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Institutional changes in global water sector: trends, patterns, and implications*

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Abstract

Water institutions, defined jointly by the interactive roles of water law, water policy, and water administration, are undergoing unprecedented changes worldwide. Despite country-specific variations, these institutional changes observed in the global water sector do evince certain common patterns and clear trends. This paper aims to (i) unravel the nature and origin of these trends and patterns, and (b) evaluate their implications for global water sector policy, 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. The review suggests that institutional changes within the water sector occur due to the role of both endogenous factors (e.g., water scarcity, performance deterioration, and financial non-viability) as well as exogenous factors (e.g., macro economic crisis, political reform, natural calamities, and technological progress). These factors act together to raise the opportunity costs of institutional change, reduce the corresponding transaction costs, and create a *pro-reform climate*. From a policy perspective, the synergy from these factors can be exploited well with a sequential reform strategy where water sub-sectors and institutional components are prioritized in terms of their relative performance impact, fiscal significance, facilitative roles for downstream reforms, and political acceptability. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Institutional arrangements governing the water sector are undergoing remarkable changes worldwide. Although the extent of these changes varies by country-specific economic, political, and resource realities, they do evince some common patterns and clear trends. What are the nature and direction of these institutional changes? Which are the factors that motivate such changes? What are their implications for future strategies for promoting water institutional reforms? To answer these questions, this paper attempts to evaluate the institutional changes observed within global water sector by considering a sample of 11 countries: Mexico, Chile, Brazil, Spain, Morocco, Israel, South Africa, Sri Lanka, Australia, China, and India. The specific objectives of the paper are to (i) develop a theoretical framework based on transaction cost theory for explaining institutional changes in the water sector, (ii) review the key features of current institutional arrangements and recent institutional changes in the water sector of sample countries, (iii) identify the 'best practice' cases, (iv) delineate the common trends and patterns evident in water-related institutional changes observed among the sample countries, and (v) conclude by identifying the format and thrust of future strategies for furthering institutional reforms in global water sector.

2. Water sector problems and institutional responses: an analytical framework

The concepts of 'water sector' and 'water institution' can first be defined both to specify the analytical framework of this paper as well as to clarify its scope of coverage and contour of analysis. Although water sector is considered to cover all uses of water from both surface, sub-surface, and reclaimed or recycled sources, the main focus here is on the major macro level issues of allocation, finance, and management. Consistent with the institutional economics literature (e.g., Bromley, 1989; North, 1990), water institution is conceived in a much broader sense than mere organization. Water institution sets the rules and defines, thereby, the action sets for both individual and collective decision-making in the realm of water resource development, allocation, and utilization.¹ Since these rules are often formalized in terms of three inter-related aspects, i.e., legal framework, policy environment, and administrative arrangement, water institution can be conceptualized as an entity defined interactively by its three main analytical components, i.e., water law, water policy, and water administration. Water institution is also viewed from a macro and formal perspective rather than from a micro and informal perspective, as the macro level institutional features are more amenable for standard characterization essential for international comparison than their micro and informal counterparts.

The factors that lead to changes in the three main dimensions of water institutions, i.e., water law, water policy, and water administration, are many with a diverse origin and varying

¹ This definition is not, however, inconsistent with the classical social science definition (i.e., institutions as routinized patterns of behavior based on values) as the social, economic, and political values are often codified in terms of formal laws and informal conventions that govern human behavior and choice.

level of impact. For analytical convenience, these factors can be grouped into endogenous factors that are internal to water sector and exogenous factors that are outside the strict confines of both water institution and water sector. The endogenous factors include water scarcity, water conflicts, financial and physical deterioration of water infrastructure, and operational inefficiency of water institutions. The exogenous factors include economic development, demographic growth, technical progress, economic and political reforms, international commitments, changing social values and ethos, and natural calamities including floods and droughts.

Since the exogenous and endogenous factors are interrelated and their relative impacts differ by context, it is difficult either to isolate their individual roles or to generalize the direction of their effects. Nevertheless, it is possible to track their effects within the framework of transaction cost theory where they can be conceptualized as to influence either the transaction costs or the opportunity costs of institutional change. In the case of water institutions, the transaction costs cover both the real and monetary costs of instituting the regulatory, monitoring, and enforcement mechanisms related to water development, allocation, and management. Similarly, the opportunity costs cover both the real and economic value of opportunities foregone or the net social costs of 'status quo'. Since the theory asserts that institutional change occurs when the opportunity costs exceed the transaction costs to trigger a political thrust for reform, it is consistent both with the welfare-theoretic logic as well as with the political economy argument.

The institutional economics literature shows that both the opportunity and transaction costs of institutional change, though difficult to quantify exactly, can, nevertheless, be identified and estimated. There are many attempts in theoretically evaluating the gains from institutional changes both in general context (e.g., Olson, 1971; Bromley, 1989; North, 1990) as well as in water sector context (e.g., Frederikson, 1992; Picciotto, 1995). There are also studies that estimate the gains from changes in particular components of water institutions such as water markets, inter-regional water transfers, and water quality institutions (e.g., Vaux & Howitt, 1984; Dinar & Latey, 1991; Howitt, 1998; Herne & Easter, 1997). There are also instances for the national level estimation of the opportunity costs of water institutional changes. Such national level estimates vary from \$400 million for Chile (Gazmuri & Rosegrant, 1994, p. 24) to \$14 billion for India (Saleth, 1996, p. 274). Similar estimates for the San Joaquin valley in the US place the opportunity cost at \$223 million (Archibald & Renwick, 1998).

Unfortunately, the prevailing approaches underlying the estimation of both the opportunity costs and transactions costs of institutional change remain, however, static and partial as they do not account either for the dynamics of institutional inter-linkages or for the impact of exogenous factors. Since the institutional inter-linkages and exogenous factors often play a powerful role in influencing the nature, direction, and speed of the process of institutional changes, their exclusion leads to an underestimation of the true potential for institutional change in any given context. Institutional change is not a one-time event but rather a continuum that moves in line with the changing resource realities, socio-economic needs, and political power structure. Since the reforms initiated in the early stages brighten the prospects for downstream reforms, there are intricate and functional linkages between the transaction costs of subsequent reforms and the opportunity costs of

earlier reforms.² Similarly, since the institutional changes within the water sector derive considerable synergy from exogenous factors reflecting changes elsewhere in the economy, the transaction costs of water sector reforms can also decline due to scale economies in institutional change.³

The opportunity and transactions costs of institutional changes are not static but change continuously due to the effects of institutional inter-linkages as well as the impact of changes both in the endogenous and exogenous factors. Since the magnitude of net benefits from institutional changes is a direct function of water scarcity, the economic urge for institutional change increases with each increase in water scarcity. Thus, as water scarcity becomes acute due to economic development or population growth, the real 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 within the water sector. 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 the water sector form only a small part of the overall reform process. Likewise, technical progress (e.g., satellite and information technologies, and computer-based water control structures) can also reduce the transaction costs of institutional changes. Since the exogeneous factors 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 institutional changes.

The analytical framework based on the transaction cost theory captures not only the role of factors both within and outside the water sector but also the strategic significance of certain dynamic aspects of institutional change such as institutional inter-linkages and scale economies. Although the set of factors affecting institutional changes does not vary much across countries, their relative significance in the opportunity and transaction costs calculus vary by country-specific contexts. It is the contextual nature of these variations that, in fact, explain why countries differ in terms of the extent and depth of water institutional reform. As the transaction cost theory provides a unified framework to track and account for the effects of a myriad factors affecting institutional changes, it can be used as a theoretical basis for explaining both the country-specific as well as cross-country variations in the nature and direction of water institutional changes.

