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Water Price Reforms in China: Policy-Making and Implementation

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Abstract Following the conviction that economic and pricing approaches are an essential addition to conventional command-and-control environmental regulation, China has gradually increased attention to, research on and experiments with the application of economic instruments in urban water management over the past two decades. This paper analyzes the actual application and implementation of economic instruments in Chinese urban water sectors, applying an ecological modernization perspective. Water tariffs in China have increased sharply over this period, increasingly representing full costs and increasing water use efficiency. But implementation of water tariffs does run into problems of unclear responsibilities, poor collection rates and institutional capacities. It is concluded that Chinese style ecological modernization should pay more attention to the institutional dimensions of natural resource pricing policies, if it is to profit from the theoretical advantages of economic approaches in urban water management.

Keywords Water pricing policies · Urban water management · Ecological modernization · China

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1 Introduction

The application of economic approaches in environmental governance and natural resource management is not new. For over three decades (environmental and natural resource) economists, among others, have argued that the application of economic instruments is an effective and efficient way to achieve environmental goals. These economic approaches need to complement conventional policies of specifying technological standards and implementing these via command-and-control strategies. With respect to water systems (water resource, water supply, and wastewater) this argument has received further attention and application after 1992, with the promulgation of Agenda 21 (UNCED 1992) and the 1992 Dublin Statement (International Conference on Water and the Environment, Dublin, Ireland, 1992). Both documents claimed that water should not be regarded as only a public good, but also as an economic good. Other scholars, however, have warned against a too one-sided emphasis on the economic nature of water, resulting in still ongoing discussions and debates on economic approaches in water management, touching upon issues such as valuing water resources, water pollution taxes, setting of tariff structures for different user categories, rational water pricing, and cost functions (e.g. Rogers et al. 2002; Renzetti 1999; Winpenny 1994; OECD 1999; Montginoul 2007; He et al. 2007). But in all these debates, consensus seems to emerge that water should be priced.

Over the last two decades, China has witnessed simultaneously a dramatic change in its economic structure and organizing principle, and an increase in a variety of serious urban water challenges (e.g. safeguarding drinking water quality and quantity, treatment of industrial and domestic wastewater, urban water flooding). During these past two decades there has been a gradual increase in attention to, research on and experiments with the application of economic instruments in urban water management. Due to its developmental and transitional status interest of policy-makers and researchers in economic approaches in urban water management developed in China later than in most OECD countries. But at the start of the new millennium, both central and local governments have made considerable efforts to introduce economic approaches into water-related (national and local) policy papers (ref. Table 1). Currently, the issue of water pricing is seen as of central importance in water sector reform in contemporary China; topics such as setting right prices for water resources, water rights and tradable permits, full cost recovery of water services, and cost control are given priority over traditional water policies. But designing and implementing economic instruments for governing China's water system also face major challenges (in particular compared to other western countries).

This paper analyzes the actual application and implementation of economic instruments in urban water management in China, with a focus on the water tariff system and its reforms since the Chinese economic reform in the late 1970s. After reviewing ideas of economizing the ecology through economic instruments under the framework of ecological modernization (Section 2) and a short history of economic instruments in water policies (Section 3), this paper analyses the national water tariff reforms of China (Section 4), followed by a detailed analysis of water tariff reforms in one province, Guizhou (Section 5). In doing so, this paper aims to identify how national policies of water pricing have advanced over the last decade and to what

extent these policies have been successfully implemented at a provincial and local level.

2 Water Pricing Reform as Ecological Modernization

Developed from the late 1980s onwards, first especially in Northwestern Europe, ecological modernization (EM) theory has become a leading perspective in analyzing and interpreting environmental reform (Mol et al. 2009). The basic premise of EM theory is the centripetal movement of ecological interests, ideas and considerations in the social practices and institutional developments of modern societies. This results in ecology-inspired and environment-induced processes of transformation and reform of core practices and central institutions of production and consumption. In ideas of EM technological change and the internalization of external costs (often referred to as the 'ecologizing of the economy' and the 'economizing of ecology', respectively; cf. Mol 1995; Spaargaren 2000) are key mechanisms for environmental reform. But a successful EM should not be reduced to just technological or economic reforms (Christoff 1999; Mol and Spaargaren 2000). Institutional changes and dynamics are of equal importance, often referred to as political modernization, environmental capacity building, and civil society participation and involvement (cf. Mol 2000; Andersen and Massa 2000; Tatenhove et al. 2000).

For quite some time EM has been mainly a western concept. But with respect to China, the release of the 'China Modernization Report 2007: Study on Ecological Modernization' (China Centre for Modernization Research, CCMR 2007)—with large scale media and public attention in China and around the world—changed that. Through its subtitle, literature review, and analysis, it officially and publicly introduced in China the concept, ideas, and scholarly literature around EM. It is not the first introduction of EM in China. Several Chinese academics have studied and applied EM (e.g. He and Wu 2001; Zhang 2002), and western scholars have discussed EM dynamics in China (e.g. Mol 2006). But the background and positions of the experts and academics that assembled this 2007 study indicate that through this report EM ideas have reached relevant governmental departments.

In developing EM for China the CCMR (2007) provides an extensive introduction to the history, core principles, developments and analytical methods of EM theory as it was developed in Europe. Many of the key concepts of Western style EM theories can be found back here, such as dematerialization, the ecologizing of the economy, decoupling, prevention, clean technology. But, besides a few remarkable new things, this Chinese interpretation of EM deviates on several point from its western counterpart (see Zhang et al. 2007, for a review). In contrast with the Western literature on EM, the CCMR (2007) follows primarily an economic-technological analysis of (and explanation for) environmental improvements. Political modernisation, subpolitics, and the reinvention of environmental governance—as the more political and institutional innovations in western EM literature—are hardly referred to. There is also limited attention to civil society participation and the role of environmental NGOs in the CCMR study. Given that, one could classify this report as belonging to the first—rather than third—phase of EM scholarship, i.e. that focusing on technological

innovation and economics, rather than on governance, institutions and participation (Sonnenfeld and Mol 2002).[1]

Water pricing policies in urban water management can be interpreted as a clear case of Ecological Modernization, as it aims to make water use more ecologically rational by a strategy of 'economizing the ecology'. Pricing water is then interpreted as a modern strategy for more efficient and less wasteful water use. Against this background of ecological modernization we are interested in two aspects of China's water pricing policy. First, how far has China proceeded with pricing water to rationalize its use? Second, does this actual ecological modernization approach in China's water management also reflects the theoretical position as advocated in the 2007 CCMR study? In other words: to what extent is China's water pricing policy restricted to technology and the market, and does it neglect the governance institutions underpinning a successful implementing water pricing?

