## The Beginning (1999)

The growing need for adequate water supply and sanitation services resulting from rapid urban growth and industrialization was increasingly constraining the physical and financial capacity of most Chinese cities.

Beginning in the mid-1980s, rapid economic growth increased water demand for both industrial users and domestic consumers. Water was still being offered at subsidized rates, where prices to consumers averaged about 60 percent of the true cost of providing water—which consisted primarily of distribution and logistics systems. Water Supply Companies (WSCs) had to rely on short-term borrowing, debt refinancing, continued subsidies, and deferred maintenance. Investments on facility improvements were delayed. One outcome of central and local governments subsidies was low water supply.

The obvious solution was to reduce water subsidies and thus bring water costs up to market standards. Consequently, economic reforms leading to growth created a fiscal crisis among WSCs, especially among State-owned enterprises (SOEs) that were mandated to achieve full cost recovery and to end their reliance on subsidies.

In 1999, ADB undertook a Technical Assistance (TA) project focusing on water tariff reform in the People's Republic of PRC (PRC), recognizing that reform was only one part of systemic change involving economic costs, user behavior, regulatory enforcement, and political will.

At the time, the Ministry of Water Resources managed the water intake permit system, coordinated water resource utilization, formulated interregional and interprovincial water allocation, and prepared long-term water demand projections and supply plans. Central oversight ministries in turn worked through the provincial and municipal construction commissions that were responsible for overseeing urban plans for cities, including plans and investments for urban water supply and wastewater treatment.

* This case study was developed by Prof. Francisco L. Roman, Asian Institute of Management, for the Asian Development Bank.

The key components of the ADB TA project involved setting tariffs based on the market economy with national guidelines on water tariffs (NGWT), by promoting financial self-sufficiency of municipal WSCs at prices affordable to consumers.

As PRC's economy rapidly grew, its WSCs could no longer secure concessional grant financing to invest in water infrastructure. Securing Public-Private Partnerships (PPPs) depended on water tariff policies that assured adequate recovery of all material and labor costs, energy costs, and all fees for construction and other services including a reasonable return on equity. Another option was to impose quotas on water consumption.

The ADB initiative sought a tariff structure based on local conditions, using a two-part tariff with a volumetric and fixed demand charge, based on full cost recovery, and subject to review and monitoring at the provincial and state level.

The project aimed to establish a full-cost recovery model regulation for local water tariffs in five pilot cities but with price affordability based on income distribution, cost of living, and the value of non-cash incomes. The model would become a practical tool for tariff setting and calculation.

In the process, the project would have improved the reporting of all costs associated with water supply in the WSC financial records to support the detailed tariff calculations and create better management accounting reports.

One key output was the National National Guidelines on Water Tariffs (NGWT). A consolidated working paper included recommendations on local tariff guidelines, tariff setting and calculation, and WSC cost recovery methodologies based on a simplified tariff approval process with an impact assessment on the urban poor.

Finally, public information and consultation strategies to facilitate dissemination of tariff-related matters to the water users were outlined.

## Initial Results (2002)

A key input of the technical assistance process was to develop awareness and to generate action via four major workshops.

For example, the largest workshop was held in Chengdu, with about 160 participants from 102 local governments, water supply and price administration agencies and WSCs from 12 provinces, and officials from concerned national government agencies in attendance. The study findings and recommendations were presented and feedback obtained from the stakeholders. The report noted "strong support from the Ministry of Commerce (MOC), State Development Planning Commission (SDPC), Ministry of Finance (MOF), and concerned local governments."[1]

The run of workshops was followed by a nationwide videoconference to discuss the Zhangjiakou experience on water tariff reforms. Subsequently, SDPC and MOC issued another notice on national auditing of water tariffs and a related training seminar was held the following year.

Major achievements of the TA included the promulgation of the first local implementation regulations of the NGWT in Zhangjiakou City with orders promoting urban tariff reforms in cities across PRC based on the lessons learned in Zhangjiakou and developing new policies on tariff reform using feedback from the workshops and the TA outputs.

The TA project highlighted the importance of commitment and ownership from the executing agency, MOC, and of close interaction and cooperation between various stakeholders (ADB, MOC, concerned national and local government agencies, and the consultants) from the early stage of implementation.

