

Multiple-use systems

Artist: Titilope Shittu, Nigeria

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Policy and institutional reform: the art of the possible

Coordinating lead author: Douglas J. Merrey

Lead authors: Ruth Meinzen-Dick, Peter P. Mollinga, and Eiman Karar

Contributing authors: Walter Huppert, Judith Rees, Juana Vera, Kai Wegerich, and Pieter van der Zaag

Overview

Poverty, hunger, gender inequality, and environmental degradation continue to afflict developing countries not because of technical failings but because of political and institutional failings. Current policies and institutional arrangements are often ineffective, and the challenges are increasing. Institutional reform is critical, but many reforms have had mixed outcomes at best.

This chapter proposes a structured, context-specific approach to reforming, negotiating, and crafting effective institutions, organizations, and policies for water management in developing countries based on a careful assessment of experiences. This approach recognizes the inherently complex, political, and contentious nature of institutional transformation. It promotes careful analysis—of the current situation, available options, vested interests, potential costs and benefits, potential allies and opposition—as a basis for a strategic plan to guide reform. The plan should be a flexible guideline, responsive to experience and new opportunities. It recognizes that institutions, organizations, and policies are context specific.

While market forces and communities play critical roles in water management, the state will continue to have a central role because of its responsibility for providing public goods and for ensuring equity and sustainability. It is also responsible for maintaining a macro-economic environment conducive to developing and using water resources effectively and equitably and for integrating the development and management of water resources into national programs in a way that optimizes the contribution of water to sustainable national growth. This includes, at a minimum, assessing the impacts of water policies, programs, and projects on national development, social well-being, and environmental



One challenge is to encourage technical water bureaucracies to see water management as a social and political as well as a technical issue

quality. Policies, programs, and projects not complying with basic threshold requirements should be redesigned. The state is best placed to mobilize resources for large-scale water development and overall regulation. However, the state is not a monolithic entity, and with its often fragmented and even contradictory structures and processes, it is also a core component of the problem.

One challenge is to encourage technical water bureaucracies to see water management as a social and political as well as a technical issue and therefore to prioritize reducing poverty, increasing equity, and enhancing ecosystem services as their overarching goals. Another is to support more integrated approaches to agricultural water management, for example, incorporating livestock and fisheries, encouraging new lower cost technologies, and improving rainfed agricultural production. Meeting these challenges will be impossible in many developing countries without substantial changes in water management policies and institutions.

The state should not be seen as the sole institution for delivering sound water management. Effective coordination and negotiation mechanisms are needed among the various state, civil society, and private sector organizations involved.

Political and institutional reforms are triggered by both internal and external pressures and opportunities, by pressures such as water scarcity, poverty, and food insecurity as well as by changes in global terms of trade and the requirements of development partners. The chapter reviews several major responses to these pressures. An early assumption that farmers were failing to respond to new irrigation opportunities (“blame the farmers”) led to emphasizing training and on-farm infrastructure development. Next came attempts to transfer responsibilities to farmer organizations (irrigation management transfer). More recently, increasing interactions among water uses and users has led to the creation of river basin organizations, with mixed results. Market-inspired reforms including privatization and new water markets remain attractive to many donors, though not necessarily to developing countries. Radical changes in the balance of power in favor of water users and major restructuring of entrenched “hydro-bureaucracies” have not been on the agenda of any developing country. International development partners have not reflected sufficiently on the extent to which they have become part of the problem faced by developing countries rather than part of the solution.

A critical review of these experiences is organized around three themes:

- The bias toward imposing blueprint solutions rather than critical evaluation of political and historical realities.
- The need for changes in the larger institutional context, not simply in individual organizations or institutions.
- The need to create an effective framework for relationships among actors and stakeholders.

Policies are produced and implemented in an institutional context. Therefore this chapter addresses both policies and institutions. The chapter argues against imposing solutions but for basing reforms and reform processes on basic principles such as the need for information sharing, transparency, accountability, equity, and empowerment of poor women and men.



Following from the critical review of experience, the chapter suggests a way forward organized around five propositions:

1. Institutional reform processes are inherently political, making generalization and advocacy of single-dimensional solutions impractical. Needed instead are insightful analysis of what is possible, coalition building, and effective champions of change.
2. Reforms do not start from a blank slate, but are embedded in a sociotechnical context with a history, culture, environment, and vested interests that shape the scope for change. These well established conditions are in a state of flux that can create opportunities for negotiating reforms, but outcomes are inherently unpredictable.
3. The state will remain the main driver of reform for the foreseeable future but is also the institution most in need of reform. The state must take responsibility for ensuring greater equity in access to water resources and for using water development and management to reduce poverty. Protecting essential ecosystem services is also vital for many reasons, including their importance to poor people's livelihoods.
4. Knowledge and human capacity are critical to implementing successful integrated water resources management and to crafting institutions and policies for reducing poverty, promoting economic growth, and conserving essential ecosystem services. More reliable data are needed and must be shared widely with stakeholders to empower them through greater awareness and understanding. Further, new skills and capacities within water management institutions are critically important—at a time when various forces are weakening governments' capacities to attract and hold people with this expertise.
5. The state cannot make changes alone. Writing new laws and passing administrative orders achieve little by themselves. Investments of time and other resources in public debate based on shared, trusted information pay off by creating knowledge, legitimacy, and understanding of the reasons for change, and increase the likelihood of implementation. Knowledge sharing and debate create opportunities for including and empowering poor stakeholders—those with the most to gain (or lose). Coalitions of stakeholders and political reformers can lead a reform process that will strengthen both the state and civil society to play more effective roles in water management.

Research is urgently needed to support reform processes and reduce the uncertainty of reforms as sociopolitical processes. Paying more attention to ways to institutionalize social equity, poverty reduction, and ecosystem sustainability is critical. Negotiating reforms is the art of the possible, but informing that art with applied professional research will make successful outcomes more likely.

Reforming reform

How can agriculture and water management reform processes be made more effective for achieving food security, environmental sustainability, economic growth, social equity, and poverty reduction? The central message of the Comprehensive Assessment is that we need fundamental changes in how agricultural water is developed and managed. We need to internalize the agriculture-water-poverty-gender-environment nexus, to make real progress toward the Millennium Development Goals.

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Institution refers to social arrangements that shape and regulate human behavior and have some degree of permanency and purpose transcending individual human lives and intentions. Examples are rotation schedules for water distribution, market mechanisms for obtaining crop credit, membership rules of water user associations, and property rights in water and infrastructure. Institutions are often referred to as the rules of the game in society (North 1990). Rules are interpreted and acted on differently by different people. Institutions, including rules, are dynamic and emerge, evolve, and disappear over time.

Organization refers to groups of people with shared goals and some formalized pattern of interaction, often defined in terms of roles such as president, water bailiff, or secretary. Examples are water user associations, government irrigation agencies, privatized water companies, water resources research organizations, farmer unions, consultancy firms, nongovernmental organizations, and regulatory bodies. There is enormous diversity in the form, scope, size, structure, permanency, and purpose of organizations. Bureaucracies are a particular type of organization characterized by role differentiation, hierarchical relationships, and formal, written, rules of procedure and accountability. This makes them very different from less formal local associations, but both are organizations.

A *policy* is “a set of interrelated decisions taken by a political actor or group concerning the selection of goals and the means of achieving them within a specified situation where these decisions should, in principle, be within the power of those actors to achieve” (Howlett and Ramesh 1995, p. 5, quoting Jenkins 1978). Any organization can have policies, but the focus here is on public policy.

How policy works is the focus of this chapter. A rationalist and linear perspective assumes that policymaking has sequential steps from problem formulation, to evaluation of alternatives, to implementation (policy as prescription; Mackintosh 1992). This perspective is associated with expert managerial approaches to intervention and with thinking in terms of models to be applied generally. Policymaking can also be seen as an inherently political activity, with different perceptions and interests contested at all stages (policy as process; Mackintosh 1992). Policy is a bargained outcome, the environment is conflictual, and the process is characterized by diversity and constraint. The intervention perspective emphasizes negotiation, participatory design and implementation, and situation specificity (Gordon, Lewis, and Young 1997). These different perspectives on policy directly translate into different understandings of reform, of transforming policy, institutions, organizations, and governance structures.

A second characteristic of policy processes is whether policymaking is more state centric or more society centric (Grindle 1999). In authoritarian systems policy processes tend to be highly state centric and confined to small circles of power, with negligible influence of civil society. In democratic societies policy processes are more society centric, with recognized opportunities for different interest groups to influence policymaking and implementation. However, a lot depends on the institutions through which civil society involvement takes place. Regardless of how policy is decided, it remains largely symbolic without effective institutions and organizational capacity to transform it into practical reality.

Governance is the way authority is organized and executed in society, and often includes the normative notion of the necessity of good governance. The Global Water Partnership defines water governance as “the range of political, social, economic, and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different level of society” (Rogers and Hall 2003, p. 7). *Governance* is therefore a broad term that includes institutions, organizations, and policies. The World Bank broadens the definition to include the process by which those in authority are selected, monitored, and replaced and the effectiveness of government in implementing sound policies (Jayal 1997).



That requires restructuring the institutions and organizations responsible for agricultural water management and policymaking, which in turn demands a transformation in reform strategies (see box 5.1 for definitions of *institution*, *organizations*, and *policy*). Reforming large formal organizations—governments, investment banks, donors, international nongovernmental organizations (NGOs)—is especially high priority though also most problematic. But local-level and informal institutions and organizations need to change as well. They are coming under increasing pressure as the large formal organizations and institutions have proven so ineffective in responding to new technologies and market conditions and dealing with inequities and social conflict at the local level.

The record in designing and promoting policy and institutional reforms is embarrassingly bad. The social engineering (box 5.2) panaceas of the past 30 years in agricultural water management and use have failed to achieve their objectives [*well established*]. Irrigation development has led to huge increases in food production and enabled large numbers of people to escape poverty, especially in Asia. But it has come at a very high cost financially (often through low returns to investments) and has exacerbated inequity, injustice, and environmental degradation and marginalized rainfed farmers, women, and other excluded people. Extreme poverty continues in many parts of Africa and Asia. If policy and institutional reforms had been more effective, irrigation investments would have yielded far higher benefits at much lower financial, social, and environmental costs.

The Comprehensive Assessment seeks to identify and promote innovative options and approaches to improve management of water resources for food and nature over the next 25 years. In most developing countries policies and institutional frameworks and capacities are inadequate to meet these challenges. Government organizations are often structured to address past challenges (for example, to construct irrigation schemes) and lack the personnel, culture, mandate, and financial resources to respond effectively to what is required of them today. Challenges are more complex. Rising demand for water is leading to scarcity and environmental threats. Climate change is threatening destabilizing impacts. Agricultural markets are globally linked. Expectations are also changing: water management organizations are expected to focus on new social goals such as poverty reduction, enhanced equity through targeting the poor, and environmental conservation.