3 A Short History of Water Pricing in China

The introduction of economic instruments in the Chinese water legal framework can be traced back to 1965, with the promulgation of the *Tentative Administrative Method on Collecting and Managing Water Charges of Hydraulic Engineering* that for the first time introduced a fee for various raw water uses,[2] especially meant to cover (part of) the costs of constructing and maintaining water engineering facilities. However, this early policy of pricing water was not successfully implemented, partly due to the political campaign of Cultural Revolution, and the prevalence of ideological above economic motives in many policy domains.

Since the late 1970s, when China started its economic reform, there has been a gradual increase in applying various economic instruments in Chinese water management, among which are standards with economic incentives, licensing the management of water-abstraction and wastewater-discharge restrictions (also with economic incentives), user charges, and a water pollution levy. These instruments were introduced through a variety of ministerial policy papers and regulations, especially since the second half of 1980s. Table 1 provides an extensive overview of the various policy documents, the major focus of each document, and the different economic instruments introduced in China's water management. Among these economic instruments, the pricing mechanism and the water tariff reform are the most important and form the main focus of this paper.

[1]The first contributions to ecological modernisation theory were characterised by a heavy emphasis on the role of technological innovations and the market in environmental reforms, and played down the role of the state. The second period (from the late 1980s to the mid-1990s) showed a more balanced view on the respective roles of states and markets in ecological transformation and more attention to institutional and cultural dynamics of ecological modernization. Since the mid-1990s, the third phase of EM emphasized the importance of governance, institutions and participation in environmental reforms.

[2]According to the *Tentative Administrative Method on Collecting and Managing Water Charges of Hydraulic Engineering* (no. 350 Policy Paper, the MOWREP, 1965), the rates of raw water charge were as follows: (1) industrial use: 0.0005–0.002 RMB per cubic metre for water circulation, and 0.003–0.01 RMB per cubic metre for water us in production; (2) hydropower use: 0.0001–0.001 RMB per cubic metre; (3) municipal use: 0.002–0.005 RMB per cubic metre (but not exceeding 5% of the cost of water production). At that time, 1 USD equalled 2.4618 RMB.

Table 1 Overview of major national water policies with economic incentives in China

Title	Document catalogue[a]	Issue year	Major focus	Proposed economic instruments[b]
Tentative Administrative Method on Collecting and Managing Water Charges of Hydraulic Engineering	No. 350 Policy Paper of the formerly MOWREP	1965	WR	2
Tentative Environmental Protection Law of PRC	SCNPCC	1979	WW	2
Water Pollution Prevention Law of PRC	SCNPCC	1984	WW	1, 2, 6
Administrative Method on Accounting, Collecting and Managing the Raw Water Charges of Hydraulic Facilities	No. 94 Policy Paper of the State Council	1985	WR, WRS	2
Environmental Protection Law of PRC	SCNPCC	1989	WW, WR	1, 6
PRC Ordinance on Urban Water Supply	No. 158 Policy Paper of the State Council	1994	WS	2
Circular on "Administrative Method of Urban Discharge Permit" (annulled)	No. 330 Policy Paper of MOC	1994	WW	1
Circular on Collecting Water Resource Fee	The GOSC	1995	WR	2
Administrative Method on Urban Water Supply Price	No. 1810 Price Policy Paper of the formerly NDPC	1998	WS, WW	2
Circular on the Key Issues for Carrying out the 'Administrative Method on Urban Water Supply Price'	No. 611 Policy Paper of the formerly NDPC and the MOC	1999	WS, WW	2
Circular on Enhancing the Enforcement of the Wastewater Treatment Charge Scheme and Establishing Urban Drainage and Wastewater Treatment System	No. 1192 Price Policy Paper of the formerly NDPC, the MOC, and the SEPA	1999	WW	2
Circular on Intensifying Water Conservation and Water pollution Prevention	No. 36 Policy Paper of the State Council	2000	WR, WW RW	1, 2, 4
Water Law of PRC (revised)	SCNPCC	2002	WR WRS	1, 2, 6
Circular on Facilitating Water Supply Price Reform	No. 515 Policy Paper of the formerly NDPC, the MOF, the MOC, the MOWR, and the SEPA	2002	WS, RW WW, WR	2
Opinions on Advancing the Industrialization of Urban Wastewater Treatment and Municipal Solid Waste Disposal	No. 1591 Investment Policy Paper of the formerly NDPC, the MOC and the SEPA	2002	WW, SW	2
Circular on Enhancing Urban Water Conservation and Ensuring Safe Water Supply	No. 171 Policy Paper of the MOC	2003	WR WS	2

Table 1 (continued)

Title	Document catalogue[a]	Issue year	Major focus	Proposed economic instruments[b]
Circular on Promoting Water Price Reform, Saving Water Use and Protecting Water resource	No. 36 Policy Paper of the GOSC	2004	WS, WR WW, RW	2, 5
Administrative Method on Raw Water Price of Hydraulic Facilities	No. 4 Policy Paper of the NDRC and the MOWR	2004	WR, WRS	2
Ordinance on Water Abstraction Permit and Water Resource Fee Collection	No. 460 Policy Paper of the State Council	2006	WRS, WR	1, 2
Administrative Method on Urban Wastewater Discharge Permit	No. 152 Policy Paper of the MOC	2006	WW	1
Opinions on Deepening the Reforms of Economic Structure	No. 103 Policy Paper of the GOSC	2008	WR, WW	2
Administrative Method on Regulating Cost of Urban Water Supply	–	Draft	WS	2
PRC Ordinance on Urban Sewerage and Wastewater Treatment	–	Draft	WW	1, 2

