World Bank Analytical and Advisory Assistance (AAA) Program
China: Addressing Water Scarcity – From Analysis to Action
Policy Note

Water Supply Pricing In China:

Economic Efficiency, Environment, and Social Affordability

The World Bank

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Environmental and natural resources management issues are an integral part of the development challenge in the East Asia and Pacific (EAP) Region. The Environment Strategy for the World Bank in the East Asia and Pacific Region has provided the conceptual framework for setting priorities, strengthening the policy and institutional frameworks for sustainable development, and addressing key environmental and social development challenges through projects, programs, policy dialogue, non-lending services, and partnerships. This study provides a forum for discussion on good practices and policy issues within the development community and with client countries.

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Abstract

The overriding issue in Chinese water management is the increasing cost and scarcity of water. Special mention must be made of the fact that pricing policy has a potentially critical role to play in addressing this problem. This report addresses pricing issues with respect to one segment of the water sector as a whole, namely the supply of water – and the disposal of wastewater – relating to residential, industrial, and commercial use. It therefore excludes by far the major user of water in terms of volume, namely the agricultural sector.

Repeated studies have shown that water and sewerage prices in China are generally too low, and efforts must be made to increase them to achieve operational efficiency goals, generate adequate revenues, and encourage efficient rates of consumption. While the first step in price reform is to fully achieve financial cost recovery, this should be seen as an interim objective only. More ambitiously, the pricing of water and sewerage should reflect the increasing long-run marginal costs of water supply and its disposal, specifically addressing the costs of environmental damage in production and consumption, and the opportunity costs of depletion. This is referred to as marginal opportunity cost (MOC) pricing.

Such an approach will require price increases well in excess of those used to achieve financial cost recovery alone and will have to be reconciled with the need to ensure that poor people and communities obtain an adequate supply of water for their basic needs. Already enshrined in Chinese national legislation, increasing block tariffs in urban areas will typically be the route to follow in this regard. A two-part tariff can be used to ensure affordable service for basic needs to low income consumers, with the top block ideally reflecting true economic and environmental costs.

Volumetric pricing covering both supply and disposal costs is clearly required for this to be possible, although metering decisions must be subjected to cost-benefit analysis and introduced on a case-by-case basis. The case for metering will increase as both incomes and water supply costs increase. Such a policy may possibly be complemented by parallel targeted and temporary income support programs or vouchers to be exchanged for water and sanitation service. Subsidies to poorer communities, in rural areas in particular, will usually be required for at least initial investment in infrastructure, but operation and maintenance expenditures should be recovered from users, and always clearly earmarked for this purpose whether or not volumetric pricing is used.

Efficient resource management for the water sector as a whole requires parallel reforms for competing water uses such as agricultural and direct industrial abstraction. In addition, wider economic development planning requires an estimate of the true economic and environmental costs of water resources even if full-scale price reform is politically not feasible in the short term. For reasons of economic

efficiency, social equity, and acceptability, a gradual approach to price reform will typically be required. Public hearings, consumer education, and transparency are necessary to overcome resistance to price reform, especially when the quality of the existing service is poor.

To summarize, the key messages of this paper are as follows: (a) pricing policy is an essential tool to improve the efficiency of water use, protect the water environment, and address water scarcity problems; (b) given the magnitude of water scarcity in China, the country should aggressively implement tariff reforms based upon the MOC concept; (c) public acceptability of price reform and affordability of water by the poor are important concerns although these can be resolved by appropriate water tariff structures and community outreach programs; and (d) since international experience offers limited guidance in this area, China should exercise its own leadership before the water crisis in the country becomes unmanageable.

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It was based on a set of case studies in Chongqing, Beijing, Hai River Basin, Shandong, and Henan as listed below. The AAA is managed by Jian Xie. The key members involved in the case studies included Linjun Zhou, Qi Dong, Zhi Zhang, Wenchao Jiang, Hua Wang, and Thomas Zearley for the Chongqing studies; Shiqiu Zhang, Liangchun Deng, Peng Yue, and Huishan Cui for the Beijing study; Hao Wang, Liping Jiang, Ariel Dinar, Geoffrey Spencer, and Ximing Zhang for the Hai Basin study; and Kunimasa Nishigaya and Shenhua Wang for the small towns study. This policy note benefited from the comments of Andres Liebenthal, Bert Hofman, Thomas Zearley, Susanna Smets, and peer reviewers Jan Bojö and Salah Darghouth. It also benefited from discussion with participants of the two technical review workshops held in Beijing and Chongqing, respectively, in November 2007.

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1. Introduction

China is facing severe water problems, in terms of both quantity and quality. Improved pricing of water supply and sewerage in both urban and rural areas is one of a number of important policy instruments that can help ensure that this increasingly scarce resource is used both efficiently and equitably.

Compared to many other developing countries, China has political will and public support for water pricing. The general public is willing to pay for water supply services as long as the quality of the service is good and the tariff level acceptable. The country is able to collect revenue from water tariffs to cover at least the operation and maintenance costs of most water supply utilities, even in several rural communities.

However, water pricing in China is still inadequate to finance efficient utility management, and, more fundamentally, to achieve sustainable long term development of water resources. This problem has already been addressed in a number of studies; for instance, a recent analysis of the issue is contained in the World Bank report: "*Stepping Up: Improving the Performance of China's Urban Water Utilities*" (World Bank, 2007, referred to subsequently as "*Stepping Up*") which addressed general management aspects of the urban water sector. While these studies have typically proposed price reform to encourage more efficient and less wasteful use of water, their main focus has generally been a financial one, with concern being expressed about the adequacy of cost recovery to permit the efficient operation of the concerned enterprises and the ability to finance needed system expansion.

The present policy note concurs with the general consensus on this aspect and should be seen as complementary to the World Bank report mentioned earlier. However, instead of addressing the issues concerning the management of the water utilities which have been dealt with extensively in other studies, this policy note focuses on the implications of the rapidly escalating costs of water supply due to environmental damage, resource scarcity and its depletion, and on the social implications of pricing reform for residential, industrial and commercial water supply. It highlights the issue of how to ensure an adequate supply of water for poorer households and communities in light of these increasing costs. Agricultural water use, by far the most significant in terms of volume, is largely excluded in the report

The findings and conclusions of this policy note are drawn heavily from a set of background case studies which include a willingness to pay (WTP) survey and a water tariff reform study in Chongqing, an economic valuation of water resources in the Hai River Basin, the impact upon real incomes of water tariff reforms in Beijing, and small town case studies in the provinces of Shandong, Henan and Chongqing.