The only way the Comprehensive Assessment can avoid becoming yet another failed panacea is by identifying practical and innovative approaches to enable institutions to formulate and implement new policies. This chapter contributes with a critical analysis

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box 5.2 | What is “social engineering”?

The term *social engineering* is used here in a narrow sense to refer to linear models for changing societies or organizations, where blueprints are used to replicate a structure in a new context, that may have worked elsewhere. Application of this model to achieve social change—if x then y follows—is based on a misunderstanding of the complex, nondeterministic, and stochastic nature of social organizations. Social engineering as used here does not imply pessimism about the possibility of facilitating and guiding social change, but cautions against overly simple prescriptions.

of experience to date. It offers no magic potions or simple panaceas for investors. *Instead of more social engineering paradigms based on linear, mechanistic models of the sort that have hindered progress before (see box 5.2), we propose a structured, context-specific approach to negotiating and crafting effective institutions and realistic policies that recognize the inherently contentious and political nature of institutional transformation. This is the main message of the chapter.*

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Since most of the literature deals with irrigation, the chapter has a clear bias in that direction.¹ That is not necessarily a problem, for at least two reasons. First, the lessons and principles apply more broadly: integrating management of water for crops, livestock, and fish; promoting water harvesting and microagricultural water management technologies (for example, treadle pumps, bucket and drip irrigation kits); targeting assistance to poor women and men; applying integrated basin management; establishing the conditions for producing more value per unit of water; and giving the environment as well as poor male and female stakeholders a voice in agricultural water policymaking—none of these objectives will be achieved unless we become far more effective at promoting policy and institutional reform. We can learn a lot from the experience of the irrigation sector.

Second, in many countries governments remain heavily involved in irrigation development and management, so that improving irrigation performance through institutional and policy reform would make a large contribution to reducing poverty, promoting agricultural growth, and reducing environmental degradation (see chapter 9 on irrigation). However, there are important differences, depending on the source and use of water. For example, groundwater is a common pool resource (subtractable, high exclusion costs) subject to capture using private technologies and very difficult for government, markets, or community institutions to control or regulate access to (see chapter 10 on groundwater). This makes it more difficult to develop effective institutions to manage groundwater than surface water, which is more observable. Furthermore, fishing, livestock, small household gardens, and other agricultural water uses are often not taken into account in irrigation system management despite their critical importance to poor people's livelihoods.

Assessing institutional and policy challenges

This section discusses the leading role of the state in water development and management and the forces that have triggered reforms. It reviews some of the leading responses to these triggers: blaming and training farmers, organizing farmers, promoting river basin organizations, and experimenting with market-inspired reforms. None of these attempts has substantially improved water management at any scale.

The state will continue to lead institutional reform— but is itself in need of reform

The state has historically played a leading role in water development, both in supporting large-scale irrigation, hydropower, and flood control as well as in facilitating private and small-scale farmer-managed irrigation. The state was the central institution driving the boom in irrigation development in the second half of the 20th century. There are sound



reasons for the state's central role, related to state authority, national welfare and development, and resource mobilization (see chapter 9 on irrigation). Vital natural resources are considered public goods to be regulated, managed, and used by the state for public welfare. Large-scale development of water resources requires substantial financial and human resources and a long-term perspective on returns to the investments. Since ancient times the state has been the only organization with the capacity to mobilize sufficient resources for investments requiring a long-term horizon with a large public good element.

Many countries adhere to some form of public trust doctrine, a principle dating back at least to Roman law, which maintains that control over water is an aspect of sovereignty (Ingram and Oggins 1992) and that the state holds navigable waters and other water resources as a common heritage for the benefit of the people. The state is accountable for allocating a scarce resource for which there is high demand, resulting in decisions that entail tradeoffs between resource sustainability and economic development. High levels of social inequity often require further state intervention to protect the silent vulnerable: the poor, the disenfranchised, the environment, and future generations. This is a tall order for any government and is proving to be a formidable challenge, especially in countries where the state is not effective. State-managed water systems have often performed poorly because of a lack of state capacity, poor incentives for agency staff and water users, and their inability to respond effectively to changes in demand, among other reasons.

While the state remains the main actor to initiate reforms, the challenges are to improve the effectiveness of the state itself and to find the right balance between state action and other institutional actors. States, like market and community institutions, are inherently imperfect. Each has serious limitations. The answer is to find the right balance and to achieve complementarity, no easy feat for policymakers.

Triggers that set off institutional and policy reforms

Governments everywhere are challenged by the need to provide food for their citizens, boost rural incomes, and reduce poverty while sustainably managing natural resources as well as water infrastructure. These challenges have to be managed in a rapidly changing world with competitive global markets, increasing competition for water, and an environment where agricultural welfare depends on much more than water availability. Policies and institutions that may have been effective 20 years ago cannot cope with these new pressures.

There are many sources of pressure for reforms in the irrigation sector. Governments, donors, and investors are concerned that returns on investments are too low, in part because crop yields, prices, and cropping intensity are below expectations. Poverty and socio-economic inequity continue even in relatively "successful" irrigation schemes. The sustainability of both infrastructure and the environment raise serious questions. And increasing demand for water for other uses threatens the water supply for agriculture.

Many governments are implementing reforms triggered by a combination of internal and external pressures. Environmental, social, economic, and political dynamics; regime change; pressures from donors and development partners; and international macro-economic trends such as globalization all play a role.

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Externally driven reforms are less likely to have a lasting impact unless they are also championed by strong domestic actors

In South Africa the end of apartheid provided enormous political momentum for radical reforms to correct injustices in many domains, including the water sector. The internal political push for reform led to participatory processes to formulate a new water act and water policies (de Lange 2004), followed by the more complex and long-term process of implementing the reforms. In Chile tradable water rights were introduced as part of a strong domestic political commitment to a neoliberal, market-driven development paradigm. The military government that came to power in 1973 adopted radical free-market policies and gave a group of US-trained free-market economists unprecedented influence in rewriting Chilean laws to further their economic policy (Carrasco 1995). The results of those water reforms have been mixed (Bauer 1997, 2005). But post-1990 changes in Brazil, Chile, and South Africa (Peña and Solanes 2003) are examples of nationally driven consensus-based reforms that have had substantial impacts.

Evidence from South America (Peña and Solanes 2003) and Asia (Molle 2005; Samad 2005) suggests that externally driven reforms are less likely to have a lasting impact unless they are also championed by strong domestic actors. Pakistan in the 1990s and Indonesia during the Suharto regime are cases in which irrigation reform was on the national agenda primarily because of pressure by international development funding agencies (van der Velde and Tirmizi 2004; Bruns 2004). There was little domestic momentum supporting reform. In both countries the irrigation bureaucracies neutralized whatever reform efforts were undertaken. In countries of geopolitical importance to the major donor countries, such as Egypt and Pakistan, international development agencies seem to have had little bargaining power to encourage or enforce reform (on reform in Egypt, see Merrey 1998).

Mexico and India are examples of combined internal and external triggers for reforms. In Mexico the seeming “big bang” irrigation reform of the early 1990s in fact had a long and complex history (Rap, Wester, and Pérez-Prado 2004). Changes in the relationship between the agencies responsible for agriculture and water resources and the evolution of their control over water resources, together with the role of international funding agencies in policy debates and in financing infrastructure development, culminated in far-reaching irrigation reform just at the time of a presidential election. Not only did the organization of irrigation management change, but the water bureaucracy regained its lost autonomy.

In India external influences on irrigation reform included both international funding agencies and participatory approaches to water management introduced by Ford Foundation–sponsored action research programs based on the Philippines irrigation reform models of the 1970s and 1980s. These experiments, combined with domestic debates on “underutilization” of irrigation systems, came to be known as “participatory irrigation management” reform. However, lacking strong political coalitions to support the reforms and their almost exclusive focus on local management, local successes were not scaled out and up. Andhra Pradesh attempted a big bang approach to irrigation reform in 1996–97 (based partly on the perceived quick and radical change in Mexico), enacting far-reaching statewide legislation, with strong political support. Vested interests in the water bureaucracy and at local levels limited its impact, however.



The Andhra Pradesh case shows that political will at the top may not suffice. Unless water users and government line agencies are strongly behind the reform, results will be limited because appropriation of the reform initiative by vested interests is relatively easy (Mollinga, Doraiswamy, and Engbersen 2004).

Failed responses to reform

What have been some of the main responses to these triggers of reform?

Blaming then training the farmers while ignoring the real problem. Triggered by the Asian food crises of the 1960s, governments made huge investments in new irrigation schemes, supported by bilateral donors and development banks (see chapter 9 on irrigation). By the mid-1970s, however, evidence was growing that while the green revolution had significantly reduced food shortages, the new publicly constructed and managed irrigation systems were performing far below expectations.

The initial response was to assume that the problems were largely on the farm, that farmers were mismanaging water and needed training to improve irrigation performance. In some cases farmers were perceived as illiterate, conservative, and too “traditional.”² Throughout Asia the response was to develop programs that focused on educating farmers at the farm or turnout level on “proper” scientific irrigation and to impose “improved” infrastructure at this level. Examples include on-farm water management projects in Pakistan, the Command Area Development Authority in India, and similar large investment projects in Egypt, Indonesia, the Philippines, and elsewhere.

This blame-the-farmers analysis conveniently defined the problem as outside the domain of the managing water agencies and placed it squarely on the farmers’ shoulders. The conditions to which farmers were responding, such as unreliable water services, were not acknowledged. The educate-the-farmers attitude persists today as a component of social engineering approaches to water sector reform.

Despite growing evidence that farmers were responding to unreliable and inequitable delivery at the main canal level (Wade and Chambers 1980)—which led the International Irrigation Management Institute in the late 1980s to focus its research at these higher levels (Merrey 1997)—the on-farm focus developed a momentum of its own that continued into the mid-1990s. Huge sums of money were spent with little visible impact on irrigation performance.