GOSC General Office of the State Council, *MOC* Ministry of Construction (renamed as Ministry of Housing and Urban-Rural Development in 2008), *MOF* Ministry of Finance, *MOWR* Ministry of Water Resource, *MOWREP* Ministry of Water Resource and Electric Power, *NDRC* National Development and Reform Commission, *NDPC* National Development and Planning Commission, *PCC* (local) People's Congress Council, *RW* reclaimed water, *SCNPCC* Standing Committee of National People's Congress Council, *SCPCC* Standing Committee of (local) People's Congress Council, *SEPA* State Environmental Protection Administration (promoted and renamed as Ministry of Environmental Protection in 2008), *SW* solid waste, *WR* water resource, *WRS* water resource system (or hydraulic engineering), *WS* water supply, *WW* wastewater

[a]The Chinese legal system mainly includes four levels: laws promulgated by the NPCC or SCNPCC (highest legal status), administrative regulations of the State Council, sector regulations of ministries and commissions, and local policies and regulations (promulgated by local PCC or SCPCC)

[b]According to Seroa Da Motta et al. (2004) and the USEPA (2004), six major types of economic instruments can be identified in water management: (1) Standards such as pollution standards, fines and sanctions, and licensing of water-abstraction or wastewater-discharge restrictions are a kind of command-and-control-oriented policy instruments with economic incentives; the government restricts nature and amount of pollution or resource use, compliance is monitored and sanctions are installed for non-compliance. (2) Pricing mechanisms, including charges, fees and taxes form widely-applied economic instruments for water management (e.g. water user charges, wastewater treatment charge, charges on water abstraction and water resource system) by which the government charges a fee to individual polluters or resource users based on the amount of pollution or resource use. (3) Trading mechanisms, for instance tradable water rights and trading of pollutant emission rights, are established by the government for polluters or resource users to trade permits at unregulated market prices. (4) Performance rating is a kind of program that requires disclosure of environmental information on the final end-use product, e.g. eco-labeling, ISO14000, and black-lists of polluters. While they do no price natural resource, they have an effect through market demand. (5) Subsidy systems, including grants, low-interest loans, favorable tax treatment, lending practices of international banks, and preferential procurement policies for products believed to be environmentally friendly. (6) Liability as a mechanism for compensating victims of pollution and as a mechanism to encourage compliance with exiting water management

Chinese water management has been—and still is—subjected to several ministries and commissions.[3] Due to the fragmented structure, the practice of pricing urban water has confronted various problems of inefficiency and ineffectiveness, following conflicting competencies between governmental organizations and the lack of effective horizontal and vertical coordination, a problem more widely known in the Chinese policy system (cf. Lieberthal 2004). In the early experiences of water-related policy design, economic instruments were only proposed on one single issue by one specific ministry (or commission). For instance, the MOWR (the competent national authority for water resources) was mainly interested in the water resources and the water engineering system, while the MOC (the competent national authority for urban water infrastructures) had responsibilities for the urban water infrastructures, among which are public water works, water and sewer pipelines and wastewater treatment plants. There was little coordination between these two authorities in issuing water prices instruments to cover the costs of their activities. Over the past three decades, one of the major changes within the national policy design is that the water tariff reform is moving from a highly segregated system of various individual prices and charges towards an integrated system, not only with respect to the different water issues (water supply, wastewater treatment, water engineering and water resource being the four important categories), but also with respect to the competent water-related authorities (such as the powerful NDRC, the MOWR, the MOC, and the SEPA; ref. Table 1).

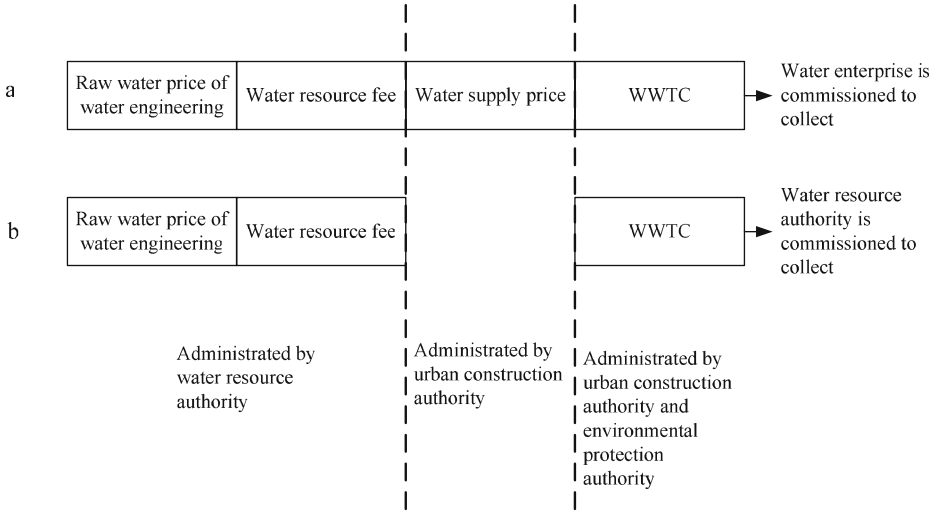
4 Current National Water Tariff Reforms

At the moment two major water tariff systems for water users are implemented, depending on the means of water supply (public water works and self-providers;[4] ref. Fig. 1). The water tariff consists of four respectively three elements, set by different authorities but integrated in one water tariff to be collected by either the water enterprise or the water resource authority.[5] Of these four elements, the water resource authorities at provincial level decide rates of water resource fee and raw water price (hydraulic engineering system), while the urban construction authorities at municipal level supervise the water supply price and wastewater treatment charges. We will elaborate on the four elements, respectively.

[3]The Ministry of Water Resources takes charge of water resources management and flood control, the Ministry of Construction (renamed as the Ministry of Housing and Urban–Rural Development in 2008) ensures urban water supply and drainage, the Ministry of Land and Natural Resources supervises groundwater, the Ministry of Environmental Protection (formerly State Environmental Protection Agency) controls wastewater discharges and water quality protection, and the Ministry of Agriculture oversees agricultural water usage.

[4]In China, the proportion of water supply by public water works has increased recently due to the regulation to decrease water supply by self-providers. In 2007, around 77% of water was provided by public water works.

[5]In some province and cities (e.g. Tibet), the local WWTC scheme has not been in place, and then the water tariff structure consists three respectively two elements for such cities.



