The development of water markets in China: progress, peril, and prospects

Scott M. Moore

Sustainability Science Program, Harvard Kennedy School, 79 John F Kennedy Street, Mailbox 81, Cambridge, MA 02138, USA. E-mail: scottm@alumni.princeton.edu

Abstract

This article employs the case of China to address questions concerning the proper design and implementation of Water Rights Trading (WRT) and its applicability in developing countries. The article relies on key-informant interviews and Chinese-language sources to explain the development of China’s water markets to date, and to assess their future prospects for expansion. The article proceeds in three parts. First, it identifies three distinctive features of water policy in China that limit the applicability of market-based responses to water scarcity: a legacy of administrative control over water, a distinctive agricultural structure and politics, and central–local tensions and conflicts. Second, it surveys the status of current WRT projects in China, highlighting their limited scope by examining three case studies. Finally, the article identifies specific issues that must be addressed to further develop Chinese water markets. The article argues that water markets have an important but only partial role in meeting China’s water resource challenges. Scholars interested in the design and implementation of water markets in developing countries should pay greater attention to such fundamental features of governance and water resource management, and the prospect of integrating market mechanisms with administrative and supply-augmentation approaches.

Keywords: China; Water markets; Water Rights Trading; Water scarcity

1. Introduction: market-based responses to water scarcity

1.1. Debates over water markets and the case of China

In recent decades, Water Rights Trading (WRT) has emerged as a leading solution to water scarcity in many parts of the world. A WRT system allocates usage rights to a defined quantity of water to various water users, who can then buy and sell their entitlements to other users. Under ideal circumstances, WRT effectively caps total water use in a given region, while also allocating the quantity of water available for use under this cap to its most productive uses. Thus conceived, WRT achieves a socially
doi: 10.2166/wp.2014.063

© IWA Publishing 2015
optimal allocation of water resources in which, put simply, scarce water resources are consumed by those who value it most (Howe et al., 1986; Chong & Sunding, 2006; Debaere et al., 2014). For this reason, WRT has received widespread backing among western scholars and development institutions (Holden & Thobani, 1996; Easter et al., 1999; Webber et al., 2008).

Yet even proponents of WRT as a solution to water scarcity emphasize the importance of careful policy design and implementation. As many analysts point out, while WRT promises to achieve an economically efficient allocation of water resources, it does not necessarily achieve an equitable distribution of those resources, which in turn raises concerns about the impact of WRT on poor and disadvantaged water users (Johansson et al., 2002; Araral, 2010). Further concerns stem from possible third-party effects of trading water rights, including the impact of consumptive use on downstream users and the need to ensure minimum flows for ecological and recreational uses (Gould, 1988; Liu, 2004; Etchells et al., 2006; Grafton et al., 2012).

Apart from these general issues, several scholars have raised concerns about the applicability of WRT to developing countries, given differences in land tenure, water use, and other structural features (Molle, 2004; Abernathy, 2005). Broadly speaking, the literature on WRT suggests that functional water markets require substantial institutional capacity, including a robust bureaucratic entity that possesses clear legitimacy and authority, technical capability to assess and monitor water use by all users, and strong powers to ensure compliance (Tripp & Dudek, 1989; Johansson et al., 2002). In Chile, for instance, bureaucratic weakness both undermined security of title and created numerous third-party effects (Bauer, 1997). In Australia, meanwhile, it has proven difficult to define water rights despite the country’s high level of development and administrative capacity (Turrell et al., 2005). Given the complexity of WRT and the institutional infrastructure necessary for water markets to function effectively, the applicability of WRT to developing countries remains something of an unsettled question for water resource management and policy. In this context, China represents an important case study of the ability for market-based mechanisms to help developing countries meet water scarcity challenges.

1.2. Market-based responses to China’s water resource challenges

This importance as a case study stems from the fact that China stands out among the several countries that have in recent decades turned to market-based responses to water scarcity. Compared to more prominent cases such as the United States, Australia, and Chile, China features a lower general level of development, lower institutional capacity, and an authoritarian system of governance. Yet despite its relevance to both theoretical and practical debates concerning the role of water markets in meeting water resource challenges around the world, the development of water markets in China is generally less well-described in the scholarly literature than in other countries (Zekri & Easter, 2007; Webber et al., 2008). Drawing on extensive interviews and Chinese-language sources, this article aims to redress this lacuna, in the process shedding new light on the role of market-based mechanisms in addressing water scarcity challenges in China and other developing countries.

