



Initiative *for* Policy Dialogue

Based at Columbia University 

## *Working Paper Series*

# Water Institutional Reforms in Developing Countries: Insights, Evidences, and Case Studies

R. Maria Saleth and Ariel Dinar

Task Force on Environmental Economics

*The opinions expressed in these papers represent those of the author(s) and not The Initiative for Policy Dialogue. These papers are unpublished. Do not cite them without explicit permission from the author(s).*

### ***Abstract***

*While institutional reforms are critical for developing countries to enhance and sustain the economic and environmental contributions of their water sector, undertaking them is not an easy task in view of binding technical and political economy constraints. Despite these constraints, reforms of varying degree do occur in the water sector of many developing countries. What is the nature and extent of these reforms? How can we explain the forces that motivate and constrain the reform process? How do countries overcome the reform constraints? What are the policy lessons that these reform experiences offer to other countries at reform threshold? This chapter attempts to address these and related questions by (a) utilizing an institutional transaction cost framework and (b) relying on stylized facts on water institutional reform observed across countries, empirical evidences on how institutional design and implementation principles are used to circumvent technical and political economy constraints, and case studies on the reform process in country-specific context. Based on the discussion and analysis, the chapter, then, concludes by identifying key implications for both theory and policy that could contribute to international policy dialogue on the interface between institutional reform and water resources management.*

**Keywords:** Water Crisis, Water institutions, Institutional Linkages, Transaction Cost Theory, Political Economy, Reform Design Principles, Reform Implementation Principles, Case Studies, India, Mexico.

## **1. INTRODUCTION**

Water availability and its quality are emerging as a major development challenge in many countries. Obviously, for countries racing towards their physical expansion to fresh water resources such as those in the Middle East, water availability remains a serious development constraint. In other countries with expanding urban settlements, industrial sectors, and intensive agriculture such as those in Asia and Latin America, water quality is emerging as a major health and environmental concern. Since pollution-induced deterioration in water quality reduces the utility of available water resources, water scarcity is also a growing concern even in countries with no apparent limits for fresh water expansion. Even though the nature and severity of water constraint vary considerably across countries, there is one aspect that is common to most countries. That is, water constraint—whether quantitative, qualitative, or both—originates more from inefficient use and poor management than from any physical limit to supply

augmentation. This diagnosis certainly raises our hope that water crisis and its economic and environmental consequences can be averted by improving the use and management of the resource. However, the task is not that easy, as the prescription involves wide-ranging changes in water institutions, i.e., the water-related legal, policy, and organizational arrangements that together govern the way water resources are developed, allocated, used, and managed. The issues of how to design, initiate, and sustain these changes within the economic, political, and environmental constraints are at the heart of the ongoing water debate both at the national and global levels.

Since water institutions in most countries are dated and deeply rooted, the task of reforming them to the required extent is certainly vast, difficult, and time consuming. Apart from the technical constraints emerging from the stupendous nature of the reform task itself, there are also serious obstacles emerging from the political economy front. Despite the binding nature of these obstacles, water institutional reforms of varying degrees are being observed in countries as diverse as Australia, Brazil, China, India, Morocco, Mexico, South Africa, and Spain. What is the nature and extent of these reforms? How can we explain the forces that motive and constrain the reform process? How do these countries overcome the technical and political constraints for reforms? What are the policy lessons that the reform experience of these countries offer to other developing countries that are at the threshold of water sector reforms? This chapter attempts to address these and related questions by (a) utilizing a simplified representation of an institutional transaction cost framework as applicable to water sector and (b) relying on stylized facts summarizing existing knowledge on water sector issues and water institutional reforms, empirical evidences for indicating the way countries exploit institutional features to circumvent reform constraints, and select case studies to derive key insights on the nature of and motivation behind the reform process in country-specific as well as cross-country contexts. The chapter, then, concludes with some key messages for research and policy that can contribute to international policy dialogue on the institutional dimensions of managing water resources on an economically, socially, and environmentally sustainable manner.

## **2. INSTITUTIONAL ROOTS OF WATER CRISIS: A GLOBAL PERSPECTIVE**

To set the context for our subsequent discussion, let us start first with an institutional diagnosis of water crisis and its economic and environmental consequences. Although water crisis is an immediate outcome of the physical phenomenon of a growing supply-demand imbalance, in a fundamental sense, it is actually an outcome of the pervasive gaps in the economic and institutional dimensions of water resource development, allocation, use, and management. While this fact can be shown in country-specific contexts, the true magnitude and universality of the problem can be understood better from a global perspective.

Water is certainly the most abundant and ubiquitous resource on the planet. However, given its physical properties, atmospheric roles, ecological functions, and spatial distribution as well as our current technical and economic capabilities, annual accessible water can be only about 12,500 billion cubic meters (bcum). This is just 0.04 percent of the global water resources [Food and Agriculture Organization (FAO), 1996:3]. These water resources are exhausted. First, the more ideal sites for the construction of large dams and reservoirs have already been developed. Second, the growing demands for fiscal austerity in most countries have resulted in growing concerns with least-cost alternatives for meeting water needs. Third, awareness and concern have increased about the environmental impacts related to the construction of hydraulic infrastructures. And fourth, increasing competition by various sectors for scarce water resources is the result of growing population and increased economic activity. These changes have caused a fundamental shift in the way that water resources development is considered—a shift from looking to construction as a means for solving water needs to looking to improved management as the means for solving such needs (Cummings, Dinar and Olson, 1996) Other supply augmentation options such as desalinization and recycling are useful, but cannot add more than a fraction of global water demand (Abdulrazzak, 1995:230; Gleick, 1998:30–31).

Water demand, in contrast, is increasing fast due to growing population, swelling food demand, expanding scale of economic activities, and broadening perspective of water in terms of its ecological and cultural roles. The result is an eightfold increase in

global fresh water withdrawals, i.e., from 500 to 4000 bcum/year during 1900-2000 (Gleick, 1999:6-7). While current withdrawal represents only a third of the accessible water resources, it is expected to reach up to 70 percent by 2025 (e.g., Postel, Daily, and Ehrlich, 1996; Falkenmark, 1999). Since a withdrawal of 30 to 60 percent of the accessible fresh water resources is considered as the practical limit for supply augmentation (Falkenmark and Lindh, 1993), many countries are expected to reach their accessible supply limits within the next 20 years. The telltale symptoms of water scarcity are already evident in 80 countries with 40 percent of the global population.<sup>1</sup> Apart from its human and productivity implications, increasing physical water scarcity also leads to serious water conflicts among users, regions, and countries (Beaumont, 1994; Frederiksen, 1998).<sup>2</sup> Water scarcity is also having serious effects on water quality, reducing the utility of available supply and enhancing the severity of environmental and health hazards.

Governments are searching for and debating on ways to close the gap between increasing usage of water and its limited availability. Among several policy interventions, one could mention allocation of water use rights (Easter, Dinar, and Rosegrant, 1998), establishment of water user association and management transfer (Johnson, 1997), and applying charges in the form of cost recovery and water prices (Dinar and Saleth, 2005). For example, water pricing is one of the most important policy instruments for integrating supply augmentation with demand management so that an efficient allocation (quantity and quality alike) and use of the already developed resources provide the economic and financial justification for the development of additional supplies from both conventional and unconventional sources.

---

<sup>1</sup> Of these countries, 18 are in the Middle East, which are either nearing or exceeding their renewable water supply limits whereas another 55 countries in Africa and Asia cannot fully meet the basic water needs of their growing population (Falkenmark and Lindh, 1993:80; Gleick, 1993:105–106).

<sup>2</sup> Some of these conflicts have the potential to become full-fledged water wars because a large proportion of surface flow in several countries originates outside their borders. In 19 countries, this proportion ranges from 21 percent (Israel) to about 97 percent (Turkmenistan and Egypt). As a result, the share of global population that will face the predicament of water conflict in these hotspots is expected to rise from 44 to 75 percent by 2025 (Postel, 1999:138–140).

Improving water use efficiency is certainly a promising avenue for supply augmentation via demand management, that too, with an added benefit of minimizing ecological effects such as waterlogging, salinity, and aquifer depletion.<sup>3</sup> Unfortunately, these supply augmentation options are very costly in terms of their investment demand, technological needs, and institutional requirements and hence, they remain infeasible for many countries under current economic and technical conditions.<sup>4</sup>

The magnitude of the socio-economic consequences of water scarcity can be understood by the central role of water resources in economic growth and development. Water resources support 40 percent of global food production through irrigation and 20 percent of global fish yield through aquaculture (FAO, 1996:2). Given their role in hydropower generation, water resources also account for 20 percent of global power supply (Gleick, 1998:70).<sup>5</sup> Water sector has indeed performed well its historical function of supporting a world with an increasing population and an expanding scale of economic activities. But, the positive relationship between water resources and economic development is now getting increasingly weakened (Orloci, Szesztay, and Varkonyi, 1985). This is because the initially observed linear relationship between water resources and economic development has to now accommodate the circularity of multifarious effects emerging from the society-water-ecosystem interactions (Falkenmark, 1999; Varis, 1999).

The negative consequences such as ecological and social disturbances in project sites, salinity in irrigated regions, aquifer depletion in arid zones, and pollution-induced

---

<sup>3</sup> For instance, a 10 percent improvement in water use efficiency can add 2 million hectare (mha) of additional irrigation in Pakistan (Postel, 1993:60) and 14 mha of the same in India (Saleth, 1996:234).

