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Kitakyushu Initiative for a Clean Environment in Developing Countries: Public-Private Partnerships for Sustainable Urban Environmental Management

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1 Introduction

Urban population growth rates are higher in developing countries than the average national growth rates. Although most of the development agencies were undertaking rural development projects to improve the living standards in rural areas, the migration towards urban centers is a continuing phenomenon in the developing countries. Therefore, the realistic challenge for development agencies is not to halt the expansion of urban centers, but to address the challenges, including environmental issues, faced by the cities.

International development initiatives are trying to help the developing countries to meet these challenges. However, it is comparatively a recent approach to assist the municipalities in place of national governments, as these are directly responsible for most of the urban environmental services. Furthermore, there is a growing trend to make local authorities independent. Moreover, now decisions are being made on demand responsive approach (DRA), to only invest for meeting the real demand from the users.

Kitakyushu Initiative for a Clean Environment also follows this trend. This initiative aims for capacity development of municipalities to improve their urban environmental management. Under this initiative, various successful practices have been gathered and pilot projects have been initiated. This initiative can provide good input for development agencies to promote sustainable urban environmental management through capacity development.

Capacity development of municipalities has various aspects including institutional strengthening, policies and regulations for environment, financial mechanism for environmental services, technology, public awareness, and stakeholder participation. All these aspects can be further divided to narrow down the research agenda for specific policy outcomes. For example institutional strengthening can be further divided into organizational structure, human resource management, jurisdictions and decision-making process, and linkages of municipalities with central government, provincial government, local communities, private sector, and other stakeholders.

Similarly the financial mechanism for environmental services can be further divided into public sector finance, community-based finance, purely private sector finance, and public-private partnerships. The investment for the environmental services like water supply and wastewater in the cities is bulky and risky. Public sector in developing countries does not have enough money to invest and private sector do not want to risk their investments in the public services, where it takes many years to recover the investment and make profits. Therefore, public-private partnerships are being promoted by the international and national agencies to provide urban environmental services.

This paper aims to analyze public-private partnerships, under the overall scenario of capacity development for municipalities to meet their environmental challenges. The two major issues, linked with the successful implementation of

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public-private partnerships, would be addressed. One is pricing policies, tariff, and subsidies to make this business attractive for investment. The other aspect is the contractual arrangements, which covers institutional setup, type of agreement, debt and equity considerations and mismatch between domestic currency revenue and foreign currency borrowing, monopolistic nature of the service, and public awareness.

In the next section, we briefly define inception, mandate, and methodology of Kitakyushu Initiative for a Clean Environment. The third section defines the role of municipalities for meeting the urban environmental challenges, and the capacity development targets for provision of sustainable environmental services. The fourth section discusses the implementation public-private partnerships by appropriate policies and contractual arrangements. We will also briefly touch on Chinese case for wastewater management in this section. The last section concludes this paper by proposing the ways and means to promote public-private partnerships to provide environmental services.

2 Kitakyushu Initiative for a Clean Environment

Kitakyushu Initiative[2] was adapted at the 4th Ministerial Conference on Environment and Development in Asia and Pacific (MCED), coordinated by United Nations the Economic and Social Commission for Asia and the Pacific (ESCAP) in Kitakyushu city during year 2000. Kitakyushu City has a successful history of overcoming urban environmental challenges and the city government is now helping other cities in the region for sustainable urban environmental management.

To take an initiative for the cities located in Asia and Pacific region, Kitakyushu Initiative is intended to act as a priority mechanism in the implementation of the "Regional Action Program for Environmentally Sound and Sustainable Development, 2001-2005," specifically in relation to environmental quality and human health. It aims to work in conjunction with local initiatives and commitments, including such activities as Local Agenda 21, as well as all societal actors, including national governments, donor organizations, academia, and local communities.

Kitakyushu Initiative mandates the achievement of measurable progress in improvement of the urban environment in major cities in Asia and the Pacific, mainly through local initiatives aiming at control of air and water pollution and minimization of all kinds of wastes. This will be achieved through the use of all available technical, institutional, regulatory, and participatory measures. Moreover, KICE aims to improve the capacity of local governments, as those are the closest governments with the people and also having primary responsibility to provide environmental services.

Kitakyushu Initiative aims to promote ground-level activities to achieve tangible improvements in urban environmental quality. The initiative also encourages the transfer of successful practices through inter-city cooperation, learning from experiences of cities with the aim of strengthening local initiatives and enhancing partnerships, with these experiences to be shared through an action-based Network. Kitakyushu Initiative seeks support from national governments to provide the setting for socioeconomic and technological conditions, legislative infrastructure, and bilateral/multilateral donor assistance; policies on sustainable development, collaboration with existing international initiatives; and promotion of multi-stakeholder partnerships.

To implement this initiative, Institute for Global Environmental Strategies (IGES), Kitakyushu office is a providing coordination and secretariat services. Furthermore, this initiative is different from other similar initiatives, as it

gets directly involved with the local governments and other stakeholders to carry out ground level activities, networking of cities, collection of successful practices, and information dissemination.

2.1 Successful practices

Under Kitakyushu Initiative, we are collecting the successful practices in urban environmental management to provide practical examples for the network cities to improve their capacity to meet their own challenges. The successful stories are being collected from Japan, China, Korea, Indonesia and other countries. Here, we will only briefly present a few successful examples, as all the information is available at the web site (footnote 2).

Kitakyushu city: This city in Japan has a rich experience in overcoming all the urban environmental challenges, as this was one of the most polluted cities in Japan during 1960's and early 70's due to the industry related pollution such as high sulfur oxides concentrations and dust fall. Since then drastic measures were taken by the city to improve its air quality. As a result, Kitakyushu City could enjoy high economic growth as well as the improvement in air quality in later years. Recognizing the achievement of Kitakyushu City, it was awarded Global 500 Award by UNEP in 1990.

This was achieved through strengthening of local regulations, enhancing of institutional capacity, fuel substitution and fuel quality improvement, clean technology and abatement measures, industrial relocations, financial mechanism and subsidiary measures, and future considerations in planning process.