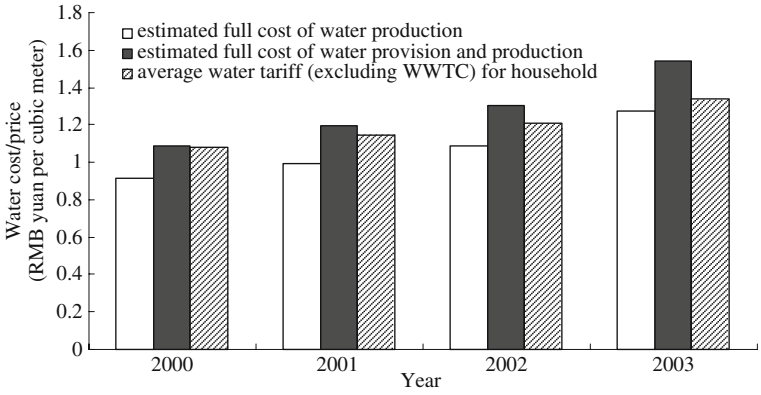
(a) water tariff structure of public water works; (b) water tariff structure of water self-providers (no water supply price included)
WWTC: wastewater treatment charge

Fig. 1 Water tariff structures

Due to the perception of abundant water resources and its public good character, raw water was provided to users almost free of charge until the promulgation of the *Administrative Method on Accounting, Collecting and Managing the Raw Water Charges of Hydraulic Facilities* in 1985 (No. 94 Policy Paper, the State Council, 1985). It proposed to charge various kinds of users for the costs of water provision (including the operation and maintenance cost, overhaul cost, depreciation, and other expenses). However, the average level of raw water charge equaled to one third of the cost of raw water provision in 1996 (Wu 2001). Moreover, the implementation and enforcement of this policy was not very effective, resulting in low levels of charge collection. In 2004 this changed.[6] Firstly, raw water obtained from hydraulic facilities should be regarded as a commercial good and be subject to a much higher commercial-oriented price, the so-called raw water price, and it doubled from 0.028 RMB per cubic metre in 2000 to 0.06 RMB per cubic metre in 2005 (MOWR 2005). Secondly, various (economic) approaches and measures were adopted for setting, managing and collecting raw water prices, such as two-part tariff,[7] volume-based metering, cost functions etc. Thirdly, private sector involvement in building and

[6]With the promulgation of the *Administrative Method on Raw Water Price of Hydraulic Facilities* (No. 4 Policy Paper, the NDRC and the MOWR 2004).

[7]The "two-part tariff" (or increasing block tariff) approach has been introduced in setting urban water supply prices since 1996. But only about 60 cities (of 661 cities) were using the two-part tariff structure for their urban water supply prices by the end of 2006. Water tariffs for the first cubic meters of water consumption are usually set at a lower level than subsequent units of water consumption. The turning point differs for various user categories and also among provinces. See below for examples in Guizhou province.



(Source: GOMOC, 2005; water tariff database of ChinaWaterNet, www.h2o-china.com, 2006)

Fig. 2 Average costs and water tariffs (excluding WWTC) for households of 36 key cities in China, 2000–2003

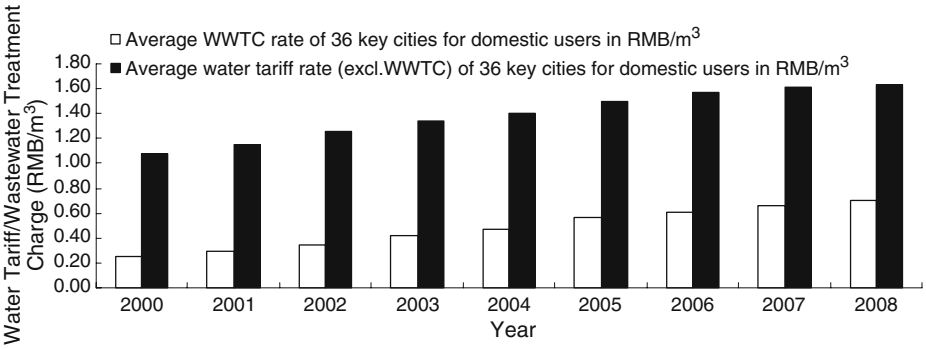
managing hydraulic facilities was encouraged, which sometimes reduced the costs and brought in much needed private capital for infrastructure investment.

In addition, with the enactment of the *PRC Water Law* (1998) a water resource fee was proposed to protect water resources and improve water use efficiency. Subsequently, the issue of increasing the rate of water resource fee was emphasized in various national policy papers.[8] In 2004, the No. 36 Policy Paper of the General Office of the State Council called for setting the rates of water resource fee according to the degree of water scarcity, and to combine this charge reform with a reform of the urban water supply price. In practice, charges for raw water from water engineering facilities and charges for water resources are often not clearly differentiated and usually lumped together or confused.

The *PRC Ordinance on Urban Water Supply* (No. 158 Policy Paper of the State Council, 1994) proposed to set a price for water supply (excluding water self-providers) and add that to the cost of water production in order to make the water provisioning self-financing. Subsequently, pricing details for water supply service were developed, such as the classification of water consumers, the tariff structure, formula of tariff setting, the administrative procedure of tariff setting, and enforcement and supervision of this water supply price.

As a consequence of these policies, the 1990s witnessed an annual growth rate of the total water tariff (excluding WWTC) of 16.5% (Wang 1999). According to a survey of the MOC (GOMOC 2005), the 2001–2003 water supply tariffs did not fully cover the costs of water provision (cf. Fig. 2). The average full cost of water

[8]Such as the *Circular on Intensifying Water Conservation and Water Pollution Prevention* (No. 36 Policy Paper of the State Council, 2000), the revised *PRC Water Law* (SCNPCC, 2002), the *Circular on Facilitating Water Supply Price Reform* (No. 515 Policy Paper of the formerly NDPC, the MOF, the MOC, the MOWR, and the SEPA, 2002), and the *Circular on Promoting Water Price Reform, Saving Water Use and Protecting Water Resource* (No. 36 Policy Paper of the GOSC, 2004).



