

Bangkok Wastewater Treatment Project : The Achievement of Public and Private Efforts

ABSTRACT

The City of Bangkok, Thailand has been developing central wastewater treatment system for more than ten years to solve the severe water pollution. Six major wastewater treatment projects which were started in early 1990s are now being completed and five sewerage zones are now under operation. The city has invested US \$ 1 billion for design, construction, training and operations. Since the project were started, the public sectors, University experts, the consultants and contractors, have played their roles in setting up design criteria. Construction and operation. The Bangkok Sewerage projects set new standards in terms of successful multinational co-operation. The collection system constitutes one of the largest trenchless pipelaying contracts, and advance nutrient removal, odour control treatment works. By using experience gained during the implementation of the city projects, more wastewater facilities at less costs could be applied for the coming project in Bangkok.

KEY WORDS

Wastewater, treatment, combined sewers, dry weather flow, turnkey, subsidy

BANGKOK “The Angle City”

Bangkok is located in the central part of Thailand on the low flat plain of the Chao Phraya River at a distance extended from 27-56 Km. From the river mouth adjacent to the Gulf of Thailand. It was established in 1782 as the new capital of Thailand by King Rama 1 of the Chakri Dynasty. Since its establishment, the city grew up rapidly from 4.14 square kilometers to nowadays a mega city that comprises 50 districts, which cover the entire area of 1568.737 square kilometers.

In 1972, National Executive Council Order Number 335 recognized the form of local government in the metropolis by amalgamating the activities of the Metropolis of Krung thep and Thon Buri, The Krung thep and Thanburi Provincial Administrations. The Metropolitan City Municipality and Sanitation Administration into the : Bangkok Metropolitan Administration (BMA.)” The amendment of BMA Act in 1975 stipulated that Governor and Deputy Governors of the BMA should be appointed by the Minister of Interior until the new Act of BMA came into effect in 1985.

According to this Act, the Governor is elected by popular vote and four Deputy Governors are appointed by the Governor for a four-year term, the Bangkok Metropolitan Council comprises of 60 elected members. The BMA, according to the BMA act, has been authorized to perform several principal functions within its jurisdictional area. These include, for example, provision and maintenance of roads, waterways and drainage system, traffic engineering, building control, environmental development and conservation, provision of utilities and facilities. Etc. Among 14 departments under the organization charge of BMA, the Department of Drainage and Sewerage is responsible for planning, controlling and carrying out works related to drainage system, flood protection and wastewater treatment.

Because of the numerous canals that crisscross the city, Bangkok is often referred as the “Venice of the East” Metropolitan Bangkok population is now close to 7 million by registered record or a bout 10 million of daytime population. This high urban density is not uniform, a high proportion of the population is crammed into an area covering less than 40 percent of the city. The large population has created a water supply demand of almost 3.5 million cubic meters per day, and in turn generated almost 3 million cubic meter. Per day of dry weather flow wastewater. The Metropolitan Water works Authority, the government enterprise, which produce and supply potable water for Bangkok and its vicinity, has reported the number of 1,086,000 connections which reflect 94 % of population served.

The sources of BMA revenues are local taxes, fees, fine, permits, service charges, assets rental, utilities and enterprises. In addition, the government’s subsidies and the interest of reserve are BMA’S supplementary fund, The expenditure is classified as investment and operation expenditures. The

proportion of investment budget to operation budget is being maintained at 60:40. This can be achieved by privatization of some public service activities.

Table 1 and 2 Show the BMA'S Source of revenue and Expenditure from 1996-2000.

Table 1
BMA'S SOURCE OF REVENUE
FISCAL YEAR : 1996-20

	(million bath)				
SOURCE OF REVENUE	1996	1997	1998	1999	2000
A. Regular Revenue	20,400.00	24,400.00	26,400.00	24,000.00	24,000.00
Local taxes	18,285.00	21,923.40	24,107.20	21,736.30	22,247.40
Rental from BMA Assets	1,443.10	1,536.77	1,543.79	1,522.79	1,022.50
Income from Miscellaneous Activities	195.10	252.10	315.71	395.05	445.05
Fee, fine, Permits and service Charges	432.20	427.73	428.30	345.86	281.55
Income from Public Utilities And Enterprises	44.00	60.00	5.00	-	3.5
B.Special Revenue	1,838.32	3,636.08	-	-	-
Grand Total Revenues	22,238.26	27,836.08	26,400.00	24,000.00	24,000.00