[1] Asian Development Bank. (2002). Technical Assistance Completion Report.

## The Interim (2009)

Water tariffs were in place in 35 major cities from 1998 to 2007, and the water tariff increased yearly by 7.14 percent, with an additional emphasis on wastewater treatment.

The water consumption expense in these 35 major cities was estimated at about one (1) percent of total family income, much lower than the global level of two to five (2–5) percent of family income. However, from 2002 to 2007, there were still substantial losses in the water supply industry. Though the losses were at a declining rate, they were insufficient to encourage investment.

There appeared to be growing resistance to the water tariff costs. One prevailing belief was that the foreign private companies operating in the water industry caused the water tariff to go up in order to cover their investment costs and "to make profit at the people's expense" alleging that the average staff salary in a water supply company was 20 percent higher than that of other industries.

Foreign companies were indeed involved in the water industry for at least 10 years and several won competitive build-operate-transfer (BOT) biddings. These firms ran about 10 percent of all urban water supplies, but focused on major cities. For instance, the French Suez Company had 22 joint venture water supply companies to date and serviced a population of 14 million. Another French firm, Veolia Company, was involved in water supply in 19 major cities with a service population of 30 million.

Another concern was that "local officials/ authorities may have arranged these activities to obtain extra cash income, leaving the public to shoulder the cost."

The popular view of "foreign conspiracy concern" also raised an alert on "State security concern" against foreign control in a monopoly industry that provided an essential public service. The Ministry of Housing Urban Rural Development (MOHURD) even sent a research group to Lanzhou to investigate the water tariff and the water supply issue but came back with no hard facts to support the foreign conspiracy theory.

A water expert from the World Bank compared water tariff level with the world level and found that PRC's level was still lower than the world average. Another expert in water industry BOT pointed out that the water tariff had been increasing since the 1990s, long before foreign companies were involved in water. The findings raised the issue of viability.

Several solutions were proposed:

- Education and building awareness were critical to reduce resistance.
- Adjusting the water tariff gradually would encourage water conservation and water use efficiency.
- One priority was to set fees to fund wastewater treatment processes and control water pollution and to pay for uses like landscaping and environmental cleaning.
- The water tariff structure could be set based on three categories—domestic, non-domestic, and special usages such as wastewater and reusable water.
- Finally, the poor should be adequately protected from water and wastewater tariff increases.

## Potential Opportunities (2013)

Despite the problems, both domestic and foreign players were upbeat about the water industry's prospects given the government's consistent emphasis on nongovernmental investments. Moreover, decision makers in Chinese municipalities were by now well-educated about private companies operating in the country and appreciated the technical value of proposals from water firms.

Privatization was growing at 20 percent annually and more investments were emanating from local players and from large to small cities with opportunities in wastewater treatment. However, investments tended to focus on "quick wins" from "capital" cities with a large urban base, existing infrastructure and industrialization.

The smaller cities were also growing faster albeit from a smaller base than the well-established and larger cities. Over the next decade, these fast-growing Chinese cities could add 15 million new residents every year and by 2020, about 60 percent of the population would live in urban areas.

Veolia and Beijing Capital developed a relatively balanced portfolio between water supply and wastewater treatment activities. Sino French built a portfolio of high quality projects by focusing on the water supply market. Chinese players quickly began to enter the wastewater market.

Regulatory pressure towards water reuse was forcing "dirty industries" to improve their water processes management dramatically, potentially through the outsourcing of effluent treatment to water utilities. Additionally, for certain industrial processes, more efficient water management could generate savings not only through reducing water consumption, but also through reinforcing process reliability, reducing raw material consumption, and cutting energy costs.

However, the bulk of the population consisted of poor and low-income classes and the 10 percent with the lowest incomes devoted about 1.6 percent of their incomes to water consumption, compared with 2.6 percent in OECD countries. Moreover, tariff reform was subject to a complex and long decision-making process, moving through several stages before final approval: the plan must first be reviewed by the local government and local pricing authorities and then exposed to a public hearing, followed by inputs from local associations, experts, consumers, and researchers. During local water pricing debates, information regarding the true cost of water distribution and services was limited, generating significant risks for manipulation.

