



Paradoxes of Decentralization: Water Reform and Social Implications in Mexico

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Summary. — Decentralized governance of water resources is a centerpiece of Mexico's neoliberal reform strategy. We analyze decentralization based on urban/rural case studies in distinct geographical regions to ascertain whether it is linked to more efficient water management or sustainable use of water resources, and to examine its development implications. We assess whether or not private sector management is related to a more efficient, sustainable, and accountable management of water variety of municipal and private management arrangement in four urban areas. We find that it has not resulted in efficiency or sustainability gains. For agricultural water management, irrigation districts in two case studies benefited from the more democratic participatory management by water users under Mexico's "transference" strategy, but did not result in greater equity, efficiency or sustainability of water use. We argue that decentralization in the Mexican water sector is context specific, and marked by limited benefits. Privatization is less an instrument aimed at improving efficiency than a channel for preferred treatment for capital accumulation by private entities as well as a legitimized way for the state to transfer the burden of water management to non-state institutions. The creation of new forms of water institutions requires not the retrenchment of the state but rather its involvement to ensure accountability, transparency, equity, and sustainability.

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1. INTRODUCTION

The political economy of Mexico has been dramatically transformed over the last dozen years by neoliberal restructuring of state responsibilities and economic processes.¹ One of the most salient features of the shift has been decentralization of critical state functions to municipalities, private corporations, and user associations. Mexico's traditional strong state control of virtually all sectors of the economy and civil society, called by Fox (1992, p. 6) "one of the most powerful and interventionist in Latin America," has been replaced by a reduced state apparatus that has ostensibly disengaged from its operational, developmental role and assumed strategic policymaking, and oversight functions. Environmental governance is

one of the areas most affected by decentralization, as evidenced by broad changes introduced in water, agricultural, and general environmental legislation since 1992. The paradoxes of decentralization² in the water sector and the impacts on urban and rural water users in Mexico's most dynamic regions are the focus of this paper.

The decentralization process implemented in recent years in Mexico and elsewhere in Latin America has been presented by international

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funding organizations, national governments, and other proponents as a key component of a successful water reform strategy. It is argued that decentralization allows for a more efficient provision of service by local authorities, private companies and water users, and for a more efficient and equitable allocation and use of the resource as well (Asad, Seroa da Motta, Azevedo, Simpson, & Kemper, 1999; Garn, 1998). The World Bank and others maintain that decentralization leads to improved accountability, empowerment of local communities, and benefits for the management of natural resources (Briscoe, Anguita Salas, & Peña, 1998; Thobani, 1997). Neoliberal conceptions of water inscribed in international water agreements and national water governance strategies that focus on its economic value collide with constructions of water as a "free" good provided by nature, with traditional valuations of water as a religious/cultural symbol, and with constructions of water as a necessary part of the ecosystem whose needs also must be satisfied, equally with those of other "users" (Garn, 1998; Gleick & Wolff, 2002).

The World Bank considers Mexico one of the most successful "new globalizers" or developing countries that have promising economies based upon liberalized trade regimes and secure property rights (2002, pp. 35–36). At the same time, significant questions are being raised about the concept of water as an economic good subject to market regimes and pricing, and about equity of access to healthy water (Gleick & Wolff, 2002; World Water Assessment Programme, 2000). Some scholars criticize the notion that privatization represents any kind of "new" decentralized management scheme, but claim rather that it is really a form of re-centralizing authority and control over water subject to the demands of national markets and global economies rather than those of local households and citizens (Johnston, 2003).

In this paper, we assess the outcomes of the two principal components of decentralization within Mexican water reform, namely, the "transfer" of irrigation districts to management by water users, and the privatization and decentralized management of urban water systems. We argue that, rather than resulting in a clear success or failure, decentralization in the Mexican water sector has been a context-specific process marked by limited benefits and multiple paradoxes. In both the urban and rural cases we analyzed, decentralization and privatization appear not so much instruments aimed at improving efficiency as they do channels for

preferred treatment for capital accumulation by private entities as well as a legitimized way for the state to transfer the financial and politically charged burden of water management to non-state institutions. Privatization refers not only to the devolution of management responsibility for water systems or to the outright transfer of ownership or control of the resource, but in the Mexican case, as in other parts of Latin America that have communal resource ownership arrangements, privatization can also refer to the transfer of control of land and water assets from the ejidal (or social) sector to the private sector. Although a wide variety of decentralization and privatization strategies have been implemented over the past dozen years, we argue that decentralization has not yet uniformly yielded either efficiency gains or environmental benefits as anticipated, although in some local contexts there have been limited improvements. The very *retrenchment* of the state from its central role in managing water underscores the need for an enhanced state commitment to creating and sustaining strong water institutions while incorporating transparency and accountability in both public and private sector actions.

This paper is organized in four sections. The first section presents an introduction to the Mexican water sector and a critical discussion of the relevant literature on neoliberal assumptions and arguments underlying water reforms in the developing world; the main components of Mexico's water reform program; and the influence of international organizations, such as the World Bank, on its design. The second section analyzes four critical urban cases to see whether private participation is linked to a more efficient, fair, and environmentally sustainable management of water, and to shed light on the governance efforts and institutions involved in the reform. The decentralized management of irrigation districts and multiple channels of privatization in the agricultural context is the focus of the third section. In the final section, we return to a discussion of the paradoxes we have found in the decentralization of the Mexican water sector, and explore the implications and conclusions of our research.

2. AMBITIOUS AGENDA: WATER REFORM PROGRAM

Mexico's water reform program dovetailed both chronologically and ideologically with a

neoliberal economic transformation that began to take shape in the late 1980s, accompanied by a political opening that resulted in the election of an opposition party candidate, Vicente Fox, to the presidency of Mexico in July, 2000. The election of Fox was widely interpreted as evidence of a substantial democratic transition, at least in the electoral arena, after 71 years of prior rule by the Party of the Institutionalized Revolution (PRI). Mexico's economic opening, demonstrated by its 1986 participation in the General Agreement on Tariffs and Trade (GATT), entered into full force in the 1990s with the 1994 adoption of the North American Free Trade Agreement (NAFTA), as well as eight other bilateral or multilateral free trade agreements (e.g., with Israel, Chile, and the European Union). Mexico also overhauled its environmental, urban, and agricultural legislative framework to provide for a greatly reduced role for the state in operational responsibility for many policy areas. For example, state investment in water infrastructure has been modest, erratic, and on average, declining from pre-reform investment levels. This policy has increased the gap between water investments, which registered an average growth of -9.3% from 1992 to 2001, while water demand has risen due to average annual economic growth of 3% and population growth of 1.7% over the same period (Romero Lankao, 2001a, Table 1). The federal government water and agricultural bureaucracies have also shrunk in terms of agencies, divisions, and personnel. In the agricultural arena, for example, the number of federal agricultural support agencies shrunk by nearly one-third from 1988 to 1995, and many of the remaining agencies had their roles circumscribed and redefined (OECD, 1997; Wilder, 2002). In addition to the expansion of free trade accords and the accompanying removal of protectionist measures, the most significant change to have occurred in the agriculture sector was the revision of the *ejido* legislation via modifications to constitutional Article 27, which took effect in 1992 as did the water reforms. *Ejid*os are communal farms created in the land reform program resulting from the Mexican Revolution (1910–20) in which landless peasants demanded land from the government. Over the next six decades, over 28,000 *ejidos* were established comprising over 3 million residents (Cornelius, 1992). As a result of the *ejido* reforms, *ejidos* were allowed for the first time legally to rent or sell their individual parcels to other *ejido* members, or to private, and even foreign, parties.