The policy note is divided into seven sections. Section 2 presents a brief introduction to national water pricing policy and actual practice in China, with

special reference to financial performance of the concerned utilities. Section 3 looks beyond financial objectives, emphasizing that, in principle, prices should reflect true economic, environmental, and depletion costs. Section 4 addresses the issue of social impact and affordability and Section 5 then considers ways to ensure that price reform is compatible with the need to protect the poor. Section 6 refers to a number of implementation issues, including the need to overcome resistance to price reform, financial aspects, and metering. It also refers to strategic issues which transcend the authority of water and sanitation utilities, and which, in practice, will require a gradual approach to price reform on both economic efficiency as well as equity grounds. Summary and recommendations are presented in Section 7.

2. Policy and Practice

The *Administrative Regulation on Urban Water Supply Pricing*, introduced in 1998, provides a legal basis for water supply pricing in China. The regulation states that: 1) the general principles of setting water tariffs are "cost recovery, reasonable revenue, water conservation and social equity"; 2) municipalities are responsible for approving water tariffs; 3) tariffs should cover operation and maintenance, depreciation, and interest costs; 4) tariffs should allow for an 8 to10 percent return on the net value of fixed assets, depending on the sources of funds; 5) tariffs should be appropriate to local characteristics and social affordability; 6) a two-part tariff consisting of a fixed demand charge and a volumetric charge or increasing block tariff (IBT) should be gradually adopted; 7) the first block of IBT should meet the basic living need of residents; and 8) public hearings and notices should be conducted in the decision making process of setting water tariffs. To meet the objective of cost recovery, regular tariff increases may be necessary in many Chinese cities.

Prior to 1996, charges for wastewater discharges applied only to industrial enterprises, but they were very low. Typically set at 0.08 to 0.10 yuan/cubic meter, they did not raise significant revenues. In 1996, the *Water Pollution Prevention Law* provided a legal basis for charging wastewater fees to all users connected to an urban sewerage network, stipulating, among other things, that urban sewerage should be treated in a centralized wastewater treatment plant, and its usage should be subject to a wastewater treatment fee to ensure effective operation of such facilities. Currently, typical large-sized and megacities in China charge from one to over three yuan/cubic meter of water for residential use. The wastewater treatment fee ranges between 0.25 and 1.00 yuan/cubic meter.

Charges for water and sewerage in China vary according to consumer category. Volumetric pricing (requiring metering) is used for single family, commercial and industrial users, and apartment buildings, but rarely for individual apartments within those buildings, where only bulk meters are used. Cross-subsidization between consumer classes is common, with industrial and commercial consumers typically paying 1.5 times as much per cubic meter than households.

In addition to tariffs for the water supply and wastewater facilities, water bills typically include a water resource fee and a water development fee. The water development fee is based upon the allocated cost of the raw water supply infrastructure. The water resource fee, in principle, reflects the opportunity cost and scarcity of the actual raw water source, and is charged to all the water users. Guided by the *Ordinance of Water Permits and Water Resource Fee Management*, which replaced the old water permit management ordinance and became effective in April 2006, water resource fees are determined by the local government(s) concerned. Different areas have different levels based on the actual status of water resources. For

instance, Beijing now charges 1.10 yuan for its water resource fee but Chongqing only 0.10 yuan. In practice, this fee rarely approaches the level required to cover true opportunity costs in their respective cities. According to the Ordinance, the water resource fee goes to the local and central governments as part of general revenue.

Water tariffs in China have been increasing constantly since the inception of the economic reform process, for example, increasing from 0.80 to 3.70 yuan (by 3.4 times in real terms) in Beijing from 1997 to 2004 and from 0.85 to 2.8 yuan in Chongqing from 1999 to 2006, and they will continue to rise. Although the legal basis for full cost recovery is present, and while considerable progress has been made in recent years in this regard, much improvement is still required, even in the best performing systems (see Box 1, which refers to the Beijing situation). This applies in particular to wastewater financing. Charging residential consumers for wastewater management other than a purely nominal amount is now observed in only a few cities, and most frequently under conditions imposed by multilateral lenders. Subsidization from general government revenues is thus the norm.

Box 1: Water and Sewerage Pricing in Beijing

Since the late 1970s, water has been priced volumetrically in Beijing. Prior to 1997, the pricing policy in Beijing did not embrace the concept of full cost recovery, i.e. recovery of capital, operations and maintenance costs (O&M), and wastewater treatment. Since 1997, however, the real price of water in Beijing has increased sharply. Furthermore, in 1998, an additional volumetric tariff for wastewater treatment was added. In addition to covering the cost of supply, the water laws, policies, and regulations are very much concerned with water saving and conservation and the protection of water resources. In this sense, pricing has also been promoted as an instrument of water demand management.

The price of water in Beijing reflects a number of different cost items. For example, the tariff in 2003 was 2.9 yuan/cubic meter. This consisted of a water resource fee (for both surface and groundwater) of 0.6 yuan/cubic meter, a sewage treatment fee of 0.6 yuan/cubic meter, a tap water fee of 1.7 yuan/cubic meter to cover the fixed and variable (capital and O&M) costs of the water supply company, and a tax of 0.33 RMB/cubic meter paid to the Beijing municipality. This breakdown reflects the structure stipulated in China's Price Law and the National Guidelines on Water Tariffs. At present, the price of water in Beijing is the highest in all the cities in China and recent price adjustments for the residential sector have been focused on the sewage treatment fee and water resource charge, rather than the tap water tariff. Despite these reforms, including a further increase in the residential water tariff to 3.7 yuan/cubic meter in 2004, water and sewerage in Beijing remain subsidized even in strictly financial terms.

As stated in "*Stepping Up*", the result of the above is that many urban water utilities in China experience financial and operational stress. Since user fees are well below the full cost recovery level, utilities are forced to rely on unreliable municipal capital contributions and government payments, and, even when provided, government payments are usually not enough to fill the gap between the true cost of service and the revenue from users. The general recommendation therefore is that the financial and operational performance of urban water utilities should be improved by ensuring that water and wastewater utilities (including drainage bureaus) can meet their financial obligations through user fees only, and by adjusting tariff structures to ensure more reliable and higher utility revenues with

government funding limited to capital contributions. Clearly, constraints to such a policy arise in the case of low income communities and in rural areas in particular where a subsidy will often be unavoidable if adequate services are to be supplied. In rural water supply projects, it is common for local governments to subsidize connections through a grant to the poor who otherwise cannot afford the connection.

3. Marginal Costs, Environment, and Depletion

General Principles

Full recovery of financial costs for water supply and wastewater management is a critically important and undeniably ambitious objective. Nevertheless, even this should be seen as a stepping stone to an even more ambitious goal. In order that consumers can reveal their willingness to pay for the water they consume (and thus its value), it is necessary that they be charged a price that reflects the real economic cost of using it. This requires that the cost be defined, not simply as the average historic cost of supply incurred by the water utility, but as the cost of producing additional or marginal supplies, which are required as demand increases. Such a pricing policy provides a signal as to whether investment in additional capacity is justified - a critical function where the cost of water is escalating rapidly.