Water markets in China represent a response to several interrelated water resource challenges. First, China has in recent decades experienced a combination of population growth, demographic change, and rapid economic development, which together have dramatically increased demand for urban and industrial water use (Yong, 2009). By 2030, total water demand in China is expected to significantly outstrip population growth over the same period (see Figure 1) (2030 Water Resources Group, 2009). In arid northern China, these demand-driven pressures are manifested in groundwater mining and rapidly
depleting surface water resources (Xia et al., 2007; Cai, 2008). Moreover, China realizes very low water use efficiency, which results in large quantities of water being appropriated for agriculture and industry while contributing little to economic output (Zhu et al., 2001).

China has adopted a variety of market-based measures to address these water resource challenges, with a particular focus on WRT (Yao, 2005). In part, this focus results from the failed implementation or embryonic state of other policy responses to water scarcity. Despite featuring prominently in the government’s overall water resource strategy, water price reform has been very gradual, and agricultural water prices in particular remain very low (Zhong & Mol, 2010). Moreover, recent research indicates that agricultural water demand is highly price-inelastic, suggesting that price increases alone may not drive significant efficiency gains (Aregay et al., 2013). Efforts to encourage wastewater reuse and water conservation, meanwhile, remain at a very early stage (Liu & Persson, 2013). In pursuing these efforts, the government has made clear that it intends to make WRT the foundation of its new ‘water-saving society’ (Xia & Pahl-Wostl, 2012), and in July 2014 pledged to establish WRT systems in seven provinces (Chen & Reklev, 2014). This article assesses both progress toward this goal as well as several challenges that may impede it.

1.3. Objectives, methods, and structure

This article pursues three specific objectives: first, it identifies several fundamental institutional constraints on the development of water markets in China that limit its general applicability to the Chinese case. Second, it examines the design and implementation of three current WRT projects, stressing that they represent adaptation to locally specific conditions rather than a scalable model for water market expansion in China as a whole. Third, this article assesses the prospects for future development of water markets in China, with emphasis on the relationship between WRT and other policy responses to water scarcity. These objectives are pursued in the three remaining body sections of this article, while the Conclusions summarize how lessons from the Chinese case apply to the study and practice of WRT in other countries.
To pursue these objectives, this study follows a descriptive case-study method applied in several recent accounts of water management and WRT in China (Shen, 2012; Li et al., 2013). Primary data are based on 33 key-informant interviews conducted with a range of researchers, policy-makers, journalists, and environmental activists in three Chinese cities, as well as an extensive review of Chinese-language documentary sources concerning WRT. This case selection is designed to represent the various models of WRT currently operative in China, including inter-jurisdictional, inter-sectoral, and inter-communal WRT (Gao, 2007).

This account builds on several recent descriptive studies of the implementation and operation of WRT in China (Calow et al., 2009; Speed, 2009). However, it differs from these by overlaying description with a critical theoretical framework that questions the value of developing water markets de novo according to a Western model versus adapting existing institutions for water resource allocation (Molle, 2004). The case of China is thus presented as an explicit test of emerging theory concerning the design and implementation of water markets in developing countries (Bruns et al., 2005a, b).

This article contends that the current literature on WRT does not capture the complexity of design and implementation in a context such as China. China represents a case where institutional constraints preclude the large-scale adoption of market-based water resource allocation mechanisms but where, equally, WRT is an integral component of a portfolio of policy responses to water scarcity, including regulation and supply augmentation. The China case thus illustrates that water resource scholars and managers should pay greater attention to fundamental institutional constraints and factors in the design of water markets, as well as how water markets relate to a broader system of responses to water scarcity.

