

Research Note

International Experience of Public-Private Partnerships for Urban Environmental Infrastructure, and its Application to China

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Public-private partnership-based services could be one of the better solutions for developing urban environmental infrastructure—which includes sewage treatment and municipal solid waste disposal services—in developing countries. Due to the low availability of funds for investment in the public sector and operating inefficiencies in government-run utilities, public-private partnership (PPP) can help to provide environmental services by calling on private-sector investment and managerial and technical skills. The Chinese government is facing a “capital bottleneck” and low efficiency in the existing government-run system for developing urban environmental infrastructure (UEI). To achieve the environmental targets under the Tenth and Eleventh Five Year Plans (2001–2010), the Government needs to draw up financial strategies and implement financial mechanisms that include PPP. There is no substantial experience of establishing PPP systems in most developing countries, including China. This study identifies the role of PPP, and examines the necessity of introducing the PPP system in China. It also clarifies the reform process in the UEI sector, existing policies, and important options for PPP-based projects and services. The study focuses on key issues like target setting, pricing regulations and tariff policy design, policies for promoting PPP, and contractual arrangements. It is based on international experiences and seeks to examine how these can be applied in China in order to enhance UEI implementation capacity.

Keywords: urban environmental infrastructure, public-private partnership, tariff, China, Asia.

1. Introduction

Urban environments have been deteriorating over the years in Asia. The major reason is insufficient government spending on environmental infrastructure to meet the increasing demand that has resulted from high population influxes, rising living standards, and economic activities. However, funding deficiencies and the low efficiency of existing systems have been recognized as barriers to expanding and/or maintaining urban environmental infrastructure (UEI)—which includes environmental services like wastewater treatment, and municipal solid waste (MSW) disposal. Around the globe, targets for

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annual investment in water and sanitation are expected to grow to \$75 billion by the year 2025 (Cosgrove and Rijsberman 2000). Achieving these investment targets will require innovative financing solutions. The urgent need to access financial and technical capability in UEI, coupled with the trends of globalization and privatization, has encouraged governments to establish public-private partnerships (PPPs) to deliver urban environmental services and, consequently, to improve urban environments.

Under an ideal PPP for UEI, the government's main role is regulator, while the private sector brings financial resources, technical capability, and entrepreneurship to provide the environmental services. The consumers, including both households and businesses, pay appropriate charges to make provision of these services financially viable for the provider. Due to the nature of these services as public goods requiring substantial investment, the government may provide some direct or indirect subsidies to relieve the burden on poorer consumers and to check the abuse by the private sector of the natural monopolies they are given. However, the process of private-sector participation tends to go faster than relevant administrative and financial reforms in the field of UEI. Some projects are being carried out without clear understanding of PPP, appropriate institutional frameworks, and implementation capacity; for such projects, targets will be difficult to achieve.

China has a tremendous demand for UEI, and most cities are experiencing increasing strain on their physical and financial capacity to deliver adequate UEI services. Ambitious targets requiring large investments to improve UEI are set under China's Tenth Five Year Plan (2001–2005). Methods to procure the necessary funds, as well as to identify appropriate roles for the public and private sectors, have become some of the most important policy issues in China. This paper focuses on several major issues relating to the establishment of PPP systems, to support the Government's future policy-making.

2. The need for public-private partnerships

2.1. Expansion of construction funds and improvements in efficiency

Two approaches could be considered in drawing up a long-term financing and investment plan for UEI development that can adequately cope with projected economic development. The first one is to diversify financial sources from government-run systems, and elaborate a long-term repayment plan. Construction costs could be covered by a combination of various methods: national and local bond issues; loans from foreign governments or multilateral financial agencies; and policy-based schemes, including the Water Revolving Fund in the United States and loans from government-run banks. However, many developing countries do not allow local governments to access capital through issuance of municipal bonds, because of the possibility of losing control of local public finances.

The second method is to open the market to the private sector, as has already been done in France, the UK, and some Southeast Asian and Latin American countries, under a PPP system. In this system, the government moves from being the direct service provider to being supervisor and manager, creating the regulatory framework, setting up the necessary institutional structures, setting tariffs, and providing subsidies and guarantees; while the private-sector partner takes on the responsibility of sharing the

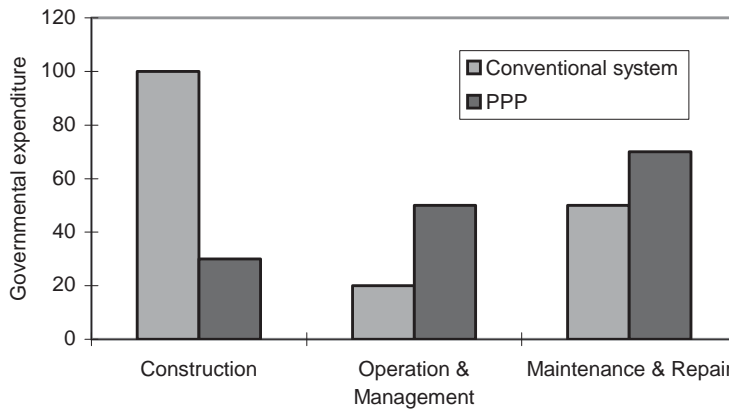


Figure1. Comparison of government expenditure flow in conventional government-run UEI projects and PPP

financial burden, introducing technical innovations, and/or management. Funds are raised through loans from commercial banks, stocks, and corporate bonds.

In the case of PPP, the government, or residents, undertake over the long term to share payment in the form of service fees related to the amount of wastewater or solid waste being treated to the private-sector partner. Expenditure over the whole project life-cycle (construction and operation for a certain period) is calculated as accurately as possible beforehand, these costs are spread equally over the fiscal years of the life-cycle, and a payment plan is formulated according to the government's financial capability. If the government has a problem immediately accessing funds, it can leave expensive construction to the private-sector partner (see figure 1). Thus, even if economic development remains low and financial capacity is weak, it is possible to construct UEI by leveraging future revenue from services. Moreover, since calculation of profitability based on charge incomes is performed by the private sector, which is generally more skilled in making such calculations compared with the public sector, improved efficiency can be expected.

Government-run systems experience "public sector failure" after long operation, for two reasons: (1) uncontrolled expansion of public works with high construction costs create a budget deficit; and/or (2) services become highly inefficient in terms of the human resources they engage, corruption, obsolete technology, and inadequate tariffs leading to higher losses. In the case of the great Buenos Aires, Argentina, water supply and sewerage system, for example, the two most favorable bids for privatization came in at 27 percent below the tariffs being charged at that time by the public sector (ESCAP 1997). PPP not only overcomes shortages of funds in the public sector, but also solves the problems of "public sector failure" and provides cheaper and higher-quality public services.

