

**FEDERAL
REFORM
STRATEGIES**

Lessons from Asia
and Australia

edited by
Stephen Howes
M. Govinda Rao

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Federalism and Water Management in India*

Nirvikar Singh

INTRODUCTION

As global water demand grows over the next two decades, India will be one of the most severely affected countries. Its potential supply shortfall could be 50 per cent of possible demand two decades from now (2030 Water Resources Group 2009). The reasons behind this severe probable shortfall include rapid economic growth, relatively low per capita water availability, and an underdeveloped infrastructure, both physical and organizational.

Absent mitigating responses, much of the projected shortfall will be manifested in agriculture. Traditional rain and river-fed agriculture has been supplemented by water storage, surface irrigation, and groundwater pumping. The resulting ability to use water in a more assured manner has combined with new seed varieties and use of chemical fertilizers and pesticides to increase yields. However, the current pattern of input use is not sustainable, not only because its use of water is inefficient, but also because of negative long-run environmental impacts.

Economic growth will also lead to changing demand patterns with respect to food, in addition to sheer increases in output. This can potentially increase water requirements, but as is discussed later, may also provide opportunities for shifting to more socially optimal water use practices. Increased industrial and urban residential demand for water will also need to be met with new infrastructure.

* I thank Stephen Howes for his detailed and cogent comments and suggestions which helped me in the revision of this essay. As always, I owe a special debt to M. Govinda Rao, for teaching me so much about Indian federalism. For this analysis, I have specifically benefited greatly from his work on environmental federalism in India. Any and shortcomings in this chapter are my responsibility.

A further complicating factor in India's water future is the spectre of climate change. Climate change may affect patterns and levels of temperature and precipitation. In turn, these changes can affect groundwater recharge, productivity of prior investments in storing and channelling water, and other investments in agriculture that complement water as an input.¹

Given these current and looming challenges, water management has assumed greater importance than ever before. Throughout history, agriculture has been a mainstay of India's economy, especially in providing employment to large sections of its population, and water has, therefore, been an important resource. Local and state level disputes over water allocation for agricultural use have been common in certain regions in particular. Nevertheless, the scale and complexity of issues revolving around water as an economic resource have increased very rapidly in just a few years.

A constant thread in discussions on water management in India has been the nature of the institutions of governance. At the local level, such institutions can be traditional panchayats, reflecting long-standing local power structures, or their modern elected counterparts. State-level institutions of governance include departments of water resources and of irrigation, and the occasional river basin organizations. These state institutions have often displaced traditional local management practices. At the national level, the central government has a Ministry of Water Resources, a Ministry of Agriculture, a Planning Commission, and several other organizations that can affect how water is managed. The centre has the constitutional authority to shape the management of river basins that encompass more than one state's territory, though its role in the past has often been little more than that of a referee or mediator in inter-state disputes as they have arisen. This role has evolved rapidly, as climate change and economic growth together increase the need for a more integrated and forward-looking policy towards water management.

This chapter, therefore, aims to summarize and assess the status of India's water management in the context of multiple layers of governance. These multiple layers are embedded in a formal constitutional

¹ A detailed analysis of the potential impacts of climate change on water resources in India can be found in Mujumdar (2011).

framework of federalism has advantages in terms of public goods by better jurisdictions, as well as At the same time, decentral externalities, conflicts of an inevitable tension in eral resolution. However of a particular sector or possibilities for instituti potentially Pareto impro gestions along those line

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² An important precu hensive analysis by Mandal of Indian environmental p the many aspects of water of authority and resulting i brought out in that paper, judicial activism on environ and implementation withir

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looming challenges, water management has become more than ever before. Throughout history, agriculture has been a major part of India's economy, especially in providing food for its population, and water has, therefore, been a critical resource. Local and state level disputes over water rights have been common in certain regions in India. The scale and complexity of issues revolving around this vital resource have increased very rapidly in

discussions on water management in India has led to a re-examination of governance. At the local level, traditional panchayats, reflecting long-standing community-based or modern elected counterparts. State-level governance includes departments of water resources and regional river basin organizations. These state-level bodies have replaced traditional local management practices. The central government has a Ministry of Agriculture, a Planning Commission, and other agencies that can affect how water is managed. The central government has authority to shape the management of water across more than one state's territory, though this authority has been little more than that of a referee or mediator as they have arisen. This role has evolved as economic growth together increase the need for a more forward-looking policy towards water

attempts to summarize and assess the status of water management in the context of multiple layers of governance are embedded in a formal constitutional

potential impacts of climate change on water resources (Mujumdar (2011)).

framework of federalism.² The division of authority under federalism has advantages in terms of increasing the efficiency of the allocation of public goods by better matching their supply and demand in diverse jurisdictions, as well as supporting non-economic motives for diversity. At the same time, decentralization increases the potential for inefficient externalities, conflicts of authority, and loss of scale economies. This is an inevitable tension in federal systems, and is not amenable to any general resolution. However, at the margins, and contingent on specificities of a particular sector or set of resource allocation issues, there can be possibilities for institutional reforms within the federal system that are potentially Pareto improving. This chapter seeks to develop policy suggestions along those lines.

To set the stage, the next section discusses India's situation with respect to the availability and use of water resources. Complementing this stage-setting on the institutional side, the following section summarizes India's federal institutions, both general and those specific to water management. This section also relates the general issue of economic reforms through existing federal institutions—or by reforms of those institutions themselves—to the specific case of water resources. The next section provides a selective review of past analysis of federal issues in India's water management, drawing heavily on earlier works with M. Govinda Rao and Alan Richards. Much of this earlier focus was on inter-state river disputes, though the link to local agricultural use was also tackled. In particular, this work made recommendations for institutional reforms to make dispute resolution more efficient. The section that follows provides an update, discussing recent and potential future institutional innovations in managing inter-state river disputes, but going beyond them to consider microeconomic issues as well as ways of 'changing the game', so that the focus is overall water management, rather than dispute

² An important precursor of the discussion in this chapter is the comprehensive analysis by Mandal and Rao (2005), which examines all the dimensions of Indian environmental policy, including air pollution and forests as well as the many aspects of water management in the context of federal assignments of authority and resulting implementation issues. One of the significant points brought out in that paper, which is not touched on here, is the substitution of judicial activism on environmental protection due to the failures of coordination and implementation within the executive branch of the government.

resolution. Thus, this section develops the idea of pursuing reforms in the water sector by reforming the federal structures within which water issues are addressed by policymakers. The next section provides a summary conclusion. The crux of the analysis and conclusion of this chapter is that India's pressing water challenges can potentially be better addressed through more effective horizontal, as well as vertical, coordination among government institutions—the latter representing the federal dimension of government action.