2. Basic constraints on water market development in China

China possesses a number of fundamental political, social, and economic arrangements that together constrain the development of water markets, and which must be understood before examining specific case studies of WRT implementation. Although the Chinese government has pledged to expand markets for water, their current scope is quite limited (36-ZZ, 2014)1. Accordingly, this section identifies and discusses three distinctive features of water resource management and policy in China that serve to distinguish it from other countries where WRT has been implemented, and which constrain the use of market mechanisms to allocate scarce water resources.

2.1. Legacy of administrative control of water resources

The first of these constraints concerns a long history, in some cases going back over a millennium, of administrative control over water resource allocation, which recent developments have mostly served to enhance. The present system of water resource allocation emphasizes administrative water use regulation in the context of state ownership of all water resources (Gao, 2007). It dates

---

1 Due to confidentiality concerns, I cite each interview source using a two-part code consisting of two numbers, which correspond to an individual interviewee, and two letters, which refer to the city where the interview was conducted. For example, 21-BJ references the 21st individual interviewed in Beijing; and 36-ZZ references the 36th individual interviewed in Zhengzhou.
to around 1982, when Shanxi Province required major water users to apply for abstraction permits, a provision that other provinces subsequently adopted (Zhang & Jia, 2012). China’s 1988 Water Law codified this abstraction-permit (qushui kexu) principle for water allocation, and also introduced a specific provision for ‘compensated’ transfers of abstraction permits – the first discrete provision for market-based water transfers.

In recent years, the Chinese government has attempted to build on these provisions by following an approach known as ‘promoting water rights and moving toward the market’. The primary means of doing so include strengthening the legal foundations of water rights and promoting WRT as a means of boosting water conservation rates (Wang, 2013). In 2001, the Ministry of Water Resources (MWR) issued a plan for establishing a water rights system based on an initial allocation of usage rights to both regions and enterprises, which could then sell any excess water saved from their initial allocations. The 2002 revisions to China’s Water Law further strengthened the legislative basis for this form of compensated water rights transfer.

Subsequent legislation has been geared towards refining implementation of these basic legislative provisions. In 2005, MWR issued instructions requiring water resource agencies at all levels to ‘take water rights seriously and establish appropriate water rights systems’. Most significantly, following the enactment of the landmark Property Law in 2007, MWR issued new regulations that established a number of basic criteria for initial water rights allocation, including consideration of equity, historical water use, and environmental water requirements (Zhang & Jia, 2012). Under a few pilot projects, water rights have been granted to individual farmers in the form of usage certificates (shiyongzheng), which then entitles farmers to purchase tickets (shuipiao) allowing them to use a defined quantity of water in a defined period of time (Calow et al., 2009).

Yet despite these market-oriented measures, water resource allocation in China overall remains subject to strong administrative control. Long-standing administrative allocation plans for several of China’s major river basins, most notably the Yellow, govern initial allocation (Liu, 2005). Moreover, the hierarchical model by which state-owned water resources are allocated by the central government to various provinces, and then by the provinces to local governments, persists (Shen, 2012). WRT in China therefore represents a transfer of water usage entitlements allocated to administrative entities, rather than constituting true trading between individual rights-holders (Wang, 2013). As two leading scholars of water resource management in China have written, ‘At present most of China’s water rights practices have stopped at the level of [administrative] water quantity allocation … [which] are relatively simple and easy’ [to establish] (Zhang & Jia, 2012).

2.2. Agricultural structure and politics

A second fundamental characteristic of the Chinese case lies in the distinctiveness of its agricultural sector, and the salience of peasant political interests. Water use in China is distinguished from the case of other countries that employ WRT, such as Australia and Chile, by the fact that communal Irrigation Districts (IDs) constitute the primary unit of agricultural production and water use (Wang, 2013). This characteristic creates severe challenges for the designation and enforcement of water rights, because within IDs, water rights are effectively communal, making it very difficult to assign rights to individual users (15-BJ, 2014).

The lack of clarity surrounding water entitlements within IDs also reduces incentives to invest in water conservation technologies, since it is unclear who would benefit from selling the resulting savings.
The overall effect is to reduce participation in WRT among many water users (Gao, 2007). Moreover, unclear water entitlements often provide legal cover for over-abstraction, particularly of groundwater resources, by agricultural water users (21-BJ, 2014). Because of this distinctive agricultural structure and its second-order effects on the clarity of water entitlements, many Chinese water resource specialists are convinced that China must follow its own distinctive approach to water market development. According to one prominent water resource scholar, WRT ‘with Chinese characteristics’ includes a system with strong government planning and supervision, and based upon the ID as the basic unit of water allocation (Wang, 2013).