Dalian city: This city in China is growing up rapidly and due to its economic growth, there were negative environmental impacts. However, due to effective urban environmental management, there are considerable achievements in air and water quality. The counter measures against the pollution control include policy and regulation, and administration for relocation, removal, and merger, scaling down, and selling of the enterprises. The government also improved financial policies, technology and monitoring to control the industrial pollution.

2.2 Pilot projects

Under Kitakyushu Initiative, we are carrying out the pilot projects to improve the capacity of local governments for meeting overall environmental challenges. The cities are only provided with a small grant through ESCAP and IGES, in collaboration with other experts, works on capacity building and also in the areas of public awareness and community participation. We are citing two pilot projects over here.

Nakhon Ratchasima (Korat): This city in Thailand is facing the sever problem of water quality in Lumtakong Canal, when it passes through the municipality boundaries. There was solid waste in the canal, and the communities, living on the banks of the canal, discharge their wastewater directly. To address this problem, the municipality started public awareness campaign for the cleaning of the solid waste from the canal. To control the quality of the wastewater, they have constructed simple water treatment plants in the two communities, where BOD level has been changed from 188 to 66. The municipality tries to compost the organic solid waste, collected from the canal. KICE assist this city in community participation, public awareness, construction of simple wastewater plants with improved technology, and advice on overall solid waste and composting.

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[2] All the details of Kitakyushu Initiative and materials are available at the web site: http://www.iges.or.jp/kitakyushu

Nonthaburi city: This city in Thailand is facing a challenge for solid waste management. Hence their aim is to minimize the solid waste by maximizing the separating recyclable waste at source. Therefore, two communities have been selected and public awareness campaign has been started. These communities are being provided separate bags to collect recyclable materials. Municipality arranges the collection of the recyclable materials and then sells those to the recycling shops. The earnings are being divided equally between collectors and the communities. This will encourage communities to manage their recycling materials on sustainable basis. For other solid waste, the municipality charges minimum of 20 bhat and it increases with the weight of the waste. The municipality composts the waste, from the falling trees and from fruit markets, and uses the composting material for public parks or sells those fertilizers. The municipality aims to increase recyclable materials up to 30% of total waste and decrease the solid waste by 20%. IGES is assisting the cities for their capacity building to meet these targets.

In addition to these pilot activities, other activities will shortly be finalized and among these, we will be working on public-private partnership for wastewater management in Weihai, China. This research may directly support that activity and other similar pilot activities under Kitakyushu Initiative.

3 Capacity development for municipalities

In urban centers, local governments or municipalities are responsible to provide the environmental services including water supply, sewerage, and solid waste management (O'Sullivan 2000). However, this is the biggest challenge for the municipalities, as most of the services in the developing countries are either not available or run into the problems due to weak institutions and due to scarcity of the resources. Hence the availability of optimal social and physical infrastructures is crucial factor for urban environmental management.

Ostrom et al. (1993) suggests that social infrastructure consists of institutions, which based on the people, and the patterns of regular, repetitive interactions among them transform inputs into outputs. The institutions include families, private firms, government agencies, local communities, NGOs, and so on. For urban environmental management, municipalities are playing a greater role; however, these institutions are not performing at the optimal levels due to various reasons. The most important aspects include the job description for the people, and incentives and accountability to perform up to the best levels. Then either there are no firm rules, regulations, and incentives to generate revenues, and to promote public-private partnerships, or their enforcement is an issue.

Provision and maintenance of the physical infrastructure has been a long-lasting challenge for the municipalities due to financial constraints, as most of the services require the cross-subsidies and due to budget deficits the required funding is not available. A part from financial constraints, the lack of proper planning, designing, construction, and operation and maintenance also hampers the performance of the physical infrastructure. However, these problems are mainly linked with the social infrastructure.

The policies for the environment are either not framed or not implemented, especially the policies on the pollution and the regulations to either enforce standards or to charge the polluter or consumers for the environmental services. This

also leads towards insufficient revenue generation to finance the environment services. Moreover, community and stakeholder participation was traditionally not the part of either decision-making or the implementation of the decisions.

Hence, capacity development of municipalities must be targeted for all of these major areas. Figure 1 identifies all the major areas, which could be addressed, as they are equally important for municipalities to achieve sustainable environmental management. We will briefly discuss all these areas in the following paragraphs.

Institutional strengthening: The direct focus is on municipality; however, the institutional strengthening of central and provincial governments, and civil society institutions may also be addressed, if that fits into the goals for the institutional strengthening of the municipalities. These goals are to improve: jurisdiction for decision-making and implementation including linkages with central and provincial governments and communities, clear role of departments within municipality including departmental hierarchy and interdepartmental coordination, human resources with proper job descriptions and job skills, and room for physical and human resource growth.

Policies and regulations: The municipalities should effectively develop policies for environmental services and then draw the regulations in line with these policies. The environmental regulations' aim is not only to curtail the environmental pollution, but also to generate revenue for the environmental services. Hence the proper understanding of command and control (CAC) regulations and market based instruments (MBI) is important with reference to local conditions. The environmental policies also incorporate the equity consideration.

Financial mechanism: The investment in environmental services like water supply and wastewater treatment is bulky, indivisible, risky, and monopolistic. Hence, the public sector, with limited funds, and private sector, due to risks and long periods of recovery, may not be able to finance these services on their own. This has led to formation of public-private partnerships to finance and manage these services. However, all the options and ways and means to adopt these options should be clearly established.

Technological considerations: The adaptation of any particular technology for the environmental services, various considerations should be well understood by the municipalities. The understanding for local versus imported technology, capital versus labor intensive technology is essential to adapt an appropriate technology. Usually local technology is low tech, traditional, with indigenous knowledge, and widely accepted. The imported technology is more often a high tech and acquired through aid or foreign direct investment, and having a black box phenomenon. The capital-intensive technology is usually considered as efficient with high initial costs and lower operation costs, while, labor-intensive technology may be appropriate if labor is cheap.

Public awareness: This is a very crucial factor for effective urban environmental management. On the one hand, the public awareness helps to understand the impact of pollution and conservation, so people can change their behavior to

become environmental friendly. On the other hand, the awareness may also target to make environmental policies, including privatization, acceptable to the local communities.