WATER ISSUES

A good place to start in assessing India's water situation is simply with the gross availability of water. India has 2.4 per cent of the world's total area and 16 per cent of the world's population, but only about 4 per cent of the total available fresh water. The Indian Planning Commission (Government of India 2008: Table 2.1) reports domestic estimates of 1,869 billion cubic metres (bcm) of total water resources, of which 1123 bcm are utilizable. This latter figure includes 690 bcm of surface water, a figure which assumes that the requisite storage is built. On the other hand, the 2030 Water Resources Group (2009) reports current availability of only 740 bcm. In this context, the Planning Commission reports per capita storage of 213 cubic metres, less than one-fifth of China's per capita figure, and an even smaller fraction of that in major developed countries.

On the demand side, the Planning Commission reports current requirements of 813 and 710 bcm from two different government sources, growing to 1,447 and 1,180 bcm respectively by 2050. The latter figure assumes substantial increases in irrigation efficiency. The 2030 Water Resources Group, assuming slower increases in such efficiency, estimates demand at about 1,500 bcm by 2030, or twenty years sooner than the higher Indian estimate. Both sources emphasize that the position is worse than what the aggregate figures indicate, since water availability is uneven. Close to half, or possibly more, of India's twenty major river basins serve populations who are already, effectively facing water-stressed conditions.³

³ An excellent survey of the statistics on water availability in India, including its distribution across the country, is provided by Gaur and Amerasinghe (2011).

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⁴ A very recent— of India's water chal port (IDFC 2011). V current analysis, but

develops the idea of pursuing reforms in federal structures within which water-makers. The next section provides a further analysis and conclusion of this. Further challenges can potentially be better addressed horizontally, as well as vertically, through institutional arrangements—the latter representing the vertical dimension.

India's water situation is simply with China. India has 2.4 per cent of the world's total water resources, but only about 4 per cent of the world's population. The Indian Planning Commission (Government of India 2008: 2.1) reports domestic estimates of 1123 bcm of total water resources, of which 1123 bcm includes 690 bcm of surface water, and 433 bcm of groundwater. Adequate storage is built. On the other hand, the Planning Commission (2009) reports current availability of water, less than one-fifth of China's per capita, and a fraction of that in major developed

The Planning Commission reports current requirements from two different government sources, respectively by 2050. The latter figure is for irrigation efficiency. The 2030 Water Resources Report estimates increases in such efficiency, estimates that by 2030, or twenty years sooner than the 2050 target, the position is worse than it is now, since water availability is uneven. India's twenty major river basins serve over 800 million people, many of whom are already facing water-stressed conditions.³

Further information on water availability in India, including a detailed analysis provided by Gaur and Amerasinghe (2011).

Within the context of aggregate and regional water scarcities, there are numerous issues that concern policymakers in India. For example, the Planning Commission (Government of India 2008: 43) lists ten manifestations of a perceived 'water crisis'. These are, organized by category:

Supply and Access

- Limited hours of drinking water supply in almost all cities.
- Lack of progress, or even backsliding, in rural drinking water availability, with chemical contaminants an increasing problem.
- Groundwater declines, raising short-term access costs, and threatening long-term aquifer collapse.

Irrigation

- Failure to complete larger-scale irrigation projects, as well as cost overruns.
- Lack of maintenance eroding the capacity of existing systems.
- Irrigation investment not leading to commensurate increases in irrigated area.

Floods

- Recurring floods of increasing intensity due to changes in land use.

Quality

- Pollution of rivers and lakes from inadequately treated urban sewage.
- Contamination of surface and groundwater by industrial effluents.

Conflicts

- Increasing water conflicts of greater complexity, involving different types of uses and sources, as well as quality issues.

Clearly these problems can be dissected and expanded further.⁴ For example, the problem of industrial effluents is multi-dimensional,

⁴ A very recent—sweeping but heterogeneous—review of many dimensions of India's water challenges is contained in the latest India Infrastructure Report (IDFC 2011). Various specific chapters of the report are referenced in the current analysis, but our scope is narrower in many ways.

reflecting a variety of activities and locations. Similarly, flooding is affected by changes in the hydrological cycle associated with climate change, as well as industrialization and increased agricultural use of land, so that many processes are at work. In other cases, multiple problems in the Planning Commission list are interrelated effects of what can be viewed as fundamentally the same cause. This is particularly true of the irrigation issues (numbers 4 through 6). The irrigation challenges are manifestations of deficiencies in the way that irrigation infrastructure is built and maintained, which are in turn traceable to deficiencies in the institutions of governance, including, but not limited to, corruption. In fact, an important cause of inefficiency is simply the lack of incentives for efficient actions, whether of design, maintenance, pricing, or other aspects of irrigation infrastructure. The problem of poor or missing incentives is also at the root of groundwater decline, with the common pool problem being compounded by subsidized, even free, electricity for pumping groundwater.⁵ Poor availability of drinking water in cities is connected to inappropriate pricing and lack of incentives for investment as well.

If we set aside conflicts, which are in some respects a symptom of the other nine issues, we can also separate them into problems of the provision of water infrastructure, maintenance of that infrastructure, efficient pricing, and the regulation of externalities. Looked at in this manner, the economics of water issues becomes somewhat clearer. This approach also indicates that the issues highlighted are themselves symptoms of a system that does not provide proper incentives, whether for construction, maintenance, usage, or externality control. In turn, the solutions

⁵ The critical problem of groundwater depletion is finally receiving some attention, though in the state of Punjab (by far the worst affected), action may come too late to prevent aquifer collapse. Gandhi and Bhamoriya (2011a) provide data and analysis on the state of groundwater resources in India, with additional data being referenced in Mandal and Rao (2005). Upadhyay (2011) discusses new legal frameworks, including a 'public trust' classification of groundwater to replace the traditional idea of land ownership providing an easement to all water under the land—this is, of course, what leads to the common pool problem. While other countries have successfully made this legal shift, it remains to be seen if India will accomplish it. As noted, there is a complex of political and economic institutions supporting the current short-run equilibrium.

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may need to be sought in redesigning the system rather than trying to
 do more of the same, or to spend more, or to try and increase supply
 through engineering solutions alone.

Before we turn to what system redesign might mean more concretely,
 the 'engineering approach' deserves further elucidation. What we mean
 by this is technical solutions that neglect issues of human behaviour, but
 not issues of costs and benefits. For example, the 2030 Water Resources
 Group (2009) report suggests that no-till farming is one of the most
 cost-effective measures for India to meet its projected future demand-
 supply gap. Such changes in farming practices may require overcoming
 behavioural inertia and inconsistencies—doing so would go beyond the
 usual 'technical' solution. At the same time, technical or engineering ap-
 proaches ought to take account of costs and benefits—this is often not
 done in weighing policy alternatives with respect to water issues in India.
 In this context, Figure 7.1, reproduced from the 2030 WRG report, is
 instructive.