3. Sample countries and information base

The value and credibility of a cross-country approach as a tool for evaluating institutional

² 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 water rights system.

³ 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. It shows how institutional changes within the water sector are linked to exogenous changes elsewhere in the economy.

changes in the global water sector is critically predicated on the appropriateness and representative character of the sample countries. The sample is selected in such a way as to cover a broad spectrum of countries representing a range of political systems, development stages, demographic situations, and water sector problems. The countries finally selected were: Mexico, Chile, Brazil, Spain, Morocco, Israel, South Africa, Sri Lanka, Australia, China, and India. These countries were visited during October–December 1997 for interacting with a cross-section of key water sector experts and for collecting recent materials on water sector and water institutions. It is these personal discussions as well as a critical review of past literature and recent materials that form the intellectual basis for the cross-country evaluation of institutional changes observed in global water sector.

Table 1 provides information on the political arrangements, physical attributes, sectoral orientation, and key issues facing the water sector in the sample countries. Since these data describe the general context within which the water sector of each sample country is operating, they are valuable as a background to understand the nature and direction of water institutional changes observed among the sample countries. As to the representative character of the sample, the sample countries account together for 27% of global area, 41% of global population, and 20% of global renewable water resources. Since the sample covers different continents, historical backgrounds, political systems, development stages, demographic trends, and levels of water scarcity, it can represent well the reality of global water sector in all its relevant dimensions. The representative character of the sample is enhanced further by the fact that it also covers the full spectrum of recently observed institutional changes both in terms of their coverage and effectiveness.

4. Institutional changes in the water sector: review of country-specific trends

Since water institution is a complex entity and the institutional changes are many in the sample countries, it is difficult to be exhaustive and comprehensive here.⁴ As a result, the country-specific review to be attempted below is brief, focusing on certain key features of existing institutional arrangements and recent institutional changes in the three main components of water institution, i.e., water law, water policy, and water administration. Although brevity prevents the review from covering broader issues such as hydro-power generation, recreation, navigation, flood prevention, and catchment and estuary management, some of them do receive attention in a few relevant contexts, especially to the extent they affect the institutional aspects related to water allocation, financing, and management. Finally, for a better understanding of the why and how of institutional changes observed among the sample countries, it is useful to keep in mind both the transaction cost framework (section 2) as well as the water sector context (Table 1) while going through the country-specific review of institutional changes.

⁴ For a more comprehensive, though not an exhaustive, review of institutional changes in the sample countries, see Saleth and Dinar (1999).

Table 1
The water sector of sample countries: political context and physical attributes

Country	Governmental form	Area (million km ²)	Population (million)	Mean rainfall (mm)	Renewable water resources (billion m ³)	Actual water extraction (billion m ³)	Agricultural use (%)	Water sector orientation	Key water sector issue
Mexico	Federal system (strong centre)	2.00	90.0	780	441.00	185.00	80	Irrigation	Quantity + Quality
Chile	Unitary form	0.75	14.0	50-1250	468.00*	34.20	89	Power	Quantity
Brazil	Federal system (strong states)	8.50	150.0	600-3600	2587.00	45.00*	15	Power	Quantity + Quality
Spain	Federal system (strong centre)	0.50	40.0	668	114.00	47.00	81	Irrigation	Quality
Morocco	Kingdom	0.70	27.0	500	29.50	17.60	90	Irrigation	Quantity
Israel	Unitary form	0.002	5.7	25-355	1.93	1.93	63	Domestic Irrigation + Domestic	Quantity
South Africa	3-Tiered federal system	1.30	42.0	497	35.40	20.00*	55	Irrigation	Quantity + Quality
Sri Lanka	Federal system (strong centre)	0.66	17.6	2000	43.00	25.00	95	Irrigation	Quantity
Australia	Federal system (strong States)	7.7	18.0	200-2400	188.00	30.00	80	Irrigation	Quality
China	Centralized 5-tier system	9.6	1200.00	648	2812.00	680.00	78	Irrigation	Quality (Floods)
India	Federal system (strong centre)	3.29	980.00	130-11,000	1086.00	605.00	84	Irrigation	Quantity + Quality

* Estimates based on the figures from World Resources Institute (1992, pp. 328-329).

4.1. Mexico

Prompted by the macro-economic crisis of the late 1980s, Mexico has initiated unprecedented reforms in the water sector beginning first with its irrigation segment in 1988. The irrigation sector reform involved a massive transfer of public irrigation systems to user groups. By 1996, 2.9 mha — representing 87% of the area under major and medium irrigation and 46% of the total area under all irrigation — were transferred to 386 Water User Associations (WUAs). This irrigation management transfer (IMT) has led to a dramatic improvement in cost recovery, system maintenance, and water use efficiency (see Johnson, 1996; Palacios, 1997). There were also notable changes in the legal sphere with the enactment of the National Water Law in 1992 and the Federal Law of Regulations in Water Matters in 1994.⁵

Water policy has also been undergoing notable changes in recent years with a clear accent on decentralization and privatization initiatives especially in the urban water sector. In this respect, there are, at least, four positive developments. First is the initiative to move water supply functions to state and municipal governments and promote financially self-dependent utilities and private companies in urban water supply (see Hazin, 1998). Second, with the success of the Llerma Basin Council (1989) that solved the most contentious inter-state water conflicts in Mexico, basin level organization as an instrument for stakeholder participation and negotiated settlement is also being extended to the Rio Bravo (1994) and the Valley of Mexico (1996) basins. Third, the New Agrarian Act has relaxed the land ceiling for irrigated land from 20 to 100 ha to encourage private investment in irrigation. And, finally, there are policy efforts to rectify the sectoral bias in water policy and to strengthen the regulatory and enforcement capabilities of water administration.

The legal and policy changes coupled with the IMT have also led to some notable changes in water administration. With a reduced role in the irrigation sector and the passage of a private-oriented water law, the government can now concentrate more on the critical areas of regulation, monitoring, and enforcement. For accomplishing such a role as well as for minimizing its sectoral bias, the Commission Nacional del Agua (CNA), the key organ of water administration in Mexico, was recently moved from the Ministry of Agriculture to the Secretariat of Environment, Natural Resources, and Fishing. Institutional changes in Mexico, though still inadequate to address key water sector challenges such as the second-generation problems of IMT, inter-regional/sectoral and water conflicts, water pollution, and aquifer depletion, they are successful in laying a strong foundation for building a sound water institution.

4.2. Chile

Chile has one of the earliest and most well developed institutional arrangements quite

⁵ Notably, these new laws that make a clear distinction between water as a resource and water as a usufruct create a legal basis not only for private and transferable use rights but also for public rights in safeguarding the environmental aspects of water resource management.

favorable for market-based water allocation, decentralized management, and private sector participation. Thanks to the 1981 Water Code and the 1988 Constitution, water use right is treated — both legally and practically — as a private property independent of land that can be traded, used as collateral, and treated as assets for tax purposes (see Gazmuri and Rosegrant, 1994). Chilean water administration also has a better demarcation of responsibilities between water-related state organizations, water supply and sewerage service agencies, private construction companies, and WUAs. While the state grants quantified water rights to users, an active water market facilitates the reallocation of such rights both within and across sectors and WUAs and courts resolve water-related conflicts (see Gazmuri & Rosegrant, 1994; Brehm & Quiroz, 1995; Herne & Easter, 1995).

Project construction is conditional on users' prior agreement to pay the full project cost over time and WUAs — both at the project, canal, and channel levels — are responsible for system maintenance, water distribution, and fee collection. Since WUAs in Chile, unlike those in other countries, involve users with individual water use rights, they are more effective both in facilitating water transfers as well as in tackling local level water conflicts. In the urban sector, the corporatization and privatization of state-owned water supply agencies and the entry of private water companies have improved both the coverage and quality of water supply and sanitation services (Gazmuri & Rosegrant, 1994, p. 25). Notably, the policies of market allocation and privatization in Chile is also accompanied by state protection to poor farmers and urban users.