<sup>4</sup> However, desalination and water recycling are important for countries in the Middle East and North Africa as well as for few coastal regions in other parts of the world. Although the total daily water supply from desalination exceeds 18 million cubic meters, it is no more than a fraction of total global water demand (Gleick, 1998:30-31). Similar is also the case with water recycling, though it is growing in countries such as Chile, India, Israel, Mexico, Pakistan, and Tunisia. However, these options are very important for countries such as those in the Arabian Peninsula where desalination meets 10 percent of the total water demand and water reuse accounts for 2 percent of the same (see Abdulrazzak, 1995:230-232).

<sup>5</sup> The direct economic contributions of water resources can be still higher at the regional level. For instance, irrigation contributes to 70 percent of food production in China and 50 percent of the same in India (FAO, 1996:5). Similarly, in 63 countries, hydropower accounts for more than 50 percent of total power production and in 23 of them, this proportion is over 90 percent (Gleick, 1998:71).

water quality and health risks in urban areas tend to raise the social costs whereas poor maintenance, inefficient use, and mismanagement reduce the social benefits possible from additional supply.<sup>6</sup> As a result, the net economic and welfare contributions of water tend to decline over time and across countries. Equally serious is also the persistence of a negative trend in the financial contributions of water sector in many countries. This negative trend jeopardizes both the quality of existing water infrastructure as well as the potential for future investments in new projects. Given the close linkages among the financial status, physical health, service quality, and economic performance of water sector, the overall process of economic development itself depends critically on water sector performance.

The key issue, therefore, is how to improve the financial and economic sustainability of water sector so as to enhance and sustain its indispensable socio-economic and environmental contributions. The answer lies in the creation of appropriate incentive systems, allocation mechanisms, and management structure, especially with an explicit recognition of the fact that water sector is no longer isolated but are linked closely with the economy, environment, and society. Unfortunately, the water institutions in most countries are unable to promote such arrangements so indispensable for the sustainable management of water resources, as they were developed mostly in an era of water surplus. The predominance of supply-side solutions, engineering approach, bureaucratic allocation, and centralized management are now inconsistent with the requirements of the scarcity era such as demand management, economic approach, user involvement, market-based allocation, and decentralized management. This is why we see only few cases with a comprehensive water sector reform success (Dinar, 2000). Given an increasing inconsistency between existing water institutions and emerging resource realities, the ability of most countries to face their

---

<sup>6</sup> For instance, the area affected by irrigation-induced salinity is estimated to be 20 to 47 mha and the yield loss from these areas is estimated to be about 30 percent (Postel, 1999:93; Rosegrant and Ringler, 1999:11). On the other side, while the total storage capacity of all reservoirs in the world is about 6,000 bcum, the actual storage in these reservoirs is far below this capacity due to siltation, catchment degradation, and irregular flow (FAO, 1996:8). Such problems are still more serious for countries such as India where a tenth of the created irrigation potential of 90 mha is unutilized and a sixth of the irrigated area is waterlogged/saline (Saleth, 1996:20).

water challenges depends clearly on the extent and speed with which they undertake institutional reforms to create a new governance structure for their water sector.

### **3. OBSERVED REFORMS ACROSS COUNTRIES: A STYLIZED OVERVIEW**

Countries are increasingly recognizing the importance and urgency of reorienting the institutional foundation of their water sector. Despite the challenges and difficulties, many countries have indeed undertaken significant reforms in an effort to create water institutional structure that are more responsive to their current and future economic and environmental requirements. These reform initiatives are visible both at macro level (e.g., declaration of water laws and water policies, preparation of national and regional water plans, and administrative reorganizations) and at sub-sectoral level (e.g., irrigation management transfer and urban water sector reforms). Specific reforms observed in many countries include the enactment of water laws, creation of basin-based and user-based organizations, management decentralization to promote stakeholder/user participation, privatization of urban and irrigation water supplies, establishment of water rights system, promotion of inter and intra-sectoral water markets, reorientation of water prices, and water quality regulations. There is now a rich literature that has reviewed and evaluated these reform initiatives with varying focus and detail both in country-specific as well as cross-country contexts (e.g., Le Moigne, et al., 1992; Brinkerhoff, 1994; Hearne and Easter, 1997; Easter, Dinar, and Rosegrant, 1998; Frederiksen, 1998; Savedoff and Spiller, 1999; Challen, 2000; Shirely, 2000; Dinar, 2000; Saleth and Dinar, 2000 and 2004; Dinar and Saleth, 2005; Bauer, 2004; Gopalakrishnan, Biswas, and Tortajada, 2004). A careful review of this literature allows us to distill few stylized facts on the overall thrust and common trends of the recently observed water institutional reforms across countries.

#### **3.1. Ushering into an Allocation Paradigm**

There is a gradual but definite shift from water development or supply-side approaches to water allocation or demand-side solutions. This shift has already occurred in water scarce countries in the Middle East and North Africa as well as in countries such as Australia and regions such as California and Colorado in the US. It is also inevitable in



countries such as India and Spain that are fast approaching their physical limits for fresh water expansion. Even in countries such as Brazil with no apparent limits for supply expansion, issues related to spatial mismatch between water availability and demand, growing water pollution, and ecological constraints warrant water allocation institutions for an efficient use of both existing and future supplies. While a paradigmatic shift towards water allocation is evident in almost all countries, though there are considerable variations across countries as to the extent of creating the necessary institutional arrangements to underpin an allocation-oriented water management system. For instance, countries such as Australia, Chile, and Israel as well as regions such as California and Colorado in the US are already having the institutional capability for an allocation paradigm. While countries such as China, South Africa, Spain, and Mexico can develop their institutional potential faster, others such as India, Brazil, and Egypt have a long way to go to create the necessary institutions for ushering their water sector into the allocation paradigm centered on economic instruments and market mechanisms.

### **3.2. Moving towards Management Decentralization**

The dominant trend toward management decentralization is an unmistakable thrust of water sector reforms observed in most countries. The decentralization initiatives include the creation of River Basin Organizations (RBOs), promotion of irrigation management transfer (IMT), and the emergence of utility-type bodies in urban sector. RBOs are being created in most countries with varying level of effectiveness and success (Barrow, 1998; Bruns and Bandaragoda, 2003).<sup>7</sup> IMT, the program for transferring the managerial, cost recovery, and maintenance responsibilities to legalized water user associations (WUAs), is the main mode of decentralization within irrigation sector. IMT is extensive in Mexico, Turkey, and the Philippines and is picking up in countries like India, Morocco, Indonesia, and Pakistan (Vermillion, 1997). China and Central Asian transition countries such as Uzbekistan have a long established tradition of involving local communities in

---

<sup>7</sup> RBOs are called differently in different countries (e.g., Watershed Committees in Brazil, Water Conservancy Commissions in China, Basin Councils in Mexico, Hydro-geological Federations in Spain, and Catchment Management Agency in South Africa). However, they share a common conceptual basis and functional framework.

lower level irrigation management. Decentralization within urban water sector takes the forms of moving water supply functions to autonomous and financially self-dependent utility-type organizations. Instances of such utility-type organizations can be found in many cities in countries such as Australia, Chile, and Mexico. Although China has no such utilities at present, its 1997 Water Industry Policy mandates the creation of such arrangements.

### **3.3. Going for Selective Privatization**

Another thrust of water sector reforms observed in many countries is an increasing tendency towards water sector privatization.<sup>8</sup> Such a tendency is more visible particularly in urban water sector as compared to other water sub-sectors. National and international private water companies are now involved in the provision of urban water supply and sanitation activities in countries such as Argentina, Mexico, Morocco, the Philippines, and Thailand. Privatization initiatives can also be seen in irrigation sector with two notable patterns. In England and Australia, irrigation supply functions were transferred to private irrigation companies. In contrast, in Argentina and New Zealand, the irrigation assets were transferred directly to farmers themselves. Although there is not any actual case of irrigation privatization in countries such as China, India, and Sri Lanka, they are currently pursuing the policy of promoting private sector involvement in irrigation-related water resources development and service provision. Despite the few but striking instances of irrigation privatization, privatization initiatives are confined mainly to the economically attractive and technically viable segments of the water sector such as urban water supply, sanitation, and desalinization.

### **3.4. Espousing Integrated Approach**

Many countries have undertaken significant initiatives to promote integrated water resources management (IWRM). Flow loss from catchment degradations, storage loss from siltation, and productivity loss from salinization are some of the common factors

---

<sup>8</sup> Although privatization can be linked to decentralization, given the historically established bureaucratic domination of water sector in most developing countries, it is more appropriate to interpret it as an effort

inducing countries to take a holistic approach in the use and management of land, water, and environment resources within an integrated framework. Obviously, the institutional implications of IWRM are vast given the requirements for strengthening the linkages among land, water, agricultural, and environmental institutions and dovetailing various component of ongoing and planned development programs. In this respect, the creation of RBOs by countries augurs well, as they provide an appropriate spatial and organizational context for operationalizing IWRM approach. Similarly, the fact that many countries have developed their national water plans indicates their informational and technical capabilities for pursuing IWRM. This is true for both countries that are already having their national plans (e.g., Australia, India, Israel, Mexico, and Spain) as well as those (e.g., Brazil, China, Morocco, South Africa, and Sri Lanka) with a mandate to develop such plans under recently enacted or proposed water laws. There are also few reform initiatives to firm-up the organizational basis for IWMI. These include the ministerial reorganization to move water from agriculture or power-related ministries to environmental ministries (e.g., Australia, Brazil, Mexico, Spain, and Morocco), organizational streamlining to integrate most water-related functions within one organization (e.g., Brazil and India), and the incorporation of watershed and catchment considerations within basin management plans (e.g., China, South Africa, and Sri Lanka).