Figure 7.1 shows an estimated marginal cost 'curve' for increasing
 water availability in India. The left-hand part of the curve represents
 interventions that are the most cost-effective. On the other hand,
 the right hand side of the curve has the costliest policies. Interest-
 ingly, these include large infrastructure, municipal dams, and river
 interlinking. Therefore, even without considering behavioural and
 incentive issues, one can come up with a very different perspective
 on the challenges faced by India in managing its water resources than
 that provided by the Planning Commission and other government
 bodies.

The water marginal cost curve and the set of policies and actions
 on its least-cost left-hand side raise another important point. Agricul-
 ture accounts for over 80 per cent of India's water use. Even though
 industrialization will increase that sector's demand for water, agriculture's
 share will not fall significantly, absent the kind of changes incorporated
 in the cost curve. In fact, since agriculture's absolute water consump-
 tion will continue to rise, driven by increasing demand for food and
 changing consumption patterns as incomes rise, the biggest challenge
 and the most critical solutions with respect to water management lie
 in agriculture. In brief, they all involve increasing the water-efficiency
 of agriculture, as well as overall productivity (conventionally equivalent
 to land-efficiency). This is very different from augmenting water supply

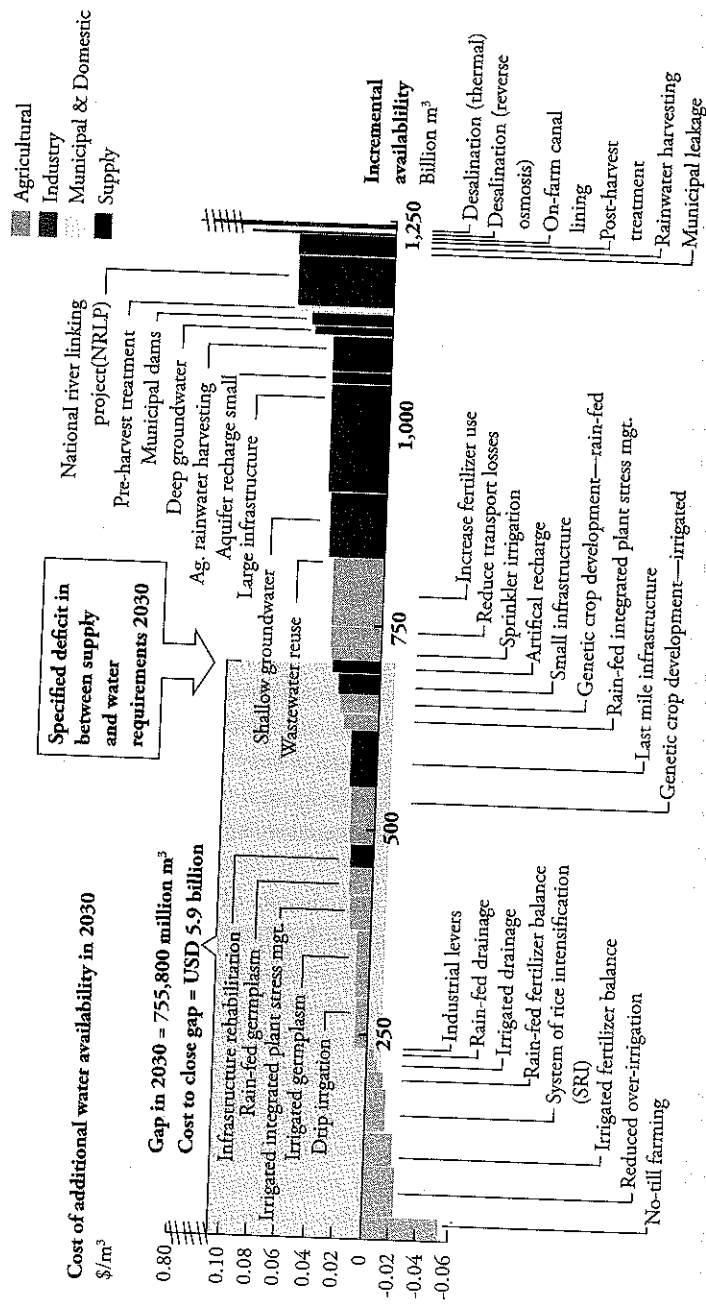


Figure 7.1 India—Water Availability Cost Curve
 Source: 2030 Water Resources Group (2009).

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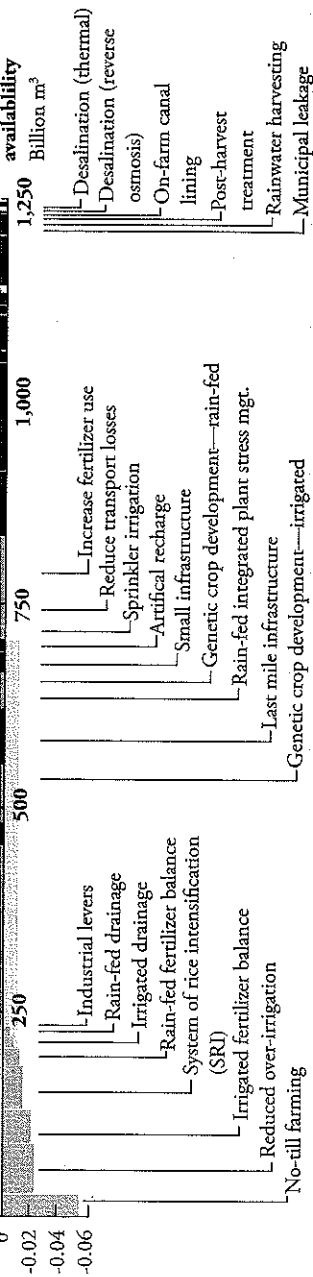


Figure 7.1 India—Water Availability Cost Curve
 Source: 2030 Water Resources Group (2009).

through dams, canals, or pumps.⁶ This is not to say that supply-augmenting measures are useless or irrelevant, just that they will be insufficient on their own. In fact, some supply-augmentation may be in conjunction with, or complementary to, efficiency-increasing actions (for example, infrastructure rehabilitation reduces leakage as well as increases capacity).