An associated characteristic of Chinese water resource management is the relationship between individual peasant farmers and higher levels of organization, including IDs and the national government. From its inception, the Chinese Communist Party has staked a large part of its legitimacy on representing peasant political interests, and the issue of poverty alleviation and rural development continues to loom large in Chinese water resource management policy (Hu, 2009). Most Chinese commentators on WRT are therefore careful to note that the government must protect the interests of the peasants (Gao, 2007).

This long-standing concern for the welfare of peasant farmers, however well-founded, nonetheless often impedes water transfers to meet the rapid growth in water demand for industrial uses (38-ZZ, 2014). In the words of one interview informant, it is ‘politically very risky’ to reallocate water away from agriculture (22-BJ, 2014). Despite the government’s desire to use WRT to effect this reallocation, agricultural interests continue to impede this process. According to another interviewee, ‘agriculture will always win fights over [water] allocation’ (42-BJ, 2014). Yet such inter-sectoral tensions are matched by even more contentious relationships between central and local levels of government in water resource management.

2.3. Problems of central control and central–local relations

China possesses a distinctive governance structure in which decision-making is tightly controlled by the central government, but policy implementation is left largely in the hands of local governments (Xia & Pahl-Wostl, 2012). In the water sector, this is manifested in a principle of ‘the center controls, [while] the local [level] implements’ (Gao, 2007). A key feature of this division of powers is experimentation with the design of water policies in response to local conditions (Li et al., 2013), and the scope of experimentation has resulted in a variety of regionally specific forms of various WRT policy designs (Jia & Yan, 2012). One interview informant specifically stated that there is no one-size-fits-all solution to WRT for the country as a whole, for example (38-ZZ, 2014).

A largely unintended consequence of this experimental and patchwork approach is a marked disconnect between centrally formulated WRT regulations and locally implemented policy. According to 2006 guidelines issued by the State Council, each province must develop a framework to manage water abstraction, including provisions for reviewing abstraction permit applications. Provinces are supposed to consider sustainability, water scarcity, and other criteria in making their decisions on permit applications (Gao, 2007). But according to interview informants, this division of power means that while MWR has established a framework for WRT, in practice each province develops its own discordant approach, meaning that in some areas issues like environmental water requirements are taken into account, and in others not at all. In some particularly stressed river basins, such as the Yellow, River
Basin Commissions under MWR also approve WRT plans, compounding wide variations in the implementation of WRT across regions (13-BJ, 2014; 38-ZZ, 2014).

This patchwork approach to the development of water markets in turn creates space for local governments to pursue their own objectives, often to the detriment of efficient water resource allocation. Local governments have often been noted to be hesitant to implement market-oriented reforms in the water sector in order to protect favored local industries (Yang et al., 2003; Zhang, 2007). Interviewees describe a number of cases where local officials refused to consider inter-jurisdictional water transfers because they wanted to keep all water resources within their individual jurisdictions (38-ZZ, 2014; 42-BJ, 2014). The degree of this local protectionism encapsulates the systemic challenges that constrain the development of water markets in China, despite the progress of individual projects, which are described in the section that follows.

3. Progress in WRT in China: three case studies

This section examines three case studies, each chosen according to a typology developed by a prominent Chinese water scholar: inter-jurisdictional and inter-sectoral water rights’ transfers and short-term WRT mechanisms (Gao, 2007). This section explores one representative case study of each, in the process painting a picture of the overall development of water markets in China. The cases demonstrate two important features: first, each possesses several characteristics that limit their applicability in other regions of China; second, only the final type corresponds to the model of WRT operative in the United States and Australia. Together, the cases indicate that to date WRT has taken the form of locally specific responses to specific challenges, rather than a scalable policy model applicable to China as a whole.

