Country Water Action: Beijing Beefs Up Sewage Treatment

Before it could be engulfed by its own wastewater, Beijing knew it needed to build treatment plants for the sewage produced by its growing population. But the city government did not have the experience to deal with huge volumes of wastewater. Where could they turn for help?

Just how much sewage can a city of close to 18 million people produce everyday? "Plenty", said Dai Sen Wei, one of the many workers in the newly built Gaobei Dian Wastewater Treatment Plant that takes care of about 40% of Beijing's daily untreated wastewater.

In the 1980s, with the city's population booming, managing Beijing's sewage became increasingly difficult. Unfortunately, the city government lacked the experience and capacity to respond to the mounting problem. The solution? Beijing turned to Tokyo, its sister city, and sought the advice of the Tokyo Metropolitan Sewerage Bureau.

The Bureau helped the city government in designing the Gaobei Dian Wastewater Treatment Plant. It also helped build the government's skills and capacity to operate and maintain the treatment plant's system. Construction began in 1990, and the Beijing government itself executed the entire project.

Today, the Gaobei Dian is one of the biggest sewage treatment plants in the People's Republic of China (PRC). With it, tariffs for sewage discharge have also been gradually introduced. These cover not only direct costs such as electricity, water, chemicals, and small repairs, but also indirect costs such as personnel cost and principal and interest payment, together with maintenance costs of the sewers. The sewer users' charge is collected together with the water charge in one bill.

"Tariff is one of the best ways to recover the cost of sewerage treatment", Dai Sen Wei said. "It also pays for my salary", he grinned.

Before the sewage treatment plant

Since the 1980s, the PRC has developed modern sewerage systems in more than 50 cities, many financed by loans from the Japan Bank for International Cooperation. The Beijing Sewage Treatment Plant Construction Project was the first of these investments.

Sewage discharges in Beijing jumped from 65,000 cubic meters (m³) in 1950 to 2,000,000 m³ in the 1980s. Half of it came from domestic wastewater, the other half from industries. At the time, the majority of the urban population lived in apartment houses, which were connected to sewers, but most were not connected to a treatment plant. Nearly all the sewage was discharged to the nearby rivers and lakes without treatment. There were also some 1,200 industries that discharged wastewater directly to the rivers.

A master plan for Beijing's sewerage was completed in the 1970s, but construction of a new sewage plant was not immediately implemented, mainly due to financial reasons. Also the Beijing Municipal Design and Research Institute did not have the experience to design such a large sewage plant as was required, with a capacity to treat 1 million m³ of wastewater a day, until Beijing sought Tokyo's help, and the design of the Gaobei Dian Wastewater Treatment Plant was conceived.

Partnering with a sister city

The Beijing-Tokyo connection was renewed in March 1993, when work on the Gaobei Dian Wastewater Treatment Plant was almost 80% complete. Beijing then asked the Tokyo Metropolitan Sewerage Bureau to train personnel in sewerage operation and management.

Three study groups were formed, each with 12 members. The first and second groups were managers who were interested in administration and finance of sewage works. Their training program in Japan covered lectures and field trips, including visits to national government agencies and local municipalities other than Tokyo. The third group consisted of the personnel who would operate the Gaobei Dian plant. Their training program covered such areas of operation as maintenance of machinery, chemical analysis, and monitoring.
When they returned to Beijing, mission members played important roles in the operation of the Gaobei Dian plant. Today, most of them are key members of organizations related to sewage works, including the Beijing Drainage Group Co. Ltd., which is responsible for operating several sewage plants in Beijing and in the PRC’s other major cities. Human resource exchange between Tokyo Metropolitan Sewerage Bureau and Beijing continues today.

**Environmental bonuses**

Gaobei Dian Lake receives most of its water from the treatment plant. Formerly, it was badly polluted from raw sewage. Ecological improvement became evident in 2002, when fish, shrimps, mollusks, and amphibians began to return.

The secondary effluent of the plant is reused for irrigating trees along streets and washing equipment in factories, while tertiary effluent is transported to a water purification plant and a thermoelectric plant for recycling. The sludge is anaerobically digested, and the biogas produced can cover 20% of the total power requirement of the plant.

To promote environmental education and gain public support and acceptance of the sewage charge, the government established the Beijing Water and Wastewater Science Education Center, which opened in October 2005. Adjacent to the Gaobei Dian sewage plant, the center features displays of environmental problems, such as water shortages and pollution, and their solutions, including sewage treatment technology. It also has meeting and lecture rooms, and provides an educational program for secondary school students.

**Investing in the future**

Many developing countries will mortgage their future in terms of water security if they continue to treat sanitation in the very restricted sense, i.e. just collecting and transferring the untreated sewage to another area, thereby contaminating freshwater sources. The PRC Government understood this and took steps to ensure that this did not happen to the country.

The operation of Gaobei Dian Plant has shown that sewage collection and central treatment are very effective for pollution control and improvement of living conditions. The centralized system is less expensive in construction and operation, and site requirements are less. The centralized system also allows accumulation of know-how in operation and maintenance. Following the success of the Gaobei Dian Plant, construction of centralized systems has become a national target and much money is being invested in this.

Today, there are eight waste water treatment plants in Beijing, treating 1.88 million m3 of discharge each day. A further six plants are scheduled to be added before 2010.

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