Mexico's water reform program needs to be understood not only within the national context of economic reform and democratic electoral transition within Mexico but importantly, within a global context as part of a movement with many developing countries—under World Bank guidance and funding—toward adoption of neoliberal water reforms and decentralized governance models. For example, a 1998 World Bank study of decentralized management strategies involved projects in 20 countries, including Mexico, Chile, Perú, and Colombia in Latin America.³ The World Bank's 1992 policy paper on Water Resources Management focused on three core improvements: (1) treatment of water as an economic good; (2) improved institutional arrangements involving greater stakeholder participation and more participation by the private sector; and (3) a "comprehensive" management of water (Briscoe *et al.*, 1998, p. 1). The "Dublin principles" emanating from the International Conference on Water and Environment (Dublin, 1992) concluded "water has an economic value in all its competing uses and should be recognized as an economic good" (Gleick & Wolff, 2002, p. iii). Following Dublin, the United Nations Conference on Environment and Development (Rio de Janeiro, 1992) not only reiterated water's essential economic value, but also underscored its social value, calling water "an integral part of the ecosystem, a natural resource, and a social and economic good" (Gleick & Wolff, 2002, p. iii). Under recurrent financial crises of the state, especially in developing countries, the state's role as a developer and provider has been undermined and questioned. This is particularly true since notwithstanding government efforts fully, half of the people of the world still fail to receive water services (Gleick & Wolff, 2002). The market and the private sector therefore have been presented as attractive, effective alternatives to government intervention, and the involvement of water users and other sectors in the management of water through decentralized governance arrangements has also come to be seen as an integral part of the alternative form of governance. The argument for the economic construction of water as a tradable commodity states that, under conditions such as clear, exclusive, and transferable property rights, the private sector and the market are more efficient than the governments in providing water services and allocating water resources (Asad *et al.*, 1999). Relative to

markets, the state “fails” to efficiently provide water infrastructure and services, because government costs of developing infrastructure and providing water services outpace the benefits of provision; thus, the state is claimed to be inefficient (Asad *et al.*, 1999; Garn, 1998). These costs include the environmental consequences of water provision—externalities—that under private management regimes are “internalized” and passed on to water users via higher water tariffs for the provision of drinking water (consumer-pays principle) and the treatment of sewage (polluter-pays principle, Romero Lankao, 2001b). Efficiency measures are believed to lead to more sustainable management of water resources, since the economic value and pricing of water become incentives for consumers to use water more efficiently (Asad *et al.*, 1999). Decentralized governance aims to improve “resource allocation, efficiency, accountability, and equity” (World Bank cited in Larson, 2002, p. 18). Here we find decentralization defined as a strategy to guarantee improved governance of water resources in terms of social participation, accountability, and liability (Badenoch, 2002). The participation of water users and stakeholders confers an air of transparency, accountability, and equity to decision-making processes that may or may not manifest such attributes. The role of the state is circumscribed to allow the rules of the marketplace to reallocate water to higher value, more efficient uses (Wilder, 2002).

With widespread adoption of decentralized governance of water resources, a small but growing body of study has developed to address the multiple impacts of decentralization strategies in different countries and sectors. Bakker (2001) situated Spain’s 1999 movement to a market-oriented water economy within the broader political economy of the country, focusing on the retrenchment of the state and limited devolution of control to the market, finding that the state has retained strategic control of water resource management in areas such as allocation and regulation, while relegating the “thorny issue” of cost recovery to market mechanisms. In Latin America, Briscoe, senior water policy advisor for the World Bank, and his co-authors (both national water directors for the government) found on balance that Chile’s 15-year experience with managing water as an economic resource was successful in terms of transferring water to higher-value urban and industrial users (like hydroelectricity generation) from agriculture. However, although the

study outlines at least seven “water resource management challenges” for Chile’s future, it neglects to address these in any depth (Briscoe *et al.*, 1998). Via legal revisions passed in 1999, Brazil has initiated a major decentralization strategy being implemented at the river basin level. The Watermark Project is a 5-year study being implemented in 23 sub-basin areas to evaluate watershed level decision-making processes and other institutional and social aspects of watershed planning. Early evidence from Brazil’s experience indicates the powerful “democratizing potential” of participatory water management, in a program that is home grown in terms of its philosophy and not seen as imposed “from abroad” (Keck & Abers, 2004, p. 32). Gleick and Wolff (2002) have documented “failed privatizations” in Cochabamba, Bolivia and Tucumán, Argentina, examining the violent street protests against increased water prices under privatization by Aguas de Tunari (a subsidiary of Bechtel) in the Bolivian case and the grassroots movement to stop water bill payments to Aguas del Aconquija, a subsidiary of Vivendi and local companies, in the Argentine case. In Mexico, a few studies have examined decentralization and privatization in urban areas (Bennett, 1995; Castro, 1995; Pineda, 1999a, 1999b; Romero Lankao, 2001a, 2001b), while others have focused on the rural water decentralization experience (Whiteford & Bernal, 1996; Whiteford & Melville, 2002; Wilder, 2002) or on the US–Mexico border (Mumme & Brown, 2002). Castro (1995) focused on constructions of new social forms—“water entrepreneurs” and “water consumers”—as a result of the rupture of Mexico’s state-led water resource development model. Castro argued that the new state form was concerned primarily with increasing its regulatory power and control over the private sector, and constructed new social relations of power to accommodate market reforms required for “modernization” (Castro, 1995, p. 485). Pineda (1999a, 1999b) examined transfers of management of urban water systems to municipal governments and private corporations, and found that such measures did not lead to improved efficiency or effectiveness. His Aguascalientes case study is discussed in greater depth in section two. Bennett (1995) studied the relationship among social movements, the state, and water reform and found that housewives’ participation in street protests in Monterrey led to improved water services. Like Pineda, Bennett found that privatization

did not lead to greater efficiency and that private systems require substantial government oversight to ensure accountability to public needs. Within the rural framework, **Palacios Velez (1997)** is an authority on the implementation of the transference process in irrigation districts, finding that problems experienced by transferred districts initially tended to work themselves out as the new institutions mature. **Whiteford and Bernal (1996)** studied early impacts of the water reforms in the northern district of Mexicali, documenting high water rate increases and developing social conflicts between private and *ejidal* producers. **Whiteford and Melville (2002)** is an edited volume of multiple case studies linking water reforms in Mexico to various kinds of social impacts in distinct regions. In one of the chapters, **Mumme and Brown (2002)** focus on the development of institutional decentralization on the Mexico–US border, demonstrated by bi or trilateral institutions like the Border Environment Cooperation Commission, the Border XXI Program (now Border 2012), and the Commission on Environmental Cooperation. Building upon these previous studies which have mostly examined either the urban or rural context for water separately in distinct geographical areas, we present a view of Mexico’s decentralized water governance strategy from a perspective that recognizes the critical linkages between the urban/industrial context and the agricultural context, and attempts to provide more generalized insights into Mexico’s overall decentralization experience based on evidence from both of the major water-consuming sectors in Mexico’s most dynamic central and northern regions.