3.1. Inter-jurisdictional transfers: Dongyang – Yiwu, Zhejiang Province

The first type, transfers of water between administrative jurisdictions, is significant for having ‘broken the old model’ of administrative water resource allocation in China. The primary example of such inter-jurisdictional transfers is a 2000 agreement between two cities in Zhejiang Province, Yiwu and Dongyang. Beginning in 1998, downstream Yiwu invested 3.1 million RMB to upgrade a reservoir in upstream Dongyang, enhancing its storage capacity by 10,000 m³, while also investing a further 35.7 million RMB in water conservation projects to save an additional 13,000 m³. This investment increased water supply capacity for both cities at a cost of 0.73 RMB/m³, saving Yiwu an estimated 100 million RMB from having to build its own reservoir (Yi, 2010; Wang, 2013). The Yiwu–Dongyang transfer remains viewed as one of the most successful market-based water management policies in China (Gao, 2007).

However, the Yiwu–Dongyang case exhibited several special features that make it difficult to replicate elsewhere. The level of water conservation investment in Zhejiang was already relatively high, as was the general level of economic development and the resources available to both Yiwu and Dongyang cities. The two cities also enjoyed a history of unusually close cooperation, manifested in a ‘special partnership’ status. City officials communicated frequently, and business relationships between the two cities were already extensive at the time of the deal. As several Dongyang leaders put it, ‘The two cities see themselves as a single integrated market … and view cooperation from a strategic perspective’
Dongyang, for its part, had also entered into water supply contracts before, and so was well disposed to Yiwu’s proposal.

This history of cooperation played a critical role in allowing the two cities to conclude what is effectively a long-term water supply contract, with Yiwu paying Dongyang 200 million RMB for the transfer of its water entitlements, plus a 0.1 RMB/m³ reservoir management fee. The long-term nature of the agreement and investment was designed to provide water security for Yiwu – as a city official put it, ‘spending money buys certainty’ (Wang, 2013). However, the very nature of this long-term water supply agreement indicates both the special circumstances that led to its conclusion, as well as the fundamental differences that separate it from individual water rights’ transfer schemes operative in Australia, Chile, and elsewhere.

3.2. Inter-sectoral transfers: Ningxia and Inner Mongolia autonomous regions

Similar differences are found in the second inter-sectoral model of WRT. Inter-sectoral transfers are most common in the province-level autonomous regions of Ningxia and Inner Mongolia, where rapidly increasing industrial water demands, combined with physical water scarcity, have created an especially pressing need for the reallocation of water away from agricultural uses. In 2003, Ningxia submitted a pilot project to the Yellow River Conservancy Commission (YRCC), which approves water transfers in the Yellow River Basin on behalf of the MWR, to invest some 47 million RMB in irrigation district conservation projects in order to transfer 144 million m³ of water entitlements to two new hydropower plants for a period of 25 years. Along with a further two pilot projects initiated shortly afterward, some 19.22 km of canals were lined, yielding a water rights’ transfer from agricultural to industrial uses of 539 million m³ at a cost of 2.68–3.1 RMB/m³ (Zhang, 2012).

By 2008, the YRCC had approved 26 water rights’ transfer projects, with 20 of these located in Inner Mongolia alone. Together, these projects accounted for a total of 23 million m³ of water, with a total investment of some 123 million RMB (Wang, 2013). These efforts have been highly successful on many measures: the additional investment in water conservation has reportedly reduced the quantity of water required for irrigation by half, and cut expenditure for farmers by a third. Moreover, investment in these projects rather incredibly represented 10 times the total investment in irrigation water conservation over the preceding 50 years (Zhang, 2012).

However, much like the case of inter-jurisdictional transfers between Yiwu and Dongyang, inter-sectoral water rights’ transfer projects in Ningxia and Inner Mongolia do not represent true WRT, nor are they easily replicated in other contexts. As several Chinese water resource scholars point out, pilot projects in Ningxia and Inner Mongolia represent transfers of water usage rights under government leadership, rather than true WRT between economic actors (Zhang, 2012). More significantly, however, special conditions pertain in Ningxia and Inner Mongolia that limit the applicability of pilot projects in other regions.