## Government Efforts (2014)

A news report[2] noted that: "PRC's richest households face higher water bills." The article went on to make several additional points:

One, Beijing once again renewed efforts to roll out wide-reaching reforms in water tariffs. The government planned to charge higher prices for the heaviest urban consumers in order to conserve diminishing resources and spur investment. Under the plan, the heaviest consumers—or top five percent of households—would pay at least three times the base rate of water. The second tier would pay 1.5 times the base rate, while the lowest tier—roughly 80 percent of urban households—would not be affected by the changes.

Two, while underpriced resources helped Beijing to protect its citizens and industries from inflation, the low cost was contributing to PRC's environmental woes and long-term concerns about economic sustainability.

Three, the reforms however had to link with improved drinking-water standards, that in turn would require new investment in water treatment to improve drinking water quality. "Ultimately, quality standards can only be raised when tariffs are adjusted more comprehensively," said Debra Tan, director of PRC Water Risk, an advocacy group based in Hong Kong.

Four, social unrest because of higher prices from cabdrivers angry over higher pump prices to workers laid off as industry continued to grapple with rising costs. Stable inflation rates were necessary to undertake wide pricing reforms. Over the longer term, it appeared that industrial water consumers would likely bear the largest burden from higher costs as industrial water prices and wastewater discharge tariffs rise. An example for this is PRC's economic growth which has long been dependent on water-intensive industries such as steelmaking.

Five, the trend of dismal margins remained and dissuaded companies from undertaking badly needed upgrades to improve water quality, especially in lower-tier cities and provincial urban areas.

[2] Spegele, B., & Kazer, W. (2014, January 8). To Conserve Water, China Raises Prices for Top Users. Retrieved from China News: http://www.wsj.com/articles/SB10001424052702303870704579297410328066466.

Six, water in PRC was unevenly distributed, with large swaths of its industrialized north facing shortages while parts of the south were powered by massive hydroelectric projects. The south-north water transfer project would redirect water from Yangtze River reaches to the arid northern plains but hundreds of thousands of people were forced to move. The north-south water diversion project designed to transport water from southern PRC to the water-scarce north was estimated to cost the economy USD62 billion.

## The Economics of Water Reforms (2014)

The consensus among economists was that if the price of water was controlled by the State and not the market, prices were often slow to adjust to supply and demand. Low water prices encouraged waste and subsidized water-intensive households and corporations.

Although PRC had the sixth largest supply of water resources in the world, per capita availability was 101 out of 175 countries. Compared with the United States, PRC had four times less freshwater available per person, but charged half the price for businesses and one-fourth the price for most urban households.

**Table 1.** PRC's Water Expenditure as a Percentage of Disposable Income

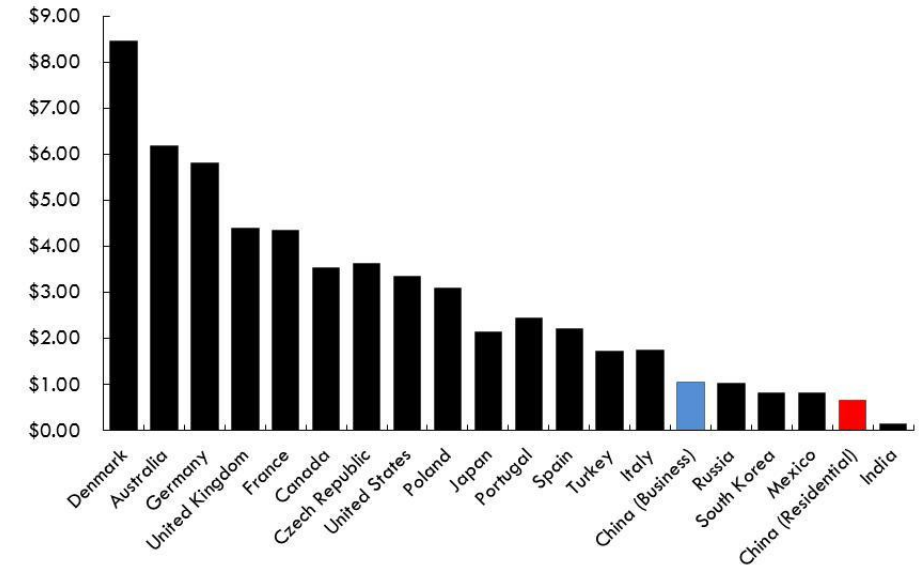
| Country | Percentage |
|---|---|
| Australia | 8.6 |
| Czech Republic | 4.6 |
| Japan | 2.9 |
| U.S. | 2.8 |
| France | 2.7 |
| Germany | 1.7 |
| Mexico | 1.6 |
| South Korea | 1.3 |
| U.K. | 1.3 |
| PRC | 0.5 |