In practice, therefore, long-run marginal cost should be used as a basis for cost recovery in order to avoid frequent price fluctuations that would otherwise be implied where investments in additional capacity do not follow a smooth trend over time. Long-run marginal cost in such cases can be approximated by discounting the future stream of unit costs (or costs per cubic meter), a concept sometimes referred to as “discounted unit cost” or “average incremental cost”. A key implication of this approach is where unit costs of water rise rapidly, marginal costs by definition are greater than average costs, and so a policy based on this principle would require tariff levels considerably in excess of those required for financial cost recovery alone.

However, there are still more costs to be considered in addition to the investment and operating costs incurred by the water utility. The supply of water may involve a variety of environmental costs. When they involve the construction and operation of sewerage and sewage treatment systems to handle wastewater, they are, to a limited extent, already factored into the pricing policy, but there are often other environmental impacts which are rarely considered in the context of the pricing policy. While typically difficult to estimate precisely but nevertheless real, these may include ecological impacts due to the construction of reservoirs or cross-country transmission pipelines, and the costs of disposing of wastewater directly into the environment where sewerage and treatment works do not exist. A recent World Bank study on pollution costs in China (World Bank 2007) estimates that water pollution damage to irrigated crops is of the order of 7 billion yuan per year and more than 4 billion to fisheries, implying an average damage cost for these two aspects alone of about 0.24 yuan/ cubic meter of wastewater. This average figure, however, may not be very useful as a guide for a specific municipality, as costs will doubtless vary widely from case to case. Moreover, the costs exclude other ecological damage, threats to public health from direct exposure, and costs of treatment by waterworks, industrial, and commercial users. Nevertheless, the estimates provide an idea of the magnitude of the problem.

Finally, even with tariff levels based on long-run marginal costs of supply, including environmental costs, there might still be absolute water shortages. In principle, efficient pricing in such cases requires tariffs to be raised to ration existing capacity so that consumers are required to pay a price for water equal to its value in the highest alternative use known as the opportunity cost. Therefore, when a community runs into absolute supply constraints, economically efficient water consumption requires that in addition to marginal production and environmental costs, the price of water should also include depletion or scarcity costs. Conventional tariff structures in China actually allow these various components of cost to be identified: for instance, production costs are contained in the water development fee, environmental and depletion costs in the water resource fee, and waste disposal in the sewerage fee.

It is clear that strict adherence to the above rules is unlikely in practice. Even so, they offer guidance to a new strategy for China to adopt in its water management policy. The increasingly well documented evidence about water scarcity, due to a combination of global climate change and resource mismanagement, means that water pricing policies in China, as elsewhere, have a potential role by far transcending that of achieving financial objectives of water and sewerage utilities.

MOC Pricing for Water Supply and Wastewater

The above suggests that attention to the various components of long-run marginal cost is required. Recognition of the importance of these components is evident in the formal designation of this approach as marginal opportunity cost (MOC) pricing. In turn, this can be formally defined as MOC = MDC+MEC +MUC, where MDC is the direct cost of the resources used by the concerned utility to supply additional water and wastewater management facilities, MEC is the external or environmental cost, and MUC the user or depletion cost (Pearce and Markandya, 1989).

The MOC pricing approach has been illustrated by a series of studies conducted under the auspices of the China Council for International Cooperation on Environment and Development (CCICED), in which the rapidly escalating costs of water and its disposal are typically shown to imply the need for prices well in excess of those required to cover the purely financial costs incurred by the utilities concerned (Warford and Li, 2002). However, this will not be equally true in all cases. Adoption of the principle would tend to highlight differences between cities and regions in terms of the real costs of water consumption and disposal, and thus, inter alia, provide important information for regional and economic planning decision making.

A CCICED study conducted in the late 1990s (Spofford, 1998), while noting there were large regional variations in the availability and cost of water with the north of China generally facing water shortages while the south was water-abundant, compared pricing policies for Beijing and Shanghai. It found that in the case of Beijing, where water was in short supply and where massive investments in cross-country transmission of water were projected for the future, prices for non-agricultural use were probably from one sixth to one

tenth of what they should have been with agricultural use being almost free of charge. It was obvious that potentially huge savings could be achieved from price reform. In Shanghai, on the other hand, where supply costs were not rising rapidly, prices roughly approximated the economic cost of supply.

These studies also emphasized that quite apart from avoiding wasteful use at the municipal level, MOC pricing also has a major strategic role. Allowing regional variations in the real cost of water to be reflected in price policy would tend to encourage large water-using industries to shift to where water supplies are cheapest. Improved pricing would also encourage careful consideration of the regional water demands of agriculture, and the scope for meeting future food requirements by means of less water-intensive land use in water-scarce regions.

A study conducted more recently for Beijing also proposes that a pricing policy be developed around the concept of MOC. It is estimated that current residential tariffs are about one half of the long-run marginal cost of water (about 7 yuan/cubic meter), and much less if the costs of depletion and scarcity are included.

Few studies have been conducted to study the implications of the real cost of water scarcity or depletion, which should in principle be reflected in the water resources fee component of the overall price. However, it is generally clear that in regions facing water scarcity, current water resource charges do not come close to reflecting the opportunity costs of depletion costs. This has been documented in one study that has addressed this issue, namely that of the opportunity cost of water in the Hai River Basin (Box 2).

Box 2: Opportunity Cost of Water in the Hai River Basin

Environmental considerations aside, the real, or opportunity cost of water, is either the cost of producing incremental supply or the price necessary to ration existing capacity, whichever is greater. Defined this way, some evidence about the depletion cost of using water in water-scarce regions is obtained from a study of the Hai River Basin. This region has the most severe water related problem among all major water resource regions in China. However, while water production costs, at 5.08 yuan/ cubic meter, are relatively high, they are minimal in comparison with the potential costs of a water shortage in the region. The study estimates the economic value of water (EVW) - or opportunity cost - in terms of value added in alternative industrial or agricultural uses, and finds that the average EVW for economic sectors based on integrated water withdrawal in eight study areas to be 41.8 yuan/cubic meter, in which that for tertiary industry is as high as 208 yuan/cubic meter, the next highest is for construction at 180 yuan/cubic meter, the third is for mining and quarrying at 114 yuan/cubic meter and the lowest is for various agricultural uses, ranging between 3–16 yuan/cubic meter. There is considerable variation in EVW between different areas, with the average EVW in Beijing being the highest and that in Xinxiang is lowest.