Both regions face growing water demands as a result of skyrocketing coal production, and at the same time feature exceptionally low irrigation water use efficiency. In Ningxia, some 18–24% of water abstracted for irrigation is lost through canal seepage, creating large scope for investments in canal lining in order to transfer usage rights to industry (Zhang, 2012). Finally, both regions are subject to particularly dire water shortages as a result of over-abstracting both surfacewater and groundwater. According to one interview informant, water use in Ningxia’s urban regions is 80% above the natural rate of replenishment, prompting special concern from the local government (41-BJ, 2014). This
combination of factors distinguishes the case of Ningxia and Inner Mongolia from other regions in which inter-sectoral allocation issues are less pronounced, and where transfers are less easily implemented.

3.3. Individual short-term trading: Shiyang River Basin, Gansu Province

The final model of WRT in China, individual short-term trading, is represented by the case of the Shiyang River Basin in Gansu Province. The implementation of WRT in the Shiyang Basin was driven primarily by a combination of physical water scarcity and long-standing tensions between upstream and downstream water users. In the early 2000s, groundwater abstraction was estimated at 135% of the natural rate of recharge, and irrigation accounted for 86% of basin water use (Zhang, 2012). In 2005, the Gansu Provincial government approved a plan to reduce basin water consumption by 60 million m³ annually, largely through agricultural water conservation and strict limits on groundwater use, while also providing for environmental water requirements (Gao, 2007).

The plan consisted of three primary elements, including the initial allocation of water rights to individual water users, an emphasis on the engagement of individual water users, and investment in water use monitoring technologies (Zhang, 2012). Distinctive features of the Shiyang Basin WRT system included relying on Water User Associations instead of Irrigation Districts as the basic unit for water rights’ assignment and trading, and the installation of smart meters on individual wells to monitor abstraction (Gao, 2007). Furthermore, the basin has recently developed an online platform to record trades in an attempt to increase peasant participation and monitoring capability (see Table 1). The Shiyang Basin project thus follows the Western model of individual water rights’ allocation, and incorporates many of the features, such as popular participation, that are emphasized as international best practices.

 Nonetheless, the Shiyang Basin case represents a highly specific local circumstance. Although Gansu is host to several other WRT pilot projects that share some of these features (Li, 2013), the Shiyang Basin example stands out for the degree to which the central government encouraged the establishment of WRT. The basin had experienced a number of acute tensions between water users, attracting the attention of the Communist Party Central Committee and the State Council. The degree of high-level interest is indicated by the fact that former Premier Wen Jiabao had, by 2007, visited the Shiyang Basin.

Table 1. Recent water trades in the Shiyang River Basin (Gansu Shiyanghe Liuyu Jiaoyi Zhongxin (Gansu Shiyang River Basin Trading Center), 2013).

<table>
<thead>
<tr>
<th>Record Number</th>
<th>Trade Date</th>
<th>Buyer Type</th>
<th>Seller Type</th>
<th>Market Water Price (RMB/m³)</th>
<th>Quantity of Water Traded (10,000 m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>December ’13</td>
<td>Water User Association</td>
<td>Water User Association</td>
<td>0.03</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>December ’13</td>
<td>Village</td>
<td>Village</td>
<td>0.2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>December ’13</td>
<td>Village</td>
<td>Village</td>
<td>0.2</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>November ’13</td>
<td>Group</td>
<td>Group</td>
<td>0.05</td>
<td>0.26</td>
</tr>
<tr>
<td>5</td>
<td>November ’13</td>
<td>Group</td>
<td>Group</td>
<td>0.05</td>
<td>0.2</td>
</tr>
<tr>
<td>6</td>
<td>November ’13</td>
<td>Village</td>
<td>Village</td>
<td>0.2</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>November ’13</td>
<td>Water User Association</td>
<td>Water User Association</td>
<td>0.04</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>November ’13</td>
<td>Village</td>
<td>Village</td>
<td>0.17</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Basin no fewer than eight times (Gao, 2007). Yet even this high-level attention did not prevent the Shiyang Basin pilot project from experiencing a number of challenges in the implementation of WRT. First, the initial allocation of water rights in the Shiyang Basin conflicted with the allocation plans of individual localities within the Basin, in the words of one commentator, ‘undermining the government’s credibility and [water users’] respect for the law’. Furthermore, the pilot project failed to establish sanctions for abstracting water without possessing the necessary usage rights (Gao, 2007). Finally, as Table 1 indicates, both trading prices and trading volume are quite low, reflecting an immature market for water rights (Gansu Shiyanghe Liuyu Jiaoyi Zhongxin (Gansu Shiyang River Basin Trading Center), 2013). These basic problems may yet be rectified: as one interviewee stated, ‘the MWR has plenty of power to implement WRT’ (22-BJ, 2014). Nonetheless, water markets in China must overcome a number of barriers if they are to capitalize on the initial success of individual pilot projects.