While the Chilean water sector is institutionally quite advanced, it still faces problems such as the conflicts between irrigation and power sectors, speculation in water rights and the resultant crowding out of farmers, and water pollution. Recently, there are notable legal and policy initiatives to address these problems. For instance, a 1998 decision of the supreme court that upheld farmers' claim over that of power companies provides a legal basis for resolving the conflicts between consumptive and non-consumptive uses. To avoid speculation and discourage large-scale water rights transfer from agriculture to power and urban sectors, there is a legislative proposal to allow forfeiture of water rights for non-use for 5 years and specify sector-specific water rights.⁶ The Environmental Law of 1994 not only mandates water supply agencies to treat urban waste water but also specifies the minimum in-stream flow for ecological purposes.

4.3. Brazil

The Brazilian water sector is undergoing notable changes since the adoption of a new Constitution in 1988. Since the Constitution distinguishes 'federal waters' (i.e., inter-state rivers) from 'state waters' (i.e., intra-state rivers), both the federal and state governments are responsible for managing water in their respective jurisdiction. The National Water Resource Policy Law, though delayed since 1991 due to federal-state disagreements, was finally passed in 1997. Eight major states have also passed their own water laws. While the law precludes

⁶ Although these changes risk the security and transferability of water rights (Gazmuri & Rosegrant, 1994, p. 23), they are needed to balance inter-sectoral allocation and to prevent water monopolies.

ownership rights in water, it does allow authorized private use rights. Even though these legal changes effected at the national and state level have neither pervaded through the lower echelons of water administration nor accompanied by clear-cut operational policies, they did change the overall policy environment with the articulation of many progressive ideas and approaches.⁷

On the water administration front, the long domination of the power sector on national water policy finally ended in 1995 with the transfer of water from the Ministry of Mining and Energy to the newly created Ministry of Environment, Water Resources, and Legal Amazon. Since the Secretariat of Hydraulic Resources created under the latter Ministry is given the planning and regulatory powers over all water uses, an institutional condition is created for facilitating integrated water resource management. There are several recent initiatives to improve managerial coordination and resolving water conflicts. They include the creation of the National Water Resource Management System — covering National Collegiate as well as Basin Commissions — and the establishment of national, basin, and state level water councils. But, these institutional structures are in a formative stage and need time to articulate themselves within the existing system.

Notwithstanding the serious attempt to consolidate water issues within a single administrative apparatus, there are many water-related functions (e.g., irrigation, extension, urban water supply, and water quality) that remain still administratively dispersed making it difficult to ensure their effective integration with the broader water management concerns. The 1997 law also remains largely silent on water pollution that is an acute and growing problem in major cities like Sao Paulo and Rio de Janeiro. Decentralization and privatization programs (in urban water supply) also need to be packaged well within the overall reform strategy. But, judging by the policy commitment and the direction of changes, Brazil is in a strong position to deepen the reform process and strengthen its water institution.

4.4. Spain

While the Ministerio de Obras Publicas y Transportes (MOPT) is the apex of water administration in Spain with fiscal, policy, and overall regulatory responsibilities, it is the 14 — nine inter-community and five intra-community — river basin organizations (RBOs) known as 'Confederaciones Hidrograficas' that function as the executive arm of water administration. They are responsible for water development, inter-sectoral allocation, water pricing, authorization of water and discharge permits, and water quantity and quality monitoring as well as enforcement. Operating below the RBOs are the municipalities and irrigation communities which distribute water, collect charges, and resolve conflicts at the local levels. To facilitate technical and policy coordination, Water Commissions have also been set up both at the federal and basin levels.

Although the 1985 water law that replaced the 1879 water law makes water resource a public

⁷ These ideas and approaches include: water as an economic good, integrated approach to water resource management, targeted strategies to address region and sector-specific water challenges, decentralization through user participation (e.g., 'water democratization') and basin level organizations (e.g., 'watershed committees'), water concession/permits, and users pay principle.

property, it allows users to obtain use and source-specific water and discharge permits from the RBOs. As mandated by this new law, a comprehensive National Water Plan together with Basin Water Plans was prepared in 1993 (see MOPT, 1993). Since Spain is a member of the European Community (EC), its water policies — especially those related to water subsidy and water quality — are strongly influenced by the EC's agricultural and environmental policies. As per the EC's directives, Spain prepared during 1994–1995 a plan with time-bound targets for sewerage treatment and discharge regulation. While it is easier to meet EC's targets for subsidy removal and water quality, it is a real challenge for Spain to tackle a 10% reduction in irrigated area as required under the EC's commodity restriction programs.⁸

Recently, there are notable initiatives both in the legal, policy, and the administrative spheres of Spanish water sector. They include the proposals to introduce private and transferable use rights, grant full financial autonomy to the RBOs, make construction of new projects dependent on users' prior agreement to pay full costs, and encourage private sector participation in construction, distribution, sewerage treatment, and pollution control. With the EC's directives exerting strong pressure for financial discipline and water quality standards, these proposals, if implemented soon with the least compromise, could strengthen further the water institutions of Spain.

4.5. Morocco

Despite a centralized political structure, water administration in Morocco evinces a remarkable tendency towards decentralization and functional specialization. While the Directorate General of Hydrology under the Ministry of Public Works (MOPW) plans and develops water resources, the nine Regional Authorities for Agricultural Development (RAADs) under the Ministry of Agriculture (MOA) develop and maintain water distribution networks, acquire and distribute water, collect water charges, and provide farm inputs and extension services. In smaller systems including groundwater areas, however, local governments and farmers play a stronger role in water distribution and system maintenance. The National Office of Potable Water, again under the MOPW, acquires and distributes water not only on a retail basis to households and industries in major urban centers but also on a bulk basis to municipal/provincial governments.

The water law of 1995 has led to significant changes both in the spheres of water policy and water administration. It makes the Supreme Water Council (involving all major water sector stakeholders) as the key organ for national level water policy and the RBOs — each covering one or more RAADs — as the regional nodes of water administration. The national and basin water plans are to provide technical framework for formulating both national and regional water management strategies. By advocating users pay principle and full cost recovery, the law allows the imposition of water abstraction and pollution taxes. Although the new law views

⁸ The crop diversification programs alone cannot meet this challenge because the institutional mechanisms for protecting/compensating the water permits of farmers and regions subject to such restrictions are also needed. As water markets can be a part of the solution in such situations (Garrido, 1997), deliberate policies and legal provisions are needed to facilitate their emergence and growth.

water as a public resource, it does permit authorized use rights and recognizes also the water rights obtained under the 1914 law.

The recent ministerial reorganization that brought together agriculture, water, and environment under the Ministry of Agriculture, Equipment, and Environment is good to enhance administrative cohesion between water and agricultural sector agencies as well as to pursue integrated water resource management policies. The ongoing programs for canal lining, pressurized supply of canal water, and the application of sprinkler and drip systems are vigorously pursued to enhance water use efficiency. The urban water conservation in Rabat achieved through demand-side management and that in Casablanca attained through a privatized water supply suggest new avenues for reforming the urban water sector. Although the institutional changes observed until now are far from adequate, Morocco has certainly succeeded in creating some of the basic institutional conditions for improving the performance of its water sector.