PPP requires formulation of a suitable tariff system from the start. Rational use of pricing mechanisms can also have the effect of encouraging citizens to adopt environmentally friendly consumption patterns, such as saving water and waste reduction, from an early stage of economic development, contributing to sustainable development in Asian countries. Furthermore, it is expected that the technological demands

associated with UEI will bring about improvements in environmental technology and promotion of environmental businesses in Asian developing countries, and these could become key industries promoting economic development. For these reasons, many international organizations are promoting PPP:

- UNDP: “(PPPs) are an effective means of establishing co-operation between public and private actors and to bundle financial resources, know-how and expertise to address these urban environmental needs. PPPs offer alternatives to full privatization, combining the advantages of both the public and the private sector.” (UNDP 2002)
- World Bank: To support such efforts, the World Bank established the Partnerships Group to identify and fortify current and future strategic development alliances. “Partnerships must be inclusive and straddle the main categories of development actors—governments, private sector, civil society, and aid agencies.” (Partnerships Group 1998). Such partnerships provide the basis for on-going participation from a wide range of players—which can only help to sustain development projects (World Bank 2003).
- ADB: On PPPs, ADB policy pronounces that “global experience indicates that public responsibility and ownership are often best blended with private management.” (<http://www.forum-adb.org/RESOURCES/Briefers/02-03.pdf>).
- OECD: “Another challenge concerns the supply of safe drinking water and sanitation at reasonable cost to all... Considerable water infrastructure expenditure will also be required at a time when central government subsidies are being reduced. Growing contributions from the private sector through public private partnerships (PPP) can be expected.” (<http://www.oecd.org/dataoecd/15/53/2968153.pdf>).

2.2. Why does China need PPP?

By 2002, only around 22.3 percent of the total volume of sewage produced nationwide was treated, and only 20 percent of garbage was disposed of safely. China will face a great challenge in water pollution prevention and control in the next 20 years.¹ Under the Government’s environmental protection plan for the Tenth Five Year Plan period, by 2005, 45 percent of all urban domestic wastewater should be treated, and the rate should reach 60 percent in cities with populations larger than 500,000. Capacity for sanitary treatment and disposal of urban solid waste should be 150,000 tons per day. In order to realize the above objectives, hundreds of billion RMB will be needed to construct treatment facilities for urban domestic wastewater, and 45 billion RMB will need to be invested in the construction of treatment facilities of domestic solid waste. The need to speed up construction of UEI is a driving force for developing appropriate new financing mechanisms.

The following could be considered as reasons why China needs to develop PPP.

Firstly, local governments are playing an increasing role in UEI construction and operation, but their financial capacity cannot meet the huge demand due to the lack of a system of subsidies from central

¹ Forecasts for rising urban domestic sewage discharge are given in table 1.

Table 1. Environmental pressures due to urbanization in China

	1995	2000	2010	2020
Total population (100 million persons)	12.11	12.66	13.46–13.92	14.30–14.90
Urban population (100 million persons)	3.52	4.56	6.20–6.40	7.90–8.20
Rate of urbanization (%)	29.4	36	46	55
Discharge amount of urban domestic sewage (100 million tons/year)	140	221	322	500
Discharge amount of MSW (100 million tons/year)	0.91	1.21	2.17–2.24	3.55–3.66

Source: Ge et al. 2003.

government as well as to the limited flexibility that local governments are allowed to utilize their own revenues. For some localities, the problem of insufficient funding for construction of UEI will be very serious; for example, according to calculations using the OECD's FEASIBLE model² by the OECD and the Chinese Academy of Environmental Planning, the shortfall of capital for the construction of 14 sewage treatment plants and sewerage networks in Sichuan province will be 70 percent of total required investment from 2000 to 2020. The participation of any economic entities³ besides public agencies should be encouraged in the construction and operation of the facilities, in order to attract private investment. The current situation of the local credit market is as follows:

(i) Bank loans play a key role in China's financial system, accounting for 90 percent of the total financing volume. Policy banks like the State Development Bank of China function as the major financing source for the development of UEI, but UEI represents just one small component of their lending. The policy-based approach of establishing a "Public Environmental Trust Fund" with money from the social security fund is still being studied. Following recent reforms to deregulate the financial sector, the People's Bank of China will not command commercial banks to make special loans; the low profits, unsatisfactory cost recovery, and long-term investments inherent in UEI projects make it difficult to obtain loans from commercial banks.

(ii) The Budget Law prohibits the issuance of municipal bonds; thus corporate bonds are used to finance UEI projects instead.

(iii) Treasury bond investment has played a significant role in accelerating the construction of UEI, but there are also problems with this, as the use of treasury bonds is too broad and the supervision of projects funded by treasury bonds is not adequately effective (CCICED 2003).

(iv) The stock market and corporate bonds are playing an increasing role. It is necessary to invite private companies as new investment bodies and utilize social capital to finance UEI in order to meet investment targets.

² The FEASIBLE model was developed by the OECD to calculate costs and financing of UEI.

³ In China, economic entities besides the public sector include state-owned enterprises, collective enterprises, private enterprises, foreign-funded enterprises, joint ventures and others, whose content exceeds the private sector, as frequently mentioned in global forums.

Secondly, in China, the Government has been the main source of funding for construction of UEI facilities, with government-affiliated non-profit organizations⁴ responsible for their operation and management. This type of government monopoly excludes institutional competition, which in turn contributes to the problem of low investment efficiency. Enterprises⁵ can undertake commercialized management of existing facilities.

Thirdly, introducing advanced environmental technology from foreign countries, as well as developing domestic environmental technology, could be achieved through deregulation and privatization of the UEI sector. It would be in harmony with the national policy of developing environmental technology and promoting environmental businesses in China. China has a major market for UEI; output of environmental industry is projected to increase by 14–17 percent per year between 2000 and 2015 according to the China Association of Environmental Protection Industry. It represents a good opportunity for both foreign and domestic companies. In particular, as domestic companies are facing saturation in the industrial pollution control equipment market, UEI is seen as a new market to which the private sector is responding positively.

3. Implementation of PPP projects in China

3.1. Development of relevant policies for PPP

In establishing PPP in UEI development in China, an important role of central government will be to establish a national UEI development vision and paradigm that encourages private-sector participation. But this will be very complex in China; the expansion of PPP will need to be accompanied by reforms of the administrative and financial systems to promote development of a market economy (see figure 2).

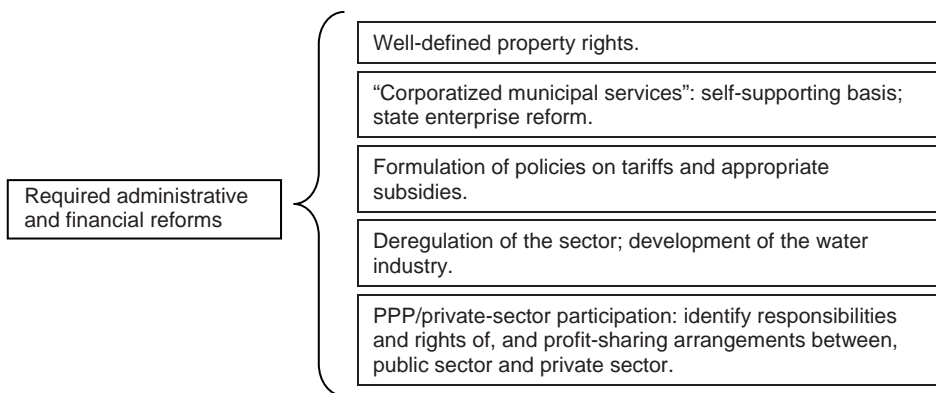


Figure 2. UEI sector reform process in China

4 Briefly, a category of public services operated according to governmental mechanisms, whose finance is provided by the Government, and whose human resources are managed by the Government.

5 The enterprises referred to include, among others, enterprises established on the foundations of reformed government-affiliated non-profit organizations (e.g., state-owned or state-holding enterprises).

To achieve this, since 1999, the Government has issued seven sets of policy guidelines on: promoting private-sector participation; reforming existing management and operation systems; setting up a charging system; deregulation, including granting concessions; opening the market to foreign companies; decisions on preferential policies; and safeguarding the market by strengthening supervisory management. From the point of view of enforcement, however, the sheer number of these guidelines may detract from their effectiveness since they may cause confusion and thus reduce their authoritativeness.