With regard to wastewater, the Beijing study referred to above shows that charges roughly equal wastewater treatment costs, but do not cover all the environmental costs involved. Wastewater charges are based on the volume of wastewater discharged which are in turn based on the quantity of

water consumed, and are about 0.9 yuan/cubic meter, which covers only treatment costs. The Beijing study estimates that wastewater treatment will cost around 1.25 yuan/cubic meter by 2010, and proposes that wastewater charges should be equal to or higher than this level.

For residential consumers, whose wastewater discharge is fairly homogeneous, it is convenient to charge for sewerage, sewage treatment and disposal simply on the basis of metered water consumption. This is in contrast to industry and certain types of commercial activity where it is important to distinguish between wastewater dischargers based on the quality of effluents and where a variable tariff should be used based on volume and type of pollutant. In each case, charges for emission of wastewater or pollutants should be based as best as possible on the cost of the environmental damage that is caused.

Seeking guidance on the above topics from international sources is unlikely to be helpful. Reviews of water pricing in OECD countries show that financial cost recovery is usually achieved for water supply, but despite growing concern about shortages, there is little evidence to show that prices are beginning to reflect real economic costs. This is even more apparent in the case of wastewater. A partial exception to this rule can be found in the case of Israel, which has made major efforts to factor depletion costs into pricing schedules for irrigation water. It is frequently the case in OECD countries that private abstraction of water by larger industrial and agricultural users requires payment of abstraction fees, which in principle are aimed at addressing depletion costs, or at least the marginal cost of expanding capacity resulting from such use. However, such payments rarely reflect the true magnitude of the marginal costs involved. In view of this experience, and the urgency of the water problem now facing the country, it is perhaps worthwhile for China to take the lead internationally on this topic.

4. Social Impact and Affordability

Social Impact

Price reform in the water sector worldwide has often encountered strong social and political opposition, and China is no exception to this rule. Local governments in China and elsewhere around the world are often reluctant to raise water tariffs to a sustainable level and, as a result, water subsidy is common in various forms. Although often stemming from concern for the well-being of poorer households, low water tariffs, which result in inadequate financial performance of a water utility, may have perverse income distributional consequences. Evidence from Chongqing City illustrates this general issue.

In 1999, the residential water tariff in Chongqing was around 0.85 yuan/cubic meter. The municipal government provided free capital investment to water utilities, which was equivalent to a subsidy of 1.34 yuan/cubic meter. The municipal water company needed 500 million yuan each year for new construction, extension, and improvement of water supply service. The amount was greater than the total annual budget for all municipal construction activities, the result being that neither the scope nor the quality of water and sewerage services were able to keep up with the rapid rate of economic growth in the city. At that time, inadequate funding meant that only 20 percent of municipal distribution pipelines met national technical specifications, and the water available for residential consumers barely met minimum drinking water standards. Meanwhile only 6 percent of municipal wastewater was treated and untreated domestic and industrial wastewater contaminated public water bodies and threatened human health.

The social impact of low water pricing on the poor was negative and obvious. First, higher income consumers enjoyed better quality service and were the main beneficiaries of the prevailing policy of subsidizing water supply, since they consumed the most water. The 2006 WTP survey shows that in Shapingba District, one of six survey areas within the vicinity of Chongqing Municipality, poor households with monthly incomes below 200 yuan consumed only 0.4–8 cubic meters of water per month (2.4 on average) while those with monthly incomes exceeding 1,500 yuan used from 1.5 to 30 cubic meters (9.6 on average). A previous household survey found that a typical poor family with a monthly income of 500 yuan received only 3.4 yuan per month from water subsidy, while a wealthy family with over 10,000 yuan per month enjoyed a subsidy of over 22 yuan per month.

Second, low water quality and inadequate service invariably have a disproportionate impact upon the poor. Such cases have been extensive and well documented, with inadequate funding precluding extension of networks into underprivileged areas. Again, in Chongqing, the analysis shows that the public spent more on bottled water and other water-related expenses than on metered water due partially to their concerns over poor quality of tap water. Failure to expand and improve service

to low income areas gives poor people no alternative but to consume water of inferior quality often obtained from private sources at an extremely high cost. Moreover, as shown in the Chongqing case, the very poor, who could not afford either of these alternatives, also suffered more from the threat to human health due to consuming low quality water. Indeed, these findings prompted a major evaluation of the relationship between financing public services and poverty issues in the city of Chongqing, referred to subsequently in this paper.

Affordability

Many household surveys done in China show that residents, in both urban and rural towns, are willing to pay for water supply to a certain extent. Their WTP level varies by city and by income category. Nevertheless, affordability by the poor is a concern in any effort at pricing reform. The challenge is therefore to reconcile the objective of economically efficient water use with that of ensuring that poor people obtain adequate service for their essential needs. If safeguards for the poor are built in, price reforms aimed at improving the quality of water services may in fact be a win-win solution.

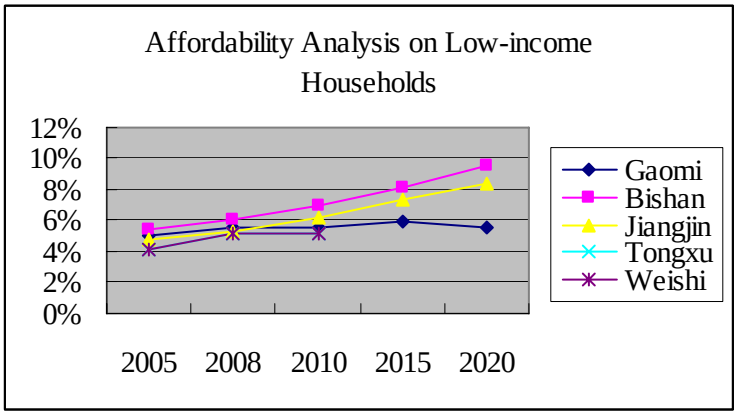
The issue of affordability of water supply by the poor is analyzed and addressed in the studies of Chongqing and five small cities or counties located respectively in Shandong, Henan, and Chongqing. They provide a good illustration of the situation confronting municipal authorities in China. The governments of these cities or counties have undertaken improvement of pricing policy in line with the *Administrative Regulation on Urban Water Tariffs* and compliance with standard World Bank loan conditions for cost recovery, and they show that affordability will be of growing concern as cost recovery requirements tighten.

