

Kitakyushu Initiative for a Clean Environment: Successful and Transferable Practices
**Shenzhen (China): Market Model for Construction and Operation of Environmental
Infrastructure**

Policy Research Centre for Environment and Economy¹

Target Area: Construction/operation of UEI

Time Period: 2000-2005

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1. Background

1.1 Strategic Direction of Construction and Operation of Environmental Infrastructure in China

During environmental infrastructure building and operating in cities and towns, governmental investment and operation is the traditional model, which causes serious financial load to the government and low efficiency on facility operation. Developing countries face grim situations in this field. On one hand, urban habitation becomes worse, and the facility demand of sewage and waste processing become larger due to fast urbanization and serious lag of environmental infrastructure. On the other hand, the finance ability of developing country is not adequate to address investment demand of facility construction. Therefore, in recent years, referring to the experience of other countries and combining specific national situation, Chinese Government raised a strategy trend that environmental pollution control should be adjusted by marketing mechanism. Private enterprises were encouraged to invest in construction and operation of urban environmental infrastructure facilities, in addition to encouraging the local government. From the view of actual practice, Shenzhen has formed cooperation structure and relationship between the government and private enterprises in principle, and has developed out some good marketize models.

1.2 The brief introduction of Shenzhen

Established in 1979, Shenzhen is located along mid-south coastal area in Guangdong Province. The Shenzhen Special Economic Zone approved and established by the State Council in 1980 is one part of Shenzhen City. The total area of Shenzhen is 1948.69 km², while the Special Economic Zone is 391.71km². During the past 23 years after its establishment, the development of national economy of Shenzhen City was very fast, a great success has been made and focused by the whole world. The GDP of the city reached RMB166.524 billion in 2000, which is the 4th in large and middle sized cities all over the country. The figure is 260 times more than that of 1979 according to the fixed price. The GDP increased 30.3% yearly in average. GDP per capita reached RMB 39,739 (USD 4,811), which is the top one in large and middle sized cities all over the country.

The government of Shenzhen paid much attention to construction of environmental infrastructure during the economic development and urban construction. By the year 2000, 5 urban sewage treatment plants have been built in Shenzhen City. The daily processing capacity is 680,000 ton, the rate of urban sewage treatment reached 30.6% (53.7% in Special Economic Zone): 4 waste treatment plants have been built and put into use with 3,200 ton daily processing capacity. The rate of waste treatment is about 57.85% (100% in Special Economic Zone). The fast development of urban environmental infrastructure construction played an important role in overall environmental quality improving. Shenzhen won the title of State Environmental Protection Model City and International

Garden City successively.

2. Successful Practices

2.1 Achievements

In 2000, Shenzhen municipal government made a decision to apply market mechanism on environmental industry, and identified the main idea to develop power generation by waste. Industrial investment is instead of governmental investment, namely centralized construction is used in place of decentralized construction by different districts; technology importing, equipment, localization and system integration are used in place of importing foreign equipment. At the same time, building and operating sewage treatment plants are also open to the society. By the year 2001, private enterprises had involved in building and operating 4 sewage treatment plants and 3 waste destructor plants (table2-1), cutting down RMB1.5 billion for the government finance expense, and accelerating the steps of the whole city's infrastructure construction greatly. After the completion of all the construction projects under development, the rate of urban sewage and waste treatment will be 76.96% and 100% respectively in 2005.

Table 2- 1 Building / operating environmental infrastructure with private enterprises (2001)

	Name of sewage or waste treatment plant	Processing capacity (1000 tons /day)	Remarks
Sewage	Gushu Sewage Treatment Plant, Bao'an	240	Will be completed in 2005, BOT mode
	Banxuegang Sewage Treatment Plant, Longgang district	80	1 st phase, 40,000 ton processing capacity, will be completed in 2003, BOT mode
	Longtian Sewage Treatment Plant, Longgang district	30	Was completed in 2001, built by the government, operated by an enterprise
	Shatian Artificial Wetland, Kengzi town, Longgang district	5	Was completed in 2001, built by the government, operated by an enterprise
Garbage	Longgang Central City Waste destructor plant	3000	Was completed in 1999, built by the government, operated by an enterprise
	Laohukeng Waste destructor plant, Bao'an	12,000	Will be completed in 2002, BOT mode
	Nanshan Waste destructor plant	8,000	Will be completed in 2002, BOT mode

2.2 Marketize model for construction and operation

(1) Built by government, operated by enterprises

For those sewage and waste treatment plants financed by the government that are completed or under development, Shenzhen City is zealously exploring ways to be operated by enterprises. One way is to change the operating department under the control of the government into Independent Corporation, and make it operate and manage facilities according to commercial rules; another way is to invite public bidding on the table, and choose an operation enterprise (Case 1). Presently in

Shenzhen, Longgang Central City Waste Destructor Plant, Longtian Sewage Treatment Plant of Longgang district, and Kengzi Shatian Sewage Treatment Plant, etc. have changed their operation mode into enterprises operating.