Local government should play a key role in implementation of PPP projects; this role would include:

1. Drafting a local UEI development plan;
2. Carrying out comparative studies of whole-life costs and benefits of government-run systems and PPP systems;
3. Acting as planner, regulator, manager, monitor, negotiator, incentive provider, and evaluator;
4. Making financial arrangements using subsidy, national or local bonds, and tariffs for achieving cost recovery;
5. Disclosure of information to the public and absorbing ideas from the public to promote public services.

Most local governments in China are interested in involving the private sector, but most of them have no experience relevant to implementing PPP.

3.2. Implementation of PPP projects in China

Various project options exist for PPP, each of which differs in the role assigned to the private sector, business risks, and profitability. Four of these—management contracts, build-operate-transfer (BOT), joint ventures and transfer-operate-transfer (TOT)—are applicable to China.

- 1) Management contracts: The public sector retains ownership and responsibility for funding and construction of facilities, and entrusts operation and maintenance of existing facilities to private companies. This is low-risk for the government and promotes technology transfer, introduction of private-sector management know-how and improvements in efficiency and management of the facility. Management contracts cannot bring in funds from the private sector, but can reduce operating costs. Although competition between participating companies is high, there are few merits in introducing private-sector capital. Such management contracts generally have terms from eight to 15 years.

Box 1. Management contract for sewage treatment plants in Long Tian and Sha Tian townships of Shenzhen City

The construction of two sewage treatment plants in Shenzhen City—Long Tian (total treatment capacity: 60,000 tons per day; gross investment: 28.5 million RMB) and Sha Tian (total treatment capacity: 5,000 tons per day; gross investment: 8.8 million RMB)—was funded by local administrations at the city, district, and township levels. To relieve the administrations of the burden of operating and maintaining the plants, as well as to improve management efficiency, the city and district governments authorized the township administrations to put operation and management of the two sewage treatment plants out to tender, in order to find one enterprise with high standards and professionalism to operate and manage each plant. Through a nationwide public bidding process, a strong combination of two companies, Shenzhen Bi Yun Tian Environmental Protection Corporation and Anhui Guozhen Environmental Protection Science and Technology Co., Ltd., was finally chosen as the contractor for the two plants, with a contract period of 15 years. According to our estimates, the monthly operation and maintenance cost of the two plants was originally over 500,000 RMB. Under the management contract, a monthly fee of only 400,000 RMB is paid to the contractor, saving more than 1.2 million RMB annually and greatly reducing financial pressure on the government. On the other hand, the contractors believe the projects can still be profitable after paying for technological improvements and introducing management innovations.

Source: Pei et al. 2003.

- 2) Build-operate-transfer: This is an effective method for project funding, and is often used in China because of the many new facilities that have to be constructed. In the BOT option, after a private-sector contractor builds the facility, they then also operate and manage the facility during a fixed period, after which responsibility is transferred to the public sector. Here, ownership of the facility stays with the public sector, while the private sector partner has responsibility for investment, construction, and operation and management. There are many actual examples in each country, and experiences have also been gained in BOT projects in China for management of economic infrastructure such as power plants, highways, and water supply, which are expected to be profitable. Many BOT or concession contracts are for periods of 20 or 30 years. In order for management of the facility to go smoothly during the whole period of the contract, government policy and plans must not undergo major changes. Sudden changes of direction in government policy pose a big risk for the private sector in developing countries. Adjusting a BOT contract is complicated, and many past experiences show that it can lead to many difficulties in terminating the contract. Moreover, although close co-operation is required between regional environmental management and infrastructure construction, little co-operation should be expected from the private sector.

Box 2. Wenzhou Dong Zhuang refuse incinerator power generation plant

Wenzhou City produces 400,000 tons of household refuse per year, and this amount increases by about 8–10 percent annually. Two existing landfill sites have already reached their full capacities, and there are no appropriate locations in the city for new landfills. For this reason, Wenzhou City has decided to enter into a BOT contract with a private-sector contractor to build and operate a new refuse incinerator power generation plant. Gross investment required for this project is 90 million RMB, which will be provided by the private company Wei Ming Environmental Protection Engineering Co., Ltd. This contractor will build the plant and manage, operate, and maintain it for a period of 25 years (not including the two-year construction period), and then transfer ownership of the plant to the city government, without any compensation. The plant is designed to dispose of 320 tons of municipal garbage per day, and to generate 25 million kWh of electricity annually. The total investment for the first phase of construction is 6.5 million RMB. Daily treatment capacity in this phase will be about 160 tons, generating a total of 9 million kWh of electricity annually; which, deducting power expenditure of 2 million kWh per annum required for operating the plant, is all available for sale. Besides this, the municipal government pays 73.8 RMB per ton of garbage disposed of. After deducting running and depreciation costs, the project is expected to net a significant annual income, and its payback period is predicted to be 12 years.

Source: The authors, from a field survey 13–14 May 2002, in co-operation with the State Environmental Protection Administration of China.

- 3) Joint venture: The local government and one or several private companies enter into a joint venture. The local government's share in the venture could be part of a government-owned facility, the land on which it is built, the human resources, or other forms of capital. The investors own shares, and provide services based on the terms of their partnership contract. Joint ventures combine the advantages of the private sector—dynamism, access to finance, knowledge of technologies, managerial efficiency, and entrepreneurial spirit—with the social responsibility, environmental awareness, and local knowledge of the public sector. Public-sector and private-sector partners share all responsibility related to investment and management. This should lead to improved efficiency of investment decision-making; development of innovative technologies and solutions; greater innovation and flexibility at the project planning stage; and other benefits. Early dialogue between the public- and private-sector partners can help to reduce the transaction costs associated with more traditional tendering processes. In China, joint ventures have frequently been formed between the local public sector and multinational corporations.
- 4) Transfer-operate-transfer: Under this arrangement, the government transfers the assets and the franchise rights in a government-constructed environmental pollution treatment facility to private-sector investors through open tender, based on the capital rating of the facility. After purchasing the treatment facility and the franchise rights, the investors form a project

company to own, operate, and maintain the facility during the period of the contract, allowing them to obtain a return on their investment and make profits from service charges. On the expiration of the contract, the project company transfers the facility, in good condition, back to the government without any compensation. Essentially, TOT means that government leases the UEI facilities to the project company, which pays the lease price as a lump sum rather than in periodic payments. TOT contracts allow the government to collect substantial lump sums, which can then be invested in new UEI construction projects. Shenzhen City declared that TOT contracts would be sought for the the municipal sewage treatment plants (one was completed in 2000; the other is still under construction and to be completed before the end of the Tenth Five Year Plan period in 2005) built by the government (Pei et al. 2003). The key issues here are proper valuation of assets before the facility transfer and ensuring appropriate return on investment.

3.3. Challenges in implementing PPP

There are two major challenges the Chinese government faces in implementing PPP. The first is that central and local governments in China tend to misunderstand their role in implementing PPP. Under neither the existing system nor a PPP system should the government partner expect to cover all costs through charge income and revenues. Private-sector participation does not mean that the government's role becomes smaller, only that it changes—government should play the more important role of encouraging private-sector investment and of ensuring provision of high-quality services at a lower cost burden to citizens. The second challenge is setting up an appropriate public monitoring and management system. This is challenging because of the serious lack of capacity, in both central government and local governments, in implementing PPP. Setting up such a system should include the following policy design tasks: development of an enterprise performance assessment system; development of pricing regulations and tariff design; resolution of project-based management issues, like standardization of risks for risk management, contractual arrangements, etc.; promotion of public awareness and information disclosure; and institutional development for implementation.

