharves and embankment reconstruction. The Shanghai Municipal Government has set a good example for cooperation in the fields of water resources and coastal management as well as effective decision making in order to allow for the implementation of such major projects in a relatively short time frame [1].

Country/ City Profile



Source:© OpenStreetMap contributors

Country		City	
Population (2014)	1.364 billion [16]	Population (2013)	24.1515 million [2]
Land area (km²)	9.6 million [16]	Land area (km²)	6,340 [2]
GDP per capita (2014, current international $, at purchasing power parity)	13,216 [14]	GDP per capita (2014, US$, at purchasing power parity)	24,065 [15]
Region	East Asia	Region	East China Sea, Coastal

City's physical geography		
	Location	✓ Shanghai is one of the world's largest cities by population, sitting in the middle of the Chinese north-south coastline and bounded to the east by the East China Sea. **(flooding risk, risk of sea level rising)** ✓ The city is located at the mouth of the Yangtze in the Yangtze River Delta. **(land subsidence)**
	Climate	✓ Subtropical monsoon climate (average temperature: 17.6 C°) [2] ✓ The climate is mild and humid with distinct seasons. Annual precipitation was 1,173.4cm in 2013, with 60% of it from May to September [2]

Initiating context

Suzhou Creek, originating in Jiangsu Province, is an important tributary of Shanghai's Huangpu River. The Creek is about 125 km long, of which 53.1 km are lying within the boundary of the Shanghai municipality and 23.8 km are within the city. According to the statistics of the hydrologic station in the Huangpu district, the average net flow is 6m^3/s [4]. At the river mouth the flow is more than 10m^3/s, 40-60% of which comes from the inflow of domestic and industrial wastewater along the banks. Both prior to and after it had become polluted, the Creek served many functions, including flood prevention, navigation, industrial water supply, irrigation and aquatics breeding [4].

Suzhou Creek had been a historically important shipping and trading route in China since 1600s and became the most polluted water body in Shanghai in the 1990s. Starting from the 1920s, the Creek has observed severe pollution due to urban population growth, industrialization, raw sewage and other wastewater discharge which directly damaged plant and aquatic species and caused algal bloom. As a source of irrigation and industrial water supply to Shanghai, poor water quality of the Creek also threatened the health conditions of the 3 million residents in the area. Pollution from human and industrial waste dumping over the past few decades led to visual pollution and release of a foul odor. Algal blooms became a common occurrence in the early summer. According to official

sources in China, Suzhou Creek failed overall to meet Class V — the lowest of the national water quality standards. Out of the six branches of the Creek, Zhengru Port was once recorded as having water quality three to four times lower than Class V and thus far from achieving national water quality standards [5].

Project description

The Shanghai Municipal Government established the Suzhou Creek Rehabilitation Leader Group in the mid-1990s following the Central Government's intent for pollution remediation. Suzhou Creek Rehabilitation Project had three main objectives: to "improve water quality, strengthen water resources management, and improve flood control" [6].

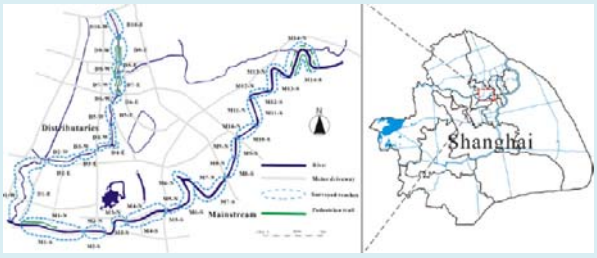
Implementation process

Granted a US$ 300 million loan by the Asian Development Bank (ADB) in 1999, the first phase of the Suzhou Creek Rehabilitation Plan was launched in 1998. During this first phase three main aims were followed, namely the reduction of sewage discharge into the river, the installation of a water lock between Huangpu river and Suzhou Creek and the input of oxygen into the dead river. The first phase of the Rehabilitation Plan was completed in 2003 with a total investment of around 7 billion yuan (US$ 846 million or Euro €748 million, exchange rate of 2003). The second phase of the project started following the first phase in 2003 and was completed in 2005. With an estimated investment of 3.94 billion yuan (US$ 746 million or Euro €421 million, 2003 exchange rate), the second phase aimed to maintain and improve the current water quality, to extend the cleaning to the six tributaries of Suzhou River, and to develop large areas of green space along the Suzhou Creek. The second (2003–2005) and third phases (2006–2008) of the Shanghai Suzhou Creek Rehabilitation Project (SSCRP) began to emphasize riverfront accessibility to the surrounding residents. Public use of riverfront space, appropriate distribution of a riverfront greenbelt, and regulation of riverfront buildings were included in the Suzhou Creek Landscape Planning. The planning aimed to fully take advantage of social and environmental benefits of the Creek by transforming it into a recreational and residential zone with clean, clear water and beautiful surroundings and also by developing the scenic spots and cultural relics along the Creek. The overall project cost 14 billion yuan (about Euro €1.4 billion, calculated with the exchange rate in 2008) [7].