Why is the water sector fundamental to a consideration of Mexico’s development potential and challenges? Several studies have articulated the closely limned linkage between power and water resource development in diverse settings (e.g., **Castro, 1995; Sheridan, 1988, 1998; Swyngedouw, 1997; Wilder, 2002**). Water is a critical lens to examine the development implications of transformation of domestic power arrangements via a region’s water-management strategies. Mexico’s ambitious water reform program was superimposed upon an uneven, physical, and social landscape in terms of the availability of and access to water. In Mexico, the natural distribution of water resources exists in an inverse relationship to the geography of water demand and economic dynamism. Mexico has a population of 97.3 million (**INEGI, 2000**) of whom 75% live in urban areas and

25% live in rural areas (**CNA, 2001, p. 23**). The southeast of Mexico, which occupies 20% of the land surface and contributes about 10% of GDP, receives more than half the rainfall, while the north, with 30% of the surface and nearly 30% of GDP, receives only 4% of the country’s annual rainfall. The central region with 11% of the surface contributes nearly 55% of GDP (**Romero Lankao, 2001a, Table 2**). This pattern of mismatch between supply and demand results in “a profound division between a ‘south’ rich in water and a ‘north’ subject to chronic scarcity” (**Búrquez & Martínez Yrizar, 2000, p. 277**). Although Mexico has approximately 1% of the global water supply, it has almost 2% of the world’s population, and the per capita supply falls to “dangerously low” levels in the highest population growth regions of the center, north and northwest (**CNA, 2001, p. 23**). Climatic conditions such as highly variable inter-annual precipitation due to periodic and prolonged droughts and extreme hydrologic phenomena such as hurricanes and floods affect much of Mexico. Adequately meeting water needs is difficult under these natural supply conditions, especially in periods of drought (**CNA, 2001, p. 23**). In 2000, 12 Mexican states were declared federal emergencies due to the prolonged drought (**Becerril & Muñoz, 1999**).

The impacts of these natural conditions are heightened due to social and economic factors such as rural-to-urban migration patterns over the last 30 years that have increasingly led people to settle in over-stressed urban areas in the central and northern regions of Mexico, as well as the adoption of NAFTA that has stimulated development in the water-scarce north and northwest. Patterns of inequity in the availability of and access to water are also evident. Most important from a development perspective, poverty is most severely entrenched in Mexico’s vast urban centers, especially Mexico, D.F., and in its rural areas. The Mexico City metropolitan area alone has approximately 18% of the country’s total population, and is growing about as fast as the national average (**INEGI, 2000**). Cities increasingly look toward the acquisition of *ejido* land and water rights as a way to expand urban supply. Mexico City already relies on imported water to meet 30% of its local demand. Populous urban areas have higher rates of piped water and residential sewerage service than rural areas with fewer people and less political power. Approximately 88% of Mexico’s total population has residential water service and 76% has sewer service, but there is

great disparity in urban and rural service provision. While most urban residents have water/sewer service, only 68% of rural residents have water service and only 37% have sewer service (CNA, 2001, p. 33).

Agriculture uses approximately 80% of Mexico's total water supply, employs 21% of the economically active population, and generates just 4% of national GDP (CNA, 2001, pp. 24, 35). Urban and public uses consume 12% of the water supply, and industry use consumes approximately 8% (CNA, 2001, p. 32). Although agriculture's overall contribution to GDP is modest, irrigated agriculture is responsible for 50% of the value of total national production and represents 70% of Mexico's agricultural exports, and accounts for 80% of rural employment (Contijoch Escontria, 1999, p. 1). Mexico is the seventh largest irrigator in the world with 6.3 million hectares under irrigation (CNA, 2000, p. 35). Industrial water use represents only 8% of total supply, but increasing industrial demand has created more competition with other water using sectors and the sector is highly polluting.⁴

Mexico's water reform program developed as part of a modernization strategy outlined in the *Plan de Desarrollo Nacional, 1988–1994* (National Development Plan), and subsequently elaborated in the neoliberal economic program the country turned to in the mid-1980s. The National Water Law (*Ley de Aguas Nacionales*) entered into effect on December 1, 1992. It was adopted in accordance with World Bank modernization prescriptions and relied substantially on World Bank funding. For example, the Bank's Program for Investment in Irrigation and Drainage invested in Mexico's irrigation transference initiative, with an initial budget of over US\$1 billion. The World Bank provided 29% of this total (US\$350 million) as a loan to Mexico (World Bank Loan 3419ME) and the Inter-American Development Bank lent 17% (US\$200 million) (Pineda Blancarte, 2000, p. 67).

What were the major provisions of Mexico's water reform strategy? In the municipal context, the National Water Law decentralized water system management from the federal level to state and municipal governments and opened the door for privatization of municipal service provision. At the same time, new environmental principles were incorporated into water policy such as watershed-based management, the "polluter-pays" principle, environmental impact analysis, and cost-benefit

analysis (Romero Lankao, 2001b). The new law elaborated a dramatic philosophical shift allowing the federal government for the first time to grant concessions to lower level governments and non-state concessionaires to manage urban water service, although water resources themselves remain legally under the jurisdiction of the federal government. On the rural front, the new law required the transference of management responsibility for Mexico's 82 irrigation districts to water users themselves. In the rural context (as well as the urban), the law required full-cost recovery pricing of water for operation, maintenance and system improvements, representing a dramatic departure from previous decades of water subsidies. The law also established a formal market and registry of water rights. The National Water Law has been modified several times, and revisions focused ostensibly on strengthening watershed management and environmental principles are pending in the Mexican Congress as of this writing. The implications of the decentralized management model embodied in the water reform are addressed in the next two sections of this article, first, in the urban context assessing governance and privatization strategies in water institutions with respect to sustainability.

3. MARKET VERSUS LEVIATHAN? WATER MANAGEMENT IN URBAN SETTINGS

In this section, we examine a number of distinct cases of water-management decentralization in urban areas to see whether or not private participation is related to a more efficient, sustainable, and accountable management of water.⁵ The first two examples—Federal District and Aguascalientes—constitute different forms of private participation in the management of water services. The examples of Tijuana, Mexicali, Tecate, and Ensenada in the state of Baja California represent systems still managed by public bodies, but under new "managerial" schemes of administration. Puebla represents a combined management regime wherein water treatment services were designated to the private sector and water supply services to the municipal government. Seven qualitative indicators were utilized to assess the relative sustainability of urban water-management strategies in each case: (a) promotion of the decentralization and privatization reforms (e.g., either promoted by the CNA in

a “top down” process characteristic of a centralized, authoritarian model; or promoted by local authorities and water users in a “grass-roots” approach); (b) institutional strength, defined as clear regulations regarding privatization; oversight ability invested in a government authority; and accountability of privatization processes; (c) participation by water users and other stakeholders was allowed and/or promoted; (d) water revenues increased and financial self-sufficiency was achieved; (e) equity criteria were achieved; (f) a basin management approach was applied; (g) urban water reforms have resulted in decreases in water consumed and/or increases in quality.

(a) *Federal District—privatization: improved service, lagging efficiency, and equity*

Water reforms were first introduced in the Federal District in 1989, when authorities stated that supply-side strategies were no longer feasible, as water became scarce, costs were not recovered, financing was difficult and water pollution was sufficiently severe so as to limit management options. Two kinds of demand management approaches were designed: increases in water charges and retrofitting of water infrastructure. Furthermore, the Water Commission of the Federal District and more recently the Water System of Mexico City were created (DDF, 2003; DDF-GEM, 1989).