Source: Budget Division, office of the Permanent Secretary for the BMA

: Exchange Rate 1 US \$ = 43.40 Baht

Table 2
BNA'S EXPENDITURE SORTED BY ACTIVITIES
(million bath)

Activities	1996	1997	1998	1999	2000
Public Works and Traffic	6,688.9	7,744.5	5,740.7	4,997.7	6,193.8
Cleansing Services and City Orderliness	2,529.6	3,171.1	3,752.6	3,647.6	3,951.3
General Administration	3,530.2	3,729.5	4,950.1	4,432.4	3,883.7
Public Health	2,194.9	2,574.3	3,586.6	3,638.8	3,107.1
Drainage and Waste Water Treatment	3,711.5	4,462.3	4,264.4	3,172.5	2,449.6
Education	810.6	1,244.2	2,484.4	2,231.9	2,272.8
Social Services and Development	1,114.4	1,574.2	1,621.2	1,889.1	2,141.7
Commercial of BMA	189.4	270.0	361.3	371.1	124.3

Source : Budget Division, Office of the Permanent Secretary for the BMA

Policies for public-private partnerships

In Thailand, most of the public utilities such as water supply electricity, railways, telecommunications, buses transportation have been undertaken by the state-owned enterprises. Some of these enterprises have been running the business successfully. However, there are few enterprises which facing losses as well as higher costs of services. Several cabinets have realized the needs for having the public-private partnership policies to reduce the fiscal burden, avoid management interference from politics and to improve service efficiencies. Therefore, in 1992, the Act on Private Participation in State Undertaken was enacted, Under this Act, the legal framework had been set to allow the private sector participating in the management of state-owned business which worth more than one billion bath. For such business the detailed project appraisal and analysis must be proposed to the ministry concerned and reviewed by the Nation Economic and social Development Board (NESDB) and eventually be consented in principle by the cabinet. If any project worth than five billion bath, the scope of works must be drafted and submitted by the qualified and experience

consultants according to the procedure set forth by the NESDB. The proposal should include at least the detailed scope of works, private firm information, project experience, personnel, financial, status. The business plan should also include financial expectations, income statement, cash report as well as balance sheet, financial return, return on debt, return on equity, return on asset, debt/equity ratio, revenue and investment plan. The public-private partnership proposal has to state the time of project completion, benefit allocation plan for the government agencies. In addition to these, it has to describe the currency, tax, guarantee, special risks, settlement of disputes as well as the languages and laws to be observed.

The Bangkok Sewerage Program

Bangkok city depends largely on natural and constructed waterways for stormwater drainage and transportation. A stormwater drainage system has been planned and designed on the basis of networks of canals. The canals finally convey stormwater to the Chao Phraya River. There are as many as 1,145 canals which have total length of the network approximately 2,316 kilometers. The width of the canal ranges from a few meters to 50 meters and 54 of them are major canals which the width more than 20 meters. Because of the low-lying flat topography, many areas of Bangkok are liable to flooding. The runoff from the city area is drained into canal through the combined sewers collection system by gravity and eventually is discharged to the Chao Phraya River by pumps.

All private properties are required to have some form of wastewater treatment facilities. Small private houses are at least required to have septic tanks to accept toilet wastes. Septic tank effluents cannot generally be disposed off by leaching into the soil because of the high groundwater and impermeable clay soils. Therefore, these septic tanks have outlets to the drains or canals. Other domestic wastewater sources such as bathing, washing pass directly to the drains without treatment.

Until the current program started in the early 1990s, there were no central wastewater interceptor or treatment facilities. With the growth in population and industry, the waterways become severely polluted and were like open sewers in many parts of the densely population city.