Case 1: Inviting public bidding from the society for an operating enterprise on sewage treatment

On 7 Nov. 2001, Shenzhen held the completion celebration for Longtian and Shatian Sewage Treatment Plant of Kengzi town, Longgang district, namely the signing ceremony for operation by market mechanism. In accordance with the signed agreement, the two sewage treatment plants were formally taken over by Shenzhen Biyuntian Environment Company and Anhui Guozhen Environment Company respectively.

In order to reduce the governmental load on operation and maintenance, and improve managing efficiency, introduce scientific and advanced managing mode into the city, governments of the city and the district authorized pushing the operation management of the two sewage treatment plants to the market. An operation organization will be selected to operate and manage these sewage treatment plants that owns the mechanism of enterprise, specialization, and standardization. Via inviting public bidding on the table in the whole country, the strong-strong combo, the combination of Shenzhen Biyuntian Environment Company and Anhui Guozhen Environment Company, was selected as the operating contractor of the plants of Longtian and Shatian. The contact period is 15 years.

According to estimation, originally, the operating and maintenance costs per month of the two sewage treatment plants is more than RMB 500,000, after carried out the marketing operation, the government only need to pay RMB 400,000 to the contractor, saving RMB1.2 million every year, and greatly reducing the governmental financial pressure. Moreover, the contractor thinks after improving technology and developing management, they can still make profit.

The sewage treatment plants of Longtian and Shatian were financed and built by governments at three levels - city, district, and town. The total processing capacity for Longtian Sewage Treatment Plant is 60,000 ton/day. The processing capacity of phase 1 is 30,000 ton/day, while the total investment amount is RMB 28.5 million; and the processing capacity of Shatian Sewage Treatment Plant is 5,000 ton/day, while its total investment amount is RMB 8.8 million.

(2) BOT Mode

BOT (Build-Operate-Transfer) mode is a complete marketing model in the field of environmental infrastructure construction and operation. It not only allows private enterprises to operate and manage the facility, but also absorbs private capital, and invests it into building facilities. The government of Shenzhen adopted BOT mode in the project construction of Bao'an Gushu Sewage Treatment Plant, Banxuegang Sewage Treatment Plant in Longgang District, Bao'an Laohukeng Waste Destructor Plant, and Nanshan Waste Destructor Plant. The biggest question and obstacle is that whether investor could get any benefit from the BOT project in the field of environment infrastructure, in another words, if there is any profit power for environmental infrastructure due to its special character of public welfare undertaking? Based on the experience that Shenzhen has made

in many cases, though BOT projects of environmental infrastructure make a little benefit, they also could have rather feasible profit range if relevant charge system, rate, and other preference policy is properly made, and technology and management are improved (case 2).

Case 2: The Profit Range of Shenzhen Nanshan Power Generation by Waste Treatment Plant BOT Project

The Shenzhen Nanshan Power Generation Plant by Waste BOT Project, which conducted by Energy and Environmental Protection Company, a branch company of Shenzhen Energy Group, was set out in December of 2001. It was invested by 390 million Yuan and includes 60 thousand square meters, which will be finished by the end of 2002. The designed daily waste treatment capacity is 800 tons, which equals to about one sixth of the daily waste production of Shenzhen City. The annual power output is 60 million kwh. The Energy and Environmental Protection Company will contribute itself to constructing it so that it could become the first class gardenesque model power generation plant burned waste.