*Source: Deutsche Bank Markets Research*
*The Wall Street Journal*

To cover their costs, water suppliers would have to raise prices seven times higher than their current level. The lost potential profit for water utilities represented an indirect subsidy to water-intensive users.

The World Bank measured water productivity in terms of the amount of real GDP generated per cubic meter of freshwater withdrawals. According to World Bank estimates, PRC's water productivity was USD7.57 of GDP per cubic meter in 2011 compared with USD13.7 per cubic meter in upper middle income economies and USD39.2 per cubic meter in high-income economies.

**Combined water tariffs for households by country ($/cubic meter), September 2013**

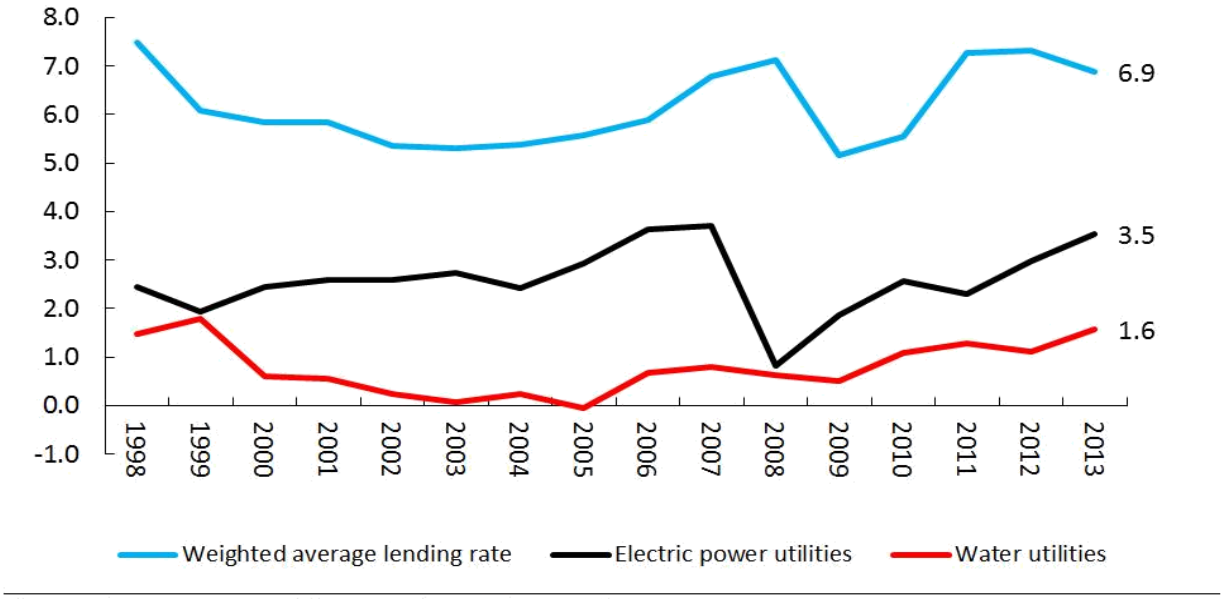



*Source: Global Water Intelligence; Author Calculations.*
*Notes: The combined water tariff typically includes the water tariff charged by utilities and the wastewater treatment fee charged by local governments. Chinese water prices also include a water resource fee charged by local governments to users for funding local water conservation projects.*

However, raising water prices, while necessary, was politically contentious. Chinese households viewed water as a public good and resisted any price increases. Policymakers were also concerned that raising water prices would exacerbate income inequality because water consumption represented a higher share of income for low-income households.