4.6. Israel

The 1959 water law that considers water as a public property remains the foundation for both the water policy and water administration in Israel. The Water Commission (WC), previously under the Ministry of Agriculture but now under the Ministry of Infrastructure, implements the water law, plans, develops, allocates, and manages water, and sets and annually revises water prices. At the operational level, the WC relies on Mekorot, a state-owned water company that produces and distributes around 70% of the water supply in the country. Mekorot operates the National Water Carrier — the pipeline system that moves water southwards from Lake Galilee to Negev desert — and has also entered now in other spheres such as urban water retail, sewerage treatment, and desalination. The WC receives technical planning as well as research and development support from Tahal, a large engineering consulting company.⁹

Despite the administrative centralization and political overtones, economic factors have a decisive impact on water use decisions in Israel due to metered allocation and volumetric pricing. While politics guides inter-sectoral water allocation to favor domestic and industrial sectors, water prices in these sectors are higher covering the full supply cost. Even though irrigation water is subsidized, the subsidy has declined from 75 to 50% since the progressive block rate pricing was introduced in 1987 to penalize large and fresh water consumers (Yaron, 1997).¹⁰ The 1997 report of the Public Commission on the Water Sector has proposed several changes to improve the institutional basis of Israel's water sector (see Arlosoroff, 1997). The heart of the reform proposal involves a market-based approach and privatization within a strong framework of public regulation. A legislative proposal, which is currently before the Israeli parliament, aims to enhance the private sector role in areas such as urban water distribution, operation and maintenance (O&M), and sewerage treatment. There is an

⁹ This firm, which has been the official and sole water planner for the past 20 years or so, has to compete now with other engineering companies within Israel to obtain project contracts from government.

¹⁰ After the block pricing system, water wastage is the least in all sectors and water productivity has increased by more than 250% in agriculture and 80% in industry since 1987.

increasing pressure for promoting market-based water allocations and adopting economic pricing schemes to include also a shadow price (rent) for water (see Kislev, 1993).

4.7. South Africa

The water sector in South Africa is undergoing radical changes as part of the ongoing process of post-Apartheid economic and political reconstruction and these changes have led to a completely new system of water rights and concessions. The new Constitution allocates water sector responsibilities among the national (for water resource planning and development functions), provincial (for irrigation and groundwater), and local or municipal governments (for domestic water supply). The 1998 water law that replaces the 1956 water law defines a modern legal system quite conducive for management decentralization, market-based water allocation, full cost recovery, and integrated water resource management. Although the new law makes water resource a public property, nevertheless, it allows private and tradable use rights obtainable from the Department of Water Affairs and Forestry (DWAF), the key organ of water administration in South Africa. For resolving water conflicts, the new law creates Natural Resources Courts in the place of the Water Courts created under the earlier law and conflicts not solved either by these courts or by the DWAF can then go to regular courts.

The White Paper on a National Water Policy for South Africa (DWAF, 1997) outlines the contour of a new water policy that gives top priority for capacity building, information gathering, and human resource development in the water sector. Water charges, which are there only in public irrigation at present, will be increased and extended to all irrigation systems to cover not only the O&M and capital costs but also a research levy and water conservation/management fee. The WUAs, which exist at present only in the sugarcane zones and public irrigation systems, are to be extended to other areas with full responsibilities for water distribution, cost recovery, and system maintenance. For urban water supply, the policy favors the creation of autonomous utility-type agencies.

On the water administration front, it attempts to link existing research, training, and technical agencies — both in the public and private sectors — with the main line water administration. For promoting integrated water resource management, it is proposed to create a National Public Water Utility that will finance, develop, and operate all the water infrastructures in the country (see DWAF, 1997, p. 29). Both the water law and water policy also call for the creation of basin entities — known as the Catchment Management Agencies — wherein farmers and existing water distribution agencies such as irrigation boards and municipalities will participate as stakeholders. The relative success of water boards — the regional public utilities for bulk water supply — has led to the proposal for the creation of new regional water utilities. Some of these proposals have already been crystallized (e.g., Lesotho Highlands Water Project and Komati Basin Water Authority). The major reform challenge of South Africa lies in translating the provision of its water law and water policy without creating much uncertainty among private investors.

4.8. Sri Lanka

After the 1987 constitutional amendment, water sector responsibilities were divided between

the union and provincial governments. While intra-provincial water issues are with provincial governments, the overall water resource planning and inter-provincial water issues are with the union government. Although 40 or so government agencies influence the water sector, only a few form the core of national water administration (see Nanni, 1996).¹¹ On the legal and policy front, while 50 or so acts influence the water sector, Sri Lanka has neither an enacted water law nor a declared water policy. However, a draft Water Resources Bill, being discussed since the early 1980s, has all the right ingredients for a modern water law such as water permit systems, full cost pricing, inter-ministerial Water Resources Council (WRC) as a coordination mechanism, and water courts for conflict resolution (see World Bank, 1992, p. 168).

Recently, with the technical and financial support from the Asian Development Bank (ADB), Food and Agriculture Organization (FAO), and International Water Management Institute (IWMI), the government is planning a major legal and administrative reform on the basis of the Action Plan for Comprehensive Water Resources Management. Notably, the Action Plan calls for the development of water policy, water law, autonomous water administration, basin planning, and water information base (Water Resources Systems (WRS), 1997, p. 3). The government has already created both the WRC and its executive organ, the WRS, that is to function as a transitory arrangement to advise, develop, and oversee the establishment of permanent institutional structures. The new institutional structure developed by the WRC and WRS, could not be established by 1998 as planned, but is expected to be in place by 2000 (see Berkoff, 1997).

While macro level institutional changes are gradually building up, there are significant micro level initiatives particularly the IMT followed since 1989. As of 1997, 757 WUAs have been registered with an operating area of 85,700 ha (MEA, 1997)¹². The IMT in Sri Lanka has two desirable features. Not only do the WUAs serve as the organizational basis for an integrated delivery of water with farm inputs and extension services but also function within a vertically integrated process of user participation. While the institutional changes planned under the Action Plan could facilitative IMT, active policies are to continue to expand its coverage and effectiveness.

Although Sri Lanka has a long experience with basin planning and organization, the dissolution of basin organizations like Gal Oya and the recent conversion of Mahaweli Development Authority into a Ministry lead to a reversal of its declared policy of management decentralization. However, as a part of its declared policy of promoting privatization, the government, in 1997, has piloted a water company with shares owned by farmers in the Ridi Bendi Ela area. But, since most of the farmlands in Sri Lanka belong to the state, irrigation privatization cannot succeed without land privatization. It is the creation of the proposed

¹¹ They are: the Ministry of Irrigation, Power, and Energy and the Ministry of Mahaweli Development (for water planning and irrigation development), the National Water Supply and Drainage Board and the Urban Development Authority — both under the Ministry of Housing, Construction, and Public Utilities (for domestic and industrial water supply), the Ministry of Agriculture and the Water Resource Board (for groundwater), and the Central Environment Authority under the Ministry of Transport, Environment, Forest, and Women Affairs (for water quality and environmental issues).

¹² Notably, with the government policy of promoting women WUAs initiated in 1995, there are now 249 women WUAs excluding 149 other active women organizations in rural areas (MEA, 1997).

institutional structures at the macro level and the consolidation of the ongoing institutional initiatives at the micro level that will determine the ultimate success of water sector reforms in Sri Lanka.

4.9. Australia

Although Australian water institutions are more mature than most other countries, they are also undergoing changes partly to reflect the changing water sector realities and partly through deliberate reforms effected since the late 1980s (Musgrave, 1997, p. 17). While the states have the constitutional responsibility in water matters, the federal government does have a strong influence on the water sector thanks to its financial and contractual leverages available under the 1994 Water Reform Agreement of the Council of Australian Governments (COAG). The riparian system was replaced by the water license system which, over the years, allowed quantitative and transferable water entitlements, metered supply, and volumetric pricing (McGlynn, 1997). These licenses are issued and regulated by government departments (e.g., the Department of Land and Water Conservation (DLWC) in NSW). The volumetric water charges have been raised following the Industry Commission's Report of 1992, to cover an access/license fee, a volumetric use charge, and a 'management fee' in the irrigation sector but a 'refurbishment fee' in the urban sector. Water institutions of Australia not only delineate the spheres of influence for various government layers and water sector stakeholders but also promote a desirable mix of state regulations and economic incentives.