Stakeholder participation: The municipalities should adapt towards stakeholder participation, as this improves the decision-making and implementation process. In the traditional bureaucratic style, there is no mechanism to induce active role of the stakeholders, including communities and industries. The rule of business may be improved accordingly to maximize the stakeholder participation.

For this paper, our main focus is public-private partnerships; thus, we will discuss these partnerships and the policies and contractual arrangements for successful implementation of these partnerships to undertake urban environmental services, especially water supply and wastewater treatment.

4 Public-private partnerships

The concept of public-private partnerships covers whole range of options involving private sector, including community ownership and management, to provide and/or manage the urban environmental services like water supply and wastewater treatment. We will discuss those options in the second sub-section on "contractual management." Here first we briefly discuss the reasons to opting for public-private partnerships and in the next sub-section we will discuss the pricing and subsidy policies for making the investments viable.

Traditional public sector agencies have been facing many problems to provide water supply and wastewater treatment services. These problems include financial constraints for installation of the services, operating inefficiencies in terms of higher operation and maintenance costs and lower recovery for each unit of production, limited human and technical resources, and bureaucratic and political interference.

Municipalities in the developing countries usually do not have access to financial resources as either central or provincial government is collecting most of the taxes. Hence, the decentralization arguments also include the financial decentralization (Shah 1998). Municipalities should have enough resources either through tax collection system or through commercial activities to improve the financial resources. The municipalities with enough financial resources can only provide standard services, as huge capital investment is required. Furthermore, the investment in water supply and wastewater treatment services is bulky and payback periods are long; hence, even if the rate of return is reasonable, the municipalities cannot generate enough resources to support the expansion of these services to meet the demand. This problem has led to invite private sector investments under public-private partnerships.

The second problem is operating efficiency, as most of the public sector services are generating operating losses. There are two major reasons for this. One is higher operation and maintenance costs per unit of production. This is due to inefficiency in terms of human other resources engaged, corruption, obsolete technology with higher difference in input-output ratio. The other reason of operating inefficiency is lower recovery per unit production. This due to lower tariffs coupled with higher losses, which are unpaid due to either theft or lower motivation for recovery, or due to old pipelines

which is also known as system losses. Public-private partnerships may improve the operating efficiency, as the costs would be reduced with higher efficiency, and imposition and collection of tariffs would be improved.

The third major problem is the availability of human and capital resources. In comparison with the central and provincial governments, there are limited resources available to municipalities. The qualified persons are in short supply and technical capacity of the municipalities is also quite low. Hence, the performance of municipalities is quite low to manage some sophisticated works involving water supply and wastewater treatment. This problem of insufficient human resources is different from overstaffing, where the municipalities are over burdened with the staff, but most of that staff is not well qualified to perform the job. Public-private partnerships may bring qualified people and technical resources to get the job done well, as their financial investment is at the stake.

The problem of bureaucratic and political interference is also a major issue, which has lead towards the discussion for decentralization (Shah 1998). The officers in the municipality may also belong to provincial and central governments; hence, their transfer from one municipality to other or to the other agency can lead towards weak commitments. In most of the developing countries, projects and plans are known from their ownership; hence, political changes and the management change leave many plans inconclusive. Then, political leaders may influence their agenda on the municipalities, which might not be in line to make public services viable and self-sustaining. Furthermore, trade unions, most often, play a damaging role by asking for more pays and more staff to work in these services. Public-private partnerships are believed to be working without bureaucratic and political influence including trade unions.

Although, it is been established that private-public partnerships can yield better results to provide standard services for most of the communities living in the urban areas; however, the questions remains how to motivate private sector and communities to form public-private partnerships. Here, we will look into the discussions on pricing regulations and tariffs, which is the basic issue to achieve financial sustainability, and then we will look into to contractual arrangements, which may offer different type of incentives for the public-private partnerships.

4.1 Pricing regulations and tariff

Pricing regulation and tariff design is the most important issue to raise the financial sustainability of water supply and wastewater treatment. First of all we will discuss about the pricing regulations. For the private goods, market demand studies are good to draw demand and supply curve and arrive at a price or break-even point for production costs versus demand price. However, for the public goods like water supply and wastewater charges, the market studies are difficult to be done due to monopolistic nature of the goods. Non-market valuation techniques including stated preference (contingent valuation), revealed preference (averting behavior method, hedonic prices), and cost-of-illness method is being commonly adopted to ascertain willingness to pay for the public goods. Some studies are based on mineral bottled water or the vendor charges. However, these prices are not realistic as either only a friction of the society is consuming bottled water or the people from poor communities, who use vendors, are using the services below their normal demand.

Contingent valuation is the best available practice for the developing countries to ascertain the demand and willingness to pay (Whittington 1998, Memon and Matsuoka 2001). The studies show that people are willing to pay more for standard utilities than what they are paying for sub-standard utilities at the moment (Altaf et al. 1993). Hence, higher

prices can be recovered, if the quality and quantity of the services could be improved. This objective is inline with the public-private partnerships, as they are supposed to improve the standard of the services. Hence, we can draw a new demand curve through a contingent valuation study.

For the supply curve, usually long-term marginal cost is assumed as the best way to put the price on the service. For the practical purposes, it is difficult to estimate the optimal production quantity (Q*) from marginal cost curve. Hence, we also need to calculate long-term average cost. The cross-section, where both costs are equal, is the optimal level of production. However, most of the water supply and wastewater services are bulky investments, as the demand for these services have to be calculated over certain years to incorporate population growth rates and improved living standards of the society. Hence, short-term, or facility specific cost curves are more appropriate. Furthermore, from the demand curve, based on a willingness to pay study, we can draw an average revenue per each unit of production. Then, we can draw a break-even point, where normal profits can be made by the utility, is the inter-section for all the three curves viz.: marginal cost, average total cost, and average revenue as shown in Fig 2.

Most of the studies support average incremental cost (AIC), as the optimum economic price for the services (Majumdar 1990). The total incremental costs include the investment costs and operating costs, as AIC can be calculated by dividing the discounting incremental costs by the corresponding discount volume of water/wastewater by the utlity:

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

Where "I_t" is the investment cost (usually investment costs are considered as the initial costs incurring during first phase of installation; however, some replacement costs or additional installation costs may be required over the life of the utility). Recurrence costs or operation and maintenance are from year Zero to the end of project (in most of projects, operation and maintenance costs start with the start of production; however, some fixed recurring costs may start from the beginning of construction and installation phase). The incremental volume of water/wastewater is "Q_t-Q_0" and the interest rate is "i".