4. Prospects for the future development of WRT in China

The identification of fundamental constraints to the development of Chinese water markets, coupled with the analysis of specific case studies offered above, provide the basis for an assessment of the general applicability of WRT in China, and its prospects for the future. In this section, two general issues are identified and discussed: a lack of trust and commitment to WRT among peasant farmers, local government officials, and senior policy-makers; and also the integration of WRT with alternative approaches to alleviating water scarcity, including supply augmentation in the form of the South–North Water Transfer Project, which play an increasingly important role in Chinese government policy.

4.1. Lack of trust and commitment

The first of these issues arises on the one hand from a lack of trust in, and understanding of, WRT among farmers, and a lack of high-level commitment on the other. Interviewees suggest that accountability for implementing WRT is often unclear (19-BJ, 2014), and that peasant farmers are frequently taken advantage of by officials who charge excessive fees on trades, thereby undermining trust in WRT (42-BJ, 2014). Several other informants indicated that while peasant farmers are used to short-term transfers of administratively allocated water entitlements such as the water ticket (shuipiao) system, they are unfamiliar with the idea of long-term designated water usage rights, and therefore opposed to change (27-BJ, 2014; 13-BJ, 2014).

At the local level, governments sometimes fail to properly manage water rights’ transfers, often for fear of offending either agricultural or industrial economic interests. In Ningxia, for example, an interviewee who works directly with local governments reported that officials prefer to enact ‘stealth’ water transfers from agriculture to industry for fear of offending either farmers or industrial groups. Instead of encouraging industrial enterprises to purchase water rights from agriculture, local governments simply finance water conservation projects, such as canal lining, directly out of their own budgets (28-BJ, 2014). Another informant indicated that there is no functional WRT in Ningxia, because there is presently no legal mechanism for industrial plants to transfer water to other users even if efficiencies are realized (41-BJ, 2014).

Yet perhaps even more surprisingly, high-level commitment to WRT also appears to be weak. Interviewees indicate that in part, this is due to the fragmentation of bureaucratic responsibility. WRT is
viewed as a rural policy about which bureaucracies concerned with other aspects of water resource management care little (18-BJ, 2014; 13-BJ, 2014). An anti-reform mindset also exists even at high levels. According to a former MWR official, ‘opposition to WRT is mainly opposition to change, [and] even MWR doesn’t think things need to change’ (22-BJ, 2014). In a similar vein, a second informant stated that while the previous Minister for Water Resources was highly committed to WRT, the present one is not, calling the expansion of existing programs into question (33-BJ, 2014).

4.2. Integration of policy responses to water scarcity

The second, even more pressing, major issue concerns the relationship of WRT with other approaches to alleviating water scarcity to which Beijing appears to be more committed. In 2011, the No. 1 Policy Document issued by the Communist Party Central Committee, traditionally viewed as one of the most important statements of government policy for the forthcoming year, pledged to strengthen China’s water resource management system through new regulations. This represented, in the words of two Chinese water resource specialists, the first time that water resource issues had been ‘raised to the level of a strategic and security issue’ (Jia & Yan, 2012). In 2012, the State Council issued the promised regulations intended to strictly limit water use throughout China, including that of establishing a cap on total national water use to be implemented by 2030.

Although principally intended to strengthen central control over water resource management, the regulations, known as the ‘Three Red Lines’ (santiao hongxian), call on provinces to develop individual implementation plans, raising the prospect of uneven implementation. Perhaps most significantly, however, the government’s vision for implementation of the Three Red Lines relies upon extensive inter-jurisdictional WRT in order to realize gains from inter-regional trade in water. Specifically, the implementation strategy assumes widespread inter-regional WRT in order to meet water demand growth in industry and urban areas while remaining under the overall national cap (Jia & Yan, 2012). This looming challenge raises anew the question of how market-based responses such as WRT relate to alternative technical and regulatory responses to water scarcity, as well as to fundamental institutional arrangements for water resource management in China.