Organizing the farmers through irrigation management transfer, but ignoring the preconditions. An important dimension of the early attention to on-farm problems was attempts to organize farmers into water user associations. Observations showed farmer-managed irrigation systems to be functioning effectively, so the hope was that organizing farmers in government-managed schemes would show similar results. Water user associations, farmer training, and on-farm infrastructure development were expected to lead to better irrigation performance while also reducing government investment and operation and maintenance (O&M) costs. At this early stage, water user associations were perceived in narrow terms: they would take responsibility for rehabilitation, maintenance, and water

The initial response to the poor performance of irrigation systems was to assume that farmers were mismanaging water—conveniently defining the problem as outside the domain of the water agencies





Pilot projects to transfer management from the state to user groups on government-built schemes have rarely been scaled up effectively to cover larger areas

distribution of irrigation systems at the tertiary level (the smallest canals from which a number of farmers take water directly). Before the 1990s few attempts had been made to give farmers a voice at higher levels of irrigation schemes (Gal Oya in Sri Lanka was an example; see Uphoff 1986, 1992). In a delayed response to pressures to “roll back the state,” some governments made more serious attempts at irrigation management transfer during the 1990s, a movement that continues today and even has its own network (International Network for Participatory Irrigation Management, www.inpim.org).

Pilot projects to transfer management from the state to user groups on government-built schemes have rarely been scaled up effectively to cover larger areas. Many governments were reluctant, even when project documents promised to do so. Another reason was the failure to recognize the critical differences between government- and farmer-managed irrigation systems. Management transfer programs in countries as diverse as Australia, Colombia, Indonesia, Mali, Mexico, New Zealand, Senegal, Sri Lanka, Turkey, and the United States have demonstrated some positive results from involving farmers and reducing government expenditures, but they have rarely shown improvements in output performance or quality of maintenance (Vermillion 1997; Vermillion and others 2000; Samad and Vermillion 1999; Vermillion and Garcés-Restrepo 1998). The few notable exceptions are middle-income developing countries such as Mexico and Turkey and high-income countries such as New Zealand and the United States. Research in the 1990s on irrigation management transfer processes and outcomes produced many case studies and some useful guidelines for implementation (for example, Vermillion and Sagardoy 1999). There is broad agreement on the necessary conditions, but very few cases where they have been met on a large scale (box 5.3).

Irrigation management transfer and similar decentralization schemes can also have unintended negative consequences, for example, by strengthening local strongmen (Klaphake 2005; Mollinga, Doraiswamy, and Engbersen 2004) or giving men unequal power over women (Meinzen-Dick and Zwarteveen 1998). Similarly, although some pilot projects have improved land productivity and helped poor farmers, most integrated watershed management projects have not delivered the expected benefits (Kerr 2002). Thus policies to devolve management to local collective action institutions have not been the solution to better performance of water systems.

Gulati, Meinzen-Dick, and Raju (2005) suggest that most user organizations failed in India because they focused on areas of concern to the government but not necessarily to the farmers. To be successful, they recommend that user organizations receive the authority to levy water fees, conduct maintenance, and represent farmers’ interests to government agencies. Moreover, where user groups have stronger water rights, farmers’ incentives to participate in O&M may also be stronger. Where farmers are involved in maintenance activities, the resources mobilized can be substantial—as much as several times the irrigation charges paid to the state. This demonstrates the potential—but the implication is that successful irrigation management transfer requires much greater policy and institutional changes [*well established*]. Even where the formal conditions seem to be in place, however, as in Andhra Pradesh, India, there is considerable evidence that the sticking point is the unwillingness of government organizations to delegate or share power with user organizations.

**box 5.3 | Conditions for successful irrigation management transfer**

The following conditions have been identified as necessary for successful irrigation management transfer:

- Firm, consistent long-term political commitment.
- Legal and political recognition of farmer organizations, including their right to raise revenue, enter into contracts, and apply sanctions.
- Clearly recognized and sustainable water rights and water service.
- Infrastructure that is compatible with the water service, water rights, and local management capacities (Perry 1995).
- Well specified management functions and assignment of authority.
- Effective accountability and incentives for management.
- Arrangements for viable and timely conflict resolution.
- Benefits that exceed costs and are proportional to farmer investments.
- Ability to mobilize adequate resources for irrigation.

The following conditions are important for sustainability following management transfer:

- Support services to farmer organizations as they evolve from single-purpose operation and maintenance to multipurpose commercial organizations.
- Periodic financial audit of the farmer organization.
- Higher level federations of local organizations for planning, allocating, and enforcing resource use at watershed or aquifer levels.

Source: Samad and Merrey (2005) and Merrey (1997), synthesizing from other sources.

This takes us back to the fundamental issue: while governments may be willing to transfer the hard work and expense of local water management to users, they are rarely willing to restructure their bureaucracies or to make the other legal and structural changes needed to achieve a new balance of political power favoring users (Mexico is a partial exception; see Rap, Wester, and Pérez-Prado 2004). Similarly, after a few papers in the 1980s (Wade 1982; Repetto 1986), the continuing problem of corruption—an institutional problem par excellence—has hardly been studied. Box 5.4 provides some recent insights into this issue.

Promoting river basin organizations—but one size rarely fits all. A more recent trend has been to promote river basin organizations to manage competition for water at the basin level. There is general agreement on the long-term benefits of effective integrated management of river basins, especially with increasing competition and environmental degradation. But attempts to impose particular models of river basin organizations in developing countries, especially models derived from the experiences of rich countries, are not likely to succeed because the objectives and institutional contexts differ so greatly (Shah, Makin, and Sakthivadivel 2005). Indeed, having a formal organization, even in highly developed basins, has been shown not to be a necessary condition (Svendsen 2005a).

Attempting to build organizations for managing river basins that represent the interests of all water users, including small farmers, is fraught with difficulties (Wester, Merrey,

box 5.4 | Reducing corruption in the water sector: examples of what works

Major sources of corruption in irrigation are lack of transparency leading to asymmetric information, and incompatible incentive structures between officials and farmers.

Preventing information asymmetry. In the Bolivian Andes, where traditional irrigation schemes apply the principle of rotating tasks (*cargos rotativos*), members of different age groups are responsible for different tasks in the operation and maintenance of the irrigation system (Huppert and Urban 1998). Over time, everyone becomes familiar with all the essential tasks needed to keep the system functional. This prevents any individual from gaining specialized knowledge not available to the others. It prevents the emergence of an asymmetrical information problem and thereby limits the risks of corruption and manipulation. Other means of limiting asymmetrical information include the use of comprehensive management information systems and co-ownership and team formation (for social control).

Improving incentives. In the Gascogne the French government is using a franchise system to prevent potential moral hazard risks in irrigation (Huppert and Hagen 1999). Compagnie d'Aménagement des Coteaux de Gascogne (CACG) was awarded a 10-year concession to provide operation and maintenance services to water users in irrigation systems. If CACG does not perform acceptably, another provider will be chosen for the next term. Creating a credible "threat" of competition between providers can act as an incentive not to deviate too far from the clients' interests when deciding on the allocation of scarce resources.

Other ways to improve incentives and bring the service providers' interests in line with those of clients include bonus payments and contractual provisions limiting the service provider's alternatives for action. Well functioning management information systems may also help. A guiding principle is to try to link service level and quality to the respective actor's payoffs (monetary and nonmonetary). Thus unifying decision rights over input resources with the right to collect payoffs in relation to the service benefit from those decisions may solve the problem. However, this must be coupled to the empowerment of farmer-clients to gain access to relevant information, especially where external influences (such as varying water availability) make it difficult to establish a fixed level of service. There are very few examples of such approaches being introduced and institutionalized in developing countries. Some years ago Svendsen and Huppert (2000) thought that the Andhra Pradesh, India, case was such an example, but more recent work (Mollinga, Doraiswamy, and Engbersen 2004) suggests that what they observed was not sustained.

Source: Huppert 2005.

and de Lange 2003; Wester, Shah, and Merrey 2005). The idea that a specific organization is necessary for integrated management of a basin may be based on the false belief that the physical reality of an integrated river basin system requires an organization coinciding with its boundaries. This not only ignores the fact that human social systems have entirely different (and often highly flexible) boundaries, but confuses organizations and institutions.

Governments are facing the complexities of managing increasing competition for water in river basins before they have found solutions to local and irrigation scheme-level problems. In many developing countries small-scale irrigation farmers are under threat from other sectoral demands for water considered of higher economic value. This threatens the livelihoods of millions of small farmers in economies with few alternative sources of employment (Svendsen 2005b). An externally imposed one-size-fits-all strategy for



managing such complexity is unlikely to be effective. (Chapter 16 provides a more detailed analysis of river basin management issues.)

Experimenting with market-inspired reform has shown little promise so far. In electricity services, healthcare, and some other development sectors, disillusionment with state agencies has led to the promotion of markets and private sector participation. In the agricultural water sector this trend has been restrained by many sources of market failure, including the existence of monopolies and the potential for serious externalities. There have nonetheless been several types of reforms associated with some forms of privatization or market instruments.

Private sector involvement. Reforms associated with greater private sector involvement in the construction and management of water systems are often advocated in response to inefficiencies of public sector agencies, with the assumption that private companies will have lower labor costs or stronger incentives to provide better services. Private investment in construction is more common in the domestic water supply and sanitation sector than in large-scale irrigation, but the rapid expansion of private groundwater irrigation and pumping, particularly in South Asia, represents massive investments by individual farmers (see chapter 10 on groundwater; Shah and others 2000; Heierli and Polak 2000; Polak 2005). Privatization of O&M has been a component of many irrigation devolution programs, particularly where pumping or other equipment management requires specialized skills that farmers may lack. A private company may be hired to operate the pumps or heavy maintenance equipment, paid for by farmers or state budgets. The impact on service provision is affected by the arrangements for authorization, payment, and accountability (Huppert, Svendsen, and Vermillion 2001). Attempts to implement public-private partnerships for urban water and wastewater services in developing countries have had a high failure rate, mainly because of economic volatility or because effective monitoring and regulation systems are lacking (Braadbaart 2005).

Positive externalities may justify public investment in irrigation systems: the benefits are social (lower food costs to consumers, promotion of economic growth) and often slow in coming. Private investment can be encouraged for constructing complementary infrastructure, such as roads and electricity, and for providing individualized technologies, such as pumps and drip systems. In most developing countries interest rates are high and long-term credit is not available. It is unrealistic to expect that private investment can substitute for the traditional role of governments in investing in irrigation projects.

Nevertheless, there is an important role for the private sector in making low-cost agricultural water management technologies such as treadle pumps, small power pumps, and bucket and drip kits more widely available. Such technologies can be readily acquired and used by individual smallholder farmers, both men and women, and in many situations can substantially improve nutrition and incomes (see chapter 4 on poverty; Shah and others 2000; Mangisoni 2006; Namara, Upadhyay, and Nagar 2005; Merrey, Namara, and de Lange 2006). Restrictive policies in some Sub-Saharan African countries are retarding the wider use of these technologies, in marked contrast to South Asian countries.