Under the perfect competition, the price will be independent of the output from a company; however, water supply and wastewater treatment services are monopolistic in nature and prices has been set by regulations and not influenced directly by the market mechanism. However, the pricing policies should incorporate the mechanism to deal the inflation and other uncertainties.

Tariff design: This is the most crucial aspect for the policy makers, as they have to optimally mix the financial and social aspects, as the society is a group of rich as well as poor households and these public services are meant for all. Due to this consideration, a cross-subsidy has been the most traditional way to adjust the tariffs. There are various ways to calculate for this adjustment depending on the targeted revenue, as shown by Majumdar (1990). However, it has been established that water is a economic and social good and it is not free (Black 1998). Moreover, Kolstad (1999) suggests that without a price

system, polluter (consumer) do not “see” the damage caused by the pollution they emit and if polluter pays a price for every unit of pollution, this corrects market failure, at least in theory.

Although it is established that water is not a free good and every consumer of water supply and wastewater should have to pay, but still the question remains how much? The arguments made by Kolstad do not take care of socioeconomic aspects of the consumers and everyone is being treated at the same scale. However, this is not a market good, rather a public good that should be reached to almost everyone in the community. Therefore, cross subsidies or indirect subsidies from other taxes should make this commodity affordable for all the people, at least up to minimum required levels. This has lead towards the concept of basic charges for a minimum level and then regressive taxes on the additional consumption. The other concept is of identifying the different classes of community either through income tax returns or through their housing and other living standards. Then charge them separately; however, this is a difficult to implement and there can be many loopholes for the charge evasion.

Regressive charges on the industries for water and wastewater services were also being seen unfair for the poor groups in the society, as Tietenberg (1996) observes that pollution tax may be regressive as higher prices hit poor people proportionately more, who spend all their money, then the rich people, who save some of their money. Therefore, subsidies are progressive to maintain vertical and horizontal equity.

The recent assessment shows that cross-subsidies have adverse economic, financial, and other effects which often are not quantified or appreciated (Yepes 1999). First of all, the different set of prices to generate the targeted revenue may send wrong signals to the different groups of consumers and may adjust their consumption accordingly. For example, in Fig 3, the poor group is being charged less generating losses, which should be cross-subsidized from the profits to be generated through high prices on rich group. However, the poor group might find water/wastewater as a very cheap commodity which could be exploited at the maximum, and they do not have any incentive to conserve water. On the other hand, rich group may also find this commodity as costly and may not use on the principles of economic efficiency. Therefore, the welfare of society also cannot be achieved at the optimal level.

The second problem is the difference between predicted and actual revenue. As shown in same Fig 3, the predicted revenue from both groups of the society may be in line with targeted revenue to achieve breakeven point (Fig 2). However, the people, who are paying higher prices, may either adjust their demand or try to find other cheaper sources. Hence, the actual revenue may fall short of the predicted revenue and may cause loss to the operator. Due to this problem, minimum throughput guarantees from the government are required by the private operators (we will discuss this in the next section).

The third problem is the collection of the revenue. In the poor group, the revenue is so low that leaves little motivation for the collectors and sometimes overhead costs of issuing bills and collecting revenue exceeds the actual revenue being collected. This also gives a negative motivation for the collection of the revenue from that group of the society. On the other hand, the higher charges for the rich group may provide incentives for the corruption and in developing countries, this is the worst problem in most the tax collection departments.

This suggests that cross-subsidies often damage the economic and financial objectives rather to support social justice. Then how to proceed? The best option may be to estimate the demand with willingness to pay studies and then compare that demand curve with the supply curve of the utility. If there are losses, then the government can subsidize losses

from the other sectors like income tax. However, if there is substantial difference between the rich and poor groups of the community, then the same willingness to pay studies can help to draw different demand curves and in poor areas, the base consumption level and price may be charged accordingly. This loss should not be cross-subsidize by increasing the prices in the rich areas beyond their willingness to pay rather these can be subsidized same way from the other sectors.

The other important aspect of tariff in this sector is concerned with the involvement of different agencies. For example, in Thailand separate ministries are responsible for water supply and wastewater treatment and water supply tariff is the responsibility of Ministry of Interior via Metropolitan or Provincial Water Authorities (MWA or PWA) while wastewater charges have to be collected by Ministry of Science, Technology, and Education, via the Pollution Control Authority (PCD) and Wastewater management Authority (WMA). The most suitable way is to make one organization responsible for tariff collection, as this will not only save overhead charges but it will also save confusion to many consumers who are not used to pay charges especially wastewater collection charges.

Tariff design for public-private partnerships cannot be left to them, as they are natural monopolies with judicial and political guarantees. Hence, government should carefully assess the tariffs and their impact on the affordability and the consumption levels of the community.

4.2 Contractual arrangements

Inviting private investment and/or management for water supply and wastewater treatment, there is a need of attractive contracts for the private sector. These attractive contracts should be comparable with the other opportunities available for the private sector. However, it is difficult to draw a direct comparison, as the nature of the investments is quite different and in the public-private sector, many factors have not yet realized fully, as this is a very recent trend. The major differences are due to investment in infrastructure projects, which characterized by large and sunk investments with long payback periods. Due to this reason, the public sector with scarce resources cannot arrange the investments on their own and the private sector cannot invest in this risky business without any guarantees and attractive terms and conditions.

The risks for the private sector are multifold, as the recovery of tariffs is sometimes a political issue and there may not be enough judicial help to recover the charges or to terminate the services to the communities. The inflation rate is much higher than the pay rise in most of the developing countries; hence, the affordability of the consumers can change within a few years hampering the profits for the operators. The foreign currencies usually appreciate as much higher rate then the local inflation and the gap between the collected revenue in local currency and the borrowing in foreign currency.