The 35% of construction investment of this project was collected by the Energy and Environmental Protection Company itself, while the balance is come from loan, which is going to be refunded in 11 to 15 years. The ground of 60 thousand square meters offered by Government free of charge. In case of 13 years' refund period and 8% annual bank loan rate, the annual refund should be 40 million Yuan. Plus the yearly operating charges of 20 million, the total annual cost would be 60 million-Yuan. Direct income came from two parts. The first is power fee. In case of 0.8 Yuan/kwh, the annual income of power charge is 48 million. The second is government subsidy, which is 16.38 million. It could be regarded as the waste treatment charges paid to enterprises by the government. Those two parts amount to 64.38 million. The income outweighs the expense by 4.38 million Yuan. The profit rate is a little more than 1%, which regarded as "tiny profit" in the viewpoint of financial income.

But the actual income is far more than this. The Energy Group has bought off and grasped the core technology of waste treatment. And the main equipment is made domestically. The actual investment and operation cost could be lowed down by over 20%. Furthermore, taking the technology advantage, the Energy Group would get benefit by offering technology support and service to other enterprises in the same field. So, saying the BOT project itself, what the Energy Group get is "tiny profit". While in view of long run, the profit range could be large.

2.3 Marketing Protection Policy

The experience of Shenzhen city shows that, charging on sewage water and waste treatment, providing free or cheaper land, decreasing or freeing tax, and other correlating favorable policy is the key of accelerating the marketing construction and operation of environmental infrastructure.

(1) Charging Policy

Price brings profit, while profit attracts investment. Shenzhen began to charge on the usage of city facility (as sewage water treatment charge) including drainage facility from August 1st, 1997. Longgang District and Baoan District began from October of 2000, May of 2001, respectively. The income of the usage of drainage facility of Shenzhen in 2000 is 133 million Yuan. The charging on the usage of drainage facilities make it possible for private enterprises take part in the building and

operating of sewage water treatment plant. But up to now, Shenzhen has not charged on waste treatment.

**Table 2- 2 Standards for Drainage Facility Fees and Collecting Tap Water Fees
(Special Economic Zone and Longgang District)**

Type of Using Water		Tap Water Fee (Yuan/ton)	Fee of Using Drainage Facility (Yuan/ton)
Household Water	Less than or equal to 30m ³	1.50	0.30
	Greater than 30 m ³	2.00	0.45
Administrative and other profitable water		1.80	0.45
Industrial water		1.90	0.34
Commercial water		2.40	0.42

(2) Subsidy, decrease and free tax policy

Shenzhen made relevant preferential policy for private enterprises that involved in environmental infrastructure building and operating, for example, the electricity that generated by waste could connect with the electrified wire netting, and the price is not affected by the disparity between the top and the bottle of using electricity. The land for building power generation plant by waste feast the policy of decreasing and freeing land tax, as while as feast the preferential policy of refunding value-added tax that made by tax department of the state. These subsidy and deceasing and freeing policy ensure the economic benefit of investors, stimulate civil capital investing in the industry of power generation by waste burning.

3. Strategic Implications

Encouraging private enterprises to involve in building and operating environmental infrastructure is the only strategic choice for developing countries to solve urban environment problems.

To solve the issue of the lack of finance that developing countries face and control the urban pollution, the only strategic choice is to encourage private enterprises involving in, and establish partnership between public department and private department. On one hand, the involvement of private enterprises could directly invest their capital in facility construction and operation; on the other hand, operating by market mechanism could improve the efficiency of construction and operation, as while as services quality of facility. Due to the accelerating function of private enterprises involvement and the governmental responsibility of serving the public, the government should continue playing a leading role on environmental infrastructure construction.

Local governments are protagonists of accelerating the marketization of construction and operation of environmental infrastructure

From the view of practice from China and other developing countries, the commercialization of environmental infrastructure construction and operation is a new concept, and there is not enough experience and knowledge to make unified relevant policy on national level. In this case, it is very important for local government to play a leading role. First actions by local government such as Shenzhen will not only facilitate the development of local environmental infrastructure, but will also accumulate experience, test policies and play a model role for the state to make relevant policy and push marketize in an all-round way.

Perfect fee collective, preferential, or compensatory policy is the key of that if private enterprises could involve in construction and operation of environmental infrastructure

Benefits are the only purpose for private enterprises involving in construction and operation of environmental infrastructure. However, compared with other fields, there is a little profit range on construction and operation of environmental infrastructure such as sewage and waste treatment. In other words, it has low commercial ability. Therefore, there is sharp conflict between the purpose and the result. However, the conflict could be solved if adequate sewage and waste treatment fee are collected, freely or preferentially providing field, decreasing and freeing tax, and other necessary policies, or even taking some compensatory measures.