### **3.5. Focusing on Financial Viability**

There is an international consensus that a phased improvement in cost recovery is the first step toward salvaging the water sector from financial crisis and physical degeneration. Many countries have indeed undertaken concrete steps in terms of water pricing reforms to enhance the financial and allocation role of water rates and pricing methods (see Dinar and Subramanian, 1997). However, these reforms could not always proceed to the needed extent due to political economy constraints and implementation costs (Dinar, 2000). As a result, currently observed pricing reforms across countries evince mixed results. In general terms, cost recovery is relatively better in urban water supply as

---

towards the debureaucratization of water management. It is also an effort to make water sector more responsive to market conditions.

compared to irrigation and rural water supply. Similarly, cost recovery is better in advanced countries and water scarce regions as compared to developing countries and water surplus regions. While the full recovery of operation and maintenance costs is the stated objective, many developing countries in Africa and Asia are struggling hard to recover even the operational and maintenance costs both in their irrigation and residential water supply projects. This is the case even in countries where water rates were raised substantially. For instance, few states in India have raised irrigation water rates by 300 to 400 percent, but could not cover yet the full costs, as the raised levels of water rates are still far below the provision costs. In contrast, countries such as Australia and Chile have gone a step ahead of others by going for an annuity-based capital cost recovery in their water projects. Notably, South Africa is planning to recover even the costs involved in activities like water management and water-related research. Despite these forward looking initiatives, financial subsidies have not been completely eliminated even in countries adopting an economic approach to water pricing such as Australia, Chile, England, Israel, and the US.

### **3.6. Moving from Mere Quantity to Better Quality**

Improved financial health can facilitate the physical health of water distribution and drainage infrastructure, but the physical sustainability of the water sector cannot be ensured without controlling the damages that pollution from industrial, agricultural, and urban sources is cause to water quality. Added to the effects of pollution are also the water quality impacts salinization, turbidity, and algae growth. As quality deterioration reduces the utility of available water resources and raises the health and environmental costs, water quality issues are receiving as much, if not more, attention as water quantity in all countries regardless of the stage of water resources development. The common approaches pursued in this respect involve water quality grading, quality standards, and pollution control regulations (Saleth and Dinar, 2000). Although most countries have provisions for a pollution permit system, they are at different stages of implementation. Australia, Israel, the US enforce strict quality standards as are all countries in the European Union. The mechanisms for water quality enforcement in countries such as

Brazil, China, India, Mexico, and South Africa, though not yet developed fully, are relatively more effective as compared to many other countries in Africa, Asia, and Latin America.<sup>9</sup> The undeniable fact, however, is that water pollution and its health and environmental consequences are deeply registered in the reform agenda of all countries.

#### **4. OUTSTANDING REFORM CHALLENGES IN DEVELOPING COUNTRIES**

The reform thrusts and trends indicated above are certainly very positive from a long-term historical perspective of water institutional change. However, the reforms undertaken so far are by no means adequate for meeting the institutional requirements for sustainable water resources management, especially in the case of most of the developing countries facing severe water scarcity problems. As we consider the overall nature of the reforms undertaken by these countries, they are mostly at a policy level rather than at the implementation level. For instance, most of the reforms are of ceremonial and cosmetic in nature (e.g., declaration of water policies, marginal raise in water rates, establishing inter-sectoral allocation priorities, creation of RBOs, and renaming of organizations) rather than substantive in character (e.g., enactment of water laws, adoption of volumetric allocation, establishment of water rights system, and reorganization of water administration). Some of the significant initiatives (e.g., IMT, water pricing reforms, and water quality regulations) are also undertaken tentatively more as a crisis-response than as part of any comprehensive reform package.

As the reform experience of many developing countries shows, the challenge is not so much on enacting allocation-oriented water laws and policies as on building an allocation-oriented organizational structure out of an outmoded and centralized water administration with insufficient skills and resources. While there is a definite commitment to move towards an allocation paradigm, the necessary institutional conditions for operationalizing such paradigm (e.g., volumetric water allocation, water rights, and water pricing reforms) have not yet been created. The decentralization

---

<sup>9</sup> In India, public-interest litigations have played a more effective role in enforcing many of the legal provisions on water pollution as compared to the state organizations mandated with the task of pollution control. The most notable case in this respect is the closure of many polluting industries on the banks of

initiatives have also not achieved their institutional objectives, as they have neither led to decentralized decision structure nor resolved the fundamental centralization-decentralization dilemma.<sup>10</sup> Similarly, with few notable exceptions (e.g., Mexico, Spain, and South Africa), decentralization initiatives have also occurred as isolated exercises without recognizing the necessity of linking them with other complementary institutional arrangements.<sup>11</sup> As a result, the currently observed decentralization initiatives in most countries are inherently unable to accelerate the transition towards the allocation paradigm. While privatization has the healthy effects of infusing economic discipline in water provision and management, it has its own limits, especially in the provision of socially important ‘public good’ water activities such as flood control and catchment management.<sup>12</sup> What is needed is a governance framework that recognizes the mutually reinforcing complementary roles of the state apparatus, private companies, and user groups and, at the same time, demarcates their respective spheres of influence within water sector. Certainly, the observed reforms across countries are far from creating such water governance structure.

---

Ganges River, as prompted by a public interest litigation filed by environmental groups in the Supreme Court of India.

<sup>10</sup> This actually points to the two caveats decentralized regional or organizational arrangements such as RBOs. First, regionalization need not automatically ensure decentralized decisions, as some RBOs of the past (e.g., the Tennessee Valley Authority in the US and Damodar Valley Corporation in India) have degenerated into centralized organizations. And, second, decentralization cannot succeed without a dose of centralization essential for effective coordination (e.g., decentralization initiatives in Mexican water sector was effective because it was undertaken with big-bang approach by a highly centralized agency). The challenge lies in carefully crafting the institutional arrangements at different spatial levels so as to achieve both local flexibility and regional coordination in water management.

<sup>11</sup> For instance, when the RBOs, WUAs, and water utilities are viewed from a larger perspective of water sector reforms, they can provide an organizational context for promoting further institutional reforms related to water rights, conflict resolution, accountability, and water pricing. Similarly, their legal and organizational requirements also suggest substantial upstream institutional changes such as water law reforms and organizational reorientation of national and regional water administration. Unfortunately, the reform programs in most countries have not grasped well the upstream and downstream institutional implications of the decentralization process.

<sup>12</sup> Although privatization and other decentralization initiatives minimize the role of bureaucracy, they cannot eliminate the role of government altogether. Nor is such elimination desirable in view of the need for both the regulatory and the enabling functions that only the state apparatus can perform better in the new context. Nevertheless, since the process of privatization process strengthens the complementarity and rekindles healthy competition between public and private sectors, it adds a new institutional dimension to water resource management.

Considering the water institutional structure and the recent water institutional reforms observed both across developed and developing countries, it is possible to make few generic observations as the ability of these countries in supporting a responsive, allocation-oriented, and forward looking water institutional arrangement. Obviously, countries differ markedly in terms of the historically inherited institutional structure as well as the extent and effectiveness of the recently undertaken institutional reforms within their water sector. From an overall perspective, countries such as Australia and Chile, England, France, Germany, and the US (especially, California, Colorado, and Arizona) are in an advanced, though not yet in an ideal, stage of institutional evolution. Israel, with its technologically advanced and economically sensitive water sector, is ahead of most countries when its reform proposals take practical shape.

China, Mexico, Spain, and, to a larger extent, South Africa have the organizational potential as well as the water law and water sector reform proposals to strengthen the allocation dimensions of their water institutions. Other Countries such as Morocco is also favorably placed in terms of its national level institutional reforms and its partial success in reforming urban water sector as well as in promoting a basin-based integrated approach in the irrigation sector. Although Brazil shows considerable political commitment followed by concrete actions in the form of water law enactment and administrative reorganization, it is still constrained by the present constitutional division of water sector responsibilities between the federal and state governments. Although India exhibits slow progress in terms of water sector reform at the national level, it does show notable progress, especially in terms of irrigation reforms, at the state and local levels. Other countries such as the Philippines, Turkey, and Sri Lanka have made notable progress in reforming their irrigation sector through IMT, but they are yet to make substantial progress in this sector as well as in other water sub-sectors.

From the perspective of deriving more effective and politically acceptable reform strategies, it is necessary to understand why developing countries are able to undertake certain kinds of institutional reforms but not others that are needed for a durable solution to their water problems. The standard explanation links the reform difficulties with the constraining role of political economy process and technical factors associated with the

nature institutions themselves (e.g., stickiness or persistence qualities of institutions, linked nature of institutions, and irreversibility of institutional change). The argument is rather simplistic, as many countries have, in fact, advanced their water sector reforms through a clever exploitation of the opportunities and contexts provided by these very factors considered to constrain the reform process. From the recent reform experiences of both developed and developing countries, it is possible to generate a rich set of empirical evidences as well as few case studies for illustrating how the political factors and institutional features are exploited to initiate and sustain the reforms process. A careful review and understanding of these evidences and cases studies is very valuable, particularly to derive more effective, replicable, and politically viable reform strategies for countries undertaking or contemplating water institutional reforms. To provide a sound and theoretically consistent context for this review, it is best first to understand the relative role that the economic, political, technical, and other factors play during the process of institutional changes within water sector.