(Source: water tariff database of ChinaWaterNet, www.h2o-china.com)

Fig. 3 Average water tariff rate (excl. WWTC) and waste water treatment charges for domestic users in 36 Chinese key cities, 2000–2008

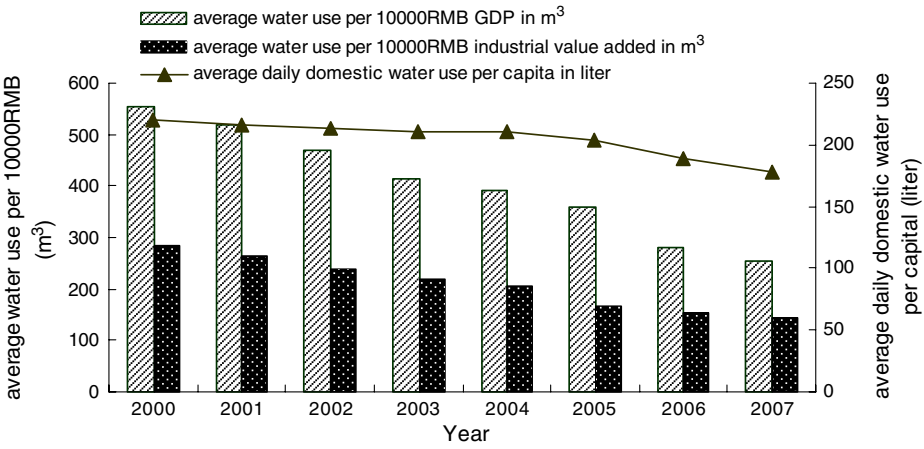
provision of 36 key cities[9] between 2000 and 2003 increased from 1.084 to 1.539 RMB per cubic metre; among which the relative largest increase was of the water resource fee, from 0.012 to 0.044 RMB per cubic metre. The average water tariff (excluding WWTC) increased over the same period from 1.081 to 1.338 RMB per cubic metre for household users and it increased further to 1.63 RMB per cubic metre in 2008 (cf. Fig. 3). For industrial user the water tariff increased from 1.343 to 2.096 RMB per cubic metre between 2000 and 2003, and increased further to 3 RMB per cubic metre in 2008).[10]

Furthermore, in the second half of the 1990s the Chinese Government called for inclusion of a wastewater treatment charge (WWTC, for both users of public water works and self-providers), as proposed in the *Administrative Method on Urban Water Supply Price* (No. 1810 Price Policy Paper, the formerly NDPC, 1998). The charge level should be set at the level of operation and maintenance cost.[11] In practice, the enforcement of WWTCs proved not simple, but a complicated and time-consuming process. In 2002, 325 cities (49% of total 661 cities in China) within 30 provinces (Tibet excluding) had set the local WWTC scheme, but the charge level in most cities was quite low and only 40 cities (12.3% of the 325 cities with local WWTC schemes) had an effective collection of WWTCs (SDRC and MOC 2003). By June of 2005, 186 cities (28% of total 661 cities) had not established the local WWTC scheme yet (MOC 2005). After a series of policies were issued for promoting the water tariff reform by Chinese governments, the WWTC level has increased sharply in recent years and also actual collection of the charge seems to move forward (although no exact data are available). Compared to 2000, the average level of WWTC for

[9]The 36 key cities are composed of all 31 provincial capitals and 5 cities specially designated in the State Plan which have a higher administrative level. They are all the typical cities of each province with various reform experiences, including the water tariff reforms.

[10]Water Price Database of ChinaWaterNet, at: www.h2o-china.com.

[11]The *Circular on Enhancing the Enforcement of the Wastewater Treatment Charge Scheme and Establishing Urban Drainage and Wastewater Treatment System* (No. 1192 Price Policy Paper, the formerly NDPC, the MOC and the SEPA, 1999).



At the constant price of 2000

(Source: MOC, China Urban Construction Statistics Yearbook 2008; NBS and SEPA, China Statistical Yearbook on Environment 2008)

Fig. 4 Average water use per unit GDP (in m^3, per 10,000 RMB GDP), average industrial water use per unit industrial GDP (in m^3, per 10,000 RMB industrial value added) and average daily domestic water use (in liters per capita), 2000–2007

households has increased 2.81 times in 2008, while the water tariff for households (excluding WWTC) increased 1.51 times over the same period (Fig. 3).

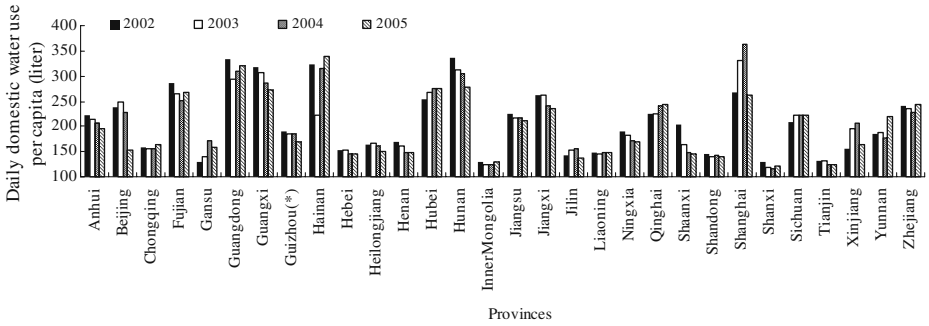
Figure 4 details the daily domestic water use per capita,[12] the water use per unit of GDP[13] and industrial water consumption per unit of industrial value added[14] in 2000–2007. All show a decreasing trend. The average urban domestic water use per capita decreased from 220.2 l/day in 2000 to 178.4 l/day in 2007; the average water use per 10,000 RMB GDP decreased from 554 m^3 in 2000 to 254 m^3 in 2007 (calculated at the constant price of 2000); the average water use per 10,000 RMB industrial value added decreased from 285 m^3 in 2000 to 142 m^3 in 2007 (calculated at the constant price of 2000). Figure 5 provides the domestic water use per capita by provinces in 2002–2005, respectively. Of all provinces 21 have decreased the domestic water use to a greater or lesser extent; in nine provinces an increase can be witnessed. Although it is difficult to relate water price policies to water consumption levels,[15] it is widely believed among Chinese water experts that the increased water tariff rates have made a positive impact on improving efficiency of water consumption (both for industrial and domestic use).

[12]The average domestic water use per capita (in liter) = [annual total urban domestic water consumption (in m^3) + annual urban water consumption for public services (in m^3)] × 1,000/urban population provided with water supply services (both public water works and self-provided works)/365 days.