These risks can be avoided by proper incentives from the governments including hedging for the foreign exchange risk, the minimum throughput guarantees for the sale and revenue, judicial and political protection, tax incentives, partnerships by providing land and other services, and banning labor unions' powerful role similar to public corporations. Here, the judicial and political protection is the most important factor in the developing countries, as the political stability is an overall guarantee for private sector investment and effective judicial laws and system provides security to the investment. Then, the minimum throughput guarantees in terms of units to be sold (water supply or wastewater treatment) and the revenue for that. Tax incentives or tax holidays can provide an incentive towards profit-loss accounts, and operator can get the higher net profits which may be comparable to other investment alternatives in the private sector. The provision of land

and other services on priority and concession basis is also an incentive for the operator. Therefore, a combination of incentives, regulations, and political and judicial guarantees should be mixed together to make an attractive contract.

There are various contractual types, which can lead towards public-private partnerships. The selection of the best available option depends on the targeted outcome; for example, if there is operation and maintenance inefficiency to be improved, or running a public utility on the lease basis to improve the operating efficiency, or make investments and manage the utility under BOT/BOO or under Full-utility concessions. Please Table 1 for different types of contractual agreements. Under the management contract, there are different contractual types, as in some places only operation and maintenance is required from private sector with annual payments to the operator; however, the collection of tariffs would be the sole responsibility of the public agencies. In the other case, this may also be the part of the same or a separate private operator. Similarly, lease contract is made between a private operator and a public agency to take over a completed utility, which might need some improvements. Then the operator can operate the utility and pay share annual profits with the public sector agency.

Build-Own-Operate (BOO) or Build-Operate-Transfer (BOT) and Concession agreements require private operators to invest their money with commercial risks involved. However, all these contractual agreements may have different type of construction, material, and revenue risks and guarantees. Hence each contract may focus different set of government priorities for specific goals including attracting FDI, technology transfer, and capacity development, as operators will hand over the utilities after certain years under the agreement. The credit support is mainly provided by the third party, which is may be an international agency like IFC, as the risks are high in water supply and wastewater in comparison to private sector investments and also in comparison to other infrastructure projects like telecommunications, power supply, and transport. The final type of contractual agreement is asset sale, where the operator does not need to return back the utility to the government. This is so far being practiced in UK only and its implications for the developing countries are yet to be assessed. Table 2 shows the cash flow and risk profiles of various approaches.

Public-private partnerships, which is normally cited as private operator is not only limited to one investor, but it can be a joint venture of two or more groups, which may also include public agency as a partner. However, that joint venture will be registered as a separate entity as a commercial company and the government will not have the same political leverage as in the case of public corporation. Communities may also take over a utility on the own under any of these contractual arrangements. The community based water supply and wastewater management is getting popular in smaller communities including peri-urban areas or in the slums.

4.3 Chinese case for wastewater management and PPP

Due to limitation of length and time, we will briefly discuss Chinese case for wastewater management and PPP. The statistics and charts are taken from Song Xuntong's findings. First of all, the disposal of wastewater is directly related with the consumption of water. The water consumption depends on many factors, but the most primary factor is supply ability. Hence from Fig 4(a), we can see that the supply ability in China has increased by 47.6% from 1990 to 1998, and the per capita consumption has increased by 37.2% from 175.7 liters to 241.1 liters with any annual growth rate of 4.03%. For urban China, the availability ratio has increased from 89.2% to 96.0%, with an annual growth rate of 0.85%. Urban

consumption population has grown from 156 million to 232 million, a rise of 48.7%. However, the industrial consumption ratio is on the decline due to readjustment of urban industry structure, and the continuous increase of the tertiary industry, new and high-tech industry, and high additional-value-added industries. The ratio of production-use water in total urban water consumption decreased from 72.18% to 57.97%, while ratio of domestic water consumption increased from 27.82% to 42.03%, as shown in Fig 14(b).

This is also evident from Fig 14(c) that urban water consumption volume is declining since its peak in 1994, although 46 new cities were added to country's city list by 1998. However, per capita household consumption is growing rapidly growing at the rate of 2.22% and it is about 141.5 litters per capita against the European countries, where growth rate is 0.41% at 161 liters per capita. We will not discuss here the subsidies and losses for the water supply firms, due to limitation space. We will directly move to wastewater management.

From Fig 14(d), we can see wastewater collection network had increased by 1.18 folds from 57,000 kilometers to 125,900 kilometers in 1998. The daily treatment capacity of urban wastewater treatment plants has registered a comparatively rapid growth, but absolute value of the capacity is still very low, as shown in Fig 14(e) and Fig 14(f). To meet the demand, fixed asset investment in construction of urban wastewater facilities has increased very fast as shown in Fig 14(g). However, still the ratio of Chinese wastewater management coverage is much lower to the cities in the developed countries as shown in Fig 14(h).

This data strongly supports the prospects of intense investment in wastewater facilities, and as government may not increase its already increased share of investments, the private sector may be attracted to invest in this sector. However these public-private partnerships for wastewater management need a careful assessment of the following issues:

i. Tariff: The current level of tariff is not enough to even operate and maintain the services; thus requiring continuous government subsidies, and due to increasing fiscal burdens and increasing wastewater coverage, government may not be able to provide the required subsidies. Moreover, the tariff does not reflect the economic value leading towards the exploitation by the consumers at the cost of refusing a right for other consumers, who are not yet covered by the facilities. However, as discussed in the previous sections, poor consumers may not be charged at the real price levels, due to their low affordability; therefore, an appropriate tariff-subsidy system should be designed in accordance with the socio-economic realities. These socio-economic realities should also not be generalized for all over China, as Eastern region is quite different than Western region and midland.

ii. Risk and benefit sharing in PPP agreements: Government needs to provide various guarantees for risk sharing. These include minimum throughput in terms of units to be produced (wastewater treatment) or tariff to be collected for overall revenue to support the viability of the investment. In some of those agreements, government may compensate through tax holidays, interest free loans, free land and existing infrastructure, and so on. However, all of those subsidies should be evaluated from existing market prices to come up with realistic financial figures. Similarly benefits, profits on the investment, should be shared in accordance with the risk sharing. For governments, it may be suitable to draw mechanism for re-investing those benefits to improve the environmental services for the public.