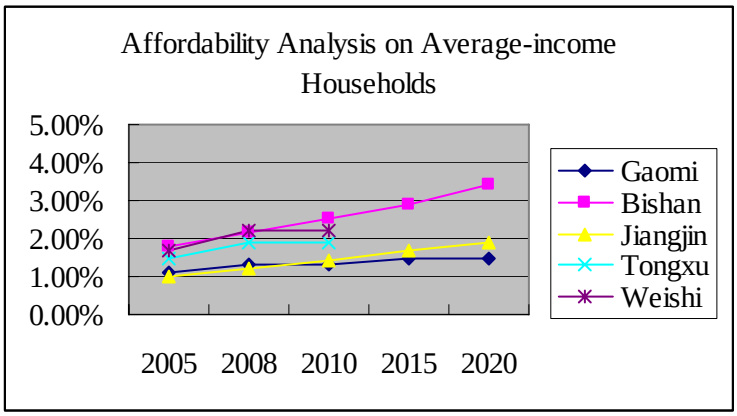
In Chongqing there were 168,000 unemployed people in its urban districts in 2004 comprising approximately 4-5 percent of the total labor force. Local governments provide the unemployed as well as the retired with small pensions ranging from 155 to 210 yuan per month depending on which district they live in but these are sufficient only for basic living requirements. A survey conducted in the summer of 2006 in one urban district and five towns in Chongqing Municipality shows that the low income (less than 400 yuan per month per household) population comprised 5-28 percent of the total sample, indicating that the percentage of the poor is significant and cannot be ignored. As estimated by the survey, the WTP for water by the poor was generally low and barely exceeded the existing water tariff. Even then, it already consisted of about 3 percent of household incomes. It is clear that the poor would be reluctant to accept a new price increase if no financial support is provided. The general public in the city (90 percent of those interviewed during the survey) agreed that it was necessary for the government to provide minimum living support to this group to compensate for further increases in water tariffs.

Box 3 summarizes the situation in five small towns - Gaomi in Shandong Province, Bishan and Jiangjin in Chongqing, Tongxu and Weishi - in Henan Province. In light of the widely accepted view that the maximum proportion of household income to be

spent on water and sanitation should be between 3–5 percent, affordability is clearly an issue, particularly for low income households in each city/county, even before projected increases take place. Among the cities or counties studied, Bishan and Jiangjin present the greatest problems taking into account that given the projected increases in incomes the proportion spent on water and sanitation will be between 8–10 percent by the year 2020. It should also be noted that this is required just to satisfy the relatively narrow objective of financial self-sufficiency for the concerned water authorities; basing prices upon the real economic cost of supply and service would clearly be much more problematic for lower income families.

Box 3: Share of Water and Wastewater Services Expenses for Average and Low Income Households





Before we close the discussion on the affordability of the poor, it should be noted that another important aspect of affordability is that poor communities, often villages or rural towns as a whole, may be unable to afford the investment and operating costs required for the supply of an adequate level of service. This often requires special governmental support, in light of spatial disparity and social equity considerations.

5. Protecting the Poor

Improving pricing policy for water resources while protecting the poor has been a preoccupation with governments worldwide, and a variety of measures have been employed. An OECD report (2003) grouped them into two categories: income support measures and tariff-related measures. Income support measures comprise those which address the individual consumer's affordability problem from the income side, such as water bill reductions or waivers, water service vouchers from the governments, capped tariff rebates and discounts, and payment assistance. Tariff-related measures, normally developed and implemented by governments in their financing role or by the water utility itself, include increasing block rates, capping metered tariffs, special tariffs for low income consumers, subsidized connections to the network, and so on. Similarly, the three general approaches are used China, namely, increasing block rates, income support, and price waivers for the poorest households.

Increasing Block Tariffs

A central issue to be addressed is that raising prices of water may have significantly regressive impacts. While a uniform pricing scheme may attain efficiency conditions at the margin, it also gives rise to affordability problems for poorer sections of the population, with potential threats to their health and general well being.

A common way to address this dilemma is to change the prevailing flat rate tariff structure to one which charges more for higher rates of consumption. Indeed, as noted earlier, concern for social equity in water pricing is already reflected in Chinese national legislation, which makes specific reference to the role of the two-part tariff in ensuring that the poor are able to obtain sufficient water for their basic requirements. More generally, increasing block tariff structures can be used to reflect the true cost of water to customers using large volumes of water while allowing subsidized prices for essential use. Thus, the charges applied to the top block of consumption could reflect the marginal cost of water. The lower blocks provide an element of subsidy and hence protection for low income households. The Beijing study also concurs with this approach and recommends that an IBT system be introduced instead of a uniform tariff for urban domestic water uses to better reflect efficiency and equity considerations.

The Beijing study notes that although an IBT system can result in a gain in welfare improvement, some problems may arise. First are the implications for revenue sufficiency. Significant price elasticities estimated in the study mean that the vast majority of consumers could end up in the lowest block of the IBT and only pay the lifeline tariff. The implication of this is that most households will be subsidized in their water consumption. The tariff will therefore fail to achieve cost recovery and hence the quality of the water supply (regularity, wastage, water quality, and so on) will be hard to sustain or improve. Altering the

various facets of the IBT could resolve the problem. The size of the first block and the size of the steps are thus critical.

The second issue concerns incentives for the water supply enterprise itself, whose objective is full cost recovery or an adequate return on capital. The study notes that when an IBT is introduced, the poor, who are generally subsidized by such tariff structures, may become a lower priority for the water supplier. Thus, a supplier who aims for cost recovery will have even greater incentives than normal to improve service for the more affluent neighborhoods and households than the poorer ones. Special problems thus arise with regard to poorer communities, as illustrated in Box 3. Ultimately, the tariff structure introduced specifically to provide immediate relief to the poor may perversely induce a lower quality service for them in the longer-term. The potential for such incentives, and the regulation required to remove them, needs to be weighed against the potential welfare enhancing effects described above.

A third issue concerns subsidization of the rich. It should be made clear that the IBT system subsidizes all water consumers, rich and poor, for the initial units of water consumption. Furthermore, the subsidy is only available when households consume the full first block of subsidized water. Not all poor households will do this and hence will not receive the full subsidy. Moreover, poor households frequently have larger families than richer households. Although family size appears to be relatively uniform in Beijing, it is likely that at the lowest extremes of the income distribution households will lose out on a system based upon a four-member family. This will be especially true where households share one metered connection.

Experience from Beijing and other cities in China suggest that there is no need to subsidize water in excess of that required for basic household requirements. Over and above this level, water should be treated as any other consumer good, and priced at MOC. A two-step tariff is thus sufficient. Determination of the volume of water that is required for basic needs is therefore crucial, and may well vary according to local economic and climatic conditions. In general, however, the level recommended by the World Health Organization (WHO) of 40 liters per capita per day (about 5 cubic meters per month for a household of 4 persons), should be considered. Within the WHO limits, there is of course some potential for wasteful use or subsidization of consumption by those who do not need it, but this is of academic rather than quantitative significance.