Water administration in the Federal District was privatized within an extremely short and closed bidding process (November 1992–March 1993) lacking public participation. The Federal District’s Water Commission granted four groups of companies (with strong transnational corporate presence) concessions to be private administrators of water systems in the Federal District (an area that neither includes the entire metropolitan area nor the entire Mexico City

basin as these have been managed historically by at least two state and 29 municipal water authorities).⁶ Three stages were included in the contract: first, the creation and regularization of an inventory of water users, water taps and meters, supply and drainage network; second, construction of new taps and connections to the sewage system, and billing of customers by metered usage (nevertheless customers are still supposed to pay to municipal water authorities, not to the companies); and third, maintenance and repair of the whole infrastructure. The Democratic Revolution Party (PRD), a left-oriented party in power in Mexico, D.F. since 1998, fundamentally disagrees with the privatization strategies undertaken by its predecessor, the PRI.

According to an assessment of the efficiency-performance of these companies, supply systems have slightly improved in installation of taps, meters, creation of a customers’ inventory, and water billing (Zentella, 2000). Although private participation resulted in increased revenues for water authorities (27.1% during 1995–99, see Table 1), it has not resulted in financial self-sufficiency of the Federal District, nor even in a reduction of its historical deficit (Romero Lankao, 1999). In 1990, when water bills were substantially increased, the deficit declined from 84% to 59.5%, and then again to 38.3% in 1993, the year privatization took effect in the D.F. After privatization, the deficit continued growing and only in 1997 diminished again to 37.8% (Melville, forthcoming; Zentella, 2000, Table 5). Thus, the Federal District experience demonstrates a mixed record with respect to increasing financial self-sufficiency, an express goal of the water reform program. Regarding equity criteria, although progressive changes have been introduced, a recent study has shown that regressive charges and an unequal access to water services persists, and is

Table 1. *Revenues for water services in selected Mexican cities (1993 millions of Mexican Pesos)*

City	1995	1996	%	1997	%	1998	%	1999	%
Aguascalientes	83,560	59,771	-28.5	51,299	-14.2	44,415	-13.4	50,210	13.0
Mexicali	75,769	86,579	14.3	84,124	-2.8	100,891	19.9	120,470	19.4
Federal District	769,487	782,708	1.7	648,949	-17.1	921,577	42.0	978,274	6.2
Monterrey	481,404	500,693	4.0	547,260	9.3	566,581	3.5	585,097	3.3
Oaxaca	10,697	6,774	-36.7	7,665	13.2	6,889	-10.1	7,746	0.2
Puebla	48,070	48,825	1.6	49,417	1.2	38,316	-22.5	40,536	5.8
Querétaro	57,751	63,389	9.8	57,943	-8.6	59,703	3.0	83,289	39.5
Total	2,330,520	2,282,152	-2.1	2,156,288	-5.5	2,552,846	18.4	2,783,082	9.0

Source: CNA (1999).

driven more by the quality and spatial distribution of water services offered by the government than by growing efficiency of water billing procedures (Libreros, 1999; Melville, forthcoming).

Company representatives explain their mixed performance by arguing that private management of water has been confronted with several obstacles; first, overexploitation of groundwater has made it more expensive to supply the city; second, maintenance of drainage systems is expensive and recurrent, because citizens and businesses constantly throw trash and hazardous wastes into the canals; third, water fees have not been substantially increased for urban users, and therefore cannot work as a water-management strategy or instrument for implementing the "consumer-pays" principle. Customers have neither an incentive to pay fees nor is there a punishment for failure to pay fees, and local politicians in the Federal District hesitate to raise water charges for fear of compromising their electability. In addition to these obstacles, the water system lacks a clear division of duties and responsibilities among authorities and companies, and the Federal District Water Commission has not been able to assume its co-ordination and oversight responsibilities (Hernández & Villagómez, 2000). Water authorities stated that privatization improved some components of water services but managers did not benefit from the transfer of technologies and know-how by the contractors. Notwithstanding private and governmental efforts aimed at maintaining distribution systems and repairing their leakage, water pumping actually increased slightly from 35.2 m³/s in 1993 to 35.31 m³/s in 1999, and with respect to water quality, the Basin of Mexico remains one of the 15 most polluted water basins of the country, since only 4.3 m³ (6.8% of the total) of sewage water is treated (Presidencia de la República, 2003; Zentella, 2000). These findings lead to the paradoxical conclusion that water reform in the Federal District has not yielded the expected efficiency results—it has not led to a reduction in the total quantity of extracted water, better water quality, financial self-sufficiency, or to more equitable access to water services.

(b) *Aguascalientes—privatization: rhetoric over reality*

During an even shorter bidding process (January 1st–30th, 1993), which again lacked public

participation and transparency, the water services of the municipality of Aguascalientes (capital of the state of Aguascalientes in central Mexico) were contracted via concession to *Sistemas de Agua Potable* (a sister company of ICA), a powerful Mexican construction company. The mayor of Aguascalientes publicly declared that costs would decline and water services would improve. The National Water Commission (CNA) actively participated in the design of the contract project. After privatization, the municipality's Commission of Water Supply and Drainage assumed a reduced role of regulating and overseeing the service (Pineda, 1999a).

As of 1995, the company had technically fulfilled its contracted responsibilities. Nevertheless, Mexico experienced a deep, economic and financial crisis in 1994–95, elections were pending in Aguascalientes, and 75% of surveyed consumers resented the water bill increases instituted by the private supplier (Pineda, 1999a, p. 60). The mayor had to fulfill his campaign promises to stop the fee increases, but was faced with a tough political confrontation with the company. The government and the company revised the contract in December of 1996, and agreed to extend it to 30 years, capitalize the company with 53 million pesos⁷ and include other modifications more rhetorical than real (Pineda, 1999a, p. 62). According to Pineda although costs were rising, fee levels were maintained at static levels thereby limiting the ability of *Sistemas* to translate efficiency gains into lower bills. Customers therefore did not benefit from efficiency improvements. Notwithstanding privatization, revenues for water services in Aguascalientes decreased 39.9% during 1995–99 (see Table 1). The Aguascalientes contract neither spelt out clear rules regarding duties, responsibilities and rights of all parties, nor did it establish an independent body to monitor and guarantee contract compliance (Valencia, 1996). The Aguascalientes case demonstrates some positive benefits at the administrative level but it was difficult to translate these into benefits experienced by the public.

(c) *Baja California—state management model yields limited successes*

Contrary to the experiences outlined above, the municipalities of Baja California represent systems operated by the state government, one of several decentralized management forms encouraged in Mexico's water reforms. The

State Commission of Public Services (CESP) designed and implemented the so-called “managerial” schemes of water administration whose goal was to improve public services through data organization, quality standards, accountability, and a more transparent management of administrative procedures (Castro & Sánchez, 1999).⁸ Mexicali, Ensenada, Tecate, and Tijuana have experienced rates of demographic growth higher than other Mexican urban areas (Peach & Williams, 1999). Notwithstanding this, the reforms allowed state authorities to extend water systems from averages of 82.1% and 67.3% of the population served in 1990 by water and sanitation to the respective averages of 92.1% and 76.6% in 1995. The government improved efficiency through increased use of meters (from 68.2% in 1989 to 93.5% in 1998) and improved productivity by reducing the number of employees per 1,000 taps from 11 to 5.3 during the same period (Castro & Sánchez, 1999). Since 1989 water bills have progressively increased, reflecting the intention of authorities to institute a new culture of water in which water bills reflect real costs and to encourage water conservation. Water authorities also adopted measures to address equity of access.