5 Conclusion

This paper shows that carefully designed and well implemented initiatives like Kitakyushu initiative may be more effective, as they respond to the local level initiatives for their capacity development to meet the urban environmental challenges including water supply, wastewater treatment, and solid waste managemnt. Furthermore, it is helpful to create a network of the municipalities for transferring successful practices into future projects for the other cities. Kitakyushu initiative is working with the municipalities to improve their capacity through institutional strengthening, policy and regulations, financial mechanism, technology, public awareness, and stakeholder participation. Hence, the mix of the strategies is being adapted for all the projects. Kitakyushu initiative is a demand responsive approach, which is vital to get commitments from the municipalities to be the active partners.

Public-private partnerships is a new trend to meet the urban environmental challenges, as municipalities are not having resources to finance and operate the services including water supply and wastewater treatment. Hence to attract the private sector resources, municipalities have to provide attractive conditions including appropriate tariff to get sustainable financial mechanism, and other incentives under contractual arrangements.

For designing tariff, the pricing policy is vital and for infrastructure projects, usually long term marginal costs provide the basis to decide the price. However, incremental average cost AIC is more realistic way to calculate the price for the each unit of production. To transfer that price in a tariff may not be straightforward for the public utilities, which should also be provided to even poor group of the society. Therefore, the basic demand level may be subsidized to make it affordable for all the members of society. However, care should be taken, as if estimate the expected revenue based on cross-subsidization then the collected revenue may be less, as rich people may avoid either paying the extra cost or they may not utilize the services at the potential level at that cost. The poor people may loose initiative to conserve on cheap costs. Hence this will create welfare losses.

The public-private partnerships require attractive contractual arrangements and public agencies have to target specific areas for the public-private partnerships. There is variety of ways to involve private sector including for operation and maintenance, management, investment and management, and total ownership. Hence appropriate contractual arrangements should be made with proper mix of the incentives and regulations. These include political and judicial guarantees, minimum throughput guarantees, and tax holidays.

Overall public-private partnerships may provide a good way out for the municipalities to provide water supply and wastewater treatment services to the wider communities at the earliest and on sustainable basis. However, in the developing countries, these experiences are new and require more in-depth understanding of all the risks and the policies to avoid those risks including monopoly risk.

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Fig 1 Capacity development for Urban Environmental Management

Urban Environmental Challenges	Institutional Strengthening	Public Awareness	Stakeholder Participation	Financial Mechanism	Policies and Regulations	Choice of Technology
Water Supply & Waste Water Management						
Solid Waste Management						
Industrial Pollution Management						
Energy related Pollution Management						
Transportation related Pollution Management						
Slums & land-use Management						
	Monitoring and Evaluation (M&E) System					

Fig 2 Pricing regulations (break even point for normal profit)