The role of technical change also deserves further discussion. Possible actions across the water marginal cost curve include innovations ranging from drip irrigation towards the low-cost left of the curve, to desalination on the high-cost right. In specific circumstances, the latter option might well be worth considering due to local needs, risk mitigation concerns, or strategic concerns. Hence, the ranking of alternatives in Figure 7.1 is not the only guide to policy choices. However, where innovations are relatively low-cost, such as seems to be the case for drip irrigation, there is a strong case for giving them priority in policy thinking. To continue with this example, complementary institutional innovations may be required to enable adoption—farmers may need new types of financing that are tailored to the investment required for drip irrigation. This could require regulatory changes or additional public sector risk management to support new private sector financing. A federal dimension arises when the regulatory authority is dispersed across different levels of government, and there may also be multiple regulators at any given level. Much of this kind of institutional innovation is outside the scope of the current analysis but, at the same time, the focus is on potential changes in federal dimensions of governance structures as a specific form of institutional innovation, pushing technical innovation to the background, but not dismissing it as part of the solution.

From the perspective of the water marginal cost curve, we can see that system redesign essentially includes changing the nature of agriculture in much of India. Many of the measures on the left-hand side of Figure 7.1 involve process improvements. These changes in processes do not necessarily—or perhaps at all—increase overall labour intensity. This would, therefore, not be the source of barriers to adoption or innovation. Rather, the issue is presumably one of knowledge and training.

⁶ It should be emphasized that dams and other measures may be appropriate for flood control. Also, water quality issues require quite a different set of policies, though better farming practices can also help control contamination through excessive or inappropriate fertilizer use.

These alternative or improved farming techniques have to be demonstrated and taught. In other words, the constraint is likely to be human capital rather than raw labour.⁷

All changes in operations can involve switching costs, which may act as barriers to adoption. If there is some randomness in outcomes, due to exogenous factors, it can be difficult for farmers to be convinced of the gains from switching.⁸ These problems are compounded if changes in cropping patterns or crop choices are also part of the shift in techniques. That can mean dealing with new kinds of market uncertainties, and new suppliers and buyers. Production choices (outputs, inputs, and processes) can also be affected by behavioural inconsistencies, particularly with respect to time. This phenomenon has recently been convincingly demonstrated for Kenyan farmers' fertilizer choices (Dufflo et al. 2009). Policies must therefore be designed to overcome these behavioural phenomena.^{9,10}

Another perspective on system redesign comes from noting that many of the issues with respect to water management, as well as the

⁷ In this context it is worth mentioning, albeit just in passing, the deterioration of agricultural extension services at the level of state governments. Addressing this problem is yet another important item for the Indian economic reform agenda at the level of the states, but possibly with a role for the national government through its ability to incentivize state policies.

⁸ To return to the point in the previous paragraph, an examination of the options on the left of Figure 7.1 suggests that they are all marked by some degree of complexity and the learning costs can be significant switching costs.

⁹ In the Kenyan experiment, farmers were given convincing demonstrations of the net gains of increased fertilizer use. However, many failed to follow through on fertilizer purchases, because they spent money on other things before the time came for applications. The experiment found that free delivery with an upfront commitment of funds was essentially as effective as a 50 per cent subsidy in overcoming the present-bias of the farmers' decision-making.

¹⁰ In discussions, M. Govinda Rao made the important point that water is an emotional issue, and this alone is an enormous behavioural factor that must be incorporated in policy thinking. Several of the chapters in the India Infrastructure Report (IDFC 2011) seem to take the special nature of water for granted, but without necessarily understanding its implications. Rather than allowing emotions to govern or distort policy, Rao's point was that policy must ameliorate emotional or affective factors. Thus education is critical in his view, and may need to be complemented by visible measures for supply-augmentation or risk mitigation as signals of government concern.

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 eem to take the special nature of water for
 nderstanding its implications. Rather than
 ert policy, Rao's point was that policy must
 ors. Thus education is critical in his view,
 ible measures for supply-augmentation
 ment concern.

cost-effective solutions captured in Figure 7.1, do not require inter-state coordination. Of course, many of the problems and solutions cross local jurisdictions, making state-local relations an important feature of water management. In fact, a recurring theme in general discussions on natural resource management (including forests as well as water and other potential common pool resources) is the relative merits of state versus local (community) management, with incentive efficiency seeming to favour decentralization as much as possible. On the other hand, at the level of centre-state relations, the federal aspect of water management is not trivial. To the extent that water basins, both surface and underground, cut across state boundaries, water management is irreducibly a centre-state issue. Ultimately, decisions about inter-state river basins and the like have ramifications for water availability and allocation at the local level. In fact, one of India's policy challenges with respect to water has been coordinating across three levels of governance: central, state, and local. Examining these challenges is a major theme of this chapter.

One aspect of improved water management that favours higher-level governments is the informational requirements of innovation. State governments ought to be more efficient in trying, refining, and demonstrating new agricultural practices that improve water efficiency and overall agricultural productivity. There are successful precedents, through state-level agricultural extension services and agricultural universities. Unfortunately, the political economy of state policies towards agriculture has favoured subsidies that lead to inefficient and wasteful water use, distorting farmers' incentives and locking the system into an equilibrium that cannot be sustained in the face of economic growth. In this case, it is possible to make an argument for central policies that improve water management. However, these must be considered in the context of India's federal assignments of authority, and we return to these later in the chapter, after describing India's federal framework and considering how it has worked in the past, with special reference to water management.

FEDERAL INSTITUTIONS

India became an independent democratic nation in August 1947 and a constitutional republic in January 1950. The constitution explicitly incorporated a federal structure, with states established as subnational

entities that were assigned specified political and fiscal authorities. At inception, the constitution clearly laid out the areas of responsibility of the central and state governments with respect to expenditure authority, revenue-raising instruments, and the legislative processes needed to implement either.¹¹ Expenditure responsibilities are specified in separate union (that is, central) and state lists, with a concurrent list covering areas of joint authority. Tax powers of these two levels of government are specified in various individual articles.

At the state level, revenue authority falls well short of what would allow governments to independently meet their expenditure responsibilities. To some extent, this is a natural outcome of the different driving forces for assigning revenue authority and expenditure responsibility. This mismatch is dealt with through significant inter-governmental transfers.¹² The inter-governmental transfer system involves multiple channels of funding, some ad hoc and discretionary, and others implicit (for example, subsidized loans). The constitution provided for the sharing of the proceeds of certain centrally levied taxes with the states, as well as grants to the states from the Consolidated Fund of India. Recent constitutional changes (the eighty-eighth amendment, passed in 2000) have simplified the sharing arrangement, replacing it with an overall share

¹¹ Legislative procedures at both the national and state levels, particularly with respect to budgets and appropriations, are spelled out in detail in the constitution, and are similar to parliamentary democracies elsewhere, having followed the British model. The quality of the functioning of these legislative institutions has been criticized, but it remains the case that rules of process are followed quite well.