Economic incentives for water allocation. Two major types of reform aim to create economic incentives for improved water management: water pricing and tradable water

The idea that a specific organization is necessary for integrated management of a basin may be based on the false belief that the physical reality of an integrated river basin system requires an organization coinciding with its boundaries





The conditions necessary for market-based reforms to contribute to sustainable water management in agriculture are extremely rare in developing countries

rights. With water-pricing policies, payment goes to the state or water agency, whereas with tradable water rights payment goes to the holder of the rights.

Water pricing may be used to create incentives for water conservation (which requires some form of volumetric pricing) or to raise resources for construction or O&M. However, such efforts have often foundered on political opposition as well as difficulties in measuring water deliveries and collecting fees (Dinar 2000; Molle and Berkoff forthcoming). Unreliable water delivery services are another reason farmers resist paying.

Generally, pricing policies for recovering the costs of infrastructure development and O&M, applied as a blanket measure, risk seriously aggravating water deprivation and poverty. A requirement to pay water fees may cause some poor farmers to give up farming. The potential to reduce poverty through subsidized new infrastructure development would be forfeited as well. Pushing poor people out of the agricultural water business is a perverse form of water conservation and demand management. A sliding-scale pricing strategy is one possible solution (Schreiner and van Koppen 2001). In many developing country situations, however, as in Sub-Saharan Africa and parts of India, formal irrigation systems may not be the most effective way to reduce poverty. Subsidized irrigation undermines the returns to already poor and marginal rainfed farmers and diverts scarce investment resources from where they may do the most good in terms of poverty reduction—improving rainfed agriculture. Critical to improving returns to rainfed agriculture is better agricultural water management, but this can often be achieved with lower cost interventions such as rain-water harvesting, conservation farming, and treadle pumps (see chapter 4 on poverty and chapter 8 on rainfed agriculture).

Tradable water rights represent the greatest degree of privatization in water management, because they involve the private sector in water allocation as well as management. Individuals with water rights have the potential to gain from transferring their water to others through water markets, thereby offering positive as well as negative economic incentives for demand management. In addition to clearly defined water rights (including transfer rights), water markets require physical infrastructure that allows water to be transferred from one user to another, and institutional arrangements to protect against negative impacts on third parties when water is transferred (Easter, Rosegrant, and Dinar 1998 and Rosegrant and Binswanger 1994).

Market-inspired reforms have not lived up to their promise. Earlier enthusiasm for market-based water reforms was at best premature. The conditions necessary for market-based reforms to contribute to sustainable water management in agriculture are extremely rare in developing countries and uncommon even in rich countries. The Chile and Valencia (Spain) water market reforms have been held up as examples, but closer inspection raises many questions (Bauer 1997, 2005; Ingo 2004; Trawick 2005). As in all market and private property rights situations, questions of regulation (who sets the rules and what are the rules?) and capture of benefits (who wins and who loses in imperfect markets?) are central for assessing market-inspired reforms. A phased approach of vesting rights in existing users and currently excluded users and of clarifying regulatory mechanisms before developing detailed water market mechanisms may be more appropriate and politically more feasible than a rush to markets (see Bruns, Ringler, and Meinzen-Dick 2005).



Roads not traveled: empowering users and restructuring bureaucracies. Outside of some NGO-led watershed management projects, empowerment of water users (especially women and ethnic minorities) and radical bureaucratic restructuring are rarely discussed. Policies for irrigation management transfer sometimes do incrementally change the balance of power in favor of water users (for example, in Turkey), but they can also be neutralized or reversed (for example, in Andhra Pradesh, India; Indonesia; and the Philippines). Why there is so little to show after more than 30 years of attempted agricultural water management reforms is the topic of the next section.

Critical review of experiences: what are the lessons?

This section critically reviews approaches to institutional reform in the agricultural water management sector, highlighting three themes:

- The dominance of social engineering paradigms and associated problems.
- The benefits of a “problemshed” perspective rather than a watershed perspective.
- The relevance and advantages of plurality in organizations, institutions, and water management objectives.

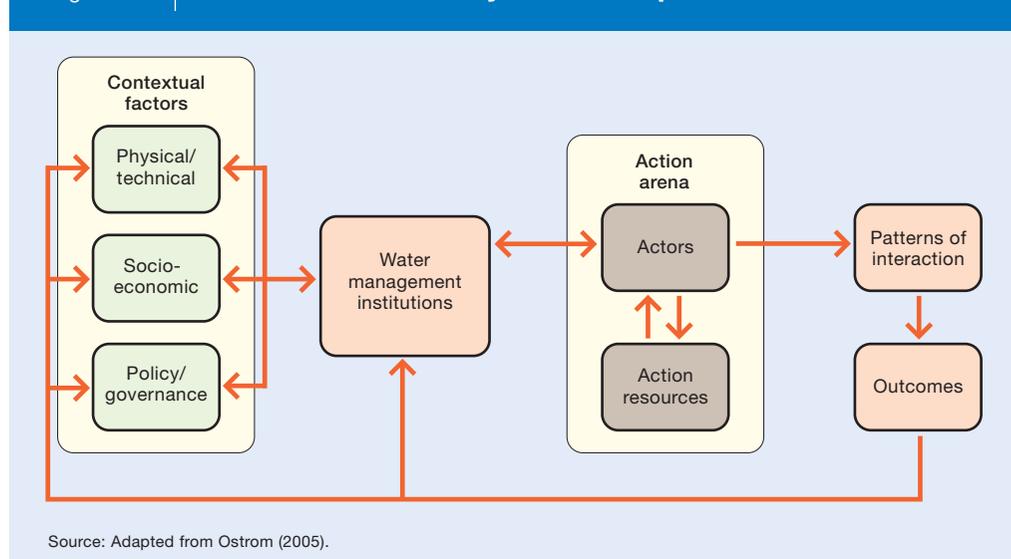
Figure 5.1 and box 5.5 summarize two conceptual and theoretical frameworks that heavily influenced this review.

The tendency to think of institutions as things rather than as relationships and processes and to apply engineering metaphors and approaches rarely leads to effective institutional change

Need for context-specific, not social engineering solutions

Policies emphasizing public management, community-level collective action, and private sector roles follow different institutional approaches, but they share several tendencies.

figure 5.1 | Modified institutional analysis and development framework



box 5.5 | **Essential elements of sustainable and effective institutions and policies**

Tactics for reforming well entrenched policies and institutions are contingent, context specific, and nonlinear, and therefore the outcomes are uncertain. Nevertheless, the underlying principles of successful water resource management systems can be derived from theory and practical experience:

- Publicly available knowledge about resource availability over time and space.
- Policies establishing allocations, rights to the resources, priorities, cost recovery, and governance (who decides and how).
- Rules, laws, and regulations codifying how policies are to be implemented.
- Definition of roles and responsibilities (formal or informal organizations) for implementation of the rules.
- Infrastructure to deliver the services in terms of the rules and allocations.
- Incentives for people to participate and invest (relating especially to the profitability of water use in agriculture).
- Capacity to adapt to changing circumstances based on lessons (learning organization, adaptive capacity).

These principles are applicable in all locations and at all scales. Worldwide, there are many successful sustainable long-standing water resources management systems. These schemes are characterized not only by the basic elements of success but by a large degree of consistency and mutual synergy among the elements (Ostrom 1990, 1992). Water schemes that are not performing well are either missing one or more of the elements or have a mismatch among them.

Clearly the relationships among these elements are complex, and neither fixed nor absolute. They are interactive and dynamic with feedback loops. Change is based on new information. The dynamism is contentious but also a creative political process.

Intervening to change one element without paying attention to its consistency with the others is a recipe for failure—one that has been cooked repeatedly.

The nature of the water resource both sets limits on what kinds of policies or infrastructure are possible and provides opportunities to choose. Policies, rules, organizations, and infrastructure based on perceived water surplus will become increasingly counterproductive as water becomes scarcer or environmental concerns take center stage (Wester, Shah, and Merrey 2005). This is the fundamental problem facing large Asian irrigation bureaucracies: these organizations, the infrastructure they have constructed, and the policies and laws which they were implementing are now inappropriate as conditions have changed, yet the political process has failed to keep pace and introduce reforms needed to sustain and optimize the stream of benefits from these huge past investments.

Source: Adapted from Perry (1995, 2003a, 2003b).

One is an attempt at social engineering, the assumption that institutions can be shaped and reshaped like the physical landscape and that the role of institutional analysis is to chart some kind of blueprint for developing the “right” kinds of institutions (see box 5.2). Another is to compare the actual performance of one type of institution with the anticipated performance of an alternative type. This creates unrealistic expectations for the alternative type of institution. Moreover, repeated underestimation of the time, effort, and investment required to change institutions means that institutional reforms remain incomplete, especially if they are tied to a time-bound, donor-funded project. The result



is that the expectations are not met, leading to yet another cycle of disappointment and experiments with another type of institution in search of a better “solution.”³

The tendency to think of institutions as things rather than as relationships and processes and to apply engineering metaphors and approaches rarely leads to effective institutional change. Key aspects of institutions are that they persist over time and that change is path dependent—where an institution is going is shaped by where it has been (North 1990). These well established fundamentals are too often overlooked in the discussion of “models,” “best practices,” “toolboxes,” and “blueprints,” which often suggest that generalized sets of solutions are possible and undervalue the importance of context specificity and process. The disappointing outcomes of the numerous attempts to impose water user associations in such diverse contexts as South Asia, Sub-Saharan Africa, and the transition economies of Central Asia illustrate this error (box 5.6; Goldensohn 1994; Sivamohan 1986; Sivamohan and Scott 1994; Wade 1982; Shah and others 2002).

Instead of such social engineering approaches it is more useful to think of organic analogies, in which each institution is a product of its environment, rather than a replica of institutions elsewhere. Institutional change may be influenced, catalyzed, guided, or enabled, but not forced. Approaches need to be grounded in the local sociocultural, political, and physical environment. Changing long-standing social arrangements requires leadership and a structured long-term process. Reform tends to be slow and gradual, in an open-ended, nonlinear process with a high level of uncertainty. The processes are the outcome of human interaction, with scope for learning and adapting to new conditions.⁴

From watershed to “problemshed”

Until recently, water sector reform focused largely on irrigation. Irrigation policy reform has rarely been integrated with agricultural policy reform, often because the two are the responsibilities of different ministries. This disconnect continues and has not been well studied.