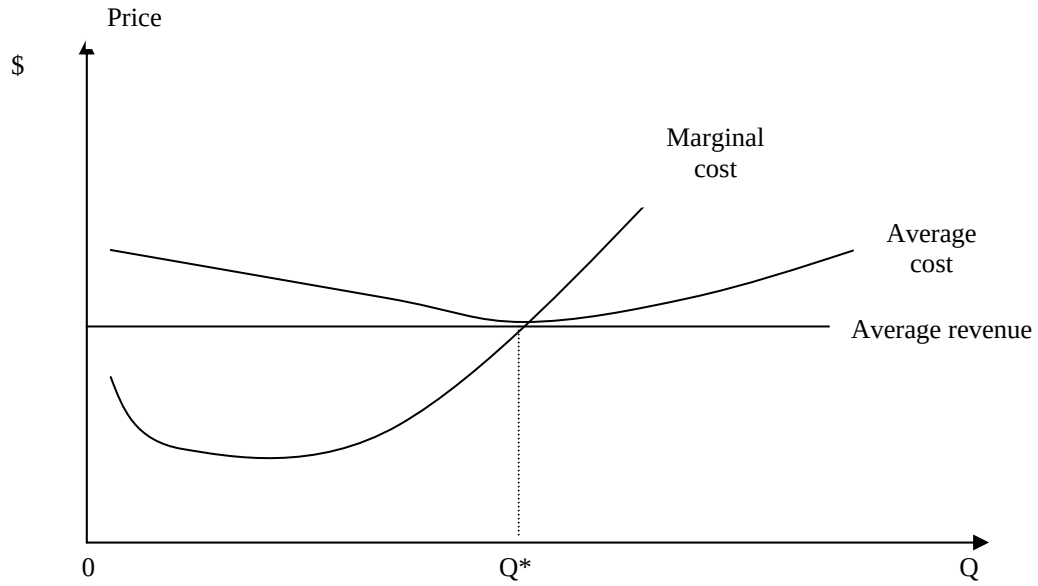


Fig 3 Revenue under cross-subsidy

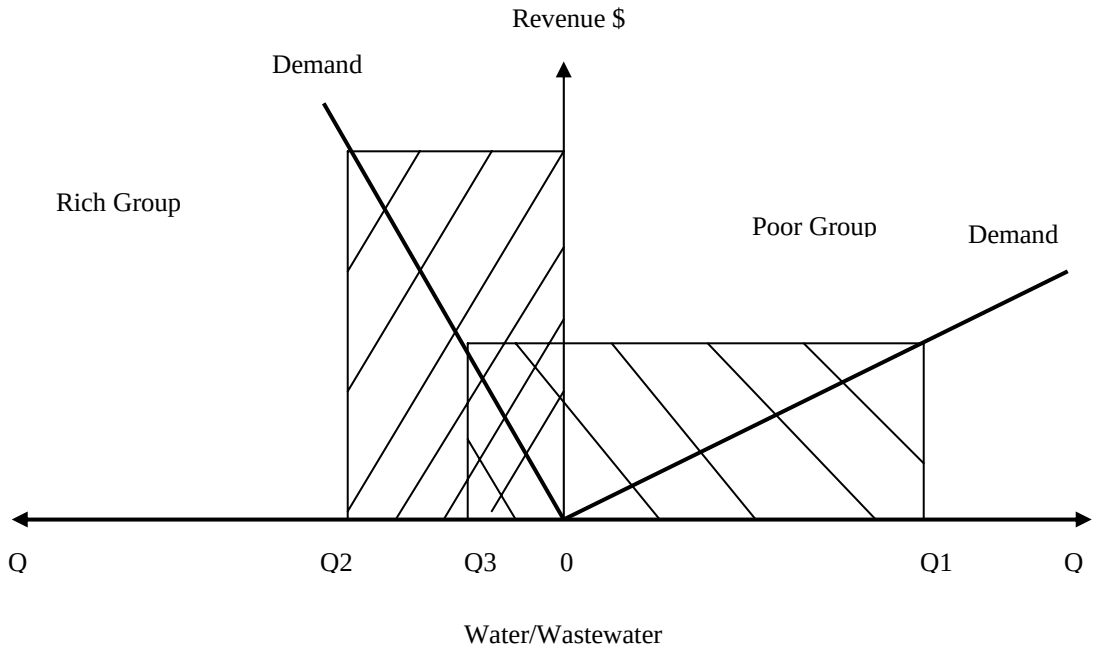
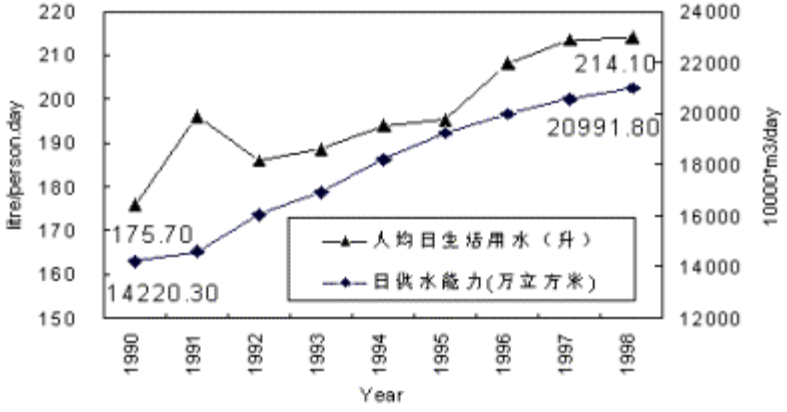
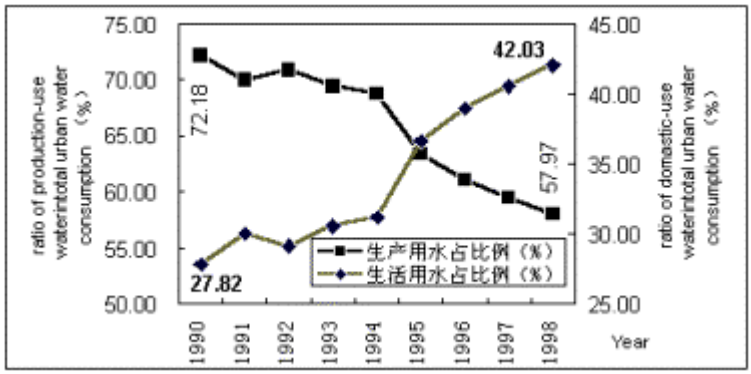


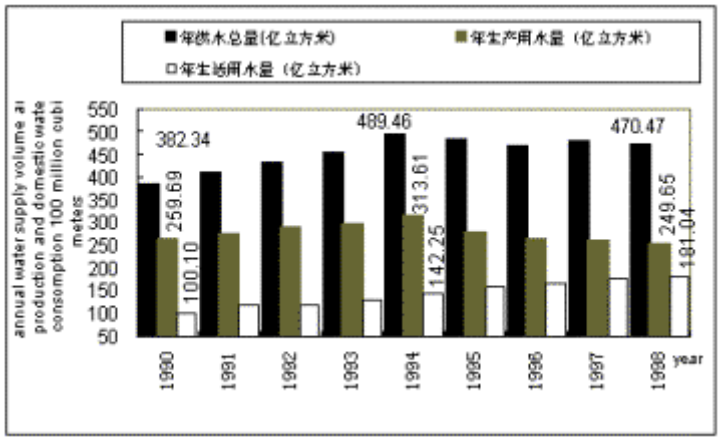
Fig 4 Wastewater management scenario in China



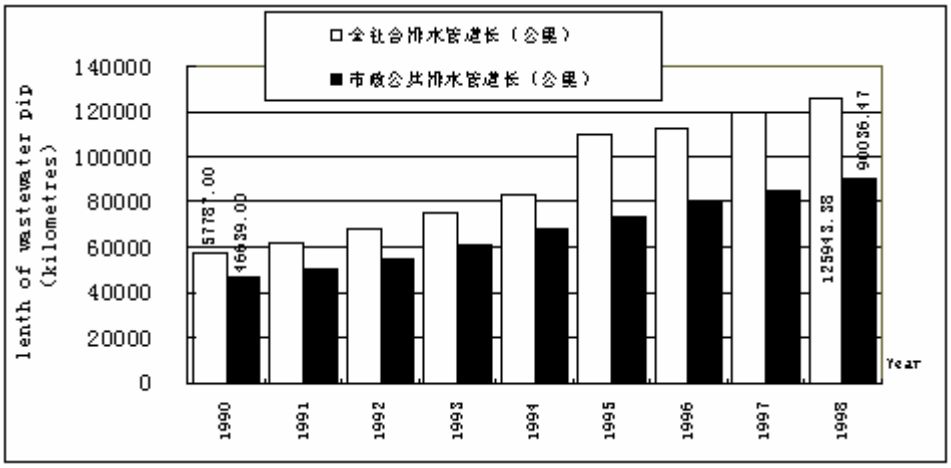
(a) Statistics Chart on Urban Daily Water Supply Capacity and Domestic Water Consumption Per Capita Per Day



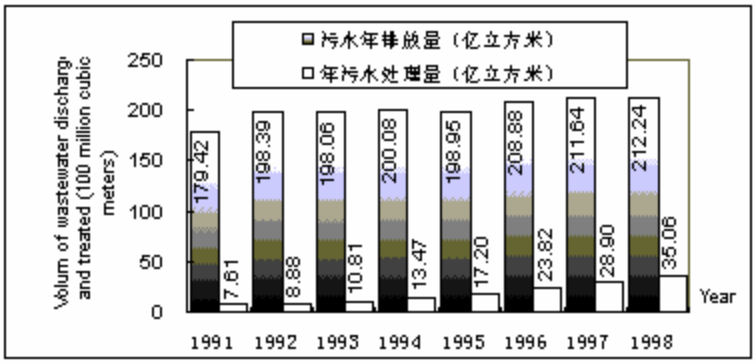
(b) Statistics Chart on Ratios of Urban Production-Use WaterAnd Domestic Water Consumption