¹² Two generic problems with government action in India are underfunding of the level of government that has responsibility for action, and a lack of clarity of assignments. These problems affect water as well as several other public goods and services. In theory, *de jure* inter-governmental transfers are supposed to deal with imbalances between expenditure responsibilities and fiscal capacity at lower levels of government. In practice, transfers do not prove adequate. The problem is partly due to distortions of incentives created by the method of transfers, reducing incentives for own-revenue-raising. There are also political economy-driven distortions at each level of government, which work against adequate taxation, or lead to subsidies for water and electric power. Finally, some of the problems of effective government action lie simply with inefficiencies in budgeting and fiscal management processes.

of the Consolidated Fund. of the states, and the share of the Consolidated Fund. mandated Finance Commission of India every five years (if needed). This commission bulk of centre-state transfers.

In 1993, after decades of constitutional amendments (the seventy-third amendment, which gave legal recognition, enhanced expenditure responsibilities, and other amendments reduced the powers of the states. The elections to rural local governments also changed the nature of local government assignments by specifying the powers of local governments and it instituted a system of inter-state river waters. The Finance Commission

Inter-state river waters while most other water issues (such as pollution assignments) state responsibility for local government responsibility. The seventy-third amendments in 1993. The provisions of the Indian constitution

- Entry 17 in the state list
- Entry 56 in the union list
- Article 262.

The first provision in entry 56 in the union list, which deals with inter-state rivers and rivers and development under the provisions of law to be expedient in the public interest grants parliament the right to legislate. It also gives it primacy over the states.

In practice, the provisions of the River Boards Act was passed in 1946. Various river authorities or established as bodies

ed political and fiscal authorities. At laid out the areas of responsibility of with respect to expenditure author- and the legislative processes needed to responsibilities are specified in separate lists, with a concurrent list covering of these two levels of government are es.

ority falls well short of what would tly meet their expenditure responsi- tural outcome of the different driving ority and expenditure responsibility, ough significant inter-governmental al transfer system involves multiple and discretionary, and others implicit e constitution provided for the shar- ally levied taxes with the states, as well olidated Fund of India. Recent con- th amendment, passed in 2000) have t, replacing it with an overall share

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rnment action in India are underfunding sponsibility for action, and a lack of clar- fect water as well as several other public ter-governmental transfers are supposed diture responsibilities and fiscal capacity ice, transfers do not prove adequate. The of incentives created by the method of -revenue-raising. There are also political el of government, which work against ad- or water and electric power. Finally, some nt action lie simply with inefficiencies in cesses.

of the Consolidated Fund. The share of the centre, the aggregate share of the states, and the shares of individual states in the aggregate state share of the Consolidated Fund are all determined by a constitutionally mandated Finance Commission. This commission is appointed by the President of India every five years (though this interval can be shortened if needed). This commission's recommendations effectively govern the bulk of centre-state transfers.

In 1993, after decades of debate on decentralization, two constitu- tional amendments (the seventy-third and seventy-fourth) gave firmer legal recognition, enhanced political status, and potentially greater ex- penditure responsibilities to urban and rural local governments. The amendments reduced the state governments' discretionary control over elections to rural local government bodies. Local government reforms also changed the nature of tax and expenditure assignments to local gov- ernments by specifying their authority and responsibilities more fully, and it instituted a system of formal state-local transfers modelled on the Finance Commission component of the existing centre-state system.

Inter-state river waters involve joint central and state responsibilities, while most other water issues are technically (according to constitutional assignments) state responsibilities. Local water infrastructure is now a local government responsibility, since the passage of the constitutional amendments in 1993. With respect to water, the main relevant provi- sions of the Indian constitution are:

- Entry 17 in the state list,
- Entry 56 in the union list, and
- Article 262.

The first provision makes water a state subject, but qualified by En- try 56 in the union list, which states: 'Regulation and development of inter-state rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by parlia- ment by law to be expedient in the public interest.' Article 262 explicitly grants parliament the right to legislate over the matters in Entry 56, and also gives it primacy over the Supreme Court in such cases.

In practice, the parliament has not made much use of Entry 56. A River Boards Act was passed in 1956 to create river basin-level organiza- tions. Various river authorities have been proposed, but not legislated or established as bodies vested with powers of management. Typically

instead, river boards with only advisory powers have been created.¹³ As a result of the centre's forbearance in this arena, state governments have dominated the management of river waters. Since rivers cross state boundaries, disputes are inevitable. The Inter-State Water Disputes (ISWD) Act of 1956 was legislated to deal with such conflicts, and included provisions for the establishment of tribunals, to adjudicate where direct negotiations had failed. There have been over 100 documented inter-state river disputes in India (Radha Singh 2003), and only a handful have been referred to tribunals. However, these have involved several of the largest river basins, and have proved to be quite intractable, even after lengthy tribunals and supposedly final awards.

Details of the issues, prior recommendations, and recent developments are discussed in the next section.

Given the potential importance of innovations in agriculture for managing water resources more effectively, one must note that agriculture is also in the state list of the constitution. However, the separation of water issues from broader agricultural issues can present challenges at the state level. At the centre, the budget of the Ministry of Agriculture is about twenty times that of the Ministry of Water Resources.¹⁴ However,

¹³ River boards include the Tungabhadra Board, Bhakra Beas Management Board, Brahmaputra Board, Betwa River Board, Bansagar Control Board, Ganga Flood Control Commission, Narmada Control Authority, and the Upper Yamuna Board all formed by government notifications or resolutions.

¹⁴ While we focus here on the agriculture-water nexus, Mandal and Rao (2005: 23) bring out the complexities of horizontal coordination (something taken up in the section on current developments in this chapter): 'The Water Resources Ministry has to coordinate with the Ministry of Agriculture for the development of watersheds and drip and sprinkler irrigation systems. The Central Water Commission in the Water Resources Ministry has to maintain close technical links with the Ministry of Power for the development of hydro-electricity. In matters related to water pollution, the Ministry has to coordinate with the Ministry of Environment & Forests and the Central Pollution Control Board since these organisations are responsible for maintaining the quality of water. The ministries of Rural Development and Environment and Forest also have programmes for watershed development. In addition, the Ministry of Rural Development is responsible for a "Million Wells Scheme", under which development of ground water is taken up. The National Drinking Water Mission is also under the Ministry of Rural Development and it is responsible for developing the source of drinking water in rural areas. The Ministry of Industry

this situation is reversed at the state level. The state list of water resources control is a state subject. For example, in Andhra Pradesh, irrigation is about thirteen per cent of the state's Ministry of Agriculture.¹⁵ To be cost-effective, irrigation are required for cost-effective policy has to integrally involve agriculture in most states is being driven by chief ministers of electric power, which heavy inefficiently cheap to pump driven by chief ministers of ministries. Cropping pattern distortions are perpetuated of water-intensive crops such

Interestingly, if one examines the Government of India 2005-06, one would find a deal with agriculture and water respectively. The first chapter of water management issues and other mechanisms for the second chapter does not mention the tendency to treat water of large-scale irrigation with this dichotomy between management prevents efficiency also a vertical dimension responsible for local water

is concerned with the planning of industrial use, Ministry of Urban Planning, the Indian Council of Agricultural Research, and the management techniques.'