Revenues for water systems in Mexicali (the only Baja California city for which we have data) have shown the highest increases of all analyzed cities (59%) during 1995–99 (see Table 1). Nevertheless, Baja California cities still experience water scarcity related to overexploitation of local aquifers affected by competition from commercial agriculture. Improving water quality is a great challenge, since only 13 treatment plants exist to treat 3.7 m³/s of sewage. Therefore, water quality emerges as the most significant environmental issue in this region, especially in “colonias” at the United States–Baja California border. In the Baja California cases, we find again that improving efficiency measures is only a limited aspect of the overall water-management picture. Although the state’s innovative management scheme led to real efficiency gains and expansion of water services (albeit at higher cost to consumers), it was not equipped to deal with broader issues of supply, allocation, contamination, and rural–urban competition for the resource.

(d) *Puebla—new directions: combined municipal–private management*

The municipality of Puebla in central Mexico created a distinct model in its approach to

decentralization, by awarding water treatment contracts to a private supplier and retaining urban water supply services under the jurisdiction of the municipal government. Two events in 1993 defined the new direction of water management in Puebla. The CNA and the decentralized water-management institution, SOAPAP (Freshwater Operating System, County of Puebla), designed a master plan for water and drainage, and the newly elected state government, headed by the PRI, designed a water project as part of a regional development program for Puebla and 12 surrounding municipalities. Citizen participation was promoted late in the design process—not during its implementation—by open hearings organized during the gubernatorial campaign. Neither plan included a basin management approach. Both programs were aimed at improving the accuracy of customer billing by using meters. Their promoters wanted to increase the supply of fresh water, increase the percentage of population with access to piped water and sewage service, and enhance the quality of local water resources through treatment plants constructed and operated by private enterprises (González, 1995). The projects were supposed to be financed by means of the Fresh Water and Drainage Program for Urban Zones (APAZU),⁹ customers’ bills, and the private sector. From 1995 to 1997, the project costs would be paid through three sources—credits (40%), private sector (35%), and government (25%). According to González (1995), loans were given by World Bank and Inter-American Development Bank at interest rates of 9% per year, while Banobras—the Mexican development bank—translated them into annual interest rates of 70% for local water authorities.

The new policies resulted in an increased supply of fresh water through the construction of infrastructure by a private enterprise (GMD) with governmental financing under an assignment scheme. The construction of treatment plants was granted to GMD under a “key in hand scheme” in which the company was responsible for finding financing for the construction and operation of the treatment plants. Water users did not participate in both processes and the construction of treatment plants faced difficulties. After the Mexican economic crisis of December 1994, the contract conditions were modified. GMD would construct four, rather than five treatment facilities, operate the plants of four localities (instead of only Puebla), and administer them for 30 years

rather than 20. Notwithstanding these favorable modifications, GMD could not finish the work due to the highly uncertain economic environment provoked by the economic crises of 1994–95, a lack of clear, binding rules, the absence of an oversight body, and structural features of the Mexican finance sector. These included factors such as high and volatile interest rates, and low levels of savings that did not allow the private sector to get adequate financing for projects demanding high and long-term investments. Political conflicts for the control over SOAPAP and the management of water among state and local governments controlled by different parties, the PRI and PAN, as well as the municipality's lack of financial and human resources were also key factors (Castillo, 1999; Hernández & Villagómez, 2000).

The new water-management schemes implemented in Puebla faced other difficulties. It has not yet been possible for local authorities to rely on water bills because of failures to improve the billing of customers via use of meters. For example, revenues from water services decreased nearly 16% in Puebla during 1995–99 (Table 1). Water managers faced structural limits such as locally powerful interests they could not—or did not want to—take on in a definitive way. Industries have not fulfilled their agreement with the CNA to build and operate treatment plants. As a result, pollution has not been reduced, and groundwater in Puebla is overdrafted by more than 100%, resulting in a decline in groundwater levels and increasing subsidence in some areas (Castillo, 1999; González, 1995).

The four urban case studies of decentralization and privatization strategies demonstrate the distinct models and local specificity of different arrangements, ranging from private con-

cessions for urban water management (Mexico, D.F., Aguascalientes) to management by a state water agency (Baja California municipalities) to a combined municipal–private sector management arrangement (Puebla). Results of the case studies are summarized in Table 2.

The Baja California municipalities (the only cases included that did *not* have a privatization component) can be considered a relatively more successful case in both economic and equity terms, since water systems were expanded to accompany urban growth, revenues increased, and productivity improved. Despite their potential, none of the cases studied has directly resulted in major efficiency gains or improvements in environmental sustainability. Instead, the privatization and decentralization experiences have highlighted the need for state involvement to provide financial resources, address transparency and accountability issues, promote cost recovery policies that may lead to enhanced water conservation, and address issues other than water supply. For example, water quality continues to decline due to ongoing pollution of water sources and water treatment facilities are still not universally or even broadly available. Effective enforcement of Mexico's strong environmental protection legislation is frequently held hostage to political and economic considerations. Privatization strategies are quite limited in their capacity to resolve larger, politically charged issues such as water scarcity, redistribution of water rights, or long-term planning for environmental sustainability. Private corporations or other institutions can be tapped to provide a limited scope of services, but unlike the state *potentially* could do, cannot adequately address urban water needs within the full sociocultural context in which communities live.

Table 2. *Urban water management after decentralization, selected indicators*

Indicator	Federal District	Aguascalientes	Baja California	Puebla
Promotion by CNA, not local authorities	Yes	Yes	Yes	Yes
Institutional strength	No	No	Yes	No
Stakeholder participation	No	No	No ^a	Yes ^b
Revenues and self-sufficiency	No	No	Yes	No
Equity criteria	No	No	Yes	No
Watershed management	No	No	No	No
Water quantity and quality	No	ND	No	No

^a Only representatives of the private sector participate in the Administration Board in charge of supervising the activities of the Public Services Commission of Tijuana.

^b Only during the campaign's hearings, organized by candidate Manuel Barlett.

4. WATER USERS AND STATE RETRENCHMENT: AGRICULTURAL WATER MANAGEMENT

We turn now to the rural context to assess how the decentralization of water management has affected water users in two commercial irrigation districts in the northwestern state of Sonora.¹⁰ The interrogation of irrigation policy illuminates issues pertinent to sustaining rural livelihoods and development. DeJanvry, Gordillo, and Sadoulet (1997) found that access to irrigation is one of the most significant indicators for the reduction of poverty among *ejidatario* (small-scale, communal) producers, with the ability to diversify into higher-value crops and use of agricultural technology also ranking as important indicators. *Ejidal* producers and their families are among the most impoverished groups in Mexico, with an average farm parcel size of only 12 ha compared with 55 ha for private farmers (OECD, 1997, p. 36). *Ejidatario* producers in Sonoran irrigation districts have access to water and modern technologies and know-how gained from generations of farming in the region. However, they share many characteristics with *ejidatarios* in poorer regions in terms of relatively smaller land parcels, lack of access to credit, high indebtedness, and lack of capital resources. An examination of how *ejidatarios* have been affected by Mexico's water reforms sheds light on issues of equity, environmental sustainability, access, and development in the water sector under decentralized water regimes.

Why is Sonora an important state in which to interpret the decentralization experience and other impacts of water reform on the *ejidatario* sector? Sonora is the largest irrigator (in area) of all 32 states in Mexico, with seven major irrigation districts. Bordering the US state of Arizona and formerly serving as the heart of the "green revolution," Sonora should be positioned to benefit from Mexico's agricultural modernization strategy, but has it? The impacts of the water reform package, as well as the response strategies of water users in Sonora, indicate that important paradoxes underlie the decentralization experience in the rural sector.