The Water Reform Agreement signed by the COAG proposes further institutional initiatives to improve water quality, refine water rights system and water allocation procedures, institute independent review of water prices, and promote community participation. Since compliance with these policies entails attractive federal money, most states have already prepared time-bound action plans for their implementation. For instance, the New South Wales has not only established the Independent Pricing and Regulatory Tribunal for reviewing water prices but also adopted a three level stress-based classification of its rivers and aquifers for controlling water pollution and depletion. The state has also constituted the Healthy River Commission for monitoring water quality and in-stream flows in all stressed rivers as well as the Water Advisory Councils at various levels to involve users in water sector reform (see DLWC, 1997).

The agreement of the Murray–Darling Basin Ministerial Council in 1995 to establish a collective cap on the water extraction from the rivers represents a unique inter-state initiative to control water stress and water salinity within the basin. While it is normally difficult to reverse current water use to its 1993–1994 level, the political commitment and the existing system of volumetric water allocation across regions, sectors, and individuals enhance the prospects of realizing the target. Apart from national, state, and regional attempts, there are also notable developments at sub-sectoral levels. Corporatization and privatization are seen both in the urban sector (e.g., Hunter Water in 1991 and Sydney Water in 1994) as well as in the irrigation sector (e.g., in the Murray Irrigation Area and Coleambally and Murrumbidgee Irrigation Area since 1997) (DLWC, 1997, p. 8). These changes can enhance further the role of economic instruments and market-based water allocation procedures even while improving the physical health and sustainability of the water sector in Australia.

4.10. China

Water sector reforms in China are closely linked to the economic liberalization programs initiated especially since the early 1980s. In contrast to a centralized political system, the Chinese water sector shows a considerable degree of management decentralization. While water planning and development functions as well as legislative and regulatory powers are with the national government, the actual management and maintenance functions are with the lower level governments. Although the ministries of agriculture, geology and minerals, and rural and urban construction and environmental protection have an influence on the water sector, it is the Ministry of Water Resources (MOWR) that forms the core of national water administration. The seven Water Conservancy Commissions (WCCs) operating under the MOWR manage inter-provincial river and lake basins, the corresponding administrative organisations at the provincial, prefectural, and county levels manage the water at local levels.¹³

Despite a vertical integration of these administrative layers, they do have substantial functional specialization and independence. The National Leading Group of Water Resources and Water and Soil Conservation Works — a high level body chaired by the Vice-Premier — and their regional counterparts promote inter-agency coordination and resolve inter-regional/sectoral water conflicts. The 1988 water law, passed after a decade-long consultation, has not only strengthened the water administration with the formalization of coordination and conflict resolution mechanisms but also led to a fundamental change in water policy (People's Republic of China (PRC), 1988). Considering water as people's property, the law distinguishes the management and allocation rights of the state from the use rights of the people. It advocates water permits system and full cost recovery, stipulates basin as the basic management unit, and mandates the formulation of national, regional, and sectoral water plans.

The Chinese water sector faces not only the dual problems of floods and water shortages but also the growing menace of water pollution and salinity.¹⁴ To address the flood and pollution problems, in 1997, China created the Law of Flood Control, promulgated the National Policy on Pollution Control, and passed the Aquatic Protection legislation. The State Water Industry Policy — declared again in 1997 — is unique for a socialist country as it allows the entry of private investors into the water sector and also requires all public water projects to operate on commercial lines (PRC, 1997, p. 1). To create the institutional framework needed for translating these policies, the MOWR has already prepared the Master Plan of the Water Law and Regulation System as well as the Water Legal System Construction (see Ke Lidan, 1997, p. 642 and p. 645). While the issuing of water drawing permits is already in progress, the

¹³ For instance, 77% of the total water projects in China are managed at the county level and only the remaining (inter-country and inter-provincial) projects are managed either at provincial levels or by the MOWR and its WCCs (Ke Lidan, 1997, p. 655).

¹⁴ The seriousness of these problems can be seen from the following facts. While a tenth of the country — with a half of population and two-thirds of agricultural and industrial output — suffers from periodic floods, over 600 cities — located mostly in the economically important northern China — suffer from perpetual water shortage. Water pollution and its health hazards threaten 436 of the 532 monitored rivers in the country.

creation of the institutional structures needed to support permit-based water allocation is expected to be in place by 2010.

4.11. India

Although water development responsibilities and legislative powers are with the state governments, the central government also has some indirect but powerful leverages thanks to its roles in project clearance and inter-state dispute resolution as well as its control over a number of planning and technical organizations at the national level.¹⁵ The Ministry of Water Resources (MOWR) and its planning and technical organizations constitute the core of national water administration whereas the irrigation or water resource departments and their specialized agencies form the core of state level water administration. There are also mechanisms (e.g., National Water Resource Council and National Development Council) to promote centre-state coordination in the water sector. But, they are not effective to articulate a countrywide consensus or to coordinate institutional initiatives at the national level. Since legislative power, technical capabilities, planning skills, and operational responsibilities are dispersed across government layers, water institutions in India remain functionally disjointed, sectorally biased, and regionally uncoordinated.

Although India has many irrigation and other water-related laws, they are basically outdated as most of them were passed in colonial times. But, the drought of 1987 and the macro economic crisis of the late 1980s have led to some notable policy changes. While the drought led to the National Water Policy (NWP) of 1987,¹⁶ the reduced water sector investment caused by the fiscal impact of the economic crisis of the 1980s has forced many states to raise internal resources through better cost recovery and external resources through the mobilization of private funds.¹⁷ The 1992 Committee on Pricing Irrigation Water suggested not only higher water charges but also group-based volumetric water distribution (GOI, 1992). The 1992 Model Groundwater Bill, though not adopted by any state so far, advocates well permits, water metering, and withdrawal limits. A high level committee has advocated the promotion of private water investments (GOI, 1995). Few states are already trying to obtain private funds directly by inviting private bids for project construction and indirectly by issuing water bonds for tapping public funds for irrigation development (Saleth, 1999).

Although most state governments attempt to involve users in water distribution, cost recovery, and system maintenance, the extent of actual IMT is insignificant except in states such as Andhra Pradesh, Tamil Nadu, and Orissa. These states, as part of the World Bank funded Water Resource Consolidation Projects (WRCPs), have not only restructured their

¹⁵ They include the Central Water Commission, the Central Ground Water Board, and the National Water Development Agency — all under the Union Ministry of Water Resources.

¹⁶ There is now a new NWP due for approval. Although this policy is almost a repeat of the earlier policy, it adds a new thrust on private sector participation in irrigation financing and management.

¹⁷ Public funds are mobilized through state guaranteed long-term water bonds issued by semi-autonomous agencies. Examples of such agencies include the Narmada Valley Development Authority created by Gujarat state and the Krishna Valley Development Corporation floated by Karnataka state.

water administration and formulated their own water policies but also have made significant progress in promoting user participation in water management. While changes are visible especially in the policy and administrative spheres, India requires a radical restructuring of its water institutions based on the reform blueprint (see World Bank, 1998) developed jointly by the GOI and the World Bank.