Local governments began experimenting with tiered pricing systems for urban households and industrial users to charge higher prices for higher water consumption. The reforms gradually raised the profitability of water utilities. For example, the return on assets of water utilities rose from -0.1 percent in 2005 to 1.6 percent in 2013.

**Profitability of water utilities, 1998-2013**
Total profits/total assets vs average lending rate (%)




*Source: National Bureau of Statistics; Peoples Bank of China.*

Urban households only accounted for 12 percent of total water consumption in PRC. Agriculture and business users accounted for 64 percent and 24 percent of national water consumption respectively.

There was a strong relationship between the level of economic development (GDP per capita) and the percentage of wastewater treatment, and also between population and wastewater treatment percentage. Both city size and level of economic development had to be taken into account when considering capacity to deliver water services.

## Users' and Researchers' Perspectives (2016)

In another news report,[3] "Water gurgling from a kitchen tap into a basin of fresh fruit and vegetables was a common scene in Chinese kitchens, as many mothers wash away pesticide residue…Water does not cost much. What matters is to make sure that it can flush away dust and poisonous stuff," said 28-year-old mother Jenny Gao in Beijing. "That is the only thing that makes me comfortable when I see my son putting food into his mouth." Mrs. Gao stated that she was "not a big water user", and consumed about six cubic meters of water every month, equal to about 300 five- gallon bottles (used in the ubiquitous water dispensers). In Beijing that cost was 30 Yuan (USD4.60) per month or about 0.3 percent of Gao's husband's salary.

Fu Tao, director of the Water Industry Policy Research Center at Tsinghua University in Beijing, called for PRC to raise water prices, noting that fees for supplied water have been going up by an average of five percent per year, much lower than GDP growth and tariff increases for other resources, such as oil, gas, and electricity. However, other fees were attached to current water prices including special funds to support national key water facility projects like the South-to-North Water Transfer Project and, earlier, the Three Gorges Dam.

David Chen Yongqin, professor of geography resource management at the Chinese University of Hong Kong (CUHK), stated that: "Water prices do not reflect the value and scarcity," he said. "The demand for water is particularly large in developing countries, which is the majority in Asia. People thus are not aware that they are using a large amount of water every day…and there is a high cost for importing water to the city, in transport, purification and distribution. So the price end users pay is rather low."[4]

Neil Wang, PRC MD at Frost & Sullivan, said many water supply plants in PRC "have great pressure on their profitability and realize very low return on investment. However, one thing to note is that raising the water rate is not an immediate approach for the PRC market primarily due to the unbalanced economic development of different regions which request differentiated pricing of water rates…The priority currently is to provide an effective system for the education of reasonable utilization of water resources, rather than to simply raise the water rate."[5]

[3] Liu, P. (2016, April 1). Ensuring a steady flow. Retrieved from China Daily Asia: http://www.chinadailyasia.com/asiaweekly/2016-04/01/content_15409595.html
[4] Ibid
[5] Ibid

## The Latest Report (2016)

There have been new insights on recurring themes, with possible approaches marked by an asterisk (*).

Country Situation

- PRC had 20 percent of global population but only seven percent of the world's freshwater.
- Much of PRC was arid and water pollution was a problem throughout PRC.
- Further, southern PRC contained 75 percent of total renewable water resources but almost 50 percent of agricultural activities and 86 percent of coal reserves were in the North.
- Demand for water was set to exceed supply by 199 billion cubic meters by 2030.

The Environment Situation

- PRC had some of the most polluted rivers in the world and its coastal waters were on the brink of ecological collapse.
- Widespread pollution of water resources further exacerbated the problem; 61.5 percent of ground water and 28.8 percent of key rivers were considered unfit for human use.
- The government emphasized the environment and sustainability in their development plans and instituted penalties including fines and closure.
- Much of PRC's water pollution came from runoff of fertilizer applied to agricultural land, large-scale livestock operations, and urban storm-water runoff.
- Water pollution endangered public health given that (a) many drinking water sources were polluted; (b) seafood was contaminated, particularly in the extensive coastal aquaculture zones as well as capture fisheries; and (c) diseases were transmitted through contact in rivers, lakes, and coastal waters. The risk of exposure to pathogens and toxic chemicals was a significant public health risk. Unreliable water supplies hindered basic washing and sanitation.