The Rio Yaqui and Altar-Pitiquito-Caborca (hereafter Caborca) regions both produce commercial crops for export, mainly to the United States market. Both irrigation districts have large numbers of *ejidatario* producers, ranging from 73% of producers in Rio Yaqui to 56% in Caborca. However, the similarities between these two districts end there, as the districts are distinct from one another in size, technological appointments, and irrigation capacity. As we see in Table 3, the Rio Yaqui is a vast wheat-producing district of 220,000 ha with nearly 20,000 producers, operating on a surface water system fed by three dams. In contrast, the Caborca district in the sandy northwest coastal region of Sonora has 60,000 cultivable hectares and under 4,000 producers. The groundwater district has a total of 831 wells, and a great variety of crops produced, including asparagus, table grapes, industrial and raisin grapes, and olives. While the Yaqui producers have

Table 3. *Characteristics of irrigation districts in study*

Irrigation district characteristics	Rio Yaqui district (District 041)	Altar-Pitiquito-Caborca district (District 037)
Size (ha)	230,000	1,050,000 (60,000 cultivable)
Irrigation system	Surface/gravity; plus 130 wells	Groundwater pumping; 831 wells
Users		
Total	19,717	3,761
Private	5,324 (27%)	1,302 (35%)
Ejidal	14,393 (73%)	2,459 (65%)
Management	Society of limited responsibility	District water users
No. of water modules	42	2
Land tenure		
Private	101,200 (44%)	44,001 (76%)
Ejidal	128,800 (56%)	14,185 (24%)
Wells	130	831
Principal crops produced	Wheat, cotton, tomatoes, melons	Table grapes, asparagus, raisins, olives, wheat, cotton

virtually no drip irrigation technology (only about 1% or 200 ha), Caborca has been more successful in installing drip irrigation on about 12,000 ha (20%). Transnational companies have been more centrally involved in Caborca production via ownership and contract farming arrangements, particularly in the asparagus sector, than in the Rio Yaqui region.

The World Bank pronounced Mexico's transference program a success and offers it as a model for other developing countries in terms of the rapidity of the transference process itself (79 districts in less than 10 years) and due to the gains in efficiency of water use that have resulted (Easter, 1998). Based on Mexico's experience, the Bank decided to reverse its former strategy of "rehabilitate first, then transfer" to a new strategy of "transfer first, then rehabilitate," founded upon the belief that after transference, Mexican water users have been more capable of deciding democratically how to utilize scarce financial resources to modernize the water system in the most beneficial ways. The Sonoran case studies generally confirm the Bank's positive views of transference. Producers believe that the transferred districts are more democratic and have streamlined processes that facilitate issuance of permits and other transactions (Wilder, 2002).

However, *ejidatario* producers are generally more skeptical of the benefits of and access to participatory decision making than are private producers (Murillo Licea, 2000; Wilder, 2002). There was some evidence in the Sonoran and other case studies that water user associations (also known as water modules) were still controlled by local elites, typically large private farmers. An important factor in ensuring a smooth transition from federal to water user management was the hiring of senior management personnel in the newly minted irrigation associations from the federal water agency, the National Water Commission, ensuring that knowledgeable, highly trained engineers were in charge after transference (Wilder, 2002).

As in the urban cases we examined in the previous section, undoubtedly the major problem facing irrigation users' associations is the lack of resources caused by the withdrawal of the federal government in supporting irrigation and the requirement that full operation and maintenance costs are now the responsibility of irrigation communities. After transference, the National Water Commission's contribution to the support of agriculture fell to only 10% of pre-transference levels (Palacios Velez, 1997, p.

128). By the early 1980s, Mexico's irrigation infrastructure was in a state of serious deterioration, a situation the World Resources Institute described as "staggering" (Cummings, Brajeer, McFarland, Trava, & El-Ashry, 1989). Half the irrigation supply never reached cultivated lands (Buras, 1996, p. 233; Cummings *et al.*, 1989, p. 26), and erosion, salinization, faulty construction work, and water shortages all impaired system functioning (Wilder, 2002). The WRI estimated Mexico's total debt for irrigation improvement at \$302 billion pesos (Cummings *et al.*, 1989, p. 27). The lack of resources for system improvements is one of the key areas that underscore the critical—if paradoxical—need for more rather than less state involvement to ensure success under the reform system. While the water reform program made possible a more effective, participatory, and democratic system under transference, at the same time it limits the ability of the new system to respond to defined needs due to an inherent lack of resources. For example, one of the major problems evident today that producers link to transference is the lack of appropriate metering equipment to mark precise water flow volumes. This problem has given rise to serious allegations of corrupt practices in the Rio Yaqui and has led to complaints of over-charging for water in Caborca. Neither district has adequate instrumentation to measure volumes of water that flow into fields or are extracted from wells. In fact, most canals and wells in the two districts are completely unmetered. In addition, both districts desperately need to expand drip irrigation to conserve water and to diversify crops, but at US\$1,200 per hectare, the costs are prohibitive for producers. Governance innovations and environmental sustainability will remain only goals if state resources are not invested in water conservation technologies that, coupled with other conservation strategies, might allow producers to continue to cultivate high-value export crops, as demanded by market conditions and national economic policy, while at the same time striving to use water resources more efficiently.

(a) *Emergence of a conservation ethos*

The water reforms when announced were heralded as the "birth of a new water culture" (Presidencia de la República Mexicana, 1992) and to a large extent that maxim appears to hold true in the case of Sonoran irrigation dis-

tricts. Paradoxically, however, improved water conservation in the irrigation districts is unlikely to translate into more sustainable use of the resource. After transference, the water users themselves have proved both capable of and committed to conserving water resources. The reasons for this change are at least threefold. First, the water users themselves form an irrigation community with a long farming tradition and a high investment in ensuring that the water resources are there for future generations. Second, due to the prolonged drought of more than seven years' duration, as well as a pattern of historical overexploitation of surface water and aquifers, water users have been forced to respond to the record of low water levels in groundwater aquifers and reservoirs. Third, unlike the federal water-management agency, the CNA, water users as a group are less subject to overt pressures from political parties, elected officials and others seeking to advance a particular agenda, and have therefore, according to many interviewed within the districts, been able to respond more flexibly and actively to reduce water use (Wilder, 2002).

In the Rio Yaqui district, irrigation managers responded to record low reservoir levels by instituting a fixed volumetric limit of water per hectare that applies district-wide (although some private producers have supplementary groundwater wells), and by cancelling the secondary (spring-summer) growing season. The water limits resulted in a reduction of crop diversification, as virtually all producers planted wheat in the 2000–01 winter growing season, and in a loss of approximately 40% of most producers' income, due to the lack of irrigation for spring-summer crops (Wilder, 2002). In Caborca, a formal Water Reduction Plan reduces well extraction volumes each year, translating to a cumulative reduction in planted area year after year. By 2004–05, with total extractions equalling 301 Mm³, the district hoped to balance extractions with projected natural recharge into the aquifer. However, at least one hydrologic study of Caborca's groundwater aquifer found that the actual recharge level is closer to 70 Mm³, and that the aquifer is highly uneven in its behavior across the district, meaning that the water table does not recuperate at an equal rate across different zones (Ojeda de la Cruz & Sortillon Valenzuela, 2000). Even if Caborca producers achieve their water-saving goal, overly optimistic estimates of the recharge levels are likely to mean that the local aquifer will continue to be one of the most severely

overdrafted in the entire region. Given the strict water reduction regime, Caborca producers face higher costs (for pumping water from ever lower levels) and reduced profits due to less area planted each year, even if prices remain stable (Wilder, 2002).