## **5. EXPLAINING INSTITUTIONAL REFORMS: A TRANSACTION COST APPROACH**

There are many theories for explaining institutional changes in general context. They include such well known theories as evolutionary theory, contractarian theory, public choice theory, institutional transaction cost theory, induced institutional change theory, demand-supply theory, and political economy theories including rent-seeking and bargaining theories. Saleth and Dinar (2004) provide a detailed review of these theories, especially from the perspective of their implications for and applicability to water sector reforms. Among these theories, the institutional transaction cost theory has both conceptual advantage in view of its close resemblance with cost-benefit analysis as well as the analytically ability to bring together many relevant factors within a common analytical framework. Since it is more inclusive in terms of explanatory factors, it provides a more generic and intuitive approach for understanding and explaining both country-specific and cross-country variations in water institutional changes, as we attempt in this chapter.



### **5.1. Institutional Transaction Cost Framework**

The institutional transaction cost theory is originally proposed by Coase (1937) and developed and extended later by Williamson (1975 and 1985). Although the initial version of the theory considered only economic transactions costs, North (1990a and 1990b) has generalized the theory to include also the real and political costs. This generalized theory can be both simplified and specialized to develop a framework for explaining institutional changes within water sector (Saleth and Dinar, 2000 and 2004). In simple terms, this framework identifies first all the major factors affecting water institutions and then, traces their effects either on the transaction or opportunity costs of institutional reform. Before seeing what these costs are, it is instructive to consider first the factors having a strong influence on water institutions.

For analytical convenience, the factors influencing water institutions can be grouped into endogenous factors that are internal to both water institutions and water sector and exogenous factors that are outside the strict confines of both water institutions and water sector. The endogenous factors include water scarcity, water conflicts, financial crisis, and infrastructural deterioration, and the internal structure and operational efficiency of water institutions. The exogenous factors, in contrast, represent the general setting within which water sector and water institutions operate. They include aspects such as economic development, demographic growth, technical progress, economic and political reforms, international agreements and pressures, changing social values and ethos, and natural phenomena like floods and droughts.<sup>13</sup> It is the interactive and joint effects of these endogenous and exogenous factors that determine the structure, performance, and change in water sector and its institutional arrangements. Thus, in broader terms, the exogenous factors represent the overall institutional environment facing water institutions whereas the endogenous factors reflect the internal features of water institutions and water sector in a given context and time point.

---

<sup>13</sup> Notice that it is these exogenous factors that together define the overall institutional environment for the water institutional structure. As such, our analytical framework captures also the transaction cost implications of changing institutional environment as characterized by both economic and non-economic factors.

Although it is difficult to isolate the individual effects of the exogenous and endogenous factors, it is still possible to track them, especially by conceptualizing their effects either in terms of the transaction costs or in terms of the opportunity costs. The transaction costs cover both the real and monetary costs of instituting and changing the legal, policy, and organizational arrangements governing water development, allocation, use, and management.<sup>14</sup> The opportunity costs, on the other hand, cover both the real and economic value of opportunities foregone (i.e., the net social costs of inaction or ‘*status quo*’). In this sense, the opportunity costs are actually the potential benefits of institutional change. That is, when the institutional change cannot be effected, these benefits are reckoned as social costs in terms of the opportunities (or, benefits) sacrificed or foregone to maintain the *status quo*. These costs are not static but change continuously due to changes in both endogenous and exogenous factors.

A major question is how and by whom the transaction and opportunity costs are reckoned. While these costs can be reckoned *ex-post*, it is of little value for providing predictive inputs into an ongoing and future process of institutional change. What is more relevant is the *ex-ante* evaluation of the transaction and opportunity costs. Such an *ex-ante* evaluation necessarily involves subjective elements including a subjective and adaptive evaluation of even objective factors.<sup>15</sup> As to the issue of by whom these costs are reckoned, these costs are evaluated by various stakeholders such as the state, water bureaucracy, rural and urban communities, water users, non-governmental bodies, and lending agencies and donors.<sup>16</sup> As to the issue of how the decisions on reforms and their implemented are taken, the state and hence, the political process, plays an important role.

---

<sup>14</sup> The real costs also include political risks (Dinar, Balakrishnan, and Wambia, 2004), the net effects of any reallocation of power/opportunities (Bromley, 1989) and the deadweight loss of institutional/bureaucratic redundancy (Dinar and Saleth, 2005).

<sup>15</sup> Subjective and *ex-ante* reckoning of these costs are, in fact, inevitable in view of the dynamic and interdisciplinary nature of institutional changes, lacking both observed data as well as an unified and trans-disciplinary framework needed to integrate and process diverse information (Saleth and Dinar, 2004).

<sup>16</sup> In trans-boundary resource systems, the stakeholder groups includes also their counterparts in other riparian countries as well as those representing regional and international arrangements such as river basin commissions and agencies (e.g., those operating in Mekong and Danube rivers).

The main factor that prompts such state role is the convergence in the transaction cost calculus of the majority or the most powerful groups.<sup>17</sup>

## **5.2. Critical Role of Exogenous Factors**

Exogenous factors play a major role in changing the transaction cost calculus and political balance toward reforms. For instance, as water scarcity becomes acute due to economic development and population growth, the real and economic costs of inappropriate water institutions tend to rise. Similarly, the economic reforms magnify the fiscal implications whereas natural calamities such as droughts and floods aggravate the political implications of the opportunity costs of institutional reforms. Political reforms involving nation-wide institutional changes, on the other hand, reduce the transaction costs of water sector reforms directly because the institutional changes within water sector form only a small part of the overall reform process. Likewise, technical progress can also reduce the transaction costs of institutional changes. As the exogenous factors tend to magnify the opportunity costs of water crisis and reduce the transaction costs of water sector reforms, they often provide a powerful economic urge and political thrust for water institutional changes.

## **5.3. Strategic Role of Institutional Linkages**

One crucial endogenous factor pertains to the internal linkages among institutional components. Institutional linkages and their implications are well recognized (e.g., North, 1990a:83&99; North, 1997:6; Boyer and Hollingsworth, 1997:445-447; Ostrom, 1999:38). Besides their effects on transaction costs, institutional linkages also have substantial effects on performance, as they can correct mutual defects among institutional

---

<sup>17</sup> How such convergence occurs and how it leads to institutional change are more fundamental and contentious issues in the literature. In an attempt to explain these issues, Saleth and Dinar (2004) have proposed a subjective and stage-based theory of institutional change. According to this theory, institutional change occurs through four stages: mind change of stakeholders (as induced by subjective and objective evaluation of existing and future state of affairs), political articulation of such change (due to the role of political entrepreneurs), policy changes and actual implementation (through the process of interest group politics and political bargaining), and performance improvement (as measured against objective criteria and subjective expectation of stakeholders). These stages are not linear but cyclical because when performance improvement is below expectation, the process will again go through the four stages. Depending on country or regional context, the time dimension and quality of the process at each stage can be different.

components (North, 1997:4; Williamson 1994:18–19). Despite its importance, the effects of institutional linkages are not formally incorporated into the framework of institutional transaction cost theory. Instances for institutional linkages include the institutional connections among water rights, conflict resolution, accountability, and water markets as well as those among user organization, cost recovery, volumetric allocation, water rights, and water markets. Still broader linkages also exist both within and across the legal, policy, and organizational components of water institutions as well as between these institutional components and the institutional environment, as represented by the exogenous factors.

From the perspective of water reform strategy, the institutional linkages and their transaction and performance implications are very important, as they form the basis for deriving reform design and implementation principles such as institutional prioritization, sequencing, and packaging as well as reform timing, spacing, speed, and scale. These principles have strategic roles in relaxing the political and technical constraints for reforms. For instance, institutional prioritization and sequencing (e.g., undertaking the reform in politically and technically easier institutional components, sectors, and areas) can bypass the political economy constraints by gradually weakening reform opponents while concurrently strengthening the pro-reform groups. Institutional sequencing (e.g., developing user organizations and volumetric allocation to promote water pricing and water rights systems, and the creation water rights to promote conflict resolution, accountability, and water markets) can also relax technical constraints by exploiting the path dependency properties of institutions. Similarly, institutional packaging (e.g., combining reform options favoring different groups) can also help in building pro-reform political coalitions (White, 1990). Institutional packaging (e.g., privatization and water pricing or institutional reform and investment programs) can also overcome technical constraints by exploiting the mutual reinforcement and balancing effects of different institutional or reform components. Likewise, changing nature and configuration of exogenous factors (e.g., macro economic reform, political reconstruction, droughts/floods, or international agreements) can also be used to advance the reform process with an appropriate choice of reform timing, spacing, and scale.