4. Important procedures for implementing PPP, and their application in China

4.1. Setting targets to develop integrated solutions

Setting appropriate criteria is the key for meaningful performance evaluation. For PPP UEI projects, quantitative and qualitative indices are developed as criteria for evaluation; we suggest the following indices: prevention of degradation of the urban environment; achievement of improvements in living standards and reduction of poverty; financial improvements; efficiency; equity; technological innovation; improvement of the political system; and social participation (see table 2). These indices are used to set targets for such projects. In addition, in China, the State Environmental Protection Administration (SEPA) or the Ministry of Construction should establish standards for certification and

technical evaluation, and provide authoritative technological information for local governments and enterprises to improve the effectiveness of PPP.

Table 2. Indices to evaluate the effectiveness of PPP projects for UEI

	Indices (quantitative or qualitative)
UEI improvement	<p>Service extension (extension of pipelines); maintenance of existing pipelines and facilities;</p> <p>Supply of safe water; improvement of rate and throughput of appropriate treatment of sewage and solid waste;</p> <p>Reduction in amount of wastewater discharged into rivers, lakes, sea, and groundwater; improvement of quality of discharged water.</p>
Financial improvement	<p>Introduction of domestic and foreign private-sector capital, covering of public-sector deficit by private-sector funding.</p>
Efficiency (cost-effectiveness and value for money)	<p>Increase in number of installed water and sewage meters; reduction in rate of non-income water (such as water lost through leakage in the system);</p> <p>Introduction of a tariff system; improvement in collection rates through provision of an efficient tariff collection/payment system;</p> <p>Increase in the number of customers served per employee;</p> <p>Space saving at the treatment site; rationalization of land use;</p> <p>Reduction in energy consumption per unit production;</p> <p>Reduction in total project cost (implementation of value-for-money assessment).</p>
Technological innovation	<p>Increase in investment for technological innovation;</p> <p>Provision of relevant equipment, such as computerized control systems, data-processing systems, and high-precision meters;</p> <p>Development of environmental technologies, such as resource-recycling technologies (water recycling, sludge and incinerator ash recycling, and waste-to-energy).</p>
Political system improvements	<p>Improvement in transparency of economic activities; dispelling public distrust of politics;</p> <p>Improvement in management efficiency and project operating capabilities of central and local governments.</p>
Social participation	<p>Increase in the scale of financing for UEI coming from social capital, utilizing banks and securities markets;</p> <p>Promotion of environmental business as a part of industrial activities: increase in number of companies participating in this field;</p> <p>Providing new opportunities for laid-off workers, while minimizing the social impacts of personnel cuts;</p> <p>Promotion of environmentally friendly practices, including water saving and solid waste reduction by local residents.</p>
Equity	<p>Attracting companies to areas with low economic levels, through incentives; expansion of services to such areas by reallocating resources; narrowing gaps in environmental infrastructure between areas;</p> <p>Special provisions for people with low incomes in tariff collection;</p> <p>Thorough implementation of public bidding and standardization of project processes.</p>

4.2. Pricing regulation and tariff policies

Pricing regulation and tariff policy design is the most important area for achieving financial sustainability of UEI.

a. Pricing

Optimal economic efficiency of public goods can be achieved if the prices are in accordance with the principles of marginal opportunity cost. Warford (1996) has discussed this at length in the context of

$$AIC = \frac{\sum \frac{I_t + R_t - R_0}{(1+i)^t}}{\sum \frac{Q_t - Q_0}{(1+i)^t}}$$

water pricing. He breaks down the price into three components. The first is the marginal production or private cost, which is a direct cost incurred by the service provider. The second component is marginal user cost, which includes the forgone cost of reduced future consumption due to the current exploitation of non-renewable resources with irreversible effects. The third component is marginal component cost, which is cost of production in the private sector, due to capital indivisibility, could be practically estimated by calculating the average incremental cost (*AIC*) as follows:

where I_t represents the investment cost (investment costs are usually considered to be the initial costs incurred during the first phase of installation; however, some replacement costs or additional installation costs may be required over the lifetime of the utility). Recurrent or operation and maintenance costs (R) are from year zero (R_0) to the end of project (in most projects, operation and maintenance costs start with the start of production; however, some fixed recurring costs may be incurred from the beginning of the construction and installation phase). The incremental volume of water/wastewater is represented by $Q_t - Q_0$, while the interest rate is represented by i .

Estimations of marginal user cost may involve various uncertainties, as discussed by Jeremy Warford (1996). However, the most convenient way to make such estimations is to add a premium for depletion of resources in the first component, marginal production cost. The third component, marginal environmental cost, is basically externalities involved with production and consumption of water. Non-market valuation techniques (contingent valuation, hedonic pricing, and so on) could be used to calculate this component.

b. Tariff design

Translating the estimated prices of public goods into tariffs is the most difficult task at hand. Even in Japan, the tariffs on wastewater can only meet one-third of the private costs of wastewater management. (Private costs only reflect the up-front costs of treatment and do not include externalities.) This is the most crucial aspect for the policy-makers, as they have to balance the financial and social aspects of a project. It has been established that water is an economic and social good and it should not be provided free of charge (Black 1998). Moreover, Kolstad (1999) suggests that without a price system, the

polluters (consumers) do not “see” the damage caused by the pollution they emit; and if the polluter pays a price for every unit of pollution, this corrects market failure, at least in theory. Society includes rich as well as poor households, and these public services are meant for all. Because of this, cross-subsidy has traditionally been the most common way of adjusting the tariffs. There are various ways to calculate for this adjustment depending on the targeted revenue, as is shown by Majumdar (1990).

The first challenge in setting a tariff structure is to “get the prices right.” The arguments made by Kolstad do not take into account the socio-economic differences among consumers, and treat everyone on the same scale. However, urban environmental infrastructure and services are not a market good, rather a public good that should reach everyone in the community. Therefore, cross-subsidies or indirect subsidies from other revenue sectors should make this commodity affordable for all the people, at least up to minimum required levels. This has led to the concept of basic charges for a minimum level of service and then a system of progressive or regressive rates on the additional consumption. Another issue is identifying the different socio-economic groups in the community, either through income tax returns or through their housing and other indicators of living standards. Different tariffs are then set for different socio-economic groups in the community. However, this is a difficult system to implement and can have many loopholes that allow people to evade full charges. A progressive rate is applied widely now, in particular in water-short cities.

A recent assessment of water and wastewater services (Yepes 1999) shows that cross-subsidies have adverse economic, financial, and other effects, which often are not quantified or appreciated. First of all, the variable tariff rates used to generate the targeted revenue may send the wrong signals to different groups of consumers, who may then adjust their consumption accordingly. In many developing countries, wide income disparities place the majority of the population in two extreme groups: poor and rich. Figure 3 is based on that concept, and shows the impacts of differentiated user charges for these two groups. The group of poorer consumers is being charged less, so the services are being supplied to them at a loss, up to a total quantity of Q1. This loss should be compensated by cross-subsidy from the profits generated by selling up to quantity of Q2 to the rich group at a higher price. However, the poor group might find that water/wastewater is very cheap, and exploit it to the maximum; they would not have any incentive to conserve water. On the other hand, the rich group may find this commodity to be rather costly and may reduce their consumption to quantity Q3, on the principles of economic efficiency. Thus the outcome of the cross-subsidy may not be optimal for the welfare of society.