Decentralized management coupled with both human-induced water scarcity (e.g., overdraft of aquifers) and prolonged natural droughts has resulted in a well-established and enforced water conservation ethos in the two districts. Paradoxically, however, this water conservation has not automatically translated into longer-term sustainability of water use or into assured water supply for "higher-value" urban or industrial users. Rather, water users in the irrigation districts are regulating themselves to assure that equally high levels of water supply will be available to themselves in future years, and to their grandchildren in future generations. Producers are conserving water now in the expectation of returning to the same high consumptive use, for agricultural purposes, in the future—it is water conservation *within the sector for the sector*, not for use by the environment or nearby growing urban areas. Thus, these cases are witness to the *decoupling* of water conservation from higher environmental principles or a notion of transferring supply to "higher-value" users.

(b) *Consumer-pays: full-cost recovery*

Decentralization encompasses myriad neoliberal transformations in addition to transference to water user associations. The World Bank conditioned its financing for Mexico's water program upon the requirement that water prices be based upon full-cost recovery principles. The result of the state's financial self-sufficiency strategy has been a huge increase in water costs borne by irrigators themselves. For producers, this is clearly a major effect of the decentralization strategy. Prior to implementation of the water reforms, the National Water Commission subsidized water by 60–80%, recovering only 20–40% from fees paid by water users. By 1998, the World Bank reported that water users in 84% of transferred districts were paying 100% of operating and maintenance costs (Easter, 1998). In the Rio Yaqui district, basic water fees increased 257% from 1992 to 2000, augmented by additional fees imposed by the individual water modules depending upon the location of a producer's land (Wilder, 2002). During 1996–2000,

although the fixed-volume of water allowed per hectare decreased by over 30%, the cost of water (CNA and irrigation district fees) increased by nearly 100% (Wilder, 2002, p. 569). In the Caborca district, during 1994–2000, water costs increased by 87% for industrial grapes, 89% for wheat, 118% for table grapes, and 186% for asparagus (Wilder, 2002, p. 569). Standing alone, water prices themselves are manageable for Yaqui and Caborca producers, largely because water fees were so low (in absolute terms) at the beginning of the reform program. However, it is the full-cost pricing of water combined with dramatic increases in costs of electricity, seeds, fertilizer, and other formerly subsidized agricultural inputs that has created insurmountable financial problems for many producers because market prices for crops have tended to be either stagnant or falling (Wilder, 2002, p. 570).

(c) “*Development*” for whom? *Water markets and privatization*

The channels of water privatization through multiple market instruments—for example, temporary transfers and permanent sales of water rights; water rights purchased or rented with land; and long-term well rentals—have been insufficiently understood. Privatization refers not only to the devolution of management responsibility for water systems or to the outright transfer of ownership or control of the resource, but in the Mexican case, as in other parts of Latin America that have communal resource ownership arrangements, privatization can also refer to the transfer of control of land and water assets from the *ejidal* (or social) sector to the private sector. It is important to note that, even prior to any water rights transfers, water is disproportionately controlled by the private sector. In the Rio Yaqui district, water rights are apportioned on a per-hectare basis, so large private landowners automatically have access to more water, a practice which *ejidatario* groups have registered disagreement with in the past. In Caborca, there is only one well to support every 27 *ejidatarios* (and their families), while there are 1.3 wells to support every private producer. Seventy-two percent of *ejidal* land in the Rio Yaqui and an estimated 50% in the Caborca district have been rented to private producers (Wilder, 2002, p. 579). But land transfers are only a small part of the privatization story. With respect to water transfers, there has been a net transfer of water rights

from the *ejidal* to the private sector in the Rio Yaqui, while in Caborca long-term well rental agreements between *ejidos* and private or corporate producers are common. The World Bank (Briscoe *et al.*, 1998; Thobani, 1997) supports the establishment of formal water rights markets in developing countries as a means of providing income to small producers with “surplus” water rights, and as a means of controlling black market trading in water. Briscoe (of the World Bank) waxed ecstatic in his description of the benefits of water markets, calling tradable water rights “a brilliant solution” and effusing over the “genius of the water market approach” (Briscoe *et al.*, 1998, p. 3). Within a purely efficiency framework, Briscoe’s enthusiasm might be justified in the Sonoran cases, because water rights are traded annually out of the *ejidal* sector into the private/corporate farming sector. From a social development and equity perspective, however, the privatization findings are troublesome. In both of the Sonoran districts, market prices for land rentals and water transfers are insufficient to compensate *ejidatario* families for loss of their productive resources and the income gained from such transactions is most frequently used to bail them out in an immediate financial emergency (such as the need for medical care for a child) or to pay off overdue agricultural debt at the bank (Wilder, 2002, p. 579). Apart from dealing with critical short-term cash-flow problems, the surplus water rights (which could be used to grow crops that translate into an annual income to support a family) do not add significantly to a producer’s livelihood. Water rights generally become “surplus” in such cases because *ejidatario* producers are being squeezed out of active production due to a combination of loss of subsidies and state supports of various kinds, increases in irrigation costs, water tariffs and input costs, volatile global market prices, and high levels of accumulated debt (Wilder, 2002).

What do these findings from Sonoran irrigation districts convey about the decentralization and reform experience in Mexico? Our initial premise was that producers in northern irrigation districts occupy a strong position and have a wealth of productive assets (e.g., irrigation, proximity to export markets, and technological sophistication) that should translate into an ability to benefit from Mexico’s agricultural modernization program. Sonoran producers generally did realize democratic gains (e.g., formalized channels for participation, more influ-

ence in decision making about system improvements) from the transference of irrigation districts to water users, and some *ejidatarios* have adopted entrepreneurial strategies such as buying new land parcels or moving into higher-value crops that enhance their profit potential. However, overall Sonoran producers have not benefited from the decentralization strategy. Even within the well-resourced northern irrigation districts, *ejidal* producers are being squeezed out of production, challenging the fundamental effectiveness of liberalization as a development strategy. The decentralization of water-management institutions has in itself been beneficial especially in a period of water scarcity due to a prolonged severe drought and overexploitation of the available resources. Local producers form an irrigating community who are concerned to conserve the resources for future generations in the community. They have actively policed their own use of water, implementing water reduction programs, and curtailing area planted, in response to the prolonged drought of recent years that caused a dozen states, including Sonora, to be declared disaster areas by the federal government. Nevertheless, the transference of management responsibility to irrigation users dovetailed with a host of other changes that have not benefited producers, and have disproportionately affected *ejidatarios*, many of whom have abandoned production but have few other realistic rural livelihood options.

5. LIGHTS, SHADOWS AND PARADOXES: IMPLICATIONS AND CONCLUSIONS

Evidence presented in these case studies from Mexico's rapidly growing urban centers and dynamic agricultural regions indicates that the country's decentralization experience has resulted in highly context-specific outcomes that are often paradoxical in nature. Mexican water reform is by no means an isolated event. Decentralization, commodification and deregulation of the resource are part of broader—global—changes being unevenly implemented around the world, and being endorsed by international organizations and corporations. As we have demonstrated, some of the top 10 water international corporations (e.g., Lyonnaise des Eaux, General des Eaux) are already participating in the management of water in Mexican urban areas. At the same time and precisely

because actors and sectors involved are not mere passive receptors of global processes, but rather *agents* reinterpreting and renegotiating them at different scales, Mexican water reforms have been implemented at different paces and with distinct outcomes involving paradoxes, lights, and shadows.