There are also some important features of institutions that can also be strategically exploited to promote institutional reforms. For instance, institutional change, by nature, is not a one-time event but rather a continuum involving gradual changes over time. This means, each small and minor change in institutions, though looks insignificant from a short-run perspective, does matter for the long-term process of institutional change. Likewise, the transaction and opportunity costs vary considerably across individual institutional components (Ostrom, 1990; Saleth and Dinar, 2004). This feature can be exploited to prioritize and target institutional reform and minimize the total transaction costs of reform.<sup>18</sup> There are also considerable synergies and scale economy effects during the process of institutional change. As the reforms initiated in earlier stages brighten the prospects for downstream reforms, there are intricate and direct linkages between the transaction costs of subsequent reforms and the opportunity costs of earlier reforms.<sup>19</sup> Since each institutional change became the foundation for subsequent and higher level institutional changes, the cost of each subsequent institutional change can decline, suggesting the presence of substantial scale economies in institutional change (North, 1990a: 95).<sup>20</sup> There are also scale economies on the performance side as well. Similarly, since the institutional changes within water sector can also derive considerable synergy from exogenous factors that reflect changes elsewhere in the economy, the transaction costs of water sector reforms can also decline due to scale economies in institutional change.<sup>21</sup> In fact, there are many instances for the fact that the reform

---

<sup>18</sup> For instance, the transaction costs of changing water policy are far lower and politically less sensitive than those involved in changing water law or reforming water organizations. Likewise, the costs of establishing a water rights system are far higher than the same in undertaking pricing reform or creating a basin organization.

<sup>19</sup> For instance, with the establishment of a transferable water rights system, the creation of other institutional aspects such as the conflict resolution mechanisms and water markets becomes easier due to the linkages that the transactions costs of the latter two institutional aspects have with those of the former.

<sup>20</sup> There are also scale economies on the performance side as well. Not only does the performance of lower level rules hinges on the performance of their higher level counterparts but also their synergy and scale economy effects ensure that the aggregate performance implications of a set of hierarchically nested rules are much more than the sum of their individual performance (North, 1990a: 95&100).

<sup>21</sup> The scale economies in transaction costs emerge from the fact that the cost of transacting water institutional changes is lower when water sector reform forms part of an overall country-wide economic reform (e.g., China) and political reconstruction (e.g., South Africa) than otherwise (Saleth and Dinar, 2000).

programs in many countries have exploited the opportunities and contexts provided by the institutional linkages, exogenous factors, and the synergies and scale economy benefits inherent in the reform process itself. They are addressed in the next section.

## **6. HOW COUNTRIES ADDRESS REFORM CONSTRAINTS?**

Let us now provide some empirical evidences to show how countries attempt to overcome their reform constraints by exploiting the design and implementation principles emerging from institutional linkages and political economy contexts. We also provide two case studies—one on India and the other on Mexico—to demonstrate the political economy and transaction cost dimensions of water sector reforms.

### **6.1. Reliance of Reform Design Principles**

Based on a carefully conducted study of economic reform process in several countries, White (1990) has concluded that the way the reform program is structured and packaged has much to contribute to its successful implementation. This result applies to water institutional reform as well. Reform packaging, i.e., the linking of institutional reforms with other economic programs, can also be used to build political coalition (White, 1990) and to minimize, thereby, the political transaction costs. More generally, the issue of packaging involves not only the linking of institutional reform with other incentive programs but also integrating two or more institutional components.<sup>22</sup> In the particular context of water institutional reforms, instances for combining economic incentives within the reform package include the provision of matching grants and a share in the collection of water charges to WUAs during IMT programs.<sup>23</sup> Similarly, an IMT program also involves the component of system improvement and modernization, which, again, has an incentive effect on the transfer process. Both these forms of reform

---

<sup>22</sup> In the latter case, it is useful to combine institutional components with differential levels and gestation periods of impact. While the institutional components with immediate and noticeable performance returns have the tactical role of maintaining the economic and political relevance of the reform process, others are critical to ensure the long-term sustainability of institutional reform through a gradual but concerted effort to strengthen the institutional structure.

<sup>23</sup> The matching grant means that the government will match the amount collected by the WUAs from each of its members (i.e., farmers) for creating an initial fund to support the organization. This grant and the

packaging are actually adopted in many countries including India, the Philippines, Turkey, and Mexico.

Instances for the adoption of the principle of institutional sequencing are also aplenty in recent water reforms observed across countries. An efficiently functioning network of WUAs at various levels is a precondition not just for cost recovery and system maintenance but equally also for the enforcement and monitoring of an effective water right system. Water rights system can, in turn, contribute to the realization of other institutional aspects such as cost recovery, accountability, conflict resolution, and water markets. The experiences in countries such as Colombia, India, Mexico, Morocco, Turkey, and Uzbekistan demonstrate clearly that WUAs have indeed contributed to cost recovery and improved system management. While WUAs have played a major role in ensuring accountability and resolving conflicts, they have not yet become the organization foundation for water rights system and water markets. For reaching such a higher stage of institutional reform, additional conditions such as legalized systems water quotas and volumetric allocation arrangements are essential. While some of the basic conditions for reaching this stage exist in Mexico (e.g., water law and registry of water rights), in the case of other countries listed above, they are still missing.

The experience of Australia shows, on the other hand, that a strong sequential linkage exists among water institutional components such as rights system, cost recovery, conflict resolution, market-based allocation, and irrigation privatization. The experiences of Australia and California also demonstrate the scope for more advanced forms of institutional sequencing. The existence of water rights system and the basin organization such as the Murray-Darling River Commission have enabled the concerned Australian states to formulate and implement what is known as the 'Cap Program' that aims to reduce water diversions to the 1993-94 use level in an effort to reduce soil salinity and water quality in the basins. The same institutional arrangements have also remained a basis for water rights reallocation, irrigation privatization, and facilitating water flow for environmental purposes. In California, the presence of water rights system and the

---

share in the collection of water charges (usually, about 10 percent of the total proceeds) are used to provide incentives for WUAs, which are in the form of induced collective action initiatives.

elaborate organizational framework for water management have facilitated additional institutions such as 'water banks'.

The fact that countries such as Australia, Chile, France, Israel, and United Kingdom and regions such as California and Colorado could undertake advanced forms of reforms without much difficulty provides a strong evidence for the transaction cost linkages between earlier and subsequent reforms. In these cases, the already prevailing institutional conditions such as water rights, volumetric allocation, economic water rates, and organizational arrangements enable the creation of higher stage institutions such as pricing reforms, water markets, and water banks with less resistance and cost. Similar effects can also be observed, though in a somewhat narrow context, in other countries such as Namibia, Portugal, and Tunisia, where the creations of financially independent corporate entities in urban and agricultural sectors have facilitated downstream reforms such as pricing reforms and organizational changes within water administration. Since the instances show how existing institutions provide scope for undertaking additional reforms or creating new institutions, they indicate how the transaction costs of creating the new institutions are reduced by the presence of appropriate institutions. In this sense, these and similar cases elsewhere illustrate the scope not only for institutional sequencing but also for scale economies in institutional reform. In countries such as Argentina, Chile, and Mexico, water reforms also involved sub-sectoral sequencing in the sense that urban water reforms preceded the irrigation sector reforms. There are also instances of spatial sequencing both in urban and agricultural sectors, as the reforms such as privatization and IMT were focused in some cities and regions. In the case of Mexico, policy and legal reforms have also preceded the organizational reforms.

On the question of scale and dose of institutional reforms, the recent experiences of China, India, Mexico (as well as many other Latin America countries) show that since water reforms form part of the larger program of macro economic reform, there were considerable synergy and scale effects powerful enough to neutralize the political economy constraints. The experience of South Africa is similar as water reform formed part of the political reform. In the case of Namibia, water sector reforms, though limited, have their origin in the country's transition from a colonial system. The irrigation



reforms in Mexico as well as in the Indian states of Andhra Pradesh and Madhya Pradesh were based on a ‘big bang’ rather than a ‘gradualistic’ approach suggesting both the scale and political economy advantages in undertaking reforms at one go. The scale of reform effort also has a time dimension, as additional reform effort can be undertaken either simultaneously or sequentially with appropriate and strategically spaced time gaps. The issue of when to make the additional reform effort, however, depends not only on the prevailing political climate but also on whether the performance impact associated with the institutional change is immediate or delayed.

The overall institutional environment—as defined by factors such as the cultural traditions, political system, and social arrangement—within which water institutions and water sector interact has a decisive role not only in determining the nature of reforms but also the effectiveness of institutions.<sup>24</sup> Performance variations in IMT program (Johnson, 1997; Vermillion, 1997) and basin level organizations (Kliot, Shmueli, and Shamir, 1997) across countries and regions are notable instances for the powerful role the general environment plays in institutional performance. These instances also show that political and legal commitments to declared policies, though necessary, are not sufficient in the face of administrative inadequacy and other bottlenecks, including the political arrangements (e.g., federal vs. unitary form, presidential vs. parliamentary form, or centralized system vs. multi-party democracy). Based on a review of water institutional changes in 11 countries (Mexico, Chile, Brazil, Spain, Morocco, Israel, South Africa, Sri Lanka, Australia, China, and India), Saleth and Dinar (2000) have established that water institutional reform in these countries are prompted more by factors exogenous to water sector (e.g., macro economic crisis, political reform, natural calamities, and technological progress) than due to those endogenous to the sector (e.g., water scarcity, performance deterioration, and financial non-viability). Notably, this observation applies, more or less equally to both the developed and developing countries.