For private goods, market demand studies are useful, allowing one to plot a demand and supply curve and thus arrive at an ideal price that balances production costs with the prices consumers are willing to pay. However, for public goods like water supply and wastewater, market studies are difficult to do due to the monopolistic nature of the goods. Non-market valuation techniques, including stated preference (contingent valuation (Mitchell and Carson 1989)), revealed preference (averting behaviour method (Dickie et al. 1986); hedonic property valuation based on location of houses with/without access to the facilities (North and Griffin 1993), and the cost-of-illness method for health expenditures and lost labor due to sickness as a result of environmental consequences (Chestnut et al. 1997) are commonly adopted to ascertain willingness to pay for public goods. Some such studies are based on mineral bottled water or vendor charges. However, these prices are not realistic, as only a fraction of the community consumes

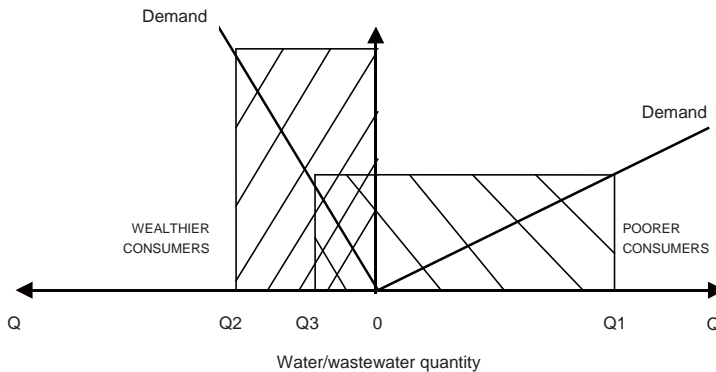


Figure 3. Revenue under cross-subsidy

bottled water, while people from poorer communities who purchase water from vendors tend to be using the services below their normal demand.

Contingent valuation seems to be a better method for developing countries to ascertain demand and willingness to pay in the area of UEI (Whittington 1998, Memon and Matsuoka 2001). Studies such as Whittington et al. (1990) and Altaf et al. (1993) show that people are willing to pay more for adequate utilities than they are currently paying for substandard utilities. Hence, higher prices can be charged if the quality and quantity of the services are improved. This objective is in line with public-private partnerships, as they are supposed to improve the standard of services. Thus, a contingent valuation study should be conducted to draw a new demand curve for water/wastewater services.

This willingness-to-pay study can be designed based on well-established formats, as described in Mitchell and Carson (1989). The results of the study can be evaluated to assess their validity, based on sensitivity analysis, as discussed in Mushtaq and Matsuoka 2002. The study could be applied to rich and poor alike, as income is the basic indicator, with some conditions, to show variations in willingness to pay; higher-income groups normally show higher willingness to pay, as long as they trust that they will get the promised level of services. It is very important in designing this study to follow a proper format in order to avoid all bias and obtain valid results.

The second challenge in establishing a pricing structure is building in flexibility to cope with differences between predicted and actual revenue. In Figure 3, predicted revenue from both groups of consumers is in line with the total revenue target for the service to break even. However, in this case, those consumers paying higher prices may either adjust their demand or try to find other, cheaper, alternatives. Hence, the actual revenue may fall short of the predicted revenue and may cause losses to the operator. Because of this possibility, minimum throughput guarantees from the Government are required by private operators.

The third challenge is fee collection. From the poorer consumers paying lower fees, monthly revenue per household may be so low that there is little incentive to collect it. The overhead costs of issuing bills and collecting fees may even exceed the actual revenue that can be collected. On the other hand, the

higher charges that richer consumers must pay may provide incentive for corruption; in developing countries this is the worst problem in most tax collection departments.

All of this suggests that cross-subsidization often makes it harder to reach economic and financial objectives, rather than supporting social justice. Then how to proceed? The best option may be to estimate demand using willingness-to-pay studies and then compare this demand curve with the supply curve of the utility. If there are losses, then the Government can subsidize them from other revenue sectors like income tax. However, if there is a substantial gap between the wealthier and poorer groups of consumers in the community, then the same willingness-to-pay studies can help to draw different demand curves for the different groups based on socioeconomic and geographical (slums vs. wealthier housing) divisions, as the different consumption levels and patterns may justify differentiated pricing. The loss that this creates should not be cross-subsidized by increasing prices in richer areas beyond the residents' willingness to pay; rather the subsidy can once again come from other sectors.

The other important aspect of tariffs in the UEI sector is concerned with the number of agencies involved. For example, in Bangkok, separate organizations are responsible for water supply: the drinking water of the Bangkok Metropolitan Administration (BMA) is supplied by the Metropolitan Water Works Authority (MWA) which is a state enterprise and sanitation and drainage is supplied by the Bangkok Metropolitan Authority (<http://www.csis.org/e4e/Mayor31Pawabutr.html>). In most Thai cities, water supply tariffs are the responsibility of the Ministry of Interior via metropolitan or provincial water authorities, while wastewater treatment charges are collected by the Ministry of Science, Technology and Environment via the Pollution Control Department and the Wastewater Management Authority. The most suitable approach is to make one organization responsible for collecting tariffs for both services, as this will not only save overhead charges but will also save confusion among many consumers who are not used to paying such charges, especially wastewater treatment charges.

Tariff design for PPP-based environmental infrastructure should not to be left to the private-sector partners, as UEI contracts are natural monopolies, and the private sector may exploit this fact to maximize their profits. Hence, government should set the tariffs based on careful assessment, including of their impacts on affordability and consumption levels. The United Kingdom has adopted an incentive-based price cap system to ensure the best value to customers (see box 3). The Office of Water Services (OFWAT) was established to regulate the water services sector, including the tariffs charged by the water companies.⁶

The following recommendations are made to the Chinese government based on international experiences in designing tariff policies:

- (1) When subsidy is unavoidable, make a clear subsidy plan, disseminate it among civil society, and ensure transparency;
- (2) As far as possible, avoid using cross-subsidy and instead utilize funds from the social security system and tax system to provide the necessary support;

⁶ OFWAT was established to: 1) enable well-managed private-sector partners to finance the delivery of water services in line with relevant standards and requirements; 2) provide incentives for these partners to improve efficiency and service delivery; and 3) review private-sector partners' charges, practices and service delivery, using an efficient and transparent process.

Box 3. Setting price controls in the UK water industry

The price setting process used in the United Kingdom is as follows:

- (1) Identify a group of comparable companies;
- (2) Identify a set of efficiency measurements;
- (3) Identify inputs, outputs, and environmental variables;
- (4) Collect data on a consistent basis;
- (5) Conduct analysis of the data;
- (6) Calculate efficiency differences between companies;
- (7) Generate efficient cost projections for each company;
- (8) Set X from difference between actual and efficient costs.

The annual charge increase that private-sector partners can make is limited by the licenses under which they operate. Each company must provide an audited statement to the water sector regulatory body, (OFWAT), which shows that, averaged out, increases in standard charges have not exceeded the price cap. The cap is calculated as $RPI + K + U$, where RPI is the percentage increase in the Retail Price Index in the year to the November before the year in which charges are being reviewed; K is the price limit set by OFWAT for each company for each year to reflect any change in charges that it needs to make, over and above inflation, in order to finance the provision of services to customers (K can be a negative number); and U is the amount of K not taken up in previous years. Price caps each year will, therefore, vary between companies. K factors include four elements: revenue requirement (operating costs + capital charges + taxation + return); base revenues; incentives; and financial ratios.