[13]The water use per unit of GDP = the annual total water consumption (in m^3)/GDP (in 10,000 RMB).

[14]The industrial water consumption per unit of industrial value added = total industrial water consumption (in m^3)/industrial value added (in 10,000 RMB).

[15]It is sheer impossible to relate actual water prices to provincial water consumption in China, because, among others, official water tariffs are often not fully implemented at all water users; water tariffs differ significantly by cities, also within provinces; and causality is difficult to prove.



(Source: National Bureau of Statistics of China, China Statistics Yearbook 2003-2006)
Note: Data is not available for Tibet; (*) selected case province in Section 5

Fig. 5 Domestic water use (liter per capita) by provinces, 2002–2005

In addition to increasing the rates of different water prices, with the 1997 PRC Price Law China has also introduced price public hearings to increase public participation in governmental decision-making processes. These public hearings indicate the development of a more participative urban water management, although the form of and participants to (water) price public hearings are still heavily debated (cf. Zhong and Mol 2008).

5 Implementation of Water Tariff Reforms of Guizhou Province

This section uses the case of water tariff reforms in Guizhou Province to provide a better insight in how these national water pricing policies have been implemented locally. Only through such a case study one can understand the institutional underpinnings of water price policy implementation in China. This case study is based on literature review and document analysis, analysis of provincial statistical data, semi-structured in-depth interviews with officials from Guizhou Price Bureau, officials from Guizhou water resource authorities as well as managers of several local water companies, and interviews and discussions with academic water experts to check and assess obtained information on the implementing water tariff reforms in Guizhou province.

Guizhou Province, located in southwest China, is one of most water-abundant provinces in China with ample capacity of hydroelectricity generation. It is also one of the more underdeveloped provinces, with a GDP per capita of 6,915 RMB in 2007 (well below the national average of 18,934 RMB). Guizhou is selected as a case study province as we can expect implementation of water pricing policies to be less smooth than in water limited provinces as well as in richer provinces. It means that findings for Guizhou can not be extrapolated to all other Chinese provinces, but are to some extent representative for other water-abundant poor provinces.

Following national policies, Guizhou Province has designed local policies and regulations and introduced various kinds of water tariff reforms proposed by the Central Government, such as a raw water price for hydraulic engineering (water

resource system, starting in 1983), a water resource fee (starting in 1993 and increased in 2007), a wastewater treatment charge (starting since the late 1990s), and a cost-recovery price of water supply; a two-part pricing system is also in use.[16] Following the various water tariff reforms, Guizhou province is one of the 21 provinces that saw its water use per capita (slightly) decreasing over the last 5 years (Fig. 5). The inconspicuous decrease of water use is partly caused by problems in designing and implementing water price policies. The problems with implementation of water price policies of Guizhou Province are not unlike experiences in several other provinces.

Endowed with large water resources, Guizhou Province has established over 89 thousands hydraulic facilities (e.g. reservoirs, dams, pumps, etc.) since 1949. But raw water from these facilities was not subjected to a fee until 1983, following the *Administrative Method on Charging and Using the Water Fee of Water Engineering System of Guizhou* (No. 111 Policy Paper of Guizhou Government, 1983). According to Guizhou Price Bureau, over the past two decades, the rate of water fees for water engineering systems has increased three times for agricultural use, while the rates for other uses (industrial, municipal, and hydroelectricity generation) were only adjusted once in 2000. Following the most recent water tariff rates, in 2003 a total water fee of over 50 million RMB (26.558 million RMB for agricultural users and 25.665 million RMB for municipal and industrial water consumers) was collected and used for maintaining and expanding the water engineering facilities. The current rates (used since 2000), which equal 34–56% of the water provision costs for agricultural users and 56–87% for industrial and municipal users in 2000, are still at a rather low level and cannot cover the full costs of raw water provision and the cost of expanding and upgrading the water engineering facilities in Guizhou (ref. Table 2). Notwithstanding the low rate of the raw water fee, the collection of raw water fee has encountered problems in practice (in particular the fee for rural irrigation), partly due to the lack of standard charging procedures (such as lacking a uniformed billing system).

In order to improve the water use efficiency, protect water resources and cover costs, Guizhou Province started to collect the water resource fee to various water consumers[17] at different rates (see Table 3) since January 1, 1993, following to the *Administrative Methods on Collecting and Administrating Water Resource Fee of Guizhou Province* (No. 55 Policy Paper of Guizhou Government, 1992). It stipulates that the water authorities at county level take charge of collecting water resource fees, which are administrated as governmental extra-budgetary funds (10% as provincial revenue, 20% as municipal revenue, and 70% as county revenue). However, the actual collected water resource fee was much lower than the amount that should have been collected. For instance, the collected water resource fees in 2003 added up to 13.91 million RMB, equaling only 13.9% of the total projected amount (100 million RMB). According to Mr. Li, Director of Water Resource

[16]Xingren County and Zhenfeng County are the forerunners of two-part pricing in Guizhou Province. Two different rates for water users are applied, according to the amount of water use. For instance, for household users the current water tariff rates of Zhenfeng County combines a basic rate (2.3 RMB per cubic metre below 5 m^3 per month) and a higher rate (2.5 RMB per cubic metre above 5 m^3 per month), formulating an increasing block tariff structure (Zhenfeng Water Supply Company, personal communication, 2007).

[17]The water resource fee is not applied to users of irrigation water, rural households, and water consumption less than 50 m^3/month.