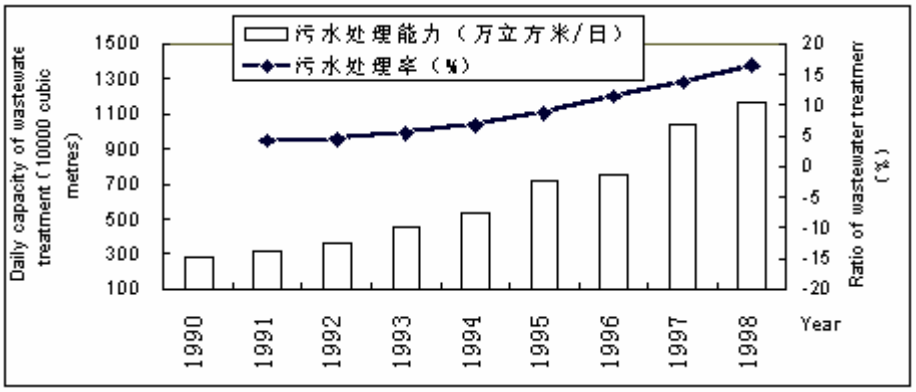
(c) Statistics Chart of Total Urban Annual Water Supply Volume, Annual Production-Use Water Volume and Annual Domestic Water Consumption Volume



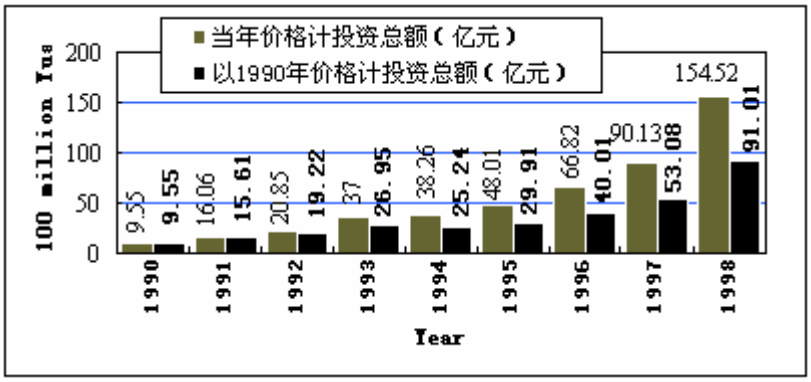
(d) Statistics Chart of Urban Public Wastewater Pipes



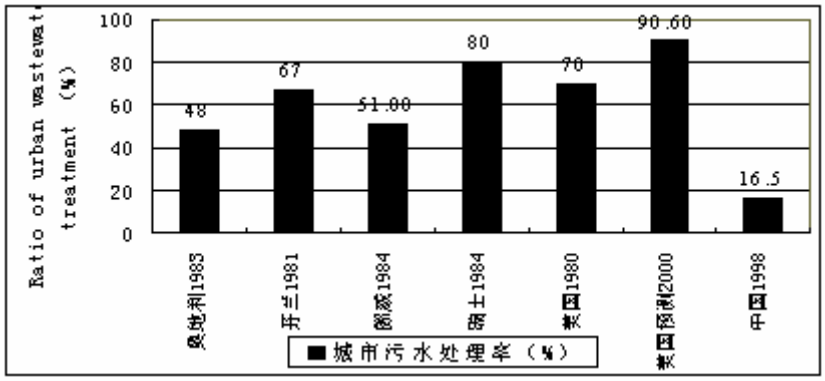
(e) Statistics Chart of Annual Volume of Urban Wastewater discharged and Treated



(f) Statistics Chart of Urban Wastewater Treatment Capacity and Ratio of Wastewater Treated



(g) Statistics Chart of Fixed Asset investment in construction of urban wastewater facilities



(h) A Comparison Statistics Chart of Wastewater Treatment Ratios in Chinese and Foreign Cities

Source: Song Xutong, “Development Characteristics of China's Urban Water Supply & Wastewater and the Counter-measures for Urban Water Management” http://www.h2o-china.com/english/technical-paper/tp-21th.htm

Table 1 Allocation of responsibilities in alternative approaches

	Management contract	Lease contract	BOT/BOO [1] concession	Full-utility concession	Asset sale
	Responsibilities allocated to				
Ownership	Public	Public	Public	Public	Private
Investment	Public	Public	Private	Private	Private
Operation	Private	Private	Private	Private	Private
Tariff collection	Public/private	Private	Public	Private	Private
	Recent cases				
	Puerto Rico Mexico City Trinidad and Tobago Antalya, Turkey	Guinea Gdansk, Poland North Bohemia, Czech Republic	Johor, Malaysia Sydney, Australia Izmit, Turkey Chihuahua, Mexico	Buenos Aires, Argentina Malaysia Limeria, Brazil Côte d'Ivoire Macao	England and Wales

Adapted from Haarmeyer, D, Mody, A (1998), Tapping the Private Sector, RMC Discussion Paper 122, The World Bank, Washington, DC

[1] The abbreviation BOT denotes build-operate-transfer; BOO denotes build-own-operate.

Table 2 Cash flow and risk profiles of various approaches

	O&M [1] contract	**Lease contract**	**BOT [1] concession**	**Full-utility concession**	**Asset sale**
Time horizon	25 years	10 years	10 to 20 years	20 to 30 years	In perpetuity
Customer	Government	Retail customer	Government	Retail customer	Retail customer
Cash flow profile	Fixed-fee for service	Subject to market risk	Contracted payments due after construction	Subject to market risk	Subject to market risk
Construction risk	None	None	High	Low	Very low
Regulatory risk	None	Medium	Low	High	Very high

Adapted from Haarmeyer, D, Mody, A (1998), Tapping the Private Sector, RMC Discussion Paper 122, The World Bank, Washington, DC

[1] The abbreviation O&M denotes operation-and-maintenance; BOT denotes build-operate-transfer.