In the past decade the concept of integrated water resources management has come to dominate water reform discussions (GWP 2000; Merrey and others 2005), directing attention to the interconnections and interdependencies of different water uses and users. Irrigation needs to be understood in the context of multiple uses of water in both a river basin and a local context (see chapter 16 on river basins). Further, irrigation is increasingly seen as a threat to environmental sustainability (see chapter 6 on ecosystems), and questions have been raised about its impacts on poverty (see chapter 4 on poverty). At a time when irrigation institutions are still ineffective at managing water within irrigation schemes, they must now also defend the interests of irrigators against increasing competition for water, often from politically powerful entities (Vermillion and Merrey 1998; Wester, Shah, and Merrey 2005) and become more effective at addressing poverty, equity, and environmental issues. Thus water governance, management, and use must be considered comprehensively, within a problem analysis context that looks at “problemsheds”—the boundaries of a particular problem as defined by a network of issues—rather than as watersheds.

Water governance, management, and use cannot be treated independently. Both the causes of water problems and their solutions are embedded partly in processes and forces

box 5.6 | **The state and water reform in Central Asian transition economies**

Since the collapse of the Soviet Union there have been major changes in the agricultural sectors of the successor states. During the Soviet period the inputs for agricultural production were controlled and organized by the government in large-scale state and collective farms. After independence the successor states chose different privatization strategies. In Kazakhstan, Kyrgyzstan, and Tajikistan agricultural land was privatized and state control of crop production was abandoned. Turkmenistan and Uzbekistan continued tight governmental controls regulating supply and demand for agricultural inputs and products.

State and collective farm employees were specialized workers with only limited experience in all aspects of farm management. With privatization accountants, tractor drivers, teachers, and nurses became farmers. On state and collective farms large-scale farm inputs and outputs were centrally coordinated; with privatization this stopped and created a high degree of vulnerability.

Irrigation systems were designed for large-scale farms and mainly for a single crop. When these farms were divided into smaller units, water management became less efficient and created conflicts among farmers. Since privatization, small farmers have tended to shift from the cash crop cotton to food crops. Because of the old irrigation infrastructure, an appropriate irrigation service cannot be provided except by increasing the overall amount of water (Ul Hassan, Starkloff, and Nizamendikhodjaeva 2004).

Some irrigation systems were built with a specific political rationale, when economic circumstances were different. Energy costs were low, and the Soviet government wanted to stabilize rural communities and secure borders. Pump stations were constructed to pump water to heights of 130 meters. With independence large-scale irrigation systems were often no longer financially feasible. According to a World Bank survey, in Tajikistan and Uzbekistan 11%–64% of irrigated land faces negative gross margins (if real energy costs are charged) affecting 250,000 people in Tajikistan and more than 1.1 million in Uzbekistan (Bucknall and others 2001).

Irrigation management transfer with full cost recovery is not feasible in certain regions of Central Asia because of high costs and low returns. It must be accompanied by complete redesign and reconstruction of irrigation systems rather than rehabilitation.

Source: Based on material provided by Kai Wegerich, contributing author.

in other domains. For example, farmers' water use behavior depends on household allocation decisions on labor, time, money, and other resources; the profitability of irrigated agriculture, fisheries, and livestock; the overall risk environment; and many other factors, and only partially, if at all, on increasing water-use efficiency. Intersectoral water allocation is to a large extent a product of broader political and economic considerations, such as the political clout of urban areas and industrial interests (see Molle and Berkoff 2005).

Failure to take this embeddedness into account has been a key factor limiting the success of previous reforms. Negotiating and crafting new types of organizational arrangements for managing irrigation, for example, are not possible without considering broader institutional arrangements and policies in the water, agricultural, and rural sectors as well as currency, trade, and overall macroeconomic policies. For example, the success of reforms of the Office du Niger in Mali lay in broader reforms to enhance the effectiveness of input and output markets as well as the restructuring of the management agency (box 5.7).

**box 5.7 | A case of effective reform: Office du Niger, Mali**

Office du Niger in Mali is a large-scale irrigation scheme created during the colonial period and expanded since then to cover about 70,000 hectares. Until about a decade ago it was seen as a hopeless case: low productivity, dissatisfied farmers, bankrupt. Today, the World Bank and others showcase Office du Niger as an example of what major policy, organizational, and institutional reforms can achieve. Between 1982 and 2002 rice yields increased by a factor of four, total production increased sixfold, incomes increased dramatically even as population exploded, women gained opportunities in farming and business, and new businesses were created. How did the government of Mali achieve this?

Aw and Diemer (2005) provide a detailed case study of the 20-year process of increasingly successful reforms. Until 1982 farmers had no voice; they were dissatisfied but poor and disorganized. However, various external and internal pressures forced the government to consider new options. Donors declined to finance further expansion until the scheme became financially sustainable. The government agreed to accept small reforms for obtaining assistance with physical improvements, including provision of credit to farmers and the first steps to organizing farmers as partners in scheme management. The support of a small group of Malian officials was crucial. Rice yields doubled, and power began to shift from agency staff to farmers as more government officials accepted the reforms. An alliance of the ruling party and donors introduced further reforms, leading to higher production and more control by farmers. After 1991 the one-party government was replaced by a democratic government committed to market reforms and further downsizing of the agency. Consultations among Office du Niger staff, farmers, ministries, and donors led to new legislation providing security of land tenure, full cost recovery, and joint management of the scheme by elected farmers' representatives and agency staff. A new balance of power was institutionalized through three-year, three-party (agency, government, farmers) performance contracts.

Aw and Diemer argue that some of the lessons learned in Mali are applicable to other countries. First, irrigation reforms are most successful when they are an integral part of a larger reform process. Second, government can begin with small politically feasible reforms that lead to benefits for farmers, creating a platform for building coalitions for further reform. Third, the key role played by powerful nonirrigation stakeholders, in Mali's case the ruling political parties and later the business community, enabled increasingly significant reforms. Fourth, there was a high degree of learning by doing, facilitated through the monitoring of results by farmers and others and sharing them widely. Finally, the reform process was long term, and the field staff committed to the welfare of farmers, with good access to decisionmakers, played a key role.

Source: Aw and Diemer 2005.

In practice, water governance, management, and use remain highly sector focused and demarcated. This is visible in the design of water organizations and in the disciplinary focus of water resources education. It is also characteristic of some multilateral investment banks and donors' internal structures, limiting their ability to foster reform in a broader national context (Molle 2005) and to foster innovative integrated water development at the local level through multiple-use water supply systems (see chapter 4 on poverty; Moriarty, Butterworth, and van Koppen 2004). Most observations in this chapter are as relevant to donors and multilateral banks as to developing countries, though less well studied at that level. A recent analysis has documented the serious institutional issues affecting the

performance of multilateral banks and their relationships with client countries in Sub-Saharan Africa (Morardet and others 2005). The positive side of a single-purpose approach is that focused and concerted action is possible. This focus needs to be maintained but set in a broader, more comprehensive problem analysis context.

Three pluralities: multiple actors, institutions, and functions

Water governance, management, and use are characterized by three types of plurality—complex, overlapping, and sometimes competing networks of actors, rules, functions, and organizations.

- Multiple actors and organizations involved in water decisionmaking at different levels.
- Multiple rules and procedures applicable to a specific issue, as in legal pluralism.
- Multifunctionality of water resources systems and the range of values attached to these functions.

Clearly, such complexity and multiple pluralities require multiple reform strategies. However, policies for agricultural water management have tended to adopt “simplifications” (Scott 1998) to make rural societies more amenable to social engineering by states, to shape landscapes and people to their images of modernity. Standardized approaches and solutions are usually problematic. Our review is empirically oriented rather than theoretically or ideologically focused: the three pluralities exist and have to be dealt with more adequately in water sector reform than they have been so far to make progress on sustainable human development. Because of space limitations, we take for granted macro-level public economic and other policies and their impacts on water development but acknowledge their importance (Peña, Luraschi, and Valenzuela no date; Allan 1998; Allan, Thurton, and Nicol 2003).

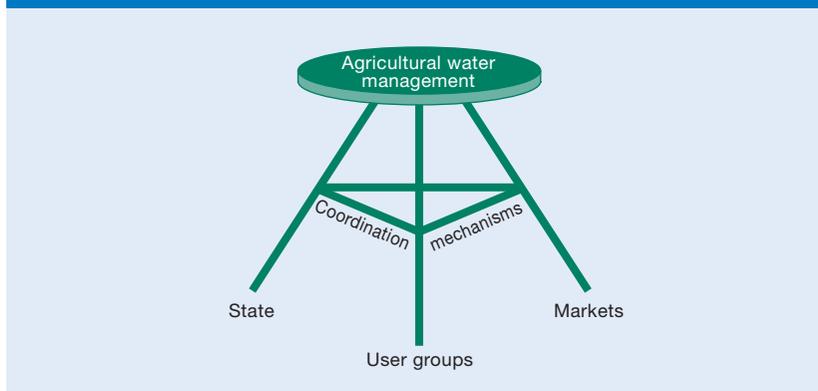
Multiple actors in polycentric governance. There are many institutional and organizational models to choose from for water resources management: from direct public management to direct private management and from delegated management by an agency or utility to community self-management. But even if a system is formally under government management, farmers and private contractors still play an important role, and even in farmer-managed systems the state and markets are still critical.

Unfortunately, most water sector reform has been single-organization or single-institution focused. Most irrigation reforms have focused on one type of institution or organization: reform of water bureaucracies, irrigation management transfer to water user associations, development of water markets, or the introduction of river basin authorities. Almost invariably these reforms have ignored gender issues. This is like building on a single pillar. A more appropriate model is a tripod with several cross-supports (figure 5.2). Through mutual support the whole structure is stronger and more flexible than a single pillar.

What is critical is not finding a single “right” type of institution or organization but identifying the conditions under which each can play an effective role, understanding what can be done to strengthen them, and ensuring effective coordination and negotiation mechanisms among them. Huppert (1997) and Huppert and Urban (1998) provide a framework for examining the “exchange relationships” among organizations in irrigation



figure 5.2 | Tripod of water management



maintenance and service delivery, focusing on who authorizes the service, who provides it, and who pays for it, and the modes and mechanisms that govern the service relationship. Examining these relationships can reveal when the institutional arrangements create incentives for effective water management and when there are critical gaps that lead to poorly functioning systems.

Coordination and negotiation among organizations are particularly important when all stakeholders affected by water management are not represented in the organization entrusted to manage the water:

- If responsibility for water management is transferred to an irrigators association, other water users in the local community will be affected but may not be included in official decisionmaking.⁵
- Decentralization to locally elected government bodies may include additional (local) stakeholders in water resources decisionmaking, but not those living upstream or downstream who are affected by management of the resource.
- A local government agency is often accountable to the central government, not locally. Sector divisions often limit their accountability to all stakeholders.
- In most cases regulation is vested with the state as the representative of the people, but there may also be separate regulatory boards with representatives of at least some key stakeholder groups (farmers, fishers, environmental agencies, or groups) included. An example is the Project Management Committee in Sri Lankan irrigation systems (box 5.8). The definition and selection of who counts as a stakeholder are crucially important aspects of constituting inclusive planning and decisionmaking institutions.