It is important to note that the current practice of some Chinese cities is to set the first block much more than the basic need for living and therefore reduce the effectiveness of water tariffs as an incentive for water saving. For instance, the water tariff scheme adopted in Lijiang City in 2005 shows that the first block is up to 25 cubic meters per household per month which is charged at 1.40 yuan/cubic meter (excluding 0.40 yuan/cubic meter for wastewater treatment), the second block is from 25 to 35 cubic meters at the price of 2.10 yuan (i.e., 50 percent increase of the base price of water supply), and the third and final block is above 35 cubic meters

at the price of 2.80 yuan/cubic meter (i.e., 100 percent increase of the base price). For a typical household of four persons, the per capita quota is far more than that required to meet basic needs as recommended by WHO. The obvious drawback of having an excessive first block would be to provide less incentive for saving more water within the first block and subsidize the rich too much. Strictly ensuring that the first block is adequate for basic health needs, and no more, should therefore be a key aspect in the design of an IBT.

Other Devices

In addition to IBT, other measures, such as provision of minimum living support and water service vouchers, are employed in China to allow the poorest households to obtain adequate water supply services. While designed to be temporary, and to become obsolete as incomes increase, the rapidly escalating costs of water supply may mean that these income support measures remain relevant for the near future, and thus are worthy of serious consideration. Indeed, it is by no means certain that, even with continued rapid economic growth, incomes will increase at a faster rate than the costs of water.

These approaches, in conjunction with other efforts to reconcile economically efficient use of water with concern for the poor, involve a number of practical difficulties. Administrative problems associated with the issuance of vouchers for low income households to exchange for water and sanitation services could include the printing of fake vouchers, while trading of vouchers has also been observed. The provision of direct subsidies, which adds to a wide range of other subsidies aimed at benefiting the poor, creates severe distortions in the overall pricing system and while trading may have some merits in terms of economic efficiency, it may clearly be at odds with the basic objective of a voucher system in terms of protecting the most vulnerable members of the community. Another practical problem is that while a subsidy earmarked for a particular commodity or service, such as water supply, may help to overcome objections to price reform in the short run, this may be of no help when future price increases are proposed. More generally, in a time of rapid change in China, these administrative approaches encounter a common difficulty with large 'floating' and migrant worker populations, the most vulnerable members of society who often do not qualify for support from the local authority in which they currently happen to reside.

In practice, a combination of various methods may be required. This is implicit in the recommendations made in a recent proposal to the Chongqing Municipal Development Reform Commission (Chongqing World Bank Project Management Office, 2007), which refers to a 'Five Orientations' approach in which fund-raising, allocation and estimation of required subsidies, the subsidization method, and management are planned and implemented as one package, and oriented toward an efficient and equitable means of helping the poor. The package includes fund raising by cross-subsidy among water consumers, rational establishment of the basic water requirement per family, use of vouchers that can only be used to pay for water, based upon volume of use, and a management system which ensures consistency and efficiency in collecting

and allocating the subsidies to those who need them most.

Rural and Low Income Communities

The general recommendation that prices should cover both water supply and disposal costs may not be feasible in the short term for poorer communities or for those whose supply costs are particularly high. This may apply in particular to low income rural communities. In such cases, subsidy from general revenues transferred from Provincial or County level authorities as appropriate may be unavoidable for initial investment in infrastructure. Thereafter however, revenues should at least cover operation and maintenance costs. This should be seen as an interim measure. Revenues collected for water supply management should be clearly identified as such and earmarked for that purpose. Populations should become used to the idea of paying for water, even though they may not have household connections or access to sewerage, paving the way for increasing financial self-sufficiency on the part of water and sewerage authorities as ability to pay increases. Establishing a link between local taxation and water use combined with educational campaigns is a necessary component of any strategy to avoid wasteful use.

For deprived areas within an otherwise fiscally sound water supply jurisdiction, assistance may be provided by cross subsidies from higher volume water consumers to facilitiate extension of distribution networks, thereby reducing or eliminating connection fees.

6. Implementation Issues

Overcoming Resistance to Price Reform

Whether within communities or for communities as a whole, increasing prices to cover financial costs is difficult enough. Covering incremental or future costs is clearly even more challenging not only because the levels required will typically be much higher, but also because political and social acceptance of such changes usually requires evidence of actual expenditures. This can be overcome to a certain degree by taxation collected by a public agency per unit of consumption rather than an increase in the revenue accruing to the water company for expenses yet not incurred. It is clear that such problems are compounded when existing services are inadequate. A chicken and egg situation may thus exist since improvement in service may typically require additional revenues but prices cannot be increased when service is poor.

A particular example of difficulty in introducing economically efficient pricing arises in the case of wastewater. There are doubtless cases in which the environmental or social costs of wastewater discharge imposed by water consumers who do not have access to sewers is greater than those who do. Economic efficiency might dictate that the former pay more than the latter, but clearly, the political constraints to such a course of action will typically be prohibitive. This is especially relevant in light of the fact that increased investments in rural water supply in China, resulting in additional wastewater discharge, are typically not accompanied by parallel investments in sewerage and sewage treatment.

As noted earlier, a number of efforts have been made to identify the potential for price reform by estimating consumers' WTP for water. A questionnaire-based survey of households in several cities in Chongqing demonstrates the complexity of such exercises. The study shows that WTP in the considered cities is typically not much greater than the subsidized prices already charged. However, it is unlikely that WTP surveys, using contingent valuation approaches, will be of much practical help in implementing tariff reform. Real WTP, or value of water, is likely to be much greater than that conveyed via questionnaires, and while some industrial and agricultural uses of water can be estimated in terms of expected productivity (as shown in Box 2), the value of water supplied by municipal authorities is only likely to be revealed when consumers are actually confronted with their water bill. However, civil unrest has frequently resulted from tariff reforms when they have been introduced without adequate attention to public concern.

Overcoming resistance to price reform is a problem encountered by water authorities worldwide. The Beijing study referred to above shows how this issue is affected by income and price elasticities of demand, presenting estimates according to income group. The combination of two features, namely: (a) generally low income elasticity; and (b) higher price

elasticities for lower-income groups, confirms intuition that price increases are a much more serious matter for the poorer, typically less well educated, consumers.

The study therefore proposes that greater efforts should be made to involve stakeholders in water pricing policy making, including public hearings to provide opportunity for all stakeholders to state their interests. The public hearing process must be transparent together with enough information disclosure to make the process effective. Above all, price reform should be gradual, and in parallel with perceived improvement in both the quality and extent of access to the water supply and sanitation services. That such an approach can be successful is demonstrated in the case of Chongqing (see Box 4).