5. Selected best practices

The best practice cases, though isolated, are healthy practices that can strengthen the institutional basis for better water allocation, financing, and management. These cases have a policy value as they help in unraveling the general principles underlying success stories. In this respect, Mexico offers three best practices, i.e., the IMT, the formation of RBOs, and the water permit registry. The IMT in Mexico is notable both for its speed and coverage as well as for the extent of other supportive legal and administrative changes effected both during and after IMT. While the Mexican case supports the big-bang approach to IMT, it also underlines the critical roles of macro economic compulsion, political will, and farmers' cooperation. Unlike the IMT program, the initiatives for basin organizations came from provincial governments due to an unprecedented threat of pollution and depletion within the concerned basins. Since the registry of water permits, which is maintained at all levels, keeps the record of quantified permits for surface and sub-surface water, it forms the technical basis for water markets.

Chile offers three major sets of best practices. The first set consists of practices that facilitate market-based water allocation such as transferable water use rights, registry of water rights, multi-tiered WUAs, and the administratively enforced third-party protection. The second set that supports project viability consists of a clear demarcation of responsibility between water administration and users, project construction being conditional on users' prior payment commitment, and the mandatory formation of WUAs right up to the project level. The third set that improves the performance of the urban water sector consists of debureaucratization and privatization of urban water supply agencies, full-cost pricing with protection of poor consumers through demand rather than supply-side subsidy, and the mandatory treatment of urban sewerage to protect water quality.

The most notable among the best practices in Brazil is the region and sector-specific water strategy that prioritizes regions and sectors in terms of their relative susceptibility to water quantity and quality problems. Other best practices include the program of 'water democratization' that aims to promote user participation; the basin level organizations such as the Watershed Committees; and inter-state mechanisms such as the Water Resources Councils that aim to promote federal-state coordination in water management.

The best practices in Spain are observed both at the macro and micro levels. At the macro level, the most notable one is the role that RBOs play both in inter-regional water transfers and inter-sectoral water allocations. This practice demonstrates that RBOs can function as a potential administrative framework for promoting market-based solutions to water allocation problems. At the sub-sectoral level is the practice of encouraging urban water supply agencies to be autonomous and financially self-dependent (e.g., Canal Isabel II in Madrid). The local

level best practices include the traditional community-based water allocation systems operating in Valencia and the water markets in the Canary Islands.¹⁸

The best practices in Morocco — observed mostly at the sub-sectoral levels — include the granting of autonomy to public urban water supply agencies and the privatization of urban water supply in cities such as Casablanca. Similarly, the use of a revolving fund for providing loans to urban users both for water meter installation and for retrofitting water appliances is also an innovative way of making users to self-finance urban water conservation. The RBOs in Morocco are unique as they are based more on projects than on the river systems and hence, their boundaries are defined both by hydrology and demand areas. Besides, since they are managed by agricultural agencies, they serve as an organizational means for integrating water delivery with the provision of farm inputs. Israel is known for its extensive application of water saving technologies and judicious choice of water conserving cropping systems. The three-part progressive tariff for irrigation water observed in Israel is also unique as a water pricing practice. Other best practices include the proposal for a selective privatization of water administration and the unmistakable tendency towards water recycling and reuse.

The most notable among the best practices of South Africa relates to its water law as it creates a modern legal framework for a market-oriented water sector. The water pricing policy is also notable for its intention to cover not only the O&M and capital costs but also the costs of water management, conservation, and research. Other best practices include the importance attached to catchment management, conflict resolution through natural resource courts, and an extensive application of sprinkler and drip technologies. The Vaal River basin — with extensively inter-connected storage and both-way water movement facilities — is an interesting case of an engineering basis for balancing demand and supply over time and space. The best practices in the urban sector include the reliance on demand management techniques including a multi-tiered water pricing, retrofitting, and water education (e.g., Hermanus, a coastal tourist town in Western Cape).

The best practices of Sri Lanka include its IMT program, the recent piloting of a share-based and farmer managed irrigation water company, and the cascade system of water use. Although the IMT in Sri Lanka is less extensive than in Mexico, it is notable for promoting WUAs as multi-purpose agencies involved not only in water allocation and cost recovery but also in farm input delivery. The piloting of water company concept is in line with the declared policy of irrigation privatization and management decentralization. The cascade system of water use, where the unused water flowing from the upper reaches of the system is used and reused several times before the water reaches the sea, leads to a system level physical water use efficiency of up to 80%.

The best practices of Australia include the permit-based volumetric water allocation, transferable permits, and user-oriented public agencies with effective regulatory capabilities. It is these practices that provide the necessary institutional framework for realizing the cap program that aims to reduce water extraction to its 1993–1994 level in the Murray–Darling

¹⁸ The Valencia system, evolved since the Arab invasion of Spain, is known for an almost quantitative inter-farm water allocation effected without any water meters. Although institutions and technologies are complementary, the Valencia case where social organization is being substituted for water measuring technology suggests that there is an economically relevant margin within which institutions and technologies can be substitutes.

basin. The Murray–Darling RBO also represents one of the most successful inter-state water management organizations in the world. Another unique feature is the role played by the Independent Pricing and Regulatory Tribunal in setting both urban and rural water prices. In the urban sector, the best practices take the form of granting autonomy to water supply agencies (e.g., Sydney Waters) as well as involving private companies in water provision (e.g., Adelaide, Southern Australia).

The legal distinction both between the regulatory and allocative functions of the state as well as between the use rights and payment obligations of the users is an important legal best practice in China. While such a distinction is also found in the water laws of Chile, Brazil, Israel, Mexico, South Africa, and Spain, it is much clearer in the Chinese law. This legal feature and the policy level demarcation of the operational spheres for public and commercial entities within the water sector that is made explicit in the 1997 Water Industry Policy are the key ingredients for an efficient water institution. Despite their bureaucratic linkages with the MOWR, the WCCs are also a form of RBOs to promote further administrative decentralization within the water sector.

Despite the limited institutional initiatives at the national level, India does have notable best practices especially at the state and local levels. The notable among them are the institutional reforms initiated under the WRCPs in states such as Andhra Pradesh, Orissa, and Tamil Nadu. Other best practices include the creation of autonomous corporations in Gujarat, Karnataka, and Maharashtra for mobilizing public funds as well as the initiative of Andhra Pradesh and Maharashtra for soliciting corporate investments in the water sector. The best practices observed at the local level cover the community-managed *Pani Panchayat* (Water Council) system and the cooperative river-based lift irrigation schemes in Maharashtra, and the groundwater markets in Gujarat, Uttar Pradesh, Tamil Nadu, and West Bengal (see Saleth, 1998).

6. Common trends and patterns

As the physical, financial, and ecological constraints tend to limit the relevance of supply-side solutions, countries are now trying their best, within their political economy constraints, to set right the institutional foundation for demand-side solutions. While institutional reforms differ across countries in terms of their coverage and effectiveness, they evince a remarkable similarity in terms of their thrust and direction. These similarities include the increasing importance attached to market-based allocation, decentralization and privatization, integrated water resource management, and economic viability and physical sustainability.

6.1. From water development to water allocation

The paradigmatic shift from water development to water allocation requires a radical reorientation of water institutions. The challenge lies not so much in having allocation-oriented water laws and policies as in building an allocation-oriented organizational structure out of an existing water administration with insufficient skills and resources. Unlike the development era characterized by bureaucratic and closed-loop decision structure and dominated by political

and engineering considerations, the allocation era demands an open and participatory decision process with a priority for economic issues and a premium for consensual water allocation. Some countries (e.g., Australia and Chile as well as regions like California and Colorado in the US) already have the capability for meeting the challenges of the allocation paradigm. They have not only the tradition of distinguishing allocation functions from development functions within water administration but also the institutional ingredients for supporting water markets as an allocation mechanism. Others (e.g., Spain and China) can develop the institutional potential faster whereas the remaining countries have a long way to go in creating the necessary institutions for ushering their water sector into the allocation paradigm.