---

<sup>24</sup> A historical instance can illuminate this point better. That is, the adoption of the U.S. constitution by many Latin America countries and western property rights laws by many developing countries has not been as successful as expected because “the enforcement mechanism, the norms of behavior, and the subjective model or models of the actors are not the same” (North, 1990a:101). Thus, institutional similarity does not necessarily assure performance consistency across contexts

The water reform initiatives in China and India as well as in most Latin America countries can be traced to their macroeconomic reforms of the late 1980s (Sayedoff and Spiller, 1999; Saleth and Dinar 2000). On the other hand, privatization of water sector in England and New Zealand is linked to the economic liberalization policies. Water institutional changes in Chile and Portugal can also be related to political changes. In contrast, environmental factors including drought, floods, and salinity played a major role in the reform initiatives in cases such as California, China, and Australia. In the case of many European countries, the preservation of water quality and inland water-based ecosystems were the driving forces for institutional reforms in their water sector. Similarly, international agreements (e.g., the Water Framework Directive of European Union, World Trade Organization, and regional water sharing agreements) also play an equally important role in explaining reform in different countries. The fact is that countries do utilize, though to varying degrees, the political economy contexts provided by the changes in the overall institutional environment of water sector. Although this happened more by chance than by design, from the perspective water reform strategy, the experience does points to the advantage of timing reform programs around ongoing and prospective changes in exogenous factors and events.

## **6.2. Water Sector Reform in India: A Transaction Cost Perspective**

We have provided some empirical evidences to show how countries use institutional design and implementation principles emerging from institutional linkages, reform process, and exogenous factors. Let us now turn to case studies of India and Mexico to understand the role that transaction cost and political economy considerations play in explaining the reform process in their respective water sector. The socio-economic consequences of widespread groundwater depletion, ecological costs of large scale water development projects, storage loss from siltation, and command area loss to water logging and salinity have remained the fundamental factors providing a strong economic motivation for water institutional reforms. Unfortunately, the financial and performance crises of the water sector have failed to gather the political economy thrust needed for prompting concrete actions. From an institutional transaction cost perspective, this

means that although the opportunity costs of inaction were high, the perceived political costs of taking actions were still higher to undermine the reform initiatives.

Fortunately, there were a number of developments—mostly exogenous to water sector—since mid-1970s that have not only reduced the political costs but also magnified the opportunity costs of water institutional reforms. For instance, the earlier practice of keeping water policy subservient to agricultural policy has lost its relevance when India eliminated food imports in 1971 and started building a comfortable buffer stock (often going beyond 20 million tons) in recent years. Although the immediate prompt for the first National Water Policy came from the serious drought of 1987, it is the political and media fallout associated with this natural event that, in fact, galvanized the necessary political will to declare even such a simple and non-binding policy statement. But, the transaction cost calculus changed rather dramatically with the macro economic crisis of the late 1980s and subsequent declaration of the New Economic Policy of 1991 focusing on financial discipline, economic liberalization, and liquidation of public sector enterprises.

The major impact of the New Economic Policy on the water sector has been a radical decline in its budgetary share. For instance, the share of the irrigation sector alone has declined from 23 percent of the total 5-year water plan expenditure in the 1950s to 7 percent in recent years. In the wake of such budgetary cuts, water-related departments were forced to take a harder look at the ways of cost saving and internal resource mobilization. At the same time, farm lobbies that were resisting water rate revision have also realized that farm income is getting increasingly affected by unreliable water supply from poorly maintained irrigation systems. It is these macro economic conditions and their micro economic consequences that have magnified the opportunity costs of reforms from the perspective of both the government and water users. As a result, pressures were building for revising water rates, involving farmers in cost recovery and system maintenance, and contemplating broader water sector reforms. It is in this particular context of economy-wide reforms and sector-specific concerns that the central government constituted the two important committees—one to look into the issues of irrigation pricing and the other to consider private sector participation in water sector—

and few state governments went for options such as the autonomous water corporations and private sector participation.<sup>25</sup>

The revival of interest on many policies that were considered once as anathema or impractical (e.g., irrigation privatization, volumetric water allocation, water rights, and moving water into the concurrent list) indicates the changing balance in water debate. This is certainly a positive development and augurs well for the prospects of more substantive reforms in future. From another perspective, the economic and trade liberalization policies initiated since 1991 have also produced significant scale economies in terms of their synergetic effects on water sector reforms. Since water sector reforms form part of an economy-wide reform, the political economy costs of the former became a small proportion of the latter.<sup>26</sup> Meanwhile, international lending agencies, especially the World Bank and Asian Development Bank, also had considerable influence on the nature and direction of water sector reforms.<sup>27</sup>

The transaction cost and political economy-based explanations apply not only to water institutional changes observed at the macro level but also those occurring at the state and local levels. For instance, groundwater markets and other forms of water-sharing contracts at the local level have emerged as the private costs are lower than their private benefits to individual farmers. Although these local arrangements have a high social costs such as the implicit/illegal sales of power, violation of proportional sharing principle, and aquifer depletion (Saleth, 1996), they are perceived by the state to be lower than the economic and political costs of creating the institutions necessary for regulating these groundwater markets and water sharing contracts. The irrigation management transfer program implemented both in Andhra Pradesh and Madhya Pradesh also has a

---

<sup>25</sup> These changes in the case of Andhra Pradesh, Karnataka, and Maharashtra also have an ulterior motive as they use these unconventional means of financing water projects so as to establish their control over water resources in the Krishna basin before the tribunal award comes for renegotiation.

<sup>26</sup> This fact clearly underlines the transaction cost implications and strategic significance of timing and packaging the water sector reform so as to make it coincide with and form part of a larger economy-wide reform program.

<sup>27</sup> For instance, most of the organizational reforms, including the promotion of basin-based organizations observed in states such as Andhra Pradesh, Tamil Nadu, Orissa, and Uttar Pradesh were introduced under different World Bank-funded projects.

perfect explanation within the institutional transaction cost framework. While there are committed change agents on all sides—the state, bureaucracy, donors, research/training organizations, and the users, the actual forces for change have their origin in the changing political economy realities of these states.

The heavy fiscal burden of irrigation subsidy has convinced the state, the bureaucracy, and the donors of the need for transferring the irrigation system to user groups. The economic threats of an increasing productivity loss from the poorly maintained irrigation system—documented well by research organizations<sup>28</sup> and personally experienced by most farmers—have convinced them of the key role that farmers, as a group, have to play in improving farm productivity and system efficiency. Though it is seldom recognized explicitly, the political groups have also viewed the program as an opportunity to build their grassroots organizations and local groups found them as an additional avenue for assuming social status and power. Since the program is viewed as a logical part of the process of decentralization centered on *panchayat* system (particularly in Madhya Pradesh), it is also perceived to have a considerable political mileage for ruling parties, especially during the election years.<sup>29</sup> Thus, from the perspective of all stakeholders, the transaction costs were reckoned to be far lower than the opportunity costs (i.e., the foregone potential benefits) of not implementing this program in the particular institutional environment faced by these states when the program was actually implemented.

While Indian water sector is gradually coming out of the bureaucratic grip and myopic political considerations, it has not yet fully matured to be influenced mainly by economic and technical forces. Unfortunately, the divisive role of political factors is

---

<sup>28</sup> International best practices and research-based knowledge produced by organizations such as the International Water Management Institute (IWMI) have also played a catalytic role in reducing the transaction costs of irrigation management transfer programs, especially in Andhra Pradesh and Madhya Pradesh.

<sup>29</sup> The irrigation management program in Madhya Pradesh was quicker and smoother than in Andhra Pradesh in view of the facilitative role of the decentralization process that was implemented before the transfer program. This is an evidence for the advantage of sequencing two different but operationally related reform components in terms of the favorable effects of the earlier program on the transaction costs (especially its implementation cost component) of the latter program. But, it is necessary to note that these reform sequencing attempts in both states have happened more by default than by design.

likely to increase, especially on the issue of inter-state water sharing, as most rivers in India are shared by two or more states. As the basin resources are fully appropriated, additional claims will be politically more acrimonious unless institutional arrangements are created to catalyze negotiated settlements and mutual agreements. But, the issue has become complicated by the proposed 'Garland Scheme' for linking most major rivers, especially when the central government lacks the legal powers and political will to implement the Scheme, though it has the technical and financial arrangements to complete most of the feasibility studies for various links (Iyer, 2002).<sup>30</sup> It is in this political vacuum and indecisive environment that the Supreme Court has been invoked to ask the government to report on the feasibility and prospects of this Scheme. This has, in some sense, reduced the political transaction costs for the Scheme, which is one of the long-term but somewhat tricky options for India to address its water shortage problems.

### **6.3. Water Sector Reform in Mexico: A Political Economy Perspective**

Recent reforms in Mexican water institutions provide an interesting case for the powerful role of political economy factors (Hearne, 2003). The irrigation and urban water sectors reforms undertaken by Mexico since the late 1980s have two major thrusts: (a) decentralization and user participation and (b) the adoption of economic instruments for cost recovery and demand management. As in the case of India, the factors motivating these reforms were external to both water sector and water institutions. For instance, decentralization has a political motivation of accommodating growing regional interests whereas cost recovery was a necessary response to the economic crisis of the late 1980s. Moreover, the factors that influenced the reform process such as urbanization, globalization, political pluralism, changing prices due to North America Free Trade Agreement (NAFTA), changing land use, and fiscal crisis were all external to water sector (Hearne, 2003). This does not mean that endogenous factors such as declining groundwater table, water shortage, and deteriorating water quality were less significant.