Table 2 Rates of raw water fee of water resource system

Year of introduction	Charge rates of raw water provision (RMB per cubic metre)				Hydraulic power generation
	Irrigation use		Industrial use	Municipal use	
	Gravity	Pumping			
1983	0.005–0.008	Half rate of gravity irrigation	0.02–0.04	0.02–0.10	8% income of power generation
1986	0.005				
1989	6.5 kg rice per mou[a]				
2000	0.036–0.06		0.13–0.20 RMB		
Average cost of raw water provision[b]	0.107		0.23		0.05

Source: Guizhou Price Bureau (2004)

[a]In 1989, it was proposed to collect rice instead of money for agricultural water use; but it was forbidden after the national institutional reform of food supplies in 2004. This has resulted in a lower collection rate of raw water fee (the current rate of 40–50% compared to the rate of 80–90% in 1989–2003) (according to Mr.Cai, the Director of Guizhou Hydraulic Engineering Administrative Bureau; personal communication, July 16 of 2007)

[b]The average cost of raw water provision was referred to the survey of Guizhou Price Bureau in 2000

Division of Guizhou Water Resource Bureau,[18] four major reasons caused the low collection rate of water resource fees. First, the water authorities in some countries are encountering capacity problems, such as being understaffed and having incapable staff, resulting in an inadequate capacity for water resource fee management. Second, the country-level water authorities fall short in enthusiasm for collecting water resource fees, due to the fact that they lack usage right of water resource fees. Third, the country-level governments often promise exemptions of water resource fee for major investors in order to attract capital for local development. Finally, but not the least, higher governmental intervention are causing poor collection rates. For instance, both the General Office of State Council and the General Office of Guizhou Government issued special policy papers to exempt certain key institutional water consumers from paying their resource fee, such as national hydraulic/thermal power plants (e.g. Guizhou Wujiang Hydraulic Power Development Company). It is estimated that about 50 million RMB of water resource fees are exempted every year due to this local, provincial and national governmental intervention. These exemption policies are also common in other provinces and have been identified as one of the main implementation problems of water resource fee approaches in China.[19] This all raises questions as to whether the water resource fee approach is still an effective economic instrument to protect water resources. The national government seems to

[18]Personal communication, July 15 of 2007.

[19]For instance, about 200 million RMB was exempted annually for national power generation plants in Shandong Province at the turn of the millennium (Liu et al. 2003). These exemptions are increasingly disputed. See for legal disputes on collecting water resource fees of a national power generation plant in Hunan Province: Cheng (2005). And see for a similar legal dispute in Dahua County of Guangxi Province (Chinese Economic Times 2006).

Table 3 Rates of water resource fee in Guizhou Province, 1993, 2007

	Surface water		Groundwater		Unit
	1993	2007	1993	2007	
General industrial use	0.02–0.04	0.06	0.03–0.05	0.12	RMB per cubic metre
General municipal use	0.01–0.02	0.04	0.02–0.03	0.08	RMB per cubic metre
Municipal water supply enterprises		0.04		0.08	RMB per cubic metre
Thermal power generation	0.001–0.005				
Cooling mode: closed cycle		0.01–0.02		0.02–0.04	RMB per cubic metre
Cooling mode: uniflow opened cycle		0.001–0.002		0.002–0.004	RMB per cubic metre
Hydraulic power generation	0.001				
Large-size Plants		0.01–0.015		0.015	RMB per kilowatt hour
Medium-size plants		0.007–0.011		0.011	RMB per kilowatt hour
Small-size plans		0.004–0.007		0.007	RMB per kilowatt hour
Bottled water producer		0.07		0.14	RMB per cubic metre
Geothermal water users				0.2–0.5	RMB per cubic metre
Groundwater abstraction from overdraught regions				2	RMB per cubic metre
Self-supplying wells in the areas covered by the public water supply networks				0.2–0.5	RMB per cubic metre
Others[a]	0.01–0.03	0.05	0.02–0.04	0.10	RMB per cubic metre

[a] In the 1993 regulations, other use refers to water used for health care, tourism, fish breeding, farming lands, etc

be aware of that. Recently, Vice-Premier Zeng Peiyan emphasized the importance of applying economic instruments to all users in order to protect water resources and specifically called for charging water resource fees at national power generation plants in similar ways as other water users.[20]

Recently, this national attention seems to affect water resource fee collection practices in Guizhou, at least as reported in local policy papers. In February of

[20] Speech of vice-premier Zeng Peiyan at the national teleconference on water tariff reform and water conservation, April 29, 2005, at: http://www.gov.cn/node_11140/2006–04/22/content_261147.htm.

2007, Guizhou Government issued the *Administrative Methods on Licensing Water Abstraction and Collecting Water Resource Fee* (No. 99 Policy Paper of Guizhou Government, 2007).[21] This policy paper is expected to institutionalize and improve the management of water abstraction and water resource fee collection. It specifies the scope of water abstraction licenses and collecting water resource fees (irrigation use and scattered individual water users with a monthly use of less than 100 m^3 are exempt from water resource fee); it further defines the roles and responsibilities of water authorities at different levels and requests a three-level tiered administration (provincial, municipal and country level) of water abstraction permits and water resource fee collection; it stipulates the procedure of setting the rates of water resource fee, which should be decided by provincial-level authority; and it calls for applying progressive rates for water resource fees. Meanwhile, new classifications of water resource fees were detailed by the No. 49 Guizhou Price Policy Paper of 2007, and the rates for different water use categories have tripled or more (see Table 3) since April 1, 2007. The policy paper is not only clear in requiring all major institutional users (including power generation plants) to pay the water resource fee, but it also institutionalizes and discloses the fee collection system through strengthening the management of the so-called charging licenses,[22] uniform bills for all users, and disclosing information to the public (such as the items of charge, rates of charge, license number, and telephone numbers of superintendents). While these government efforts in policy design for addressing water pricing problems are hopeful,[23] it needs time to observe the actual implementation of these proposals for the water resource fee governance and their impact on fee collection, water management and protection of local water resources.

In addition to this, Guizhou Povince is attempting to use economic instruments to enhance and improve its wastewater treatment service. Compared to other Chinese regions, Guizhou Province has a low capacity of wastewater treatment, with a wastewater treatment rate of 39.13% in 2007 (compared to a national average of 62.87%). As early as in 1997, only two cities (Guiyang City and Zunyi City) have established local WWTC schemes in Guizhou Province. By the end of 2008, 2 of the 87 cities and counties in Guizhou had not introduced a WWTC scheme yet. The current WWTCs range from 0.15 to 0.70 RMB per cubic metre (the average WWTC rate of 85 cities and counties is 0.262 RMB per cubic metre, only five cities have a higher rate of 0.70 RMB per cubic metre) and are required to increase to 0.6–0.8 RMB per cubic metre according to the recent *Administrative Regulation on Collecting Urban Wastewater Treatment Charge of Guizhou* (No. 3 Policy Paper of Guizhou Price Bureau, Guizhou Construction Bureau, Guizhou Finance Bureau,

[21]This administrative method is the emendation of the *Administrative Methods on Collecting and Administrating Water Resource Fee of Guizhou Province* (No. 55 Policy Paper of Guizhou Government, 1992); also the reaction to the *PRC Water Law* (revised in 2002), the *Guizhou Implementation Regulations on PRC Water Law* (2005), and the latest *Ordinance on Licensing Water Abstraction and Collecting Water Resource Fee* (the State Council, 2006).