¹⁵ Mandal and Rao (2005) discuss the internal organization of states and the various job designations in Gujarat and other states, that led to a focus on construction and an attrition in the kind of but without any effective su

ory powers have been created,¹³ in this arena, state governments over waters. Since rivers cross state boundaries, the Inter-State Water Disputes Tribunal deal with such conflicts, and in the absence of tribunals, to adjudicate where the responsibility have been over 100 documented cases (Singh 2003), and only a handful have been resolved. However, these have involved several cases that proved to be quite intractable, even after final awards.

Recommendations, and recent developments. The lack of innovations in agriculture for the future. However, one must note that agricultural substitution. However, the separation of issues can present challenges at the level of the Ministry of Agriculture is the Ministry of Water Resources.¹⁴ However,

ra Board, Bhakra Beas Management Board, Bansagar Control Board, Ganga Control Authority, and the Upper Ganga Commission notifications or resolutions.

ture-water nexus, Mandal and Rao discuss the need for horizontal coordination (something mentioned in this chapter): "The Water Resources Ministry has to maintain coordination with the Ministry of Agriculture for drip and sprinkler irrigation systems. The Ministry of Water Resources has to maintain coordination with the Ministry of Power for the development of hydroelectricity, the Ministry has to coordinate with the Ministry of Forests and the Central Pollution Control Board for maintaining the quality of water. The Ministry of Environment and Forest Development. In addition, the Ministry of Agriculture has to implement the "National Million Wells Scheme", under which the Ministry of Agriculture is responsible for the development and it is responsible for the development of rural areas. The Ministry of Industry

this situation is reversed at the level of the states, where departments of water resources control large budgets for irrigation infrastructure. For example, in Andhra Pradesh, the budget for major and medium irrigation is about thirteen to fourteen times that of the entire Ministry of Agriculture.¹⁵ To the extent that changes in farming practices are required for cost-effective improvements in water efficiency, water policy has to integrally involve agriculture policymakers. Instead, agriculture in most states is being driven by extreme subsidies for water and electric power, which heavily distort water use (the latter by making it inefficiently cheap to pump groundwater). These pricing decisions are driven by chief ministers of states, rather than specialists in agriculture ministries. Cropping patterns are distorted as well in this situation, and distortions are perpetuated by the political power of downstream buyers of water-intensive crops such as sugarcane.

Interestingly, if one examines a document such as the Eleventh Plan (Government of India 2008), the first two chapters of the third volume deal with agriculture and water management and irrigation respectively. The first chapter on agriculture is replete with discussions of water management issues, including water user associations (WUAs) and other mechanisms for local governance of water resources. Yet the second chapter does not reference the earlier discussion at all, reflecting the tendency to treat water management effectively as the management of large-scale irrigation works or flood control schemes. It is possible that this dichotomy between approaches at different scales of water management prevents efficient strategies from being implemented. There is also a vertical dimension to this problem, since local governments are responsible for local water infrastructure, but this is not integrated well

is concerned with the planning and development of water resources for industrial use, Ministry of Urban Development for drinking water in urban areas, and the Indian Council of Agricultural Research is responsible for research on water management techniques.

¹⁵ Mandal and Rao (2005) provide very useful institutional detail on the internal organization of state and local-level irrigation management, including the various job designations and responsibilities. Shah (2011) argues that in Gujarat and other states, the political economy of irrigation management has led to a focus on construction, while maintenance is being neglected, leading to an attrition in the kind of traditional positions described by Mandal and Rao, but without any effective substitute.

with authority over other aspects of agriculture, which remains a state government responsibility.

In the broader arena of water management, the central government has been playing a greater role through its increased attention to rural development, climate change, and, especially, 'inclusive growth'. We next describe several aspects of central government policy that are shaping how lower-level governments can act. The central government has been asserting itself through national schemes and missions. There are, at any one time, over a hundred central or centrally sponsored schemes, and these are often fragmentary and poorly implemented. More recently, the central government has attempted to consolidate schemes, or create new ones that subsume, but also extend, older efforts. One example of a newer national scheme is the National Rural Employment Guarantee Scheme (NREGS), introduced in 2005.¹⁶ Other important national-level efforts have been the Sarva Shiksha Abhiyan (SSA, Education for All Mission 2001), National Rural Health Mission (NRHM 2005) and Jawaharlal Nehru National Urban Renewal Mission (JNNURM 2005).¹⁷ In agriculture specifically, a National Policy for Farmers (NPF 2007) has been articulated, and a National Mission for Sustainable Agriculture (NMSA 2008) has been launched. The latter, together with a National Water Mission (NWM 2009), is also part of a National Action Plan on Climate Change (NAPCC 2008). These newer developments with respect to water and agriculture are discussed in the section on current developments.

Earlier too the central government made attempts to coordinate and guide water management, though they were somewhat less than successful. The central Ministry of Irrigation, the precursor of today's Ministry of Water Resources, outlined a proposed study of India's national water resources in 1980. This led to the formation of the National Water Development Agency (NWDA) in July 1982, to 'carry out the water balance

¹⁶ In 2009, the scheme was renamed the Mahatma Gandhi National Rural Employment Guarantee Scheme. It provides funds for rural works programmes designed to provide income support through employment.

¹⁷ Education is a concurrent subject in India's constitution while health is a state subject, creating some tension with respect to federal assignments. In addition, local governments are a state subject, and technically transfers to local governments must be made by the states. Hence the JNNURM also skirts around these constitutional federal assignments.

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In 1983, the National ated by a central governn ministers of states, lieut central government min This group first met in in ter Policy (NWP) in 19 environmentally sound but provided no specific Though the council was catory process for inter-proposals to improve th native that was hoped f (Government of India 2 by March 2012 (India was released earlier, in J water policies being dra exist, though the status these developments are rent developments.