Revenue requirement vs. base revenues = "K": Means to compare results from revenue requirements with the base revenues.

$$K = f(P_0 + Q + S + V - X)$$

P_0 to reflect past over-performance

Q = responsibility for quality

S = enhanced service exp

V = supply/demand balance exp

Source: Pollitt 2003; Hansen 2003..

- (3) In any project with private-sector participation, consider adopting an incentive-based price cap system to promote efficient business practices—this can also help to solve tariff-based bidding, as was found in Manila (see below);
- (4) Allow different tariff rates for different companies and in different areas;
- (5) Combine water supply charges and water treatment charges in one bill; these payments should be collected every two months in order to reduce administrative costs;
- (6) Ensure that the annual government financial report shows clearly how the charges have been used, and maintain a high level of transparency in financial management;

- (7) Because the number of PPP projects is increasing with the opening up of the UEI market, build public-sector capacity in the area of price regulation in order to allow better monitoring of private-sector partners' performance.

4.3. Development of policies to promote PPP

Policies for promoting PPP can be broadly classified into three fields: institutional management, development of financial methods, and management capacity building. Table 3 presents details of these three fields.

Table 3. Policy development for promoting PPP

Policy field		Necessary content
1. Institutional arrangements	Formulation of legal and regulatory framework	<ul style="list-style-type: none"> • A comprehensive legal framework that guarantees to the private sector the right to enter and be active in the public works sector; • Regulations concerning the respective roles of the public sector and the private sector in PPP, and deregulation of private-sector activity; • Specific regulations concerning UEI, including consideration of environmental preservation; • Regulations concerning the respective roles of central and local government—transfer of authority, the character of local government, etc.; • Guarantees from the central government of long-term stability for PPP policy—guarantees of institutional stability, mitigation of risk through system change; • Appropriate pricing policies and structures.
	Formulation of operating rules	<ul style="list-style-type: none"> • Regulations concerning conditions and criteria for entry of a company; • A model contract, regulations on flexibility in contracts; • Introduction and regulation of a competitive bidding system for PPP contracts; • Maximum degree of autonomy and full cost recovery at public service agency/utility level; • Regulations concerning supervision and monitoring of private-sector partners; • Regulations concerning monitoring of positive environmental impacts of enforcement of rules.
	Planning by central and local government	<ul style="list-style-type: none"> • Target setting and drafting of a development plan for UEI (for example, incorporated into national five-year plans); • Securing of policy continuity.
2. Formulation of financing methods	Securing of government revenue	<ul style="list-style-type: none"> • Source of secure revenue for implementation of the business which the public sector takes charge of—specifying financial resources, issuance of national and municipal bonds, and use of overseas development assistance; • Enhancing local financial capacity.
	Financial support from the government to the private sector	<ul style="list-style-type: none"> • Grants: business fund assistance, compensation for losses, low-interest loans; • Preferential policies: tax exemption, reduced tax rates; • Support for secure funds;; support for issuance of corporate bonds or stocks presentation; • Support for access to low-interest loans.

	Methods for securing profitability for a private-sector partner	<ul style="list-style-type: none"> • Management based on long-term profit calculations; • Offer management contracts for long periods; • Formulation of a tariff system, and securing of charge income; • Acceptance of joint implementation projects by highly profitable companies—for example, joint business for water supply and sewage treatment, or as one element of a community development project, etc.); • Permission for private-sector partners to use public property such as land or buildings; exemption of rental fees; • Guarantees by the government; • Simplification of procedures for bidding, contract issuance and negotiation, etc.
3. Management capacity building	Risk management	<ul style="list-style-type: none"> • Efforts to improve management capacity in both the public sector and the private sector; • Efforts to improve risk management capacity; • Surveillance by citizens and NGO; information disclosure; transparency preservation.
	Organizational adjustments	<ul style="list-style-type: none"> • Establishment of an organization to oversee necessary adjustments and manage the institutions, for example the BOT Center in the Philippines (see below). • Expanded role of consultants.

Source: based on Chang and Memon 2003.

Framing appropriate rules and regulations is the most important task in promoting PPP, and it might be done before implementing sectoral reforms. It is necessary to address in legislation and in implementation of rules and regulations goals and guiding principles dealing with government powers and individual rights in order to identify the details of organizational responsibilities; formulating non-negotiable conditions, such as stable institutional management, developing a guarantee system; contractual structure; and a procurement process that minimizes risk. But some developed country experiences tell a different story; some countries have developed their regulatory system after the sectoral reforms. The timing of introducing regulatory measures has thus been found to be not so important during the UEI sector reform process.

Urban environmental infrastructure is required for environmental improvement of a city, and UEI needs vary across cities. It is better to allow local authorities to use their discretion in deciding which approach or system they should introduce, rather than putting it under the uniform control of central government, since cities need to be able to construct and maintain their UEI system in the way best suited to local environmental conditions, and to shoulder the burden of expenses. However, there is a need for a monitoring mechanism to check on lapses in management.

Proper implementation of these laws and regulations would necessitate the establishment of new public service agencies—or strengthening of existing agencies—with adequate capacity in enforcement of the laws and regulations and in monitoring the performance and compliance of private-sector partners. These institutions should be financially self-reliant and entirely independent from political interference and all other vested interests. They should operate with a single set of procedures and principles consistent with national policies and socio-economic developmental goals.

It is also necessary to establish a specific governmental agency to regulate and supervise the activity of private-sector partners in order to reduce the risks involved in projects. The UK Treasury established a task force to assist local governments in implementing the new concept of privatization of water services under its Private Finance Initiative (PFI). It comprised a policy team and a project team; the policy team considered policy-related problems—standard contract and procedures etc.—and the project team reviewed, made recommendations on, etc., concrete project proposals. A PPP specialist from the private sector also participated in the task force project team. The inclusion of such a special consultant was necessary to take into account duties of both public and private-sector partners, financial management, measures to mitigate risk, and related regulatory system and a policy for a well-functioning contract and technologies used. It is most logical that a neutral consultant organization (or company) performs design and review of PPP contracts. In the Philippines, the BOT Center was established as a non-profit organization. While the BOT Centre supports the activities of the private sector, it also performs regulation and supervision for business risk mitigation. Moreover, the involvement of a special and neutral consultant to take on all responsibilities—modality of co-operative financing, financial management, risk-mitigation measures, providing guidance to government on the formulation of an appropriate legal framework and regulatory systems, government policy, etc.—is required for appropriate formulation of a contract. In particular, involvement of such a consultant is important for local governments with insufficient know-how. The ease with which there can be collusion between public- and private-sector entities poses a risk. Surveillance by third parties, such as the citizenry, NGOs, specialists in project evaluation, and consultants, is required to prevent favoritism between parties. Civic concern and information disclosure are key.

As important financial resources, international development funds and other sources of international development assistance (ODA) must not only continue their conventional efforts but must also play a new role to support participation of the private sector. From now on, their major supporting activities should be providing support to macro-level system design and policy planning in administrative and financial reform in the fields of national and regional water and waste policies, as well as support to micro-level policy planning in the implementation stage and improvement of local government capability. At the more practical level, effective support includes creation of enabling environments for project financing, supplying information based on international experiences, consulting and advising on project formation, implementation of seminars and training courses, and transfer of know-how through pilot or model projects.