[22]The organizations in charge of collecting water resource fees have to apply or update the charging license to the price authorities at the same level.

[23]For instance, Mr. Li of the provincial water authority, believes to collect about 200 million RMB annually of water resource fees, following the new requirements of No. 99 Policy Paper of 2007 (personal communication, July 15, 2007).

and Guizhou Environment Protection Bureau, 2007). These WWTCs cover only part of the cost for further developing wastewater treatment facilities. For instance, it is estimated that a total investment of about 2000 million RMB is required for developing wastewater treatment facilities in the provincial capital Guiyang in 2008–2010, in order to meet the goal of 80% wastewater treated by the end of 2010.[24]

Overall, Guizhou Province has experienced a quick increase in the urban water tariff, in particular after 2003 (Zhong and Mol 2008). The current average rates of water tariff (including WWTC) of 87 cities and counties are 1.894 RMB per cubic metre for household users (ranging from 1.2 to 3.5 RMB per cubic metre), 2.292 RMB per cubic metre for administrative users (ranging from 1.2 to 4.7 RMB per cubic metre), 2.417 RMB per cubic metre for industrial users (ranging from 1.2 to 4.7 RMB per cubic metre), 3.099 RMB per cubic metre for business users (ranging from 1.4 to 6.5 RMB per cubic metre), and 5.485 RMB per cubic metre for special users[25] (ranging from 1.7 to 11.2 RMB per cubic metre). Following the recent increase in water resource fee, Guiyang City (Capital of Guizhou Province) increased its urban water tariff sharply since July 1, 2007. The water tariff rate for household users increased from 1.4 to 2.2 RMB per cubic metre (increase of 57%), including an increase of 0.3 RMB per cubic metre for WWTC. It is argued that this new water tariff increase has a positive impact on improving the water use efficiency and protecting water resources. The average annual domestic water use per capita of Guizhou Province has decreased (slightly) from 65 m^3 in 2004 to 64.41 m^3 in 2007, while the average annual domestic water use per capita of Guiyang City has decreased from 81 m^3 in 2004 (at a water supply price of 1.0 RMB per cubic metre for household users, including WWTC) to 69.31 m^3 in 2007 (at a water supply price of 2.2 RMB per cubic metre for household user, including WWTC). Over the same period, the average industrial water use per 10,000 RMB industrial value added of Guizhou Province decreased from 574.62 to 316.10 m^3 (calculated at constant prices of 2000).

Guizhou Government has made considerable policy efforts to introduce pricing instrument into the field of water management, ranging from price increases for raw water abstraction, a water resource fee to wastewater treatment charges. However, the empirical experience in Guizhou has demonstrated that natural resource pricing policy is not just a matter of increasing prices, but a complicated process involving institution building, improving governmental capacity, decreasing conflicting governmental interventions, and making cost and collection systems transparent. With respect to these latter aspects, water reform in Guizhou is only starting.

6 Conclusions

As is evident from our analysis of water price reforms in urban China over the last two decades, major advances have been made in increasing the tariff of an

[24]Guizhou Urban Daily [*Guizhou Dushi Bao*], June 22 of 2007.

[25]Special users refer to water consumption for entertainment purpose, such as danding hall, bowling, night club, saunas, etc. In some cities, car washing also belongs to this group.

initially free natural resource. In that sense China is rapidly catching up with many OECD countries by developing an advanced system of pricing water resources and water use, in order to meet various goals: covering increasing costs, protecting scarce natural resources, and introducing economic stimuli for efficient use of these resources. Hence, China's water pricing policy fits ecological modernization ideas.

As in most countries, also in China the use of economic instruments offers several (potential and actual) benefits in urban water governance such as increased revenues, more available funding, and a decrease in water consumption per capita or unit of GDP. At this early stage of development and implementation of water pricing attention is mainly directed at the economics of setting 'right' prices, and less to the institutional aspects that come along with implementation and governance. But this current application of economic instruments in China's water governance is also facing major challenges, related to a necessary perception change of recognizing that water is also an economic good, the willingness to pay significantly for water, the capacity to pay especially for the urban and rural poor, and—last but not least—the institutional lay-out necessary for successful implementation. The Chinese experiences with water pricing policies teach us that using economic instruments in urban water management is a complicated process. It does not just imply changes in water tariffs. To be successful water pricing also has to include institutional reforms in water regulation, collection systems, financial management, governmental subsidies, public participation, and social and equity issues. And these latter aspects often prove crucial for solving urban water problems.

While environmental and natural resource economists rightly argue for the theoretical pre-eminence of these economic approaches to combat various water challenges, third generation ecological modernization studies have shown that successful use of economic approaches to water problems need a strong focus on the institutional underpinnings of water pricing (cf. van Vliet 2002). We can conclude from this water pricing study that the Chinese ecological modernization perspective, as articulated by the CCMR (2007), is more than just a different theoretical interpretation of ecological modernization compared to western EM scholars. The Chinese EM perspective also reflects current environmental policies in China. Water pricing policies in China focus strongly on the pricing aspect, but only marginally on the institutions that should enable effective implementation of such pricing policies. In that sense, current water pricing policies belong to the first rather than the third generation of EM thought.

The slight improvement of water use efficiency following significant water tariff increases in Guizhou and other provinces illustrate the need for institutional improvements: more and better professional staff; more advanced and uniform systems of monitoring and billing; improvement of accountability, transparency, and public participation in the policy-making and implementation; and further attention to policy integration. Recent developments in Guizhou with respect to water resource fees point in this direction. The newly installed institution of public hearings for setting water tariffs (cf. Zhong and Mol 2008) and various experiments with public-private partnerships in urban water governance (Zhong et al. 2008) can also be seen as indications that ecological modernization processes in China's water reform are moving away from a one sided economic-technological process toward a multi-sided governance innovation.

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