Box 4: Making Price Increases Acceptable: The Case of Chongqing

An attempt to obtain public support for price increases that were required to provide funding for improvement and expansion of facilities in Chongqing received a hostile reception at public hearings. Consequently, the Chongqing municipal government conducted a research effort to facilitate a public awareness campaign. This was aimed at educating the population about the costs of supplying water and managing wastewater generated in the city and the impact on service quality if the municipal water supply system was unable to increase revenues. It showed that the primary losers when prices are too low were the poor, whose service standards remained inadequate. Indeed, the wealthier consumers, who consumed the most water, were the biggest beneficiaries from the subsidies involved.

In addition to the educational process, and in recognition of the problems the poor had in paying higher water prices, the Chongqing municipality decided to implement a number of parallel subsidies for disadvantaged groups including the unemployed which would be sufficient to maintain basic living standards which included paying the increased water bills. The study also recognized that a step-by-step approach must be used, and a schedule for gradual increases in prices over a number of years was introduced. Since the public was made aware of the findings of the study and in particular the rationale for the price increase, subsequent public hearings attended by representatives of disadvantaged groups were very constructive. The whole process was instrumental in making the required price increases socially acceptable, and the reforms have apparently been effective in reducing water consumption in the city.

It is also clear that prevailing incentive systems work against serious price reform in the water sector and are a worldwide phenomenon. Formidable obstacles exist even for utility managers in full possession of the facts and who wish to ensure efficient and equitable use of water resources. In China, as in the rest of the world, immense difficulties arise in increasing prices of water and political unrest has often been the result. In the past, the combination of relatively high discount rates of public officials and the long-term nature of the water scarcity issue has been sufficient to preclude effective action. However, the increasing immediacy of the water shortage issue will presumably be matched by an increasing willingness of local and national officials to take the measures urgently required if the performance evaluation system is enhanced to reward local officials who take the risk of pricing reforms.

Financial Implications

The concern often noted about the financial implications of the IBT system may be unfounded if the tariff structure is carefully designed, with the top block reflecting true economic costs. If an MOC approach is used, where, as is normal, marginal costs are rising significantly, revenues will be generated in excess of financial requirements. It is the case in most cities that the bulk of consumption is by a very small proportion of industrial, commercial, and high-income residential consumers. MOC pricing will therefore typically provide ample scope for subsidizing low volume use as well as extension of distribution systems to low income areas.

The question may then arise as to the disposal of any excessive profits that the utility might make when marginal costs are rising. Precise mechanisms for dealing with this will depend upon the form of ownership of the utility concerned. But the general principle should be that profits in excess of the level mandated in national legislation should be recovered by the local government authority and used to augment general revenues, or to substitute for other forms of taxation.

While responsibility for estimating long-run marginal costs of supplying and disposing of water should clearly rest with the utilities concerned, estimation of environmental and depletion costs should be undertaken by local governments, factored into the rate base, and, along with the costs borne directly by the utility itself, passed onto the consumer for cost recovery. Estimation of such costs is complex, but efforts should be made to assign monetary values as far as possible. The water resources fee (covering environmental and depletion costs) should ideally be regional, and estimated by appropriate local government organizations based upon water scarcity in the region. Such a device would create more incentive for utilities to protect scarce resources, while at the same time facilitating a regional approach to water management. Since a locally retained fee may provide an incentive for over-exploitation of water resources at the local level, it is proposed that in the long run, the water resource fee should be reclassified as a tax, the proceeds of which would be transferred to the central government to facilitate water resource development and protection on a nation-wide basis. This is consistent with the method China currently uses to tax coal production.

Metering

Volumetric pricing, which requires meters to measure the amount of water consumed, is necessary to achieve the economic and other objectives of water supply management, but this faces major constraints in China. The vast majority of Chinese urban residents, especially those in medium and larger cities, live in apartment blocks. Water supply companies typically use bulk meters which measure the flow into the apartment building and the building management is responsible for paying the water bill. For the individual consumer, the link between price and consumption is blurred.

While installation of meters in new buildings is increasingly the policy in Chinese cities, much effort is clearly required if universal metering is to be achieved. However, this should be

addressed on a case-by-case basis. It will usually be the case that investment in metering, and the associated meter reading and billing costs, are justified for industrial and commercial users. Nevertheless, these costs may not be warranted for some small consumers, depending in large part upon their levels of consumption and the cost of water, and therefore the savings likely to result from the introduction of metering.

Gradualism

The recommendation of a gradual approach to tariff increases in Chongqing's study is consistent with a major concern that was expressed by the CCICED at its inception in the early 1990s. It was that tariff reform in any one sector, such as water supply, was hampered by the prevalence of market imperfections elsewhere in the economy, which would mean that price reform in the water sector alone may at once be inefficient and inequitable (Warford, 2002). Hence, the proposal is that price reform in the water sector should parallel overall trends in market liberalization in the country.

With the rapid pace of market reform in the succeeding period, such 'second best' considerations have diminished considerably but concerns remain. In particular, parallel pricing as well as other market-related and management reforms are still required for major competing uses, primarily agricultural water use and direct industrial abstraction of water, both of which should also be priced based on MOC. Management and pricing failures in these areas increase the scarcity and therefore the opportunity cost of water for municipal purposes. Therefore, until parallel reforms are undertaken, it is unclear what the true opportunity cost of water used for municipal purposes really is, and the ability of municipal authorities to contribute to overall efficiency in water use will remain severely constrained.

Another 'second best' issue relates to access to service by poor people. It is quite possible that the rate of increase in the cost of water may exceed income growth rates, despite the projected continued rapidity of the latter in China. Genuine hardship or inefficiency may result in some cases from water price reform which may call for gradualism in achieving such targets as full cost recovery, or certainly MOC pricing.

As noted earlier, temporary subsidization of poorer communities, particularly for wastewater, may be justified while the increasing block rate tariff and the various compensatory devices referred to earlier may be used to effect gradual improvements in pricing policy.

Marginal Costs and Planning

Even if it is not feasible or desirable to immediately charge prices equal to true economic costs for the reasons stated above, the estimation of MOC should be an essential element of water resource management and planning. It should also be a benchmark by which implicit subsidies can be estimated and should be used to assist in regional planning and locational decisions, thereby discouraging development from inherently high-cost water areas. In view of the rapidly increasing costs and scarcity of water in China, the importance of pricing in assisting such strategic economic decisions can hardly

be overrated. However, to be effective, price reform cannot be restricted to municipal water supply and sanitation. The approach proposed in this paper must also be applied to agricultural and direct industrial water use.