The first central wastewater treatment project, Si Phraya, started in 1990 and went into operation in 1993. The plant was designed by the experts from the oldest university, Chulalongkorn, under the BMA management team aiming the plant to be a "Demonstration Project" About 1 U.S. \$ billion worth of major government subsidy sewerage projects are now in process of have been completed. In order to accelerate the implementation program, a turnkey bidding was selected. However, before launching the program, a close consultation among BMA'S experience consultant, academical professors, contractors representative and BMA policy makers had been conducted to arrange a good terms of reference for bidding. BMA requested bids from international consortia to design and construction of the wastewater project. The projects provided for: the interception of all foul sewage flows prior to discharge into the canals, a piped transmission system to convey these flows to the entral treatment plants, the construction of a nutrient removal treatment plants, construction completion within three years. A further 12 months, operation and maintenance and finally the training of operators. Each bid had been evaluated technically and financially by BMA' consultant and steering committee. Finally, BMA' awarded the contract to a group of joint ventures who proposed the best bid. During the construction period, several factor such as traffic congestion, construction nuisance (noise, air, water pollution), soft Bangkok clays were identified. Fortunately, and appropriate construction techniques such as trenchless pipe laying have proved both economically viable and environmental preferable.

Current PPP experiencs in Water Supply and Wastewater Treatment

In Bangkok Metropolitan Administration area, the supply of public utilities are responsible by the state-owned enterprises i.e. water supply by Metropolitan Waterworks Authority (MWA), electricity by Metropolitan Electricity Authority (MEA), telephone by Telephone Organization of Thailand (TOT) which recently become a public company called TOT Cooperation Public Company Limited. While the wastewater treatment is responsible by the Department of Drainage and Sewerage, BMA. The public-private partnerships seems to be more general and active in water supply business than wastewater treatment business. The MWA water production from four water treatment plants is now reaching 1,500

million cubic meters per year, where as the water sales are about 1,000 million cubic meter per year. It is MWA goal to reduce the leakage from 20,000 kilometers distribution and service pipes, therefore several measures had been introduced to minimize such loss. Recently MWA has jointed hands with the private sectors and launched a project called 'Water Leakage Abatement Program' aiming at reduction of distribution leakage in 3 water distribution branch offices. A group of consultants and contractors was selected with an implementation plan proposal. Within 4 year term, the contractors will replace or rehabilitate the existing distribution pipes and will be paid by MWA unit prices. At the end of the term, the percentage of the leakage reduction will be calculated and valued, then the contractors will be rewarded 50% of the water value that can be saved.

For the wastewater treatment side, BMA is now operation five central treatment plants. Two of these are under the contractor responsibility according to the one year contract term which is going to be ended in January, 2003 The other three treatment plants have been operated by BMA staff. Since the number of treatment plant is increasing while the manpower for operation and maintenance is limited, BMA is going to contract out the O+M works to private firms. During the 5 year contract, the contractor will responsible for operation the plant with guaranteed performance and will take care all maintenance works. BMA will pay the contractor on monthly basis according to the amount of wastewater being treated. In doing so BMA can reduce the daily management works as well as the manpower recruitment.

Conclusion

The water pollution in Thailand is one of the severe environmental problems. The Thai government has allocated a huge budget to subsidize the local municipalities for constructing wastewater treatment plants during the last decade. There are several plants which are not being operated properly due to the lack of skill operators and budget, resulting in the performance failure. The private sectors are very much keen to participate as plant operators, while some municipalities are now subcontract out the O+M works. The subcontract agreement can be conducted by two types. The first type, the private will only in charge in operation and maintenance of the plant but all cost related to electricity, chemicals and consumable materials will be in the municipality hands. The second type which is more appropriate is that all costs will be borne by the private sector and the municipality pays all charges by monthly basis according to the wastewater treated.

Since the water demands in the provinces of Thailand has been growing while the supply from the Provincial Waterworks Authority (PWA) can not catch up such growth, PWA has implemented a the first privatization program in 1995. A 25 years Build-Operate-Transfer (BOT) contract for production of high quality treated water and delivery to the users via bulk mains, reservoirs and local distribution pipeline networks. By the most effective privatization in Pathum Thani province which adjacent to Bangkok and is out of MWA services, people can access water supply within just 3 years after the contract signing. Moreover, the over exploitation of ground water which leads to land subsidence can also be reduced. The public-private partnerships in water business can be expanded in some other ways such as metering reading, distribution pipe rehabilitation. Contrarily, the private participation in wastewater treatment is limited to O+M business since the profit incentive is not attractive for the other kinds of participation.