The neoliberal belief in the efficiency of markets, the role of the private sector, and the modernization path to environmentally sustainable use of the resource are bathed in paradoxes. The urban examples show no clear and direct linkages between private participation and a more efficient management of water. The structural features of the Mexican economy and institutions help to explain this; for example, high and volatile interest rates, low internal saving rates, non-binding rules, and lack of independent oversight bodies. The cases illustrate that private services present an additional burden for water users in general without significant improvement in water services. As with other examples of privatization of once public services, Mexican urban water utilities function as an additional structure between private clients and public water organizations without assuming liability for unjustified actions or without any financial responsibility for commercial failures. In this light, privatization appears not so much an instrument aimed at improving efficiency as it does a channel for preferred treatment for capital accumulation by private entities as well as a legitimized way for the state to transfer the financial and politically charged burden of water management to non-state institutions. The decentralization experience in the agricultural sector has resulted in gains for water users who now have formalized access to decision-making processes and more local control and authority over how to manage water. The prolonged drought combined with historical overexploitation of agricultural water has been a factor in uniting water users in irrigating communities to design strategies that allow them to continue production. However, the growth of a water conservation ethic and strategy has *not* led to more sustainable use of the resource. Without increased support from the state to improve water infrastructure to reduce loss and use the existing resources more efficiently, such strategies may in the end prove futile.

Financial self-sufficiency—another criterion of efficiency—has been harder to achieve than early supporters of privatization expected as it has not yet been possible for urban water

authorities to rely exclusively on water bills and private funding for their financial operation. Federal resources continue to be the main sources of financing for public water investments. Governmental expenses have decreased—or at least not been augmented—and water fees increased. The sector is faced with considerable ironies. Agriculture, the biggest water user, is the smallest source of revenues for the National Water Commission. On the other hand, production costs have increased for farmers, yet the prices of their crops decreased and are dependent on—and vulnerable to—the vagaries of market fluctuations. The nexus of free trade agreements, economic, agricultural, and water reforms, changes in legislation governing *ejidos*, volatility of crop prices on the international markets, and increasing input costs have created insuperable cost regimes for many producers, and *ejidatario* producers in particular are finding themselves unable to continue in active production (leading to more privatization of water and land). The social implications of Mexico's economic choices are formidable, as few alternatives have been developed to provide rural sources of income for the millions of small producers who have traditionally relied on the land. These producers are among those who daily choose to move to Mexico's already overburdened urban centers or to emigrate to the United States. Those migratory patterns create new demands on water, and new environmental challenges for Mexico.

Water reforms have not succeeded in other management areas. Fundamental issues of social equity and environmental sustainability have not been adequately addressed. In some cases (Aguascalientes), water users resented the water fee increases after privatization; in others (Federal District, Puebla), the unequal access to water services persists. Contrary to expectations, in both urban and rural cases water quality has not improved and indeed has worsened and infrastructure modernization necessary to stem water losses from urban and irrigation systems has not been implemented on a systematic basis. Environmental policy approaches such as watershed management tend to remain on paper without having any impact on the allocation of water, amounts and water quality for different purposes or water users. It has not been possible to implement broadly the "polluter- and consumer-pays" principles. Furthermore, the authorities did not integrate

into the water reform program related issues of human-induced water scarcity. Recent environmental regulation changes may contribute to weaken already faint implementation of environmental policies, as they lack external mechanisms to guarantee that all water users must actually comply with environmental standards. Recent changes to the National Water Law that strengthen watershed management principles and structures and call for more public participation in water resource decisions are steps in the right direction, but more state involvement and commitment are needed to make these meaningful.

It may be that water reforms have been insufficient to deal with the complete spectrum of factors that contribute to water scarcity and quality because promoters of reform centered on economic issues such as cost recovery, water markets, and privatization. They did not adequately consider cultural factors, such as the capabilities of water users to achieve self-organization, efficiency and sustainability. They neglected to pay close and careful attention to core sociopolitical issues such as equity, institutional or governance settings, power relations, and the diversified socio-economic character of Mexican water systems. Earlier scholarship on Mexico's decentralization experience highlighted such conceptual deficits a decade ago (Castro, 1995; Whiteford & Bernal, 1996), and our research confirms that 10 years' experience has not repaired most of the faults in the construction of Mexico's water problem. A fully successful implementation of such a dramatic water reform program as Mexico hopes to achieve will require strong institutional capacity, commitment and support—the kind of support that perhaps only nation-states are in a position to provide. As DeJanvry *et al.* (1997) have pointed out, in the absence of an operational and developmental role for the state in Mexico, there exists an "institutional vacuum" since few civil institutions exist that might help replace the roles and functions of the state. Perhaps the greatest paradox in Mexico's water reform program is the need to achieve a more appropriate balance between decentralized institutions with strong public participation on the one hand yet, at the same time, sustained institutional capacity and resources to carry out the programs designed by those new institutions. In Mexico's uneven social, economic and political landscape, this will be a daunting task indeed.

NOTES

1. The authors wish to thank Simon Batterbury and two anonymous reviewers for their constructive comments on an earlier draft of this article. The final product is the authors' responsibility alone.
2. Judith Tendler attributes the ironic term "paradox of decentralization" to Rudolf Hommes, a former Colombian minister of state. According to Tendler, Hommes wrote that decentralization "demands more centralization and more sophisticated political skills at the national level" (Tendler, 1997, p. 143; Hommes, 1996).
3. Other countries with decentralized irrigation management included in the World Bank study were Egypt, Tunisia, Albania, Armenia, China, the Philippines, Nepal, Turkey, Mali, Niger, and Senegal.
4. The industrial sector generates on the order of 6 million tons of organic discharge each year, primarily concentrated in a limited group of industries including sugar, alcoholic and soft drinks, chemicals, petroleum, paper and cellulose, and agricultural activities such as pigment production (CNA, 2001, p. 36).
5. This section is based on a study of Mexico's water reforms and their implications for sustainable management of water in urban settings. The study was conducted in 2000–01 and involved the review of official documents, survey data and in-depth interviews with water institution representatives. The author gratefully acknowledges the support of the German Deutscher Akademischer Austausch Dienst (DAAD in German) and the Mexican Council of Science and Technology for supporting the writing of the initial report (summer 2001) in Germany.
6. According to the contracts, the government is responsible for billing and charging water services. The winning companies are: (a) Sistema de Agua Potable, a sister of ICA, and the French company General des Eaux for the North area; (b) Industrias de Agua de la ciudad de México, Socios Ambientales de México, and the British company Severn Trent for the East zone; (c) Grupo Gutsa and North West Water International Ltd. for the West area; (d) Bufete Industrial, Bancomer, Lyonnaise des Eaux Dumez and Anglian Water Plc for the South zone (Valencia, 1996).
7. To achieve the capitalization, \$MX 40M came from CNA, the state government and the company and \$ MX13 from the municipality of Aguascalientes.
8. This was achieved in 1991, under the policy programs of the first opposition government from the right oriented National Action Party (PAN, *Partido de la Acción Nacional*). Pineda (1999b) has examined the importance of alternating political parties, a relative novelty still in Mexico in the 1990s, in creating more effective water institutions.
9. According to the APAZU, created in 1992, the local authority must present the CNA a project describing its actions and mechanisms for recovering the investment, in order to qualify for financing.
10. This section is based on a dissertation study of Mexico's neoliberal water reforms and impacts on small producers (Wilder, 2002). The study involved ethnographic interviews with 150 individual producers, producer groups' representatives, and water institution representatives in the Rio Yaqui and Altar-Pitiquito-Caborca Irrigation Districts of Sonora, Mexico, as well as surveys of water users and managers. Research was completed during 1999–2001.

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