7. Summary and Recommendations

The overriding issue in Chinese water management is the increasing cost and scarcity of water, and pricing policy has a potentially critical role to play in addressing this problem. As repeated studies have shown, water and sewerage prices in China are generally too low and efforts should be made to increase them to achieve operational efficiency goals, generate adequate revenues, and encourage efficient rates of consumption.

While the first step in price reform must be to fully achieve financial cost recovery, this should be seen as an interim objective only. More ambitiously, the pricing of water and sewerage should reflect the increasing MOC of water and its disposal, specifically addressing the costs of environmental damage in production and consumption, and the opportunity costs of depletion. In keeping with this approach, estimated environmental damage costs of wastewater disposal should be charged even to those households and enterprises not connected to sewerage systems. Subject to concessionary tariff structures to accommodate low income users, such an approach would require price increases well in excess of those used to achieve financial cost recovery alone. This is illustrated by rough estimates made of the cost of water in alternative uses, and would doubtless be even higher if rationing by price had to be used in times of severe depletion.

Economically efficient pricing is particularly difficult to reconcile with the need to ensure that poor people and communities obtain an adequate supply of water for basic needs. Already enshrined in legislation, increasing block tariffs in urban areas will typically be the route to follow in this regard. There is no particular need to have a multi-block system: a two-part tariff can be used to ensure affordable service for basic needs to low income consumers, with the top block ideally reflecting true economic and environmental costs.

Volumetric pricing covering both supply and disposal costs is clearly required for this to be possible, although the metering decisions should be subjected to cost-benefit analysis and introduced on a case-by-case basis. The case for metering will increase as both incomes and water supply costs increase. Such a policy may possibly be complemented by parallel targeted and temporary income support programs or vouchers to be exchanged for water and sanitation service. Subsidies to poorer communities, in particular in rural areas, will usually be required at least for initial investment in infrastructure, but operation and maintenance expenditures should be recovered from users, and always clearly earmarked for this purpose whether or not volumetric pricing is used.

Efficient resource management for the water sector as a whole requires parallel reforms for competing water uses such as agricultural and direct industrial abstraction. In addition, wider economic development planning requires estimation of the true economic and environmental costs of water

resources even if full-scale price reform is politically infeasible in the short-term.

For reasons of economic efficiency and social equity and acceptability, a gradual approach to price reform will typically be unavoidable. Public hearings, consumer education, and transparency are necessary to overcome resistance to price reform, especially when existing service quality is poor.

In light of the above, some specific actions that should be taken now are as follows:

- Utilities should be required to estimate the long run marginal cost of their own operations (investment and operating costs) over say a 20-year period. Such estimates should be monitored and updated on a continuous basis, requiring an expanded long-term planning capability.

- Local governments should develop the capacity to assess the environmental consequences of alternative water development programs and estimate the costs of environmental damage, including the costs of environmental protection measures where appropriate.

- Local governments should also develop the capacity to estimate water depletion costs on a regional level.

- Estimated environmental and depletion costs should be charged to the concerned utility by the local authority, and, in addition to the long run marginal supply cost, be the components of a pricing policy based upon MOC.

- Water tariffs for commerce and industry should cover full MOC; for residential consumers, the first block should be about 40 liters per capita per day, with the second block gradually increasing to full MOC.

- Utilities should be required to submit strategies to concerned local government so they can fully implement MOC pricing within a time frame, which will be based upon costs, incomes, and public acceptability; the strategies should involve a program of public education and stakeholder involvement.

- A system should be devised in which such MOC estimates can be integrated into regional and national water management and economic planning systems.

- Parallel pricing reforms should be carried out for other water uses, in particular for agricultural use and large scale industrial abstraction.

- Existing policy is to meter individual industrial, commercial, and residential consumers on a case-by-case basis, but this will need to be accelerated as water supply costs increase.

- Utilities should study demographic and income patterns in their area, while continually updating such information, in order to devise efficient and equitable cost recovery mechanisms using non-price mechanisms if metering is not justified.

- The water resource fee, which is now largely retained by local governments, provides little incentive for sustainable water resource development at the regional and national level, and should be reclassified as a tax. This will provide a legal basis for scarcity and environmental costs recovered from consumers to be transferred to the central government, thereby facilitating more efficient water resource planning on a nation-wide basis.

- Since MOC pricing can be expected to increase the revenues accruing to utilities over and above the level mandated in national legislation, mechanisms should be developed to transfer such financial surpluses to the governments with jurisdiction in the areas concerned.

Finally, it should be noted that, as evidenced by a series of OECD reports, international experience offers limited guidance in this area. With a few notable exceptions, water pricing policies throughout the world fail to address the subject of water scarcity head-on, in large part due to the political sensitivity the subject. Given the urgency of the problem facing the country, China should look beyond international experience and exercise leadership in this area before its water crisis becomes unmanageable.

Background Study Papers to the Policy Paper

Almec Corporation, *Case Study on Water Tariff in Small Cities in China,* 2007

China Institute of Water Resources and Hydropower Research, *Economic Value of Water and Policy Intervention in Hai Basin*, 2007

Chongqing University, *A Willingness to Pay (WTP) Survey and Study for* Water *Tariff Reform in Western Chongqing*, 2007

Chongqing World Bank Project Management Office, *Pricing for the Poor: A "Five Orientations" Approach to Protect the Low Income Groups During Water Tariff Reforms in Chongqing*, 2007

Zhang Shiqiu, et al, *Study on Water Tariff Reform and Income Impacts in China's Metropolitan Areas: the Case of Beijing*, Peking University 2007

Zhou Linjun, *Reform of Water Supply Tariffs in Chongqing*, Chongqing World Bank Project Management Office, 2007

References

OECD, *Social Issues in the Provision and Pricing of water services*, OECD 2003

OECD, *The Price of Water: Trends in OECD Countries*, OECD 1999

Pearce, David and Markandya, Anil, "Marginal Opportunity Cost as a Planning Concept in Natural Resource Management", in J. Warford and G. Schramm (eds), E*nvironmental Management and Economic Development*, World Bank, Johns Hopkins Press, 1989.

Spofford, Walter and Wu Yajun, Water Supply Pricing in Beijing and Shanghai, in *Natural Resource Pricing in China: Water Supply, Coal and Timber*, Li Yining and J. Warford (eds), CCICED 1998

Warford, Jeremy and Li Yining (eds), *Economics of the Environment in China*, CCICED 2002

World Bank, *Cost of Pollution in China:* Economic *Estimates of Physical Damages (Conference Edition)*, the World Bank, 2007

World Bank, *Stepping Up: Improving the Performance of China's Urban Water Utilities*, 2007

World Bank, *Willingness to Charge and Willingness to Pay: The World Bank-assisted China Rural Water Supply and Sanitation Program*, Field Note, 2002