* The typical institutional arrangement for wastewater in PRC was fragmented due to the separation of drainage collection and treatment. In large cities, drainage collection was split between district and municipal drainage bureaus for administrative convenience rather than for economic efficiency.

The Urbanization Situation

- PRC was experiencing the greatest wave of urbanization in history from 300 million in 1990 and would be expected to grow to as much as 900 million.
- Urbanization fueled the demand for more water and infrastructure investments. Cities such as Shanghai sought global excellence, while smaller and poorer cities, mainly in the west and northeast of the county, confronted economic stagnation, unemployment, and deteriorating infrastructure.
- Inequality in water persisted between rural and urban residents. Also among cities, particularly between those in coastal provinces and other parts of PRC; and even among residents within cities.

*Poorer cities and towns could start by ensuring full collection of wastewater and low-cost, simple wastewater treatment. As cities grew richer, they could transition into compliance with national standards.

*Many Chinese cities and towns tried to independently address their urban water problems, rather than cooperate with their neighbors. Potential approaches for aggregating service included: (1) creating water and wastewater utilities with regional infrastructure in metropolitan areas; (2) creating multi-city water concessions where one utility serves a number of small cities or towns with separate infrastructure; and (3) combining water and wastewater utilities in the same city.

*Water supply and integrated wastewater utilities (i.e., drainage and treatment utilities) should finance all capital investments through capital markets, private investment, and internally generated cash with full cost recovery tariffs.

The Investment Situation

- More investment would be needed but cities and the utilities had to be more efficient and financially sustainable.
- Rates were still too low to cover the full operating, maintenance, and capital costs.
- PRC's water supply utilities generally provided 24-hour service, but the quality of the service varied. One-quarter of the water utilities were unable to provide adequate water pressure to more than 40 percent of their service area.
- Around 60 percent of PRC's 661 cities faced seasonal water shortages, and over 100 cities had severe water constraints. On average, around 20 percent of the water produced at the water treatment plant was lost through leaky distribution pipes.
- Nationally, there was at least 50 percent excess treatment capacity. The average plant hydraulic utilization rate, however, was only 65 percent due to inadequate wastewater collection, poor planning, and a shortage of operating funds.

*The potential for water utilities to perform well was largely set by three factors: (a) sector governance; (b) municipal utility governance and structure; and (c) level of financial sustainability. But many municipal governments were turning to the private sector to help provide better service rather than improving governance.

*Lower costs may occur through improved capital planning, particularly for water supply planning, water distribution and wastewater collection network renovation, selection of combined versus separate drainage collection systems, and industrial wastewater treatment plant sludge management.

*"Water Boards" are a standard solution but water utilities, like many other State-owned-enterprises, had a culture of complacency and did not strive for excellence.

*Water utilities were typically organized along administrative boundaries rather than using economies of scale, more professional management, and improved access to finance.

*Utilities should also understand that combined systems, which convey both wastewater and storm-water are better than traditional separate drainage systems that can cost up to double combined systems, and the environmental benefits may not be justified.

*Cost recovery levels might be managed through a combination of appropriate standards, improved utility efficiency, municipal government equity contributions, and more effective national concessionary programs.