In this respect, central–local conflicts threaten to undermine the future prospects for WRT in China, because the development of water markets increasingly requires inter-jurisdictional cooperation. As one leading Chinese water resource scholar concludes, while WRT now occurs primarily within provinces, ‘the next step is inter-provincial trading’ (Wang, 2013). Much of the need for greater inter-provincial water transfers stems from two transformational water resource policies, the Three Red Lines and the South–North Water Transfer Project (SNWTP). The former will establish strict limits on total water use for each province, and interview informants indicated that the prospect of these restrictions, to be fully implemented by 2030, is encouraging local governments in regions like Ningxia to establish WRT systems (28-BJ, 2014).

Yet the latter SNWTP project may well prove to have the greatest impact on the future of WRT in China. Interview informants indicated their belief that the SNWTP is viewed as a complement to, rather than a substitute for, market-based mechanisms such as WRT (13-BJ, 2014). But the fact remains that, as a supply-augmentation engineering project, the SNWTP represents a fundamentally different approach to addressing water scarcity and water resource allocation. The continued commitment of the government to completing the SNWTP project, as described by several interview informants (21-BJ, 2014; 39-BJ, 2014), illustrates the fact that water markets are seen by Chinese policy-makers
as part of a system of responses to water scarcity, rather than as a silver bullet. As one informant predicted, ‘WRT will play only a very limited role’ in addressing water scarcity (15-BJ, 2014).

5. Conclusions

This prognosis captures the considerable progress of China’s water markets, as well as the limits of their future applicability to meeting the country’s water resource challenges. The basic legal provisions for market-based allocation of water resources have been dramatically strengthened, and several successful pilot and model projects have been established. Nonetheless, as this analysis has emphasized, each of these individual projects possesses distinctive features that limit their applicability to other parts of the country. Moreover, this article has highlighted a number of fundamental institutions and barriers that severely limit the role that water markets and WRT can realistically play in meeting China’s future water resource policy challenges.

In general, the case of China favors the conclusion that while water markets play an essential role in meeting water scarcity, they merit careful institutional design and implementation, and their applicability in developing countries is contingent on specific national circumstances and institutional characteristics. In particular, the China case demonstrates that the development of effective water markets requires planning and commitment of very significant political and economic resources over the long term. In many practical developing-country contexts, alternative responses to water scarcity, including supply augmentation and regulatory reform, are likely to prove attractive and to be pursued alongside WRT.

This conclusion points to several directions for future research on WRT in both China and elsewhere. First, as this analysis has suggested, the adaptive capacity of water governance institutions, including features such as inter-agency cooperation and central–local coordination, dramatically impacts the efficacy of WRT. Accordingly, scholars interested in water market development should carefully consider the adaptive capacity of relevant water resource management institutions at central and local levels. Second, the focus of this article on fundamental features of governance and water resource management in China suggests the utility of incorporating insights from comparative politics literature for the study of water resource management. Future studies seeking to evaluate the role of market-based responses to water scarcity in China and other countries would do well to consider how factors such as authoritarianism and central–local relations may affect the implementation of WRT (Ward et al., 2014). Third, water resource policy scholars should enhance their efforts to collect the necessary data to conduct large-scale analyses of WRT in developing countries, in order to better evaluate their performance in different contexts.

China represents one of the most important test cases for the ability of water markets to meet the world’s growing water resource challenges. It suggests above all that water markets and WRT can be a valuable component of an integrated response to water scarcity, but one more appropriate in some regions and circumstances than others, and one best viewed as part of a system of policy responses, rather than as a single silver bullet.

Acknowledgements

Support for this research from the Sustainability Science Program, Harvard University, and the Italian Ministry of the Environment, Land, and Sea is gratefully acknowledged.
References


Received 1 April 2014; accepted in revised form 26 August 2014. Available online 7 October 2014