4.4. Contractual arrangements

a. Formulation of attractive contracts

To promote private-sector investment in UEI, private companies should be offered attractive deals. These deals should include benefits and guarantees to make investment in UEI comparable with other business opportunities available. However, it is difficult to draw a direct comparison between PPP opportunities and other business opportunities, as the nature of the investments is quite different and PPP is a very recent development in China, where many factors have not yet been fully realized. The major differences are due to the nature of investment in infrastructure projects, which is characterized by

large sums being sunk into them with long payback periods. This is the reason why the public sector, with scarce resources, cannot make the investments on its own, and why the private sector cannot invest in this risky business without guarantees and favorable contract terms and conditions.

The risks for the private sector are manifold; for example, the recovery of tariffs is sometimes a political issue and there may not be enough help from the judicial system to recover charges or terminate services to communities. The rate of inflation is much higher than the rate of pay increases in most developing countries; hence, consumers' capacity to pay can change within a few years, threatening operators' profits. Foreign currencies usually appreciate at much higher rates than the RMB, widening gaps between revenue collected in local currency and funds borrowed in foreign currencies.

These risks can be avoided by provision of appropriate incentives from government, including hedging for foreign exchange risk, minimum-throughput guarantees for sale and revenues, judicial and political protection, tax incentives, partnerships (in which the Government provides land and other services), and banning the powerful role of unions, which most often seem to be a cause of inefficiency in public corporations. Judicial and political protection is the most important factor in developing countries, as political stability provides an overall guarantee for private-sector investment, and effective laws and judicial systems provide security for the investment. In addition, minimum-throughput guarantees in terms of units to be sold (water supply, wastewater treatment, or solid waste management) and the associated revenues also ensure a minimum level of revenue for operators. Tax incentives or tax holidays can provide an incentive and the operator can thus obtain higher net profits, which may be comparable to other investment alternatives in the private sector. The provision of land and services on a priority and concession basis is also an incentive for operators. Therefore, a combination of incentives, regulations, and political and judicial guarantees should be used to make an attractive contract. Flexibility in the application of concession contracts is critical to this success, as it is difficult to make reliable projections for some factors, for example in demand and in foreign exchange rates.

b. Selection of options

There are a variety of contract types for public-private partnerships. The selection of the best available option depends on the intended outcome; if there is inefficiency in operation and maintenance that needs to be improved; and if the public utility is to be run on a lease basis in order to improve operating efficiency, or will be investment and management of the utility under BOT or under full-utility concessions. There are different types of management contract, as in some places only operation and maintenance is required from the private sector, with annual payments made to the operator, while collection of tariffs would be the sole responsibility of public agencies; in other cases, tariff collection may also be the responsibility of the same or a separate private operator. Similarly, lease contracts are made between a private operator and a public agency to take over an existing utility, which might need some improvements. Then the operator can operate the utility and pay a share of the annual profits to the public agency.

All these contractual arrangements may carry different types of construction, material, and revenue risks and guarantees; hence each contract may focus on a different set of government priorities for specific goals, including attracting foreign direct investment, technology transfer, and capacity

development, as operators will hand over the utilities after a certain number of years under the terms of the agreement. Credit support is mainly provided by a third party, which may be an international agency like the International Finance Corporation (IFC), as the risks are high in UEI due to lower profits and longer payback periods as well as difficulties in implementing user charges in comparison to private-sector investments and also in comparison to other infrastructure projects like telecommunications, power supply, and transport.

In China, significant economic variations among cities and regions make it difficult to recommend any one contractual type for all UEI development projects. Operation and maintenance (O & M) contracts may be best for cities where facilities are already constructed but their efficiency is relatively poor (in terms of cost per unit of production). If efficiency is improved through an O & M contract, then huge savings can be made, which will lower subsidies or tariffs. On the other hand, in the near future, introduction of a mixed system, in which the municipality owns the system and a private company runs the system, will increase after the transfer of facilities to local governments: this “after-management” arrangement is now in place in France.⁷ Most Chinese cities are at the stage of facility construction. There are many BOT and joint-venture projects being carried out in the area of sewage treatment and municipal solid waste incinerator plants. Private-sector finance for construction projects is the most appropriate option because construction of these plants is a major task. BOT contracts would be better in cities like Beijing, where local governments want to improve the quality and quantity of services by building more and better treatment plants. Concession models may be better in cities where income levels are high, income disparities are not wide, and there is social acceptance of the concept of communities paying the private sector for public goods. To better identify which types of contract are appropriate for different cities or regions, some additional research into indicators will be required.

Low tariffs do not help in reaching water conservation targets. Experiences in Manila show that it is necessary to analyze the entire content of a bid, not just choose the bid that offers the lowest tariff rates. A cost-based formula, based on average cost per unit of production, may not take into account the potential for cost savings due to economies of scale. Moreover, a uniform tariff structure for all the customers may not be a viable or efficient option for resource allocation, as has been shown by experiences in Macau, where there is a uniform tariff for all consumers, as the city’s economy is rich and they can bear the subsidies easily (Chang and Memon 2003).

4.5. The French PPP model and its applicability to China

Sewage treatment infrastructure in France was developed in the 1940s using private capital under concession contracts, since neither the state nor municipalities had adequate funds at that time. The challenge was to build the facilities fast enough to get sufficient revenue back from the customers connected to the networks in order to invest it in construction of new UEI. China faces the same problems as France did in the 1940s, as it is in the early stages of economic development and the Government has financial difficulties. On the other hand, China can call on long experiences of repeated “public sector failure” and “market failure” in developed countries in order to ensure that it finds the

⁷ Lessons for China from UEI development experience in France are discussed in section 4.5.

right balance. China is approaching the solution of “public sector failure,” and as yet has no experience of “market failure” (see figure 4). The French experience shows a good balance between publicly and privately operated utilities, which solved these two problems; public operation and private operation have coexisted. In the latter part of the twentieth century, municipalities in France had more financial resources at their disposal and were more socialist-oriented, so they created water utilities by themselves. The balance between public and private operation has also been lately reinforced because of strong demand from society for public operation of UEI.