6.2. *Towards decentralization and privatization*

The dominant trend towards decentralization — a key factor to catalyze a faster transition to the allocation paradigm — is an unmistakable feature of water sector worldwide. Countries have begun to recognize the functional distinction between decentralized arrangements needed for user participation and centralized mechanisms needed for coordination and enforcement. The key features of the ongoing process of decentralization evident both at sectoral and sub-sectoral levels are an increasing importance attached to RBOs, IMT, and utility-type bodies in urban water sector. While the RBOs are called differently in different countries (e.g., Watershed Committees in Brazil, Water Conservancy Commissions in China, Basin Councils in Mexico, and Hydro-geological Federations in Spain), they share a common conceptual basis.

In the context of RBOs and other regionally decentralized arrangements, it is necessary to recognize two caveats. First, regionalization need not always lead to decentralized decision-making as some RBOs of the past (e.g., the Tennessee Valley Authority) are often considered as centralized organizations. And, second, regional decentralization also requires some form of centralized mechanisms for ensuring both coordination and conflict resolution. The key to this centralization-decentralization dilemma lies in carefully crafting the institutional arrangements at different geographical levels so as to achieve both local flexibility and regional coordination in water use decisions. It is only within such a framework that the RBOs and other regionally decentralized management mechanisms can function as an effective organizational basis both for pursuing integrated water resource management as well as for resolving inter-regional and inter-sectoral water conflicts.

The IMT, the program for transferring the managerial responsibilities including cost recovery and system maintenance to legalized WUAs, is the main mode of decentralization within the irrigation sector. The IMT is quite extensive in Mexico and Sri Lanka (as well as in Turkey and the Philippines) and also picking up in countries like India and Morocco (also in Indonesia and Pakistan). While China has a tradition of involving communities in lower level irrigation management, Australia (as well as the western parts of US) have arrangements such as irrigation districts wherein farmers have far greater managerial and financial responsibilities. In Spain, the proposal to grant full autonomy to basin organizations is likely to advance decentralization still further.

Decentralization in the urban water sector occurs in the form of creating autonomous and financially self-dependent utility-type organizations for the provision of urban water services. Instances for such companies can be found in all countries except India, Sri Lanka, and China.

Although there are no such utilities in China at present, the 1997 Water Industry Policy aims to create them in future. In Australia, Chile, Mexico, and Morocco (and also in the Philippines and Argentina), urban water sector decentralization has also taken the form of privatization. While privatization and decentralization are obviously in an advanced stage in countries with a relatively privatized water sector (e.g., Australia and Chile), even countries with a bureaucratic water sector (e.g., China and India) are now actively exploring the ways to tap private financial, managerial, and technical resources for water development and management.

Although there are notable instances for privatization initiatives in the irrigation sector (e.g., England, Australia, and New Zealand), those initiatives observed in the water sector of the sample countries confine mainly to the economically attractive and technically feasible segments of water sector such as urban water supply, sanitation, and desalinization. Since private sector cannot be expected to take up water activities of public value (e.g., flood control), the public sector will continue to be important in these water-related activities. Thus, the privatization and other decentralization initiatives, though minimizing the role of bureaucracy, cannot, however, eliminate the role of government altogether. Such elimination is neither possible nor desirable in view of the need for both the regulatory as well as the enabling functions that the state apparatus has to perform in the new context. Since the privatization process can be instrumental not only in strengthening the complementarity but also in rekindling a spirit of healthy competition between the public and private sectors, it adds a new institutional dimension to water resource management.

6.3. *Towards integrated water resource management*

Although all countries are committed to integrated water resource management, they differ considerably in terms of the institutional arrangements to underpin this approach. Most countries have policy organizations (e.g., water resource councils or stakeholder bodies) for facilitating an integrated perspective on water sector. But, not all of them have developed the regionally and sectorally disaggregated national water plan. While some countries (e.g., Australia, Israel, Mexico, and Spain) already have a national water plan, others (China, Brazil, Morocco, South Africa, and Sri Lanka) have the mandate to develop such a plan under their recently enacted/proposed water laws. India will also have soon a national water plan. Although these water plans neither require nor lead to any institutional changes, they provide a technical framework needed for promoting an integrated perspective on water sector issues. The practical translation of such an integrated perspective does entail significant institutional changes.

In an effort to eliminate prevailing sectoral bias and to incorporate environmental issues within water management, many countries are pursuing administrative reorganization to move water from the agriculture and power ministries to the environment or natural resources ministries.¹⁹ Countries such as Australia have water within the overall portfolio of natural

¹⁹ There is an emerging feeling among a few experts that the movement of water into environment and other related ministries itself causes a new bias due to the increasingly constraining role of environmental concerns leading not to an integrated approach but to a single purpose planning centered around environment and ecology.

resources from the start whereas others (e.g., Brazil, Mexico, Spain, and Morocco) have only recently moved water matters to the environment ministry. Another administrative attempt is the integration of most water-related functions within one organization (e.g., Brazil and Indian states such as Tamil Nadu and Orissa). There is also an increasing tendency among countries (e.g., China, South Africa, and Sri Lanka) to incorporate watershed and catchment management considerations within basin management plans.

6.4. Towards financial viability and physical sustainability

There is unanimity among countries that a phased improvement in cost recovery is the first step to salvage the water sector from both financial crisis and physical degeneration. While the full recovery of O&M costs is the stated objective in all countries, countries such as Australia and Chile have gone a step ahead of others by trying also at an annuity-based capital cost recovery. Notably, South Africa is attempting to recover even the costs involved in water conservation, management, and research as well. But, the basic problem still remains as subsidies continue even in countries such as Australia, Chile, and Israel. While a better financial health can facilitate the physical health of water distribution and drainage infrastructures, the physical sustainability of water sector cannot be ensured without controlling pollution and water quality problems. The common approach in this respect involves water quality grading, quality standards, and pollution control regulations. All the sample countries grade their water in terms of quality categorization defined by chemical properties and usability status of water. Although most countries have provisions for a pollution permit system, they differ in terms of its practical translation and effective implementation. While Australia and Israel enforce strict quality standards, others lack the necessary institutional mechanisms and political will to make much headway on the pollution front. But, the policy level awareness of water pollution and its health and environmental effects can be seen in all countries.

6.5. Factors motivating institutional changes

While the institutional initiatives observed in the global water sector have a similarity of thrust and direction, they differ in terms of their origin and motivation. Water crisis remained as the fundamental factor motivating reforms in most contexts. But, the proximate or immediate factors triggering institutional changes came from elsewhere in the economy. For instance, the macro economic crisis of the late 1980s has been the motive force for IMT in Mexico and the current policy debates in India. In South Africa, water sector reform forms part of the ongoing economic and political reconstruction process. Similarly, in the case of Chile, China, and Brazil, since water sector reforms have benefited from the synergetic influences of their political and economic liberalization policies, they actually form part of an economy-wide liberalization program. In Spain, on the other hand, the water sector reforms form a key component of the country's transition from a controlled system to a liberalized one and its subsequent obligations as an EC member. In Sri Lanka and India, international lending agencies (e.g., World Bank and ADB) and technical organizations (e.g., IWMI and FAO) are also catalyzing institutional changes within water sector.

While all countries are committed to reform their water institutions, they are obviously at different stages in terms of the extent and effectiveness of institutional reforms. The comparative evaluation attempted here allows a tentative placement of countries within the spectrum of water institutional change. Countries such as Australia and Chile (as well as states such as California and Colorado in the US) are in an advanced, though not yet in an ideal, stage of institutional evolution. Israel, with its technologically advanced water sector, could very well be ahead of most countries when its reform proposals take practical shape. While Mexico and Sri Lanka have made notable progress in reforming their irrigation sector, they are yet to make similar progress in other water sub-sectors.