Most reforms have focused on the organizations directly involved in irrigation or water management and not on the many other institutions that affect how water is managed in agriculture, from other sectors and other water uses to the overall economy, broader social and religious institutions, and other government agencies. Although some analysts and policymakers would like to streamline this complexity, for example, by collapsing it into a single river basin organization with a very broad mandate, organizational complexity persists. Applying integrated water resources management principles and achieving

box 5.8 | Multiple water uses in Sri Lanka

The Kirindi Oya system in southern Sri Lanka illustrates the complexities in meeting the needs of different types of users. Water is used for field crops, household gardens, livestock, fishing, and domestic use. Each use category does not represent a homogeneous interest group, but may be divided between the old irrigated area built hundreds of years ago, and the new area, with less reliable water. Each group may have its own association, and a government agency may be charged with responsible for water use. The Project Management Committee, which decides on water release patterns, does not include cattle owners or fisher groups; and even domestic water supply and environment organizations are not formally represented. Garden irrigation, done mostly by women, is not a recognized water use and has neither a user organization nor a government agency to advocate for its water needs. Fishing and gardening add substantial value but are not formally recognized. Involving these other water users is essential for any plans to balance water use in a basin or locality.

Multiple water users in the Kirindi Oya system in Sri Lanka

Use	Users	Basis of claim	Supporting institutions
Field irrigation	Old area farmers	Customary use Recognized by government	Project Management Committee Farmer organizations
	New area farmers	Government allocation	Project Management Committee Farmer organizations
Garden irrigation	Mostly women	Well ownership Proximity	Well ownership Local norms
Livestock	Pastoralists	Historic use Not recognized by project	Cattle-owning farmer organization (not active in water issues) Divisional Secretary
	Farm households	Needed for livelihood	Local norms
Fishing	Mostly male farmers, part time	Use over time Membership in Fisher Cooperative Societies	Fisher Cooperative Societies (not in Project Management Committee)
Domestic	Old area households	Customary, necessary use Special allocations from reservoir	Project Management Committee reserves water for special water issues in dry season
	New area households	Reservoir allocations for water system Membership in standpipe committee Payment of fees	National Water Supply and Drainage Board (not in Project Management Committee), Standpipe committees Local norms
Environmental	Wildlife		Department of Wildlife Conservation (not in Project Management Committee)

Source: Adapted from Bakker and others (1999); see also Renwick (2001).

the Millennium Development Goals require cooperation among many actors and sectors beyond agriculture and water, but promoting interministerial and interdepartmental cooperation is difficult everywhere.

Ostrom, Schroeder, and Wynne (1993) argue that “polycentric governance” arrangements have advantages in allowing for experimentation in developing rules to fit a range of

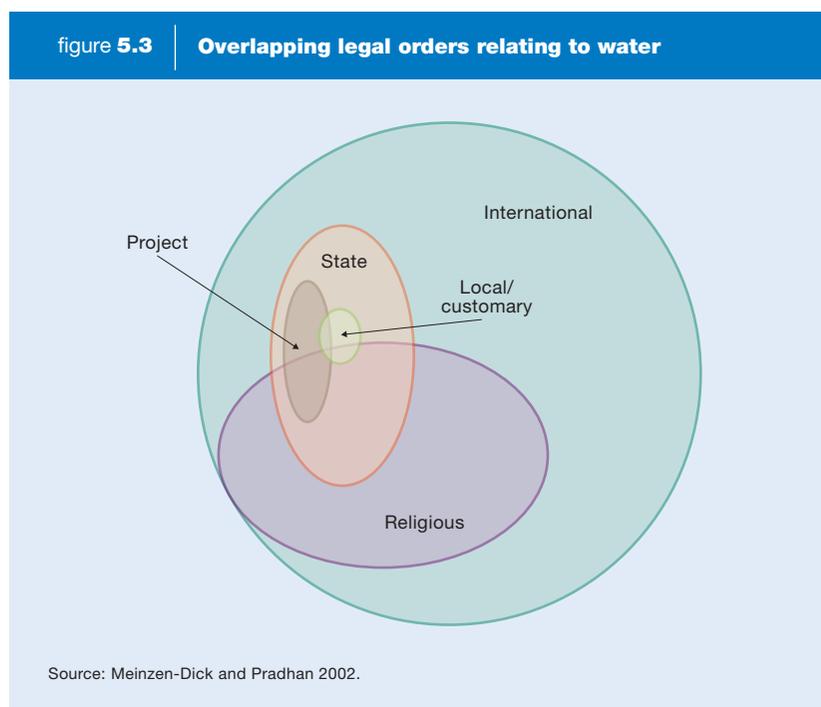


conditions and to tap into local knowledge as well as technical expertise. Blomquist (1992) shows how a range of state and local government organizations as well as user organizations have evolved to manage groundwater in California. Working together to develop governance arrangements has been as important as the actual configuration of organizations. Another advantage of pluralistic organizational arrangements is redundancy: if one local organization becomes less effective its members may use other overlapping organizations to obtain services. Redundancy may also enhance the capacity of local populations to respond to external threats.

Institutional pluralism—both a strength and a constraint. Just as many organizations have overlapping mandates, there is often a plurality of institutions relevant to particular issues such as property rights arrangements for water and land (Boelens and Hoogendam 2002; Bruns and Meinzen-Dick 2000, 2005). In addition to state law, other sources of property rights for water include international treaties and law, development project regulations, religious law and practices, rules developed by user groups, and customary law (figure 5.3).

There are often inconsistencies among these categories, for example, between environmental legislation and other water acts or between different interpretations of customary law, and formal rules may differ from rules in use. Claims to water rights may be based on any of these, and each type of claim is only as strong as the institution that stands behind it. State law may be strong, but at the local level, especially in areas far from the

figure 5.3 | Overlapping legal orders relating to water





Water rights are more accurately understood as negotiated outcomes than as clearly following from written statutes

capital city, state agencies may not have the capacity to monitor and enforce state definitions of water rights, and community norms may have greater influence. This can lead to confusion and conflict, but it is also an important mechanism for adapting water allocation to local conditions. Thus, water rights are more accurately understood as negotiated outcomes than as clearly following from written statutes.⁶

A related, often problematic, area is ownership of hydraulic structures such as canals. There is a general understanding (even if no specific law) that the government owns the irrigation schemes it constructs. In most countries irrigation management transfer policies are notably vague on this issue: while farmers are expected to take responsibility for O&M, which can require substantial investment, they are not necessarily investing in “their” property. In farmer-built and -managed systems the property relationships are generally clear: ownership is shared with others in proportion to their investment or other criteria (Coward 1986a, 1986b). For long-term sustainability of infrastructure governments would do well to avoid creating government-owned property at the local level and offer instead to share costs with communities to encourage communities to create their own property.

As governments create new water laws for implementing integrated water resources management, the diversity and flexibility of local customary laws, principles, and practices may be replaced by uniform and rigid principles and requirements. Often, local practices are equitable and effective, and undermining them may be counterproductive. Sometimes, however, there may be serious equity issues, particularly biases against women in land and water rights that governments rightly may wish to address. However, national laws are not always very effective in addressing such issues (for example, Trawick 2005; Vera forthcoming).

The plurality of organizations and institutions dealing with water management means that it is not realistic to plan sweeping reforms that impose new institutional and organizational arrangements supplanting all previous institutions and organizations. But within the limitations imposed by history, culture, and developmental pathways, there is also room to maneuver. Intentional reforms are possible, but there are so many factors at work that outcomes cannot be predicted, only anticipated with varying degrees of confidence.

Multifunctionality—added complexity and strength. Water sector reform strategies are increasingly expected to address concerns beyond water management issues, including reducing poverty and gender inequity, reversing environmental degradation, and giving voice to marginalized groups. In Asia irrigation investments contributed much to poverty reduction (Hussain 2005), but large-scale irrigation is at best a blunt instrument for achieving this purpose. Polak (2005) argues that while large-scale irrigation is a “prime mover” for achieving food security at the macro level, the greatest opportunity for improving the livelihoods of small farmers today is promoting low-cost, market-driven microagricultural water management technologies (see chapter 4 on poverty). In principle such an approach can be better targeted to women and is less likely to damage the environment than large-scale irrigation, but current capacities to implement such



targeted programs on a large scale are minimal (van Koppen, Saflios Rothschild, and Namara 2005).

Ecosystems provide many functions to societies, which are valued differently by different groups. To achieve sustainable outcomes, ecosystem functions and values need to be reflected in water policies, and mechanisms need to be in place to balance them (Abdeldayem and others 2005; see chapter 6 on ecosystems). In developed countries the environment has a strong political voice, but in developing countries attention to environmental conservation is often perceived as antipoor. It is important to find effective ways of linking ecosystem services directly to improving the livelihoods of the poor. This requires demonstrating strong evidence of a “win-win” approach and creating political coalitions to pursue them.

Another issue is how to give effective voice to poor and marginalized people—women, minorities, pastoralists, fishers. There are no easy solutions, but examining how explicit and implicit rules favor or exclude different groups is a good starting point (Vera forthcoming). Membership rules for local water user groups and higher level organizations such as project management committees or basin organizations may exclude certain categories of users—for example, fishers and female gardeners are excluded from irrigation project management committees in Sri Lanka (see box 5.8); women are excluded from water user associations in the Andes (Vera 2005); and the rural poor, including small-scale irrigators, are not represented in Mexico’s river basin councils (Wester, Merrey, and de Lange 2003). Holding meetings in a language spoken mainly by the educated elite can exclude people from minority ethnic groups or those with less education, and the timing and location of meetings can make it difficult for women to participate.

Kerr (2002) found that in many watershed management projects in India, women and herders bore the highest costs of new practices, but downstream farmers received the greatest benefits. However, where nongovernmental organizations had been involved in working with marginalized groups on other activities, such as group credit, these groups developed more bargaining power. The move toward integrated water resources management should create space for involving herders, fishers, domestic water supply users, and others who depend on water resources for their livelihoods in decisionmaking, along with farmers, environmentalist, and state actors. Finding concrete ways to recognize the multiple claims on water resources use and to create situations in which the different functions of water, the different values attached to them, and the different outcomes its use produces for different groups can be negotiated more constructively is a major challenge of water sector reform.