---

<sup>30</sup> This Scheme aims to link 37 rivers through 3,000 storages and 12,500 kilometers of canals by 2016. This gigantic water grid, probably the largest in the world, will cost \$120 billion, but is expected to generate 35 giga watts of hydro-power capacity and 35 mha of additional irrigation.

What happened, in fact, is that the opportunity costs of these endogenous factors have been magnified by the exogenous factors to give the necessary political economy thrust for the reform initiation.

Mexico was able to enhance public expenditures with international borrowing and maintain an overvalued currency with high oil prices during the 1970s. However, this was no longer possible when oil prices fell and debt crisis emerged during the 1980s. The policies adopted to solve the economic crisis included the signing of NAFTA, enhanced reliance on international trade, and the privatization of certain state enterprises. Since NAFTA has required the elimination of subsidies for most agricultural inputs and outputs and the economic crisis has necessitated a reduction in government spending, the Mexican government was forced to undertake several reforms in the water sector with a larger share of public investment and budgetary subsidies. These reforms include the management transfer of all the irrigation districts and the promotion of private sector and local government in urban water sector. Water rates both in irrigation and urban sectors were also revised to improve cost recovery.

While economic crisis of the 1980s has remained a major factor precipitating decentralization within water sector, the trend towards decentralization has started much before and it has its roots in the changing power balance of various political groups (Rodriguez, 1997). For decades, Mexico had a centralized political system with a dominant presidency coming usually from the Institutional Revolutionary Party (PRI), the single party that dominated Mexican politics from the inception. With a centralized system of political power and fiscal resources, all regional and local governments were dependent extremely on the federal government. Although decentralization was intended essentially to decentralize governmental functions and to distribute jobs and patronage geographically, it was resisted by groups who consider this will reduce their economic and political power. However, with the economic crises of 1980s and the electoral defeats of PRI in 1988 and in 2000, other political parties have become powerful to claim the presidency and several state governorships. It is the emergence of this political pluralism and the demand for regional autonomy that have deepened the process of political and economic decentralization (Pineda, 2002). The water sector—especially, its

water supply and sanitation segments—has, of course, benefited from the synergetic influence of this overall process of decentralization.

Despite the moves to decentralize government functions and decision-making, the Comisión Nacional del Agua (CNA), the apex body that develop and manage water resources in Mexico has maintained centralized control and federal proprietorship over Mexican water resources. Yet, this centralized arrangement has been conducive for decentralization, as the CNA, as mandated by the President, has led the water institutional reform process involving a large scale program of irrigation management transfer and a substantial degree of privatization and localization of urban water services.<sup>31</sup> The water policy reforms that were initiated in the mid-1990s can be traced to the National Water Plans being prepared since 1975 as part of Mexico's periodic National Development Plans (Hearne, 2003). The preparation of these water plans was supported by the United Nations Development Programme and the World Bank.

Water institutional reforms in Mexico are characterized by the establishment of ambitious long-term goals and their gradual and deliberate implementation. The 1992 National Water Law presented an ambitious reform program that will take decades for its effective implementation. Irrigation management transfer program was initiated with this law and has progressed rapidly and smoothly. Since this program was implemented with a 'big bang' approach, the whole process of transfer was completed within a span of two years. But, a careful look at the way the program was implemented will reveal that there has been a sequencing element, as it was implemented, on a pilot scale, in selected districts and the lessons learned were carried forward when the program was extended to other districts. Meanwhile, the efforts to link the agricultural input supply and extension systems with the WUAs provide an instance for institutional packaging during the reform process (Johnson, 1997). Although the irrigation sector reform was guided from above, there has been generally a favorable response from the user groups (Palacios, 2000).

Institutional sequencing has also been followed in other reform spheres. For instance, although the 1992 law authorized the creations of watershed councils and

---

<sup>31</sup> This case shows clearly that a dose of centralization is inevitable even in promoting decentralization program. Otherwise, the decentralization process will not be that fast or effective.



technical groundwater committees, these institutions (57 of them) were created only after the completion of the irrigation management transfer program. This is because the prior existence of WUAs is essential, as some of these councils/committees are to be the members of the WUAs. There is also prioritization and sequencing while creating the watershed councils, as the basins with more severe problems (e.g., Lerma and Rio Bravo) received priority over the remaining basins. The reform in the urban water sector started from the Mexico City with a deliberate three-stage implementing the privatization plan. Since such a cautious and gradualistic approach involved minimal private sector participation with no immediate long-term commitment, it had the advantage of neutralizing political opposition during the initial years of the reform. The same has also been true with the gradual process with which the urban water sector in other parts of Mexico was brought to the management of the regional and local authorities (Hearne, 2003). But, when the reform has reached a matured stage, the changes have already become entrenched making that it to be very costly to reverse. With these reforms in the irrigation and urban sectors, additional and marginal changes (e.g., water rates revision and cost recovery) become also easier. In this respect, the Mexican reform provides cases for the strategic use of both path dependency features as well as scale economies to counter political economy constraints.

## **7. CONCLUSIONS AND IMPLICATIONS**

The quantitative and qualitative manifestations of water crisis are a major constraint for economic development and environmental sustainability both at the national and global contexts. Although water crisis is an apparent reflection of a physical gap between water development and utilization, it is has its roots in an institutional gap, i.e., the gap between the prevailing archaic and outmoded institutional arrangements and those needed for a more efficient and sustainable development, allocation, and utilization of the scare resource in at present. This institutional gap also characterizes the differences between the two paradigms of water management, i.e., the one based on the supply-side approach, physical solution, agency-based bureaucratic allocation, and centralized management and the other rooted in demand-side approach, economic solution, user-based market

allocation, and decentralized management. Such an institutional gap is rather serious particularly in the case of many developing countries with a major share of global population and poor people, where the changing resource realities are already creating the economic and political pressure for moving towards an alternative development paradigm for water resources management.

It is true that the extent of institutional reforms undertaken in most of the developing countries is far from adequate for proper institutional requirements of the alternative paradigm for market and user-based water allocation. However, as we consider the overall nature and thrusts of observed reforms across countries, institutional changes are moving in the right direction as they foster economic approach, management decentralization, financial self-dependence, and environmental sustainability. There has also been a radical shift in policy dialogue and reform vocabulary in many developing countries. Many ideas that were considered once as anathema or impractical (e.g., paying for water, water privatization, and market allocation) are now not only considered seriously but also pursued vigorously even in countries such as China, Morocco, and India. These changes certainly augur well for the long-term prospects of reforms. However, current initiatives are still insufficient to take the reform process to advanced stages involving more difficult but critical changes necessary for creating the institutional conditions necessary for an allocation-oriented water resources management. The usual reasons advanced for this reform gap are related to the political economy constraints and technical difficulties associated with the institutional reform itself. Yet, the water reform experiences of many countries—both developed and developing—indicate that they are able to circumvent these constraints and could still undertake both peripheral and substantive institutional changes reforms in their water sector.

The occurrence of reforms in the face of binding nature of political and technical constraints means that these factors themselves provide valuable contexts and opportunities for reform and many countries are, in fact, exploiting them to advance the reform process either by chance or by design. This is indeed the main policy message of this chapter, which was rationalized both in terms of an analytical framework based on an institutional transaction cost theory as well as in terms of empirical and case study-based

evidences for the way political contexts and institutional features are used by countries to initiate and sustain their reform initiatives. The analytical framework is very useful for a simple yet a comprehensive understanding of both the favorable political contexts provided by exogenous factors (e.g., macro economic reform, political changes, international agreements, and floods and droughts) as well as the strategic roles played by endogenous factors, especially the technical and transaction implications of institutional linkages. These political contexts and strategic factors provide the basis for deriving reform design principles such as institutional prioritization, sequencing, and packaging as well as reform implementation principles such as reform timing, spacing, speed, and scale. The empirical evidences provided in this chapter illustrate how these principles are actually used by various countries in different forms and contexts. Similarly, the two case studies of India and Mexico are provided to explain water institutional reforms from the institutional transaction cost and political economy perspectives.

Let us conclude by identifying some strategies for advancing institutional reforms in the water sector of developing countries. The first strategy obviously involves the promotion and adoption of reform design and implementation principles in formal and planned manner. As the analytical framework and evidence provided in this chapter has shown, these principles are quite effective to promote institutional reforms through a careful exploitation of the political opportunities provided by exogenous changes and technical possibilities provided by the endogenous institutional features. The second strategy involves the achievement of a critical minimum level of reform from where the transaction cost calculus would stipulate that a reversal direction is costlier than to go ahead on the institutional change continuum. While the reform design principle based on institutional prioritization can help in identifying the key components of such minimum reform program, other design and implementation principles will help in implementing it in a gradual but consistent manner. Although the nature of this minimum reform program can vary across countries and contexts, in general terms, this program should include water law, water rights system, conflict resolution and accountability mechanisms, user-based decentralized arrangement for water allocation and management, value-based water rates, and regulatory arrangements for water quality and environment.

Finally, as transaction costs decline and political balance improves along the institutional change continuum, it is necessary to have a logically linked sequential reform strategy, where water sub-sectors, institutional components, and even, regions are prioritized in terms of their performance impact, facilitative roles for downstream reforms, and political acceptability.