Spain, followed by China, has the organizational potential as well as the water law and water sector reform proposals to strengthen its water institutions. 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 at the state and local levels.

7. Conclusions and policy implications

Even though the present evaluation of institutional changes in the global water sector is based on a small cross-country sample, it does have notable implications both for institutional economics theory as well as for national and international strategies for promoting institutional change within the water sector. The mere occurrence of institutional changes in most countries can be taken as an observational evidence for the fact that the opportunity costs of institutional change are increasing to surpass the corresponding transaction costs. But, the fact that institutional changes are uniform neither across institutional components nor across water sub-sectors suggests that both the opportunity and transaction costs vary considerably by context. The variations in the extent and coverage of institutional reform across countries provide evidence for the powerful effects that exogenous factors (e.g., economic and political reforms, international commitments, and natural calamities) have on the opportunity and transaction costs of institutional change within the water sector. The experience of Australia and Chile also points to the fact that the earlier institutional changes tend to reduce the transaction costs of subsequent institutional changes.

The synergy effects from exogenous factors and the scale-related effects of institutional inter-linkages clearly suggest that countries with only partial reforms at present could deepen their institutional reforms fairly at a faster pace, with lesser financial costs and political opposition. As the transaction cost declines and political balance improves as one moves on the institutional change continuum, it is prudent to pursue a logically linked sequential reform strategy wherein water sub-sectors and institutional components are prioritized in terms of their performance impact, facilitative roles for downstream reforms, and political acceptability. Since such a strategy can exploit better the synergies from both institutional inter-linkages and

exogenous factors with proper timing, packaging, and sequencing, it has a better chance of success with the least cost and political opposition. This strategy is also very relevant for international lending/development agencies. It allows them to concentrate their investments in countries, areas, and sub-sectors already with a critical mass of institutional change and ensure, thereby, higher and quicker economic returns necessary for an efficient recycling of funds in their capacity building portfolio.

References

- Archibald, S. O., & Renwick, M. E. (1998). Expected transaction costs and incentives for water market development. In K. W. Easter, A. Dinar, & M. Rosegrant (Eds.).
- Arlosoroff, S. (1997). The public commission on the water sector reform (the general ideas underlying its recommendations). *International Water and Irrigation Review*, 5, 1-9.
- Berkoff, D. J. W. (1997). Water policy: functional analysis. In WRC/WRS, *Institutional strengthening for comprehensive water resources management*. Colombo.
- Brehm, M. R., & Quiroz, J. (1995). *The market for water rights in Chile: major issues*. Technical Paper No: 285, The World Bank, Washington, DC.
- Bromley, D. W. (1989). *Economic interests and institutions: the conceptual foundations of public policy*. New York: Basil Blackwell.
- DLWC (1997). *Water reforms: information for users*. Sydney.
- Dinar, A., & Latey, J. (Eds) (1991). Agricultural water marketing: allocative efficiency and drainage reduction. *Journal of Environmental Economics and Management*, 20, 210-223.
- DWAF (1997). *White Paper on a National Water Policy for South Africa*, Pretoria.
- Frederikson, H. D. (1992). *Water resources institutions: some principles and practices*. Technical Paper No: 191, The World Bank, Washington, DC.
- Garrido, A. (1997). A mathematical programming model applied to the study of water markets within the agricultural sector. In *Paper presented in the Eighth European Agricultural Economists Association Congress, Edinburgh, UK, September*.
- Gazmuri, R., & Rosegrant, M. (1994). *Chilean water policy: the role of water rights, institutions, and markets*. Washington, DC: International Food Policy Research Institute.
- GOI (1992). *Report of the Committee on Pricing Irrigation Water*. Planning Commission, New Delhi.
- GOI (1995). *Report of the High Level Committee on Private Sector Participation in Irrigation and Multi-purpose Projects*. MOWR, New Delhi.
- Hazin, L. S. (1998). New strategy in urban water management in Mexico: the case of Mexico's Federal District. *Natural Resource Forum*, 22(3), 185-192.
- Herne, R., & Easter, K. W. (1995). *Water allocation and water markets: an analysis of gains-from-trade in Chile*. Technical Paper No: 315, The World Bank, Washington, DC.
- Herne, R., & Easter, K. W. (1997). The economic and financial gains from water markets in Chile. *Agricultural Economics*, 15, 187-199.
- Howitt, R. (1998). Spot prices, option prices, and water markets in California. In K. W. Easter, A. Dinar, M. Rosegrant (Eds).
- Johnson, S. H. (1996). Irrigation management transfer in Mexico: moving toward sustainability. In *Paper presented at the Sixth Annual Conference of the International Association for the Study of Common Property, University of California, Berkeley, June 5-6*.
- Ke, Lidan (1997). Water law and water management. In Q. Zhengying, *Water resources development in China*. Beijing/New Delhi: China Water and Power Press/Central Board of Irrigation and Power.
- Kislev, Y. (1993). *The water economy of Israel: principles and their application*. Policy Studies No: 14, Institute of Advanced Strategic and Political Studies, Jerusalem.
- MEA (1997). *Progress Report-1997*. Ministry of Mahaweli Development, Colombo.
- McGlynn, T. (1997). Making sense of water licenses and transfers. Sydney (mimeo).
- MOPT (1993). *Plan Hidrologica Nacional Memoria*. Madrid.
- Musgrave, W. F. (1997). Australia. In A. Dinar, & A. Subramanian (Eds).
- Nanni, M. (1996). *Preliminary Report on National Water Resource Laws and Institutions in Sri Lanka*. Water Policy and Law Advisory Programme, CGP/INT/620/NET, Food and Agriculture Organization, Colombo.
- North, D. (1990). *Institutions, institutional change, and economic performance*. Cambridge, MA: Cambridge University Press.
- Olson, M. (1971). *The logic of collective action*. Massachusetts: Harvard University Press.
- Palacios, E. V. (1997). *Benefits and second generation problems in Irrigation Management Transfer in Mexico*. Washington, DC: The World Bank.
- PRC (1988). *Water law of the People's Republic of China*. Beijing: MOWR.
- PRC (1997). *China Water Resources News*. Beijing: MOWR (December 4).
- Piccioletto, R. (1995). *Putting institutional economics to work: from participation to governance*. Discussion Paper No: 304, The World Bank, Washington, DC.
- Saleth, R. M. (1996). *Water institutions in India: economics, law, and policy*. New Delhi: Commonwealth Publishers.
- Saleth, R. M. (1998). *Water markets in India: economic and institutional aspects*. In K. W. Easter, A. Dinar, M. Rosegrant (Eds).
- Saleth, R. M. (1999). Irrigation privatization in India: options, issues, and experience. *Economic and Political Weekly*, 34, A86-A92.
- Saleth, R. M., & Dinar, A. (1999). *Water challenge and institutional response: a cross-country perspective*. Policy Research Working Paper No: 2045, The World Bank, Washington, DC.
- Vaux, H., & Howitt, R. (1984). Managing water scarcity: an evaluation of inter-regional transfers. *Water Resources Research*, 20, 785-792.
- WRS (1997). *Approach for comprehensive water resources management in Sri Lanka*. Colombo.
- World Bank (1992). *Asia water resources study: stage 1*, Vol. 2, Annexes, Agricultural Division, Asia Technical Department, Washington, DC.
- World Bank (1998). *India: water resources management sector review, initiating and sustaining water sector reforms*. Report No: 18356-IN, Washington, DC.
- World Resources Institute (1992). *World Resources: 1991-1992*, Washington, DC.
- Yaron, D. (1997). Israel, In A. Dinar & A. Subramanian (Eds).