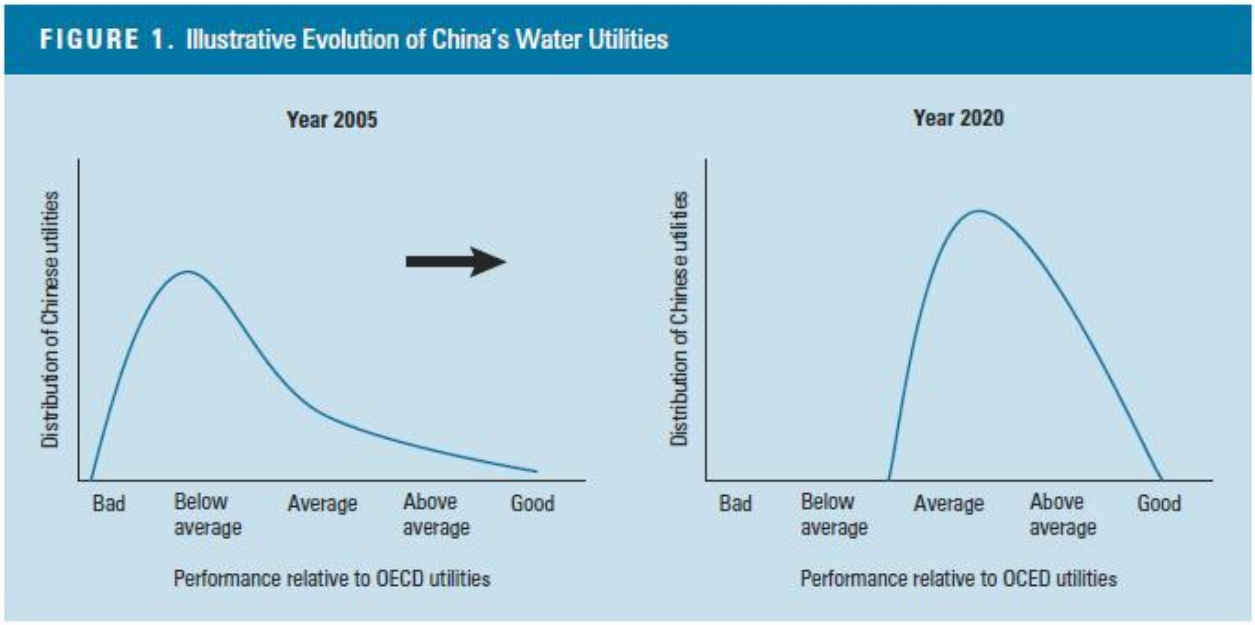
The Government Situation

- The transition to a quasi-market driven economy under central control meant that government institutions and policies during the planned economy era must be adapted to a more market-based economic environment.
- Government policy combined legal mechanisms and Party influence.
- PRC's size resulted in a complex multi-tiered government administrative system that was highly decentralized. Local governments played a dominant role in infrastructure service provision and financing, while national and provincial governments focused primarily on policy and regulatory matters.
- PRC had a relatively underdeveloped legal system and capital market structure, though they appeared to be evolving quickly.

## Conclusion

In the past, under PRC's planned economy, performance was measured in terms of achievement of physical targets, such as kilometers of pipeline or number of wastewater treatment plants. Municipal governments set many of the parameters in which the utility operates, including tariff and subsidy policy, appointing utility management, determining the extent of utility transparency and accountability, and defining the scale, scope, and authority of urban water utilities.

"Moving the curve" was an interpretation of PRC's water utilities goal:

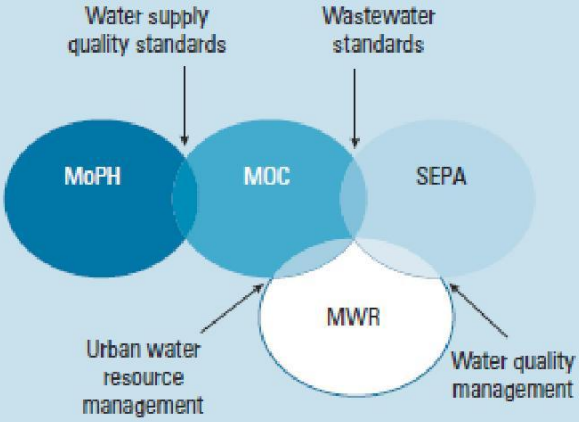



Source: Browder, G., Xie, S., Kim, Y., Gu, L., Fan, M., & Ehrhardt, D. (2007). *Stepping Up: Improving the Performance of PRC's Water Utilities.* The World Bank.

The focus of the future should be on efficient urban water utility performance as a means to achieving the nation's goals, including improving the environment, protecting public health, and providing good quality service to all at reasonable prices. New targets—such as improvements in ambient water quality, safe drinking water and reliable service, and cost-efficient service delivery—should take the place of physical targets.

**FIGURE 3.** Sector Policy Star


**FIGURE 4.** Overlapping Areas of Responsibility

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