To contribute to both poverty reduction and environmental sustainability, reforms should create a framework for development relationships among the key governance actors—government, nongovernmental organizations, civil society, and the private sector (see figure 5.2)—to identify the most effective resource uses and management modalities for empowering disadvantaged groups. Because incentives are lacking to engage poor people in the governance of water resources, the state needs to use its authority to enhance their voice and benefits. One way is to use water-related projects to generate income or employment. For example, South Africa’s Working for Water Program to remove alien

Water sector reform strategies are increasingly expected to address concerns beyond water management issues



plants from watersheds creates employment and trains local people in the skills required to manage small contracts—creating a new class of entrepreneurs (Görgens and van Wilgen 2004).

Recognizing all water users and developing institutional mechanisms to address their water needs is challenging. But it is critical for strengthening the agriculture-water-poverty-gender-environment nexus. It is often women and poor households that depend on other uses of water. Moreover, fishing, livestock, gardens, domestic, and environmental uses often have high value per unit of water, so including them can substantially increase the total value of agricultural water systems.

Recognizing all water users and developing institutional mechanisms to address their water needs is challenging—but it is critical

The way forward

Successfully moving forward requires strategies for institutional and policy reform processes that take into account reform as an inherently political process; the social embeddedness of water institutions; the state as the driver of reform; capacity building, information sharing, and public debates; and implementation strategies.

Reform is a political process

Institutional transformation is inherently political and typically slow and difficult, with losers and winners and “outsiders” who also have their own interests. Some interests are more politically powerful than others, often distorting outcomes in favor of special interests. Policy actors and advisors need to make strategic assessments of how policies and institutions related to agriculture and water management can contribute to food security, environmental sustainability, economic growth, and poverty reduction—a process of transforming perceptions, interests, and objectives into strategies. This means taking into account political feasibility as well as desired outcomes.

Key questions to ask for each situation include:

- What will be the benefits of institutional and policy reform, and how will these benefits be distributed? What will be the costs, and who will bear them?
- What coalition of interest groups will push forward and implement the change? Around which issues can such efforts be organized most productively?
- How can these coalitions be supported?
- What can realistically be done to adapt the enabling and constraining conditions for this institutional transformation?
- How can knowledge producers and processors—academics, consultants, and reflective practitioners—play a more active role?

The answers to these questions depend on specific conditions. The tendency to impose generalized solutions has led only to failure. Factors affecting the answers include biophysical characteristics; social, cultural, and political context; and types of agricultural water infrastructure (canals, wells, small or large dams, rainfed). Analyzing each situation and drawing on experiences of other cases as a practical resource and on frameworks such as those illustrated in figure 5.1 and box 5.5 are necessary first steps for strategizing effective institutional transformation.



Water governance and institutions are embedded in a broader context

There is no blank slate starting point for institutional and organizational reforms: the entire process is embedded in a context with a history and culture that shape the scope for future change. Factors such as technology, water availability, cropping patterns, market development, social capital, government policies, and overall political factors shape institutions as well as how people manage water. Thus institutions that are effective in one environment cannot simply be transplanted to another environment and be expected to have the same effect.

Interventions to change water institutions and organizations must consider the consistency of the proposed reforms with hydrologic, social, economic, and political conditions (see box 5.5). For example, introducing water markets requires water rights that are clear and not tied to specific land parcels, laws and organizations capable of enforcing and facilitating transactions, and infrastructure with flexibility and measurement capacity. Transferring management of irrigation infrastructure to farmers is more likely to succeed where farmers' water rights are specified, there is legal support for farmer organizations, infrastructure is designed for decentralized management, and the property status of the infrastructure is clear. Policies emphasizing demand management and cost recovery require water delivery infrastructure and measurement capacity—neither of which is common in developing countries.

However, conditions are not static nor changed only by conscious reform. Conditions may change on their own and require institutional adjustments to catch up. A seasonal drought or increased water scarcity induced by climate change requires greater management intensity. HIV/AIDS and malaria may reduce the ability of farmers to do heavy maintenance or engage in time-critical management practices. Trade reform undermines the food-security rationale for massive public irrigation investments, while farmers with profitable niche opportunities may exert pressure for improved irrigation services or purchase their own equipment (see chapter 9 on irrigation). As river basins develop from being “open” to “closed,” the types of policies and organizations required change dramatically (see chapter 16 on river basins).

There are several policy and institutional implications of this embeddedness of agricultural water management issues in a broader context:

- *Problemsheds: understanding issue-networks.* The single-sector perspective dominating agricultural water management needs to be replaced by an approach that starts with a concrete problem and then decides what is required and possible (defining the next step). It is more appropriate to look at “problemsheds”—the boundaries of a particular problem defined by the issue-network—than at watersheds.⁷ Most social and political boundaries do not line up with hydrologic boundaries such as watersheds. In some cases it is better to build on existing administrative units than to force the development of new, hydrologically defined “watershed” organizations (Abdeldayem and others 2005; van der Zaag 2005; Moss 2003; Swallow, Johnson, and Meinzen-Dick 2001; see chapter 16 on river basins for further discussion).
- *Realistic expectations about feasible options.* More realistic expectations are needed about what can be achieved within given constraints and circumstances, and on the

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basis of such assessments pragmatic and programmatic choices need to be made on where to allocate time and resources.

- *Out-of-the-sector policy entrepreneurship for better coordination.* More effective ways are needed to address the age-old problems of coordination, interaction, and collaboration among organizations. In addition to government agencies such coalitions should include various private and civil society interests for a truly integrated approach (Sabatier and others 2005). Water policymakers and implementers must also participate in decisionmaking outside the water sector to solve some water problems. Unfortunately, there are very few positive examples in the agricultural water sector of such integrated approaches.⁸
- *Thoughtful practitioners.* Working in a constrained environment requires policy and administrative entrepreneurship, making creative and effective use of legal, administrative, and budget space in the system for developing creative responses. It requires people with the skills to assess situations, draw lessons from experience, and create effective strategies to move forward (Schön 1983; Forester 1999). For international donors, implementing agencies, and research institutions, which tend to be captured by prevailing donor paradigms, this will require self-reflection and revision of existing practices of planning, finance, and research prioritization.

Understanding how organizations and institutions are integral parts of a complex sociotechnical system with its own history, which changes as people respond to new opportunities and pressures, is essential for designing effective reform strategies—but the very complexity means that prediction is impossible and a social learning perspective is essential.

The state is the main driver of reform—but cannot succeed alone

Successful reforms of the water sector still require the state to play a leading role [*well established*]. There are a few examples of water sector reforms initiated by civil society movements in developing countries, such as a campaign to reduce pollution in the Bhavani Basin in India (Meinzen-Dick and others 2004), but these are rare and tend to be localized and partial. There are more examples of donor-led reforms, but these often do not last beyond the project period (if they are implemented at all). The private sector may create demand for institutional change (for example, the farm sector demand for better performing irrigation systems in Mexico after implementation of the North American Free Trade Agreement increased the opportunity cost of poorly performing systems), but this will not go far without state “ownership” of the reforms.

Accepting the state as the driver of reform poses its own dilemma. The state is often itself in need of reform. In most state institutions there are few incentives, for example, to overcome gender imbalances, the male-dominated engineering culture of water agencies, and elite capture of reforms. This is a political issue and requires leadership at the political level.

Although public agency roles in design, construction, and O&M are shrinking, there are new roles for the state in basin planning and management, water rights registration and monitoring, data collection and management, environmental monitoring and assessment, support of local management institutions, and accrediting of private service providers. Some of these new roles are essential but so new that there is a question whether



existing organizations can fulfill them effectively. The regulatory capacity of the state becomes more, not less, vital. The complexity of the task in transition economies is especially daunting, as illustrated in box 5.6.

Government resources will not be sufficient as the sole source of investment in water control; in many cases governments do not have the fiscal resources to provide adequate funding even for O&M. Other financing mechanisms are required, as discussed by Winpenny (2003). There is considerable interest in public-private partnerships, but these should not be limited to partnerships with multinational corporations. India has set up “Nigams” to tap into the domestic bond industry as a source of financing for large-scale systems; these have been successful in mobilizing finance and expediting construction but have not led to improved irrigation performance and cost recovery for sustainability (Gulati, Meinzen-Dick, and Raju 2005, chap. 5). Japan is using environmental service payments to supplement resources for irrigation O&M. But the greatest source of private financing is farmers themselves, who invest considerable amounts in irrigation infrastructure and O&M when it is in their interests to do so, for example, in tubewells under their own control. Penning de Vries, Sally, and Inocencio (2005) review the large potential for investment in agricultural water development by small farmers and businesspeople.

An area critical to successful reform, but barely studied, is how governments allocate budgets and monitor outcomes of budget expenditures. Lack of transparency has led to calls for decentralized participatory budgeting. Budget allocations reflect government priorities, in turn often reflecting historical inertia and entrenched bureaucracies. If specific allocations target support for women, poverty reduction, and environmental services, for example, these are important steps, especially if accompanied by transparent monitoring. Gender-responsive budgeting provides a means to examine the priorities reflected in budgets at different levels and is being tried in many countries (Budlender 2000; Mukhopadhyay and others 2002). This concept could be applied to other priority areas as well (see Norton and Elston 2002; de Sousa Santos 1998; and www.odi.org.uk/pppg/cape for general discussion and examples). While such approaches are emerging in other sectors, they still need to be introduced in the water sector.

For such financing arrangements to lead to better performance, and not to uncoordinated development or poorly performing systems, transparency and appropriate coordination mechanisms are critical. First, this means sufficient accountability within government departments to ensure that public funds are well spent and to create incentives to deliver efficient services.⁹ Second, it means appropriate regulation of private operators to ensure that they deliver agreed levels of services to all users equitably at agreed rates. Even when user groups are entrusted with water management, accountability is critical to ensure that all users (including women and marginalized groups) are served. The state capacity for regulation in many of these arenas is often weak. This remains a serious policy challenge. Third, it means developing mechanisms for effective coordination among government units.

The state will continue to be responsible for ensuring that poor people and environmental services receive the water that they need, even if they are unable to pay. This is essential for meeting basic needs and for conserving resources. In many cases basic needs are interpreted as the minimum requirements for domestic water use (for

An area critical to successful reform, but barely studied, is how governments allocate budgets and monitor outcomes of budget expenditures





Information, knowledge, and the capacity to use it are critical to successful integrated water management and appropriate reforms—but their availability is often limited

example, 20 liters a person per day). However, many customary systems, especially in Africa, recognize livelihood needs as part of the basic requirements (von Koppen and others forthcoming), as increasingly do some new national laws (South Africa) and some service providers (Moriarty, Butterworth, and van Koppen 2004). The state's primary responsibility to ensure that people have necessary services does not mean that the state must implement everything by itself. The gap between state capacities and the scale of the problem is too great. The state needs to work with the private sector and civil society to facilitate what each does best, while concentrating its scarce capacity where it has a comparative advantage.