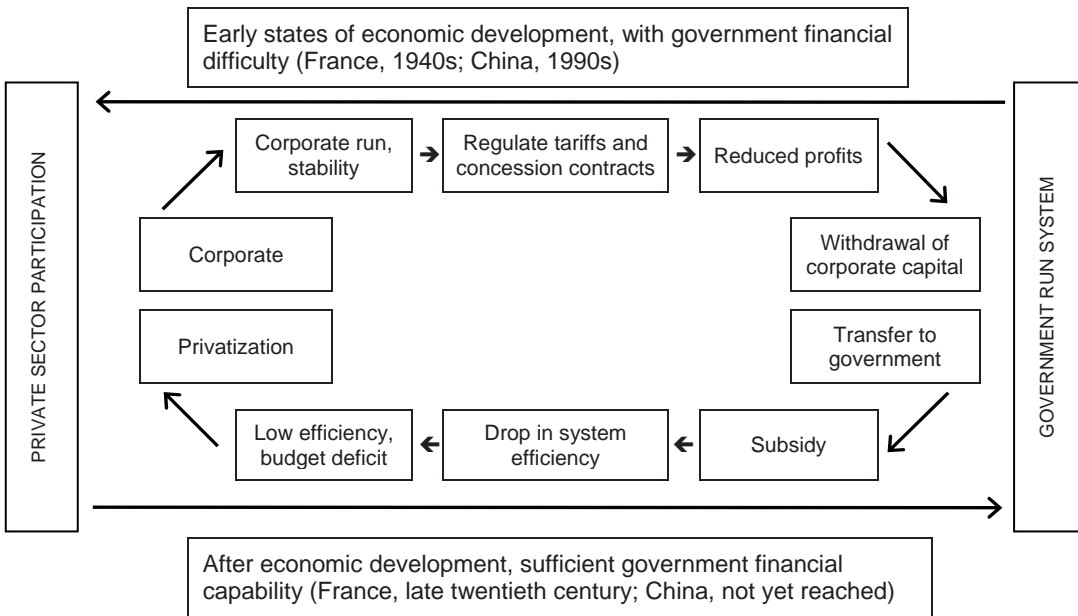


Figure 4. Development process of sewage treatment facilities in France

Balancing public and private involvement in UEI provision is quite important because public operation represents real competition to private companies. Municipalities also provide data that can be used to compare publicly operated with privately operated utilities. However, municipalities who operate UEI by themselves are protective of their production capacity data, while private companies keep their data confidential for strategic reasons. The management framework used in France can provide a scenario and a good reference-point for China. There are three main ways that French local utilities are currently managed. The municipality may both provide investment in and operate the utility: this is the *municipal corporation* type of management contract. Conversely, a private company may be required for both investment and operation: this is the *concession* type. Between these is a mixed system, in which the municipality is in charge of the assets and a private company is in charge of operation and maintenance: this is the *affermage* type. Affermage contracts allow a private operator to deliver services with a greater degree of freedom than is possible with a management contract. Currently, private

operators supply 55 percent of the population with sewage treatment services (Bonnet 2002). In most cases, the management system is the *affermage* type. This French model can be considered as a future vision for China, because the relationship between the public sector and the private sector, and the available project options, are similar.

5. Conclusions and recommendations for China

Public-private partnership can increase the coverage of urban environmental services and thus improve urban environments. The goals of efficiency and equity, along with dynamic economic impacts on environmental industries, may also be achieved if PPP is planned and implemented well.

PPP-based projects and services could be a viable option to achieve the target of UEI development in China. However, careful design and implementation of PPP projects can only guarantee to meet this objective over the long term. The Government, with the help of stakeholders—mainly beneficiaries and people or organizations otherwise affected by such projects, along with international development agencies, donors, and the private sector—should address various issues before embarking on large-scale use of PPP, including the following: putting in place the appropriate legislation, regulatory framework, and institutions; building public awareness to generate social acceptance of PPP; disseminating publicly on all aspects of PPP; analyzing and understanding diversity in and between cities; taking a long-term perspective for the public interest; ensuring mechanisms are in place to resist the formation of monopolies and cartels; ensuring a clear shared understanding of the goals and the roadmap. Governments have to also ensure that, if technology transfer is one of the objectives of PPP, then black box syndrome is avoided. BOT projects are supposed to be transferred back to the public sector after the contract period; hence, governments may explicitly put a clause on technology transfer in the agreement.

This study attempts to analyze the policy implications of, and implementation process for, PPP-based projects and services, with a special focus on assisting the Chinese government in formulating financial strategies and establishing financial mechanisms for UEI. The key outcomes of the analysis are:

- (1) It is important to identify the appropriate roles and responsibilities of the public-sector and private-sector partners. PPP-based projects and services should satisfy the interests of both groups in order to realize optimum efficiency in construction and operation/management and effectiveness of the projects and services to contribute to overall urban environmental management. The ideal role-sharing between public and private sectors should be based on optimizing social welfare by reducing the risks to each partner. For this reason, various risks under PPP-based projects and services should be allocated to the partner that can best handle that risk, whether private sector or public sector.
- (2) Private-sector participation does not in itself ensure success unless there is a good combination of competent and qualified concessionaire, capital, local knowledge, appropriate technology and expertise, and regulatory framework, including regulations on tariffs.
- (3) The primary need is to strengthen legislation on PPP for UEI. In addressing issues such as corporatization, opening of the market through deregulation, providing access to the private sector by creating an enabling policy environment, tariff policies, and preferential taxation, it

might be appropriate that the Government brings all the current views on PPP from different organizations, investors, and scholars, and of individual public-sector departments into one integral ordinance issued by the State Council (“Ordinance on the Promotion of PPP of UEI Services”). This ordinance should be designed to improve the authority and feasibility of enforcement and ensure sound development of PPP. Following the reform process of China’s public utility sector, the Government should plan to establish a special law on PPP for public utilities, including UEI.

- (4) Establishment of a public monitoring and management system to assess enterprise performance is recommended for state-owned enterprises, collective enterprises, private enterprises, foreign-funded enterprises, and joint ventures. It is also recommended to develop quantitative and qualitative indices as criteria for evaluation of prevention of urban environment degradation. Furthermore, targets for raising living conditions and bringing improvements to reduce poverty could also be achieved through improved financial management, efficiency of the services (minimal cost to society), technology innovation, and social participation in performance evaluation, and establishing a monitoring and reporting system for enterprise activity for local governments. In order to prevent non-compliance and secondary pollution, the UEI facilities may be regarded as pollution sources and be included in the monitoring schemes of local environmental protection bureaus.
- (5) As far as the common risks are concerned, political and legal risks could be dealt with at the national level through legislation or commitments. Social, economic, and environmental risks could be better dealt with at local level.
- (6) It may be a good idea to categorize China into several geographical or socio-economic zones. Regional-level policy development is required in China due to the wide economic disparities. In China’s eastern region, where most of the cities can recover full costs through user charges, the fundamental conditions are in place for intensive PPP-based UEI development. In contrast, the conditions for promotion of PPP in western China are much less favorable. However, government-affiliated businesses in charge of operating sewage-treatment facilities and solid waste disposal services should be transformed into independent corporations operating on commercial principles. If the user charges are insufficient to attract private funds, the Government can provide financial subsidies. Existing and new facilities constructed by the Government may be contracted out or leased out to such corporations. The TOT model could be used to facilitate cost recovery, then BOT contracts or joint-ventures could be gradually introduced. For specific PPP models, experiences in the eastern region can be analyzed to formulate policies for the western region. On the other hand, preferential policies could be fully utilized to provide extra incentives to the private sector to finance UEI projects in poor regions. Some regions, in particular the western region of China, have been identified as areas that require special assistance for development and could benefit from implementation support for these types of activity. The financial, technical, and managerial risks could be effectively mitigated by forming appropriate joint venture companies, which can take on the risks and are in the best position to mitigate them.

- (7) It is recommended that policies and techniques are developed to mobilize China's large base of personal savings for financing new infrastructure projects through domestic capital markets. It is necessary to encourage strong domestic banking and domestic businesses to take a leading role in PPP-based initiatives.
- (8) Providing training on relevant knowledge and technology would improve the capacity of local governments to implement PPP in UEI construction and operation. The training program should be designed for both local governmental officials and corporate managers. The content of the training program may include: relevant government policies on PPP in urban wastewater treatment and solid waste disposal; financing for UEI; models for PPP and their related advantages and risks; sample contracts for different models such as BOT, joint venture, and management contracts; key technologies for urban wastewater treatment and solid waste disposal; and supervision and management of PPP (CCICED 2003). Implementation of pilot activities might be helpful to provide a foundation for PPP-based projects as well as dissemination of the information to various stakeholders.
- (9) It is necessary to establish an impartial organization and a consulting company for contract management. City governments need to engage high-quality advisers to plan and implement the entire process.
- (10) Sanitation and water supply should be combined as one package for the purposes of PPP, and consumers should be obliged to purchase both water and sewerage connections simultaneously.

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