## REFERENCES

- Abdulrazzak, M. J., 1995, "Water Supplies Versus Demand in Countries of Arabian Peninsula", *Journal of Water Resources Planning and Management*, 121(3): 227-234.
- Barrow, C.J., 1998, "River Basin Development Planning and Management: A Critical Review", *World Development*, 26(1): 171-186.
- Bauer, Carl J., 2004, *Siren Song: Chilean Water Law as a Model for International Reform*, Washington DC: Resources for the Future Press
- Beaumont, Peter, 1994, "The Myth of Water Wars and the Future of Irrigated Agriculture in the Middle East", *International Journal of Water Resources Development*, 10(1): 9-21.
- Boyer, Robert and J. Rogers Hollingsworth, 1997, "From National Embeddedness to Spatial and Institutional Nestedness" in J. Rogers Hollingsworth and Robert Boyer, eds., *Contemporary Capitalism: The Embeddedness of Institutions*, Cambridge, UK: Cambridge University Press.
- Brinkerhoff, D.W., 1994, "Institutional Development in World Bank Projects: Analytical Approaches and Intervention Designs", *Public Administration and Development*, 14(1): 135-151.
- Bromley, D.W., 1989, "Institutional Change and Economic Efficiency," *Journal of Economic Issues*, 23(3): 735-759.
- Bruns, B., and D. J., Bandaragoda, eds., 2003, *Governance for Integrated Water Resources Management in a River Basin Context*, (Proceedings of an International Seminar, Bangkok, may, 2002), International Water Management Institute, Colombo, Sri Lanka.
- Challen, Ray, 2000, *Institutions, Transaction Costs, and Environmental Policy: Institutional Reform for Water Resources*, Cheltenham, UK: Edward Elgar.
- Coase, Ronald, H., 1937, "The Nature of the Firm", *Economica*, 4(2): 1-44.
- Cummings Ronald, Ariel Dinar and Douglas Olson, *New Evaluation Procedures for a New Generation of Water-Related Projects*. World Bank Technical Paper 349, World Bank, Washington, D.C., December, 1996.
- Dinar, Ariel, ed., 2000, *The Political Economy of Water Pricing Reforms*, New York: Oxford University Press.
- Dinar, Ariel, Trichur Balakrishnan, and Joseph Wambia, 2004, "Politics of Institutional Reforms in the Water and Drainage Sector of Pakistan", *Environment and Development Economics*, 9(3), June.
- Dinar, Ariel, and R. M. Saleth, 2005, "Issues in Water Pricing Reforms: From Getting Correct Prices to Setting Appropriate Institutions" in Tom Tietenberg and Henk

- Folmer, eds., *International Yearbook of Environmental and Resource Economics*, Edward Elgar Publishing, Cheltenham, UK (forthcoming).
- Easter, K. William, Ariel Dinar, and Mark Rosegrant, eds., 1998, *Markets for Water: Potential and Performance*, Boston: Kluwer Academic Press.
- Falkenmark, Malin and Gunnar Lindh, 1993, "Water and Economic Development" in Peter H. Gleick, ed., *Water in Crisis: A Guide to the World's Fresh Water Resources*, New York: Oxford University Press.
- Falkenmark, Malin, 1999, "Forward to the Future: A Conceptual Framework for Water Dependence", *Ambio*, 28(4): 356-361.
- Frederiksen, Harald D., 1998, "International Community Response to Critical World Water Problems: A Perspective for Policy Makers", *Water Policy*, 1: 139-158.
- Food and Agriculture Organization (FAO), 1996, *Food Production: The Critical Role of Water*, Technical Background Document for the World Food Summit: 7, Rome.
- Gleick, Peter H., 1998, *The World's Water: The Biennial Report on Fresh Water Resources*, Washington, DC: Island Press.
- Gopalakrishnan, Chennat, Asit K. Biswas, and Cecilia Tortajada, eds., 2004, *Water Resources Management: Structure, Evolution, and Performance of Water Institutions*, New York: Springer-Verlag.
- Hearne, Robert R., 2003, "Progress of Institutional Reform in the Water Sector of Mexico", Paper presented in the *Workshop on Water Reform, Sector Performance, Water Pricing and Water Resource Accounting*, 25th Conference of the International Association of Agricultural Economists, Durban, South Africa, August 16.
- Hearne, Robert, and K. William Easter, 1997, "The Economic and Financial Gains from Water Markets in Chile", *Agricultural Economics*, 15: 187-199.
- Iyer, Ramaswamy R., 2002, "Linking of Rivers: Judicial Activism or Error?", *Economic and Political Weekly*, 37(46):4595-4596.
- Johnson, Sam H., 1997, "Irrigation Management Transfer: Decentralizing Public Irrigation in Mexico", *Water International*, 22(3): 159-167.
- Kliot, Nurit, Deborah Shmueli, and Uri Shamir, 1997, *Institutional Frameworks for Management of Transboundary Water Resources*, Water Research Institute, Technion (Israel Institute of Technology, Haifa, Israel).
- Lazonick, William, 1991, *Business Organization and the Myth of the Market Economy*, Cambridge and New York: Cambridge University Press.
- Le Moigne, Guy, Shawki Barghouti, Gershon Feder, Lisa Garbus, and Mei Xie, eds., 1992, *Country Experiences with Water Resources Management: Economic, Institutional, Technological, and Environmental Issues*, World Bank Technical Paper No: 175, World Bank, Washington, DC.

- North, Douglass C., 1990a, *Institutions, Institutional Change, and Economic Performance*, Cambridge, MA: Cambridge University Press.
- North, Douglass C., 1990b, "A Transaction Cost Theory of Politics", *Journal of Theoretical Politics*, 2(4): 355-367.
- North, Douglass C., 1997, *The Contribution of the New Institutional Economics to an Understanding of the Transition Problem*, WIDER Annual Lectures 1, World Institute for Development Economics Research, Helsinki, Finland.
- Orloci, J., K. Szesztay and L. Varkonyi, 1985, *National Infrastructure in the Field of Water Resources*, UNESCO, Paris.
- Ostrom, Elinor, 1990, *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge, UK: Cambridge University Press.
- Ostrom, Elinor, 1999, *Institutional Rational Choice: An Assessment of the Institutional Analysis and Development Framework*, Working Paper, Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington.
- Palacios, E., 2000, "Benefits and Second Generation Problems of Irrigation Management Transfer in Mexico", in D. Groenfeldt and M. Svendsen, eds., *Case Studies in Participatory Irrigation Management*, World Bank Institute, Washington, DC.
- Pineda, N., 2002, "Water Supply Performance, Policy, and Politics on Mexico's Northern Border", in S. Whiteford and R. Mellville, eds., *Protecting a Sacred Gift: Water and Social Change in Mexico*, Center for U.S.-Mexican Studies, University of California, San Diego.
- Postal, S. L., 1993, *The Last Oasis: Facing Water Scarcity*, Worldwatch Institute Environmental Alert Studies, World Watch Institute, New York.
- Postal, S. L., 1999, *Pillar of Sand: Can the Irrigation Miracle Last?*, New York: W.W. Norton.
- Postal, S. L., G. C. Daily and P. R. Ehrlich, 1996, "Human Appropriation of Renewable Fresh Water", *Science*, 271: 785-788.
- Rodriguez, V., 1997, *Decentralization in Mexico*, Boulder, CO: Westview Press.
- Rosegrant, M.W., and C. Ringler, 1999, *Impact on Food Security and Rural Development of Reallocating Water from Agriculture*, EPTD Discussion Paper No: 47, International Food Policy Research Institute, Washington, DC.
- Saleth, R. M., 1996, *Water Institutions in India: Economics, law, and Policy*, New Delhi: Commonwealth Publishers.
- Saleth R. M., and Ariel Dinar, 2000, "Institutional Changes in Global Water Sector: Trends, Patterns, and Implications", *Water Policy*, 2(3): 175-199.
- Saleth R. M., and Ariel Dinar, 2004, *The Institutional Economics of Water: Cross-Country Analysis of Institutions and Performance*, Cheltenham, UK: Edward Elgar Publishing Pvt. Ltd (Forthcoming).

- Savedoff, William and Pablo Spiller, eds., 1999, *Spilled Water: Institutional Commitment in the Provision of Water Services*, Inter-American Development Bank, Washington, DC.
- Shirley, M., ed., 2002, *Thirsting for Efficiency: The Economics and Politics of Urban Water System Reform*, World Bank, Washington, DC
- Varis, Olli, 1999, "Water Resources Development: Vicious and Virtuous Circles", *Ambio*, 28(7): 599-603.
- Vermillion, Douglas L., 1997, "Impact of Irrigation Management Transfer: A Review of Evidence", IIMI, Colombo.
- White, Louise G., 1990, *Implementing Policy Reforms in LDCs: A Strategy for Designing and Effecting Change*, Boulder & London: Lynne Rienner Publishers.
- Williamson, Oliver E., 1975, *Markets and Hierarchies, Analysis and Antitrust Implications: A Study in the Economics of Internal Organization*, New York: Free Press.
- Williamson, Oliver E., 1985, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York: Free Press.
- Williamson, Oliver E., 1999, "Public and Private Bureaucracies: A Transaction Cost Economics Perspective", *Journal of Law, Economics, and Organization*, 5: 306-347.