ANALYTICAL REVIEW

The traditional approach is based on legal philosophy arguments have feature such as identity and en and popularly viewed tus) have been incorpo

¹⁸ Some states also cr there was no explicit call

¹⁹ Gundimeda and H and US experiences. See

of agriculture, which remains a state management, the central government through its increased attention to rural especially, 'inclusive growth'. We next government policy that are shaping act. The central government has been schemes and missions. There are, at any or centrally sponsored schemes, and poorly implemented. More recently, the to consolidate schemes, or create new older efforts. One example of a newer rural Employment Guarantee Scheme Other important national-level efforts yan (SSA, Education for All Mission Mission (NRHM 2005) and Jawaharlal Mission (JNNURM 2005).¹⁷ In agri- city for Farmers (NPF 2007) has been n for Sustainable Agriculture (NMSA tter, together with a National Water of a National Action Plan on Climate water developments with respect to wa- the section on current developments. ment made attempts to coordinate and they were somewhat less than successful. s, the precursor of today's Ministry of used study of India's national water re- formation of the National Water Devel- 1982, to 'carry out the water balance

ned the Mahatma Gandhi National Rural provides funds for rural works programmes through employment. ect in India's constitution while health is n with respect to federal assignments. In te subject, and technically transfers to lo- e states. Hence the JNNURM also skirts assignments.

and other studies ... for optimum utilization of water resources' This agency is a Government of India society in the Ministry of Water Resources, not a body with any statutory authority. Furthermore, its scope is technical and separate from the institutional realities of water allocation.

In 1983, the National Water Resources Council (NWRC) was created by a central government resolution. Its membership includes chief ministers of states, lieutenant governors of union territories, several central government ministers, and the Prime Minister as chairman. This group first met in October 1985, and adopted a National Water Policy (NWP) in 1987. This policy emphasized an integrated and environmentally sound basis for developing national water resources, but provided no specific recommendations for institutions to achieve it. Though the council was created out of disenchantment with the adjudicatory process for inter-state river disputes, it did not provide concrete proposals to improve the process, nor did it become the useful alternative that was hoped for in its creation. NWP was updated in 2002 (Government of India 2002), and was scheduled for another revision by March 2012 (India Water Review 2011), but a draft for comments was released earlier, in January 2012. The 2002 NWP envisaged state water policies being drawn up as well, and several such documents do exist, though the status of their implementation is unclear.¹⁸ Again, these developments are examined in more detail in the section on current developments.

ANALYTICAL REVIEW

The traditional approach to analysing water rights and water disputes is based on legal philosophy and doctrines.¹⁹ More recently, economic arguments have featured more prominently, while behavioural factors such as identity and emotions (prominent in news accounts of conflicts and popularly viewed as giving water a special 'non-economic' status) have been incorporated in academic analysis (for example, Anand

¹⁸ Some states also created water policies after the NWP of 1987, although there was no explicit call for them in the earlier document.

¹⁹ Gundimeda and Howe (2008) is a recent example that compares Indian and US experiences. See also Gosain and Singh (2004) and Upadhyay (2011).

2004).²⁰ In a series of papers, Richards and Singh (1996, 1997, 2001, 2002) attempted to reconcile legal doctrines with economic analysis in order to examine the causes and consequences of water disputes. They applied the analysis to the Indian case, as well as to other countries. The discussion here draws on those papers.

Conceptually, there are perhaps three major positions on the principles by which property rights to water could be allocated. These positions have been characterized (Richards 1994) as 'Harmon, History, or Hobbes'. 'Harmon' refers to the Harmon Doctrine, widely used in the west of the US, in which the rights of those who own land at the source of the water (for example, where the rain falls, or upstream actors generally) take precedence over others. The polar opposite doctrine, 'History', refers to the position that the rights of historical users of water, wherever they may be located geographically, should take precedence over others.

Unsurprisingly, in the case of the Israeli–Palestinian water disputes, Israeli spokesmen often adopt such a position, arguing that since they made the investments and developed the water systems, their rights should come first. Needless to say, these principles of 'Harmon' and 'History' are diametrically opposed in many cases. The third allocation principle dispenses with any concept of prior rights to water. It says that rights to water are what the interested parties agree to: the allocation of water rights is the outcome of a negotiation, a bargain, in which, inevitably relative strengths will matter. This is the 'Hobbes' principle, which asserts that the only way to decide the allocation over property rights is to 'do a deal'.

The philosophy of the Hobbes principle is translated into the economics of the Coase theorem, which says that gains from trade can be realized through bargaining, once property rights are clearly established. Furthermore, the Coase theorem asserts that the efficient allocation of resources resulting from bargaining is, in certain circumstances, independent of the initial allocation of property rights. The two necessary conditions for the Coase theorem to hold are:

²⁰ Behavioural factors also underpin views that the fundamental problem of disagreements is one of lack of 'goodwill' (for example, Iyer 1994; Mohan et al. 2007). Human rights-based approaches (Upadhyay 2011) also give water a special status not accorded to other goods—though food is now also being accorded this status in India. Issues of valuation can also incorporate ecological concerns (Ghosh and Rächuri 2011).

- 'wealth effects' do not
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These conditions may and Singh (2001) discuss of water disputes. The si property rights in water erty rights themselves is instead, it is a 'zero-sum pure conflict, and non-e importance in such 'zero altruism, which is unlike clusion of Richards and putes is central to the di disputes, for example, ar ates an adversarial situat ists in the allocation of p

Given the zero-sum ther complication is tha inter-state rivers, the foc ter, with the centre mos

²¹ Note that even if the final allocation is independent have income effects—the no allocational impact in s

²² More broadly, when of agreement is often the (1982) seminal analysis o costs of delay against their lose more from delay will smaller share of a given ec

²³ The emphasis of th water rights. It is importa transaction costs may still come. For example, if the bargaining among them c cation of resources that w markets and organizations transactions costs.

Richards and Singh (1996, 1997, 2001), legal doctrines with economic analysis in the consequences of water disputes. They also apply to other countries. The following papers.

Three major positions on the principle of water allocation. These positions (Richards 1994) are 'Harmon, History, or the Harmon Doctrine, widely used in the United States, which states that the rights of those who own land at the source of the rain falls, or upstream actors generally, should take precedence over others. The polar opposite doctrine, 'History', states that the rights of historical users of water, wherever they are, should take precedence over others. In the Israeli-Palestinian water disputes, Israel is in a position, arguing that since they made the water systems, their rights should take precedence. The principles of 'Harmon' and 'History' are used in various cases. The third allocation principle is 'Hobbes' rights to water. It says that rights to water are agreed to: the allocation of water rights is a bargain, in which, inevitably relative to the 'Hobbes' principle, which asserts that the right to property rights is to 'do a deal'. The Hobbes principle is translated into the Coase theorem, which says that gains from trade are realized, once property rights are clearly defined. The Coase theorem asserts that the efficient allocation of property rights is, in certain circumstances, the same as the efficient allocation of property rights. The two conditions for the Coase theorem to hold are:

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- 'wealth effects' do not exist, and
- there are no transactions costs.