Because the state is itself the focus of much of the required reform, while still being the critical driver of reforms, coalitions among the private sector and civil society are critically important for long-term success.

Knowledge and capacity for balanced policy processes

Information, knowledge, and the capacity to use it are critical to successful integrated water management and appropriate reforms. But the availability of reliable data transformed into credible information is often limited. In many cases the desired data do not exist (long time series of hydrological and meteorological data, density of measurement networks, gender-disaggregated household data, policy impact studies).

More often existing data are difficult to access. Hydrological data may become state secrets when interstate water conflicts emerge, or procedures for accessing data may be excessively cumbersome or expensive. The information may be unreliable if it is thought to support particular political agendas or if collection practices are not rigorous enough. Differential access to information, for example, by men or elites but not women or poor stakeholders, can make inequity worse (Vera 2005). To achieve sustainable agricultural water management, reliable information needs to be made available in the public domain and widely shared and debated, as a means to empower stakeholders by increasing their knowledge. As demand for water puts pressure on the supply, access to reliable information by all stakeholders becomes increasingly critical (Burton and Molden 2005).

Another critical area is the growing mismatch between the multidisciplinary technical capacity required for integrated water resources management and the narrow—and dwindling—capacities of most government water agencies. Budget reductions, unattractive salaries and career prospects compared with alternatives, and conservative university curricula are making it increasingly difficult for government agencies to attract and retain staff with the kinds of expertise required. There are a few bright spots. The most interesting may be two initiatives in Southern Africa that cooperate in capacity building and research (box 5.9).

As important as knowledge and capacity within government is public awareness of water issues and access to information. Transparency and accountability are critical for a democratic political process of institutional reform, whether it is government agencies, user groups, or private contractors that deliver water services. Sometimes, proposed reforms are thwarted by the deliberate dissemination of misinformation (Van der Velde and Tirmizi 2004). However, citizen committees and public hearings can contribute to

**box 5.9 | Capacity building and research initiatives in Southern Africa**

Waternet is a network for integrated water resources management capacity building with more than 50 member institutions in 12 countries in eastern and southern Africa. It is training a new generation of water professionals through a unique multidisciplinary, multi-institutional program. The Water Research Fund for Southern Africa (WARFSA) supports research by regional professionals. The two institutions, linked with the Southern Africa Development Community (SADC) and the Southern African chapter of the Global Water Partnership, sponsor an annual symposium to exchange and debate policy directions and new research findings.

Source: Swatuk 2005; van der Zaag 2005.

successful reform by creating greater accountability and trust (Moench, Caspari, and Dixit 1999; Sabatier and others 2005; Bruns, Ringler, and Meinzen-Dick 2005). Collaborative partnerships among the state, civil society, and the private sector may require investments in capacity for collaboration within partner organizations. However, the outcome of “participatory” processes is not pre-ordained: opposing parties may not converge on a common position, or one party may pressure others using superior power.

Balanced policy processes require capacity building of the groups and organizations in a disadvantaged position with regard to knowledge, notably small-scale water users and women. Sabatier’s (1988) work on the advocacy coalition framework found that in reaching agreements on watershed management plans and practices in the western United States, there were alliances among government agencies, user groups, and environmental interest groups, among others. It is critical for successful outcomes of negotiations that each group has at least one trusted person who understands the information and models being used in multistakeholder dialogue and decisionmaking processes.

Most water management institutions focus on water quantity. But each user not only takes water out, but also returns something to the hydrological system. A looming challenge is regulation of water quality. Even small amounts of contaminants can make water unusable for others, and the contamination may persist. Many water control institutions do not have the capacity to monitor or regulate water quality, and agencies that do monitor quality are separate from agencies charged with agricultural water management. Greater investment in state capacity is needed, but the state cannot do it all. Informing the general public about water-quality issues is an important adjunct. Tools such as bio-monitoring can empower communities to check the quality of their water resources (Mthimkhulu and others forthcoming; Wepener and others 2005).

Even with the best management there will be conflicts over water. Some may be resolved locally through customary institutions, but the state has a responsibility to develop mechanisms to help users resolve conflicts. Technical information may help in some cases; in others cases arbitration and enforcement will be required. The large number of international river basins means that forums for negotiating sharing arrangements between countries are also needed, calling for strong negotiating skills within government agencies, user groups, and other stakeholders.



It is remarkable how little research has been done to understand how to support agricultural water reform processes. With such a fundamental gap it is not surprising that so much uncertainty surrounds how to proceed with policy and institutional reform

Implementing reform

Encouraging the emergence of a learning culture in organizations is critical to the success of reforms. In the long run organizations able to anticipate change and learn from experience are the most adaptive, and their reforms are the most sustainable. Where institutional change is needed, identifying a champion within senior political or agency levels will often help to create a vision of reform and to overcome obstacles, especially early in the process. It is also important to build coalitions around specific shared objectives, so that change becomes institutionalized. Such a structured context-specific approach precludes the usual practice of adopting single-factor panaceas to achieve a desired goal.

The state is an essential driver of reforms, but it cannot make lasting changes alone. No matter how strong the state, customary law and institutions are not always amenable to being rewritten as statutory law. There is often a temptation to pass reforming legislation with little discussion, to minimize opposition (van der Velde and Tirmizi 2004). But reforms passed in this manner may never be implemented or may cause a public outcry when they become known. Public debate and policy formulation create broader legitimacy and understanding and increase the chances of implementation and sustainability. South Africa's debates over the reform of its water law created so much awareness among the public that there had to be follow-through (de Lange 2004), whereas other countries have reformed their water law (often in response to donor pressures, and with external models) with little fanfare and equally little impact.

Reducing uncertainty: research to support reform processes

Considering that the central importance of policies and institutional capacities to promote sustainable development has long been recognized, it is remarkable how little research has been done to understand how to support reform processes in the agricultural water sector. There are a few case studies, but most are too superficial or too partisan to contribute much. There are a few comparative analyses across countries and regions (a recent contribution is Dirksen and Huppert 2006), but almost no in-depth, long-term, or historical studies of processes and underlying drivers. Further, most research has focused more on what than on how. Many studies begin with an assumption of the desirability of a specific reform (management transfer, privatization, river basin organizations) without addressing the strategic process of implementation. With such a fundamental gap in the social science research it is not surprising that so much uncertainty surrounds how to proceed with policy and institutional reform.

Mollinga and Bolding (2004) propose a research program specific to irrigation reform, emphasizing the resilience of irrigation bureaucracies, the role of international development funding agencies, and the capture of irrigation reform implementation by elites. Studies should apply rigorous comparative analyses and contextualized case studies examining a representative range of successes, failures, and cases in between. A few of the topics needing urgent attention include:



- Studies of institutional reform as sociopolitical processes—what works, why, and under what conditions.
- Studies on incentives, positive and negative. There has been little work on rent seeking in the water sector since 1986 despite its continuing prominence, and there is almost no evidence on responses to water pricing in the agricultural sector. The role and politics of budget allocations in reform processes has been similarly neglected.
- Studies of the implementation and outcomes of integrated water resources management—a rhetorical buzzword, but little studied in practice.
- Comparative studies of the outcomes of various structural reforms, such as decentralization, alternative river basin management models, and alternative models for structuring ministries dealing with agricultural water.

A cross-cutting research topic of critical importance is how to promote greater attention to equity, including gender issues, poverty reduction, innovative ways of implementing integrated water supply systems at local levels, scale-up of new low-cost small-scale water technologies and improvements in the productivity of rainfed agriculture, and integration of ecosystem services and provision of other essential water services.

Clearly, much remains to be done. Because of the large number of contextual factors and overlapping institutions, institutional reforms are never going to be a certain process. There will be no textbook formulas for reforms, but further work in these areas can help to guide the process if supporting policy and institutional change processes are viewed as the art of the possible.

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Notes

1. Chapters 10 on groundwater and 16 on river basins, like this chapter, address largely policy and institutional issues; we have tried to avoid overlap. Chapter 9 on irrigation addresses quite different issues than those addressed here—there is therefore considerable complementarity.

2. For example, the US Agency for International Development's on-farm water management projects in Egypt and Pakistan documented farmers' alleged ignorance of rooting depths and irrigation requirements and inability to cooperate (Lowdermilk, Freeman, and Early 1978).

3. Benchmarking through systematic comparison can be useful under some circumstances, but it is important to compare likes with likes.

4. See Pahl-Wostl (2002) and Ebrahim (forthcoming) for examples and analysis of social learning in policymaking and adaptive management.

5. In South Africa in the transformation of irrigation boards whose members are white commercial farmers to inclusive water user associations, the problem became how to balance the interests of those who have large financial investments in irrigation with those making no such investment but needing water (Faysse 2004). In Andhra Pradesh, India, the law says that other water users can be observers or nonvoting members of irrigator-composed water user associations. This has not been implemented, and in irrigation tanks (small reservoirs) conflicts between fisheries and irrigation interests have emerged. In most Andean rural communities women are not allowed to be members of water user associations (Vera 2005).

6. Through which organizations competing property rights claims and interpretations are mediated is a separate question. State and customary law may have separate organizational frameworks for adjudication, but the same court organization may also have a mandate for addressing both. This is another example of the importance of distinguishing between institutions and organizations.

7. On the notion of “problemshed” and its use in water policy and discourse, see for instance, www.tropentag.de/2005/proceedings/node172.html, <http://cwrr.colostate.edu/pubs/newsletter/specinterest/parkcity.htm>, www.ucowr.siu.edu/updates/pdf/V111_A1.pdf, <http://frap.cdf.ca.gov/publications/cumim.pdf>, [www.ca9.uscourts.gov/ca9/newopinions.nsf/7DBD5DB043E626BF88256E5A00707D96/\\$file/0015967.pdf?openelink](http://www.ca9.uscourts.gov/ca9/newopinions.nsf/7DBD5DB043E626BF88256E5A00707D96/$file/0015967.pdf?openelink) (all accessed October 31, 2005).

8. Positive examples include a small river basin in Namibia (Botes and others 2003; Manning and Seely 2005) and watershed management in the United States (Sabatier and others 2005); a less positive one is the Command Area Development Authority in India (Sivamohan 1986; Sivamohan and Scott 1994).

9. For more detail on such accountability mechanisms, see Small and Carruthers (1991) and Gulati, Meinzen-Dick, and Raju (2005).

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