Projects implementation details

Process	The Shanghai Government and Asian Development Bank (ADB) collaborated to design and implement a 12-year project which involved sewage treatment, injection of oxygen into the waterway, and flood controls to upgrade water quality to acceptable levels for household use [8].
Financing	ADB granted a US$300 million loan to the Shanghai Municipal Government (SMG) in 1999 to initiate the project. The costs of the first phase of the project amounted to US$841.3 million, comprising US$764.3 million in base costs and US$77 million in IDC (Interest During Construction) according to ADB's Project Completion Report. ADB financed the entire foreign exchange cost of US$162.1 million (about 19% of the total project cost), with Counterpart financing covering 100% of the local cost (US$679.2 million) [9].
Leadership	In 1996 the President of the P.R.China, Jiang Zeming, insisted that the SuzhouCreek is treated. As a result the Shanghai Municipal Government established the Suzhou Creek Rehabilitation Leader Group and authorized increasing legal power of the Group during the 1998-2000 period. The Group was directed by Mr. Xu Kuangdi, the mayor of Shanghai at that time, Mr. Chen Liangyu, the standing V-M and Secretary, Mr. Han Zhen. The Group highlighted the rehabilitation of the Suzhou Creek among all the projects dealing with environmental issues in Shanghai [4].

Map of the Suzhou Creek and its location in Shanghai



Source: Che et al. 2011

Results

The Suzhou Creek Rehabilitation Project brought about social, environmental, and economic improvements. The Rehabilitation Project relocated an estimated 7,700 residents and generated employment opportunities for 4,000 skilled and unskilled workers [11]. Phase I of the Project addressed the urgent problems of Suzhou Creek by relieving its odor and pathogens. Phase II further treated the contaminated water and integrated recreational elements into the design. In order to highlight the environmental-friendly appeal of the city before the World Expo Shanghai in 2010, the Shanghai Municipal Government further proposed to construct cycling trails, playgrounds, and parks along the Creek. According to the ADB, property prices near Suzhou Creek have experienced double-digit increases since the Rehabilitation Project took place. Due to the transformations above, net economic benefits were estimated to be in excess of 4.1 billion yuan (US$490 million) with a 22% rate of return [11].

Lessons learned

The highly integrated collaborations among various stakeholders and institutions contributed greatly to the success of the Suzhou Creek Rehabilitation Project. The formation of the Shanghai Water Authority from the bureaus of Water Resources, and parts of the Environmental Protection Bureau and the bureau of Urban Construction fortified the institutional arrangements [12].

*The following points are adapted from ADB's Project Completion Report 32121 as bullet points 52-55

The Government's persistent political commitment was key to the success of the project. As the project focused on comprehensive environmental rehabilitation and comprised many components, strong leadership to bring in all related agencies of the Shanghai municipal government (SMG) facilitated the planning and implementation of the project. SMG carefully designed and established project implementation arrangements to allow it to effectively connect agencies, "provide guidance at the highest level when necessary, keep to schedules, and adhere to procedures" [13].

The Project Preparation Department established under The Suzhou Creek Rehabilitation and Construction Company (SSRCC) were assigned clearly defined functions and responsibilities, which ensured close coordination between resettlement activities and construction activities to prevent delays and maintain orderly relocation.

The approach to include private sector's strength was effective for such a multidimensional project. SSRCC actively incorporated the private sector in project implementation and management: tendering companies were engaged, resettlement activities were coordinated and managed by resettlement companies, and operations of some of the facilities improved and/or constructed under the project were contracted out.

Besides the outstanding integrity of the leadership, there are a few learning points during the project. Estimates of wastewater revenues were overstated due to the overestimation in the volume of water sold. This is a recurring problem in similar projects in China especially in areas where the water and/or wastewater tariff has been adjusted substantially. Similar projects in the future should call for more caution in estimating revenues derived from water supply sales and forecasts. Where possible, price elasticity of demand should be explicitly considered or only growth from increased coverage should be incorporated [13].

References

[1] JM, Peter and Chen, Meifa. (2011). Shanghai: from 'Black and Stink' to clean Suzhou Creek. Climate of Coastal Cooperation. Robbert Misdorp (Edit). 2011. II-2-2. P68-69. www.climatecooperation.net.

[2] "China Statistical Yearbook-2014." Accessed July 6, 2015. http://www.stats.gov.cn/tjsj/ndsj/2014/indexeh.htm.

[3] "上海概览." ("A Brief View of Shanghai"). Accessed July 8, 2015. http://www.stats-sh.gov.cn/frontshgl/18666.html.

[4] Song, Y. (2003). Report on Shanghai Water Projects. *Shanghai Flash,* 4, pages 1-6.

[5] Che, Y., Yang, K., Wu, E., Shang, Z., & Xiang, W. (2012). Assessing the health of an urban stream: A case study of suzhou creek in shanghai, china. Environmental Monitoring and Assessment, 184(12), 7425-38. doi:http://dx.doi.org/10.1007/s10661-011-2510-z

[6] Blacksmith Institute. 2015. Transforming an Urban Waterway. Shanghai, China. http://www.worstpolluted.org/projects_reports/display/75

[7] [8] Blacksmith 2015.

[9] Asian Development Bank (ADB) Project Completion Report: Suzhou Creek Rehabilitation Project (Loan 1692-PRC) In the People's Republic of China. (2005). Project Completion Report. PRC: PRC 32123.

[10] Song 2003.

[11] Che et al. 2012

[12] JM and Chen 2011.

[13] ADB 2005.

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

[15] 2014 Global Metro Monitor Map, Brookings Institutions, Shanghai: http://www.brookings.edu/research/reports2/2015/01/22-global-metro-monitor

[16] World Bank: Data China: http://databank.worldbank.org/data/reports.aspx?source=2&country=USA&series=&period=

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