These conditions may well not be satisfied in practice, and Richards and Singh (2001) discuss at length the extent of deviation in the case of water disputes. The simple conclusion is that the initial allocation of property rights in water is what matters. The initial allocation of property rights themselves is not a situation of mutual gains from trade: instead, it is a 'zero-sum game'.²¹ Good will cannot solve situations of pure conflict, and non-economic behavioural factors assume secondary importance in such 'zero-sum' contexts, unless these translate into pure altruism, which is unlikely, especially at a large scale. Therefore, the conclusion of Richards and Singh (2001) is that the conflictual nature of disputes is central to the disputes. In the context of India's inter-state river disputes, for example, arguments that referring disputes to tribunals creates an adversarial situation miss the point that an inherent conflict exists in the allocation of property rights.^{22,23}

Given the zero-sum nature of bargaining over water rights, a further complication is that these rights have multiple layers. In the case of inter-state rivers, the focus has been on national and state rights over water, with the centre mostly playing a role in trying to resolve or mediate

²¹ Note that even if the conditions for the Coase theorem hold, so that the final allocation is independent of the initial property rights, initial rights still have income effects—the theorem merely states that these income effects have no allocational impact in some circumstances.

²² More broadly, when there is a zero-sum bargaining situation, the driver of agreement is often the costs of delay in agreement, such as in Rubinstein's (1982) seminal analysis of non-cooperative bargaining. Both parties balance costs of delay against their current best options. For example, the party that will lose more from delay will effectively have less bargaining power, and accept a smaller share of a given economic surplus.

²³ The emphasis of the discussion is on the problems of allocating initial water rights. It is important to note that even when rights have been allocated, transaction costs may still be high, making it difficult to reach an efficient outcome. For example, if there are large numbers of rights-holders, coordinating bargaining among them can be costly, even to the point of preventing a reallocation of resources that would otherwise be efficiency-enhancing. The role of markets and organizations, such as water user associations, is precisely to reduce transactions costs.

disputes, rather than asserting rights. What is often neglected, except in a piecemeal or periodic manner, is that the users of water are individuals, organizations, or localities, and their rights are often ill-defined. Using the example of inter-state river disputes in India, Richards and Singh (1997) formally explore two level bargaining games, and analyse conditions under which the sequence of bargaining matters. In the inter-state context, the two levels can be the states and localities within the states. This analysis shows that dealing with water rights at the sub-state level may lead to more efficient bargaining at the state level. This shifts the focus to intra-state water management as an important stepping stone to a more efficient resolution of inter-state disputes.

One of the practical problems thus highlighted by the theoretical analysis is the poor state of local water management. Individual states have not created institutions or policies for good water management practices. While there has been some work on water markets and water user associations in India (for example, Bhamoriya and Gandhi 2011; Jairath 2001; Saleth 1998; Shah 1993; Upadhyay 2010), and there is well-developed general theory on local management of natural resources (for example, Bardhan 1995; Ostrom and Gardner 1993), policy attention in India seems to still be in its infancy (Government of India 2008: chapter 1). Theoretical analyses focus on issues of monitoring, enforcement, equity and norms, and essentially on how to overcome free-rider problems inherent in these kinds of collective action situations. There are diseconomies of scale in such cases, reinforcing the need for microeconomic solutions as a basis for state-level dispute resolution. Richards and Singh (2001) point out some of the challenges for creating water markets, including the need to recognize the asset nature of water, and the fact that spot markets must be built on the foundation of asset rights. They discuss problems of information and uncertainty, and the need for regulation to create and enforce the rules of the game.²⁴

²⁴ An analogy comes from financial markets, where regulators such as the United States Securities and Exchange Commission and organizations such as the New York Stock Exchange, manage rules of participation, trading, disclosure, and so on. As noted in the previous footnote, markets and user associations can both be viewed as ways of reducing transaction costs, so that mutual gains from trade can be realized, starting from an initial assignment of property rights.

In addition to recognizing rights, as well as the mutual benefits, the analysis emphasizes the significance of water. These can include agricultural and supply related to water that have uncertainty associated with decisions of inter-state water rights. This analysis shows that investment in the productivity of water and water rights, even in the face of uncertainty, emerge from the efficient allocation of rights. The analysis shows that decisions on investment and lack of efficient investment are crucial.

Based on their conclusions, the authors examined several of the disputes over the Krishna river. The analysis shows that the disputes have been the result of the failure to evolve in the long run. In the next section. Here we discuss the role of the First, Richards and Singh (1997) resolving inter-state water rights. The analysis is definite. There are too many stages of the process, and more and more fully of a conflictual nature. The resolution mechanism be taken. Another recommendation of any dispute to the dispute,²⁶ with the help of negotiation before

²⁵ The analysis was based on the recommendations of the Commission's 1988 report.

²⁶ The ability of a state to request the Commission's 1988 report.

rights. What is often neglected, except in is that the users of water are individuals, their rights are often ill-defined. Using disputes in India, Richards and Singh el bargaining games, and analyse condi of bargaining matters. In the inter-state he states and localities within the states. g with water rights at the sub-state level gaining at the state level. This shifts the yement as an important stepping stone to ter-state disputes.

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ancial markets, where regulators such as the ange Commission and organizations such as anage rules of participation, trading, disclo- vious footnote, markets and user associations ucing transaction costs, so that mutual gains from an initial assignment of property rights.

In addition to recognizing the zero-sum nature of allocating water rights, as well as the multiple layers of rights, Richards and Singh (1997) emphasize the significance of investments that affect the productivity of water. These can include dams, irrigation canals, tube wells, and even agricultural and supply chain infrastructure. Stories of investments related to water that have exacerbated disputes, or been held up by the uncertainty associated with ongoing disputes, are common in discussions of inter-state water disputes in India. Richards and Singh's analysis shows that investment by one party in a dispute, by changing the relative productivity of water use across parties, affects the efficient allocation of water rights, even in the absence of direct externalities. Several implications emerge from their analysis, including the benefits of agreement on the allocation of rights prior to investments, the benefits of cooperative decisions on investments even where there are not direct externalities, and lack of efficient investment as an additional source of costs of delay.

Based on their conceptual framework, Richards and Singh (2002)²⁵ examined several of the major inter-state river disputes in India, including those over the Krishna, Godavari, Cauvery, and Ravi-Beas. These disputes have been the subject of many other studies, and have continued to evolve in the last decade. We discuss some of that evolution in the next section. Here we note the recommendations based on the analysis. First, Richards and Singh emphasize that processes and institutions for resolving inter-state river disputes are not sufficiently well defined or definite. There are too many options, and there is too much discretion at too many stages of the process. They note that, since water is being more and more fully utilized, there is an increased possibility of disputes of a conflictual nature arising. They recommend that the dispute resolution mechanism be better defined in terms of the order of the steps to be taken. Another recommendation is the automatic and immediate referral of any dispute to a tribunal if requested by the centre or any party to the dispute,²⁶ with the tribunal bound to ratify any agreement reached by negotiation before it had delivered its decision.

²⁵ The analysis was originally presented in Richards and Singh (1996), along with the recommendations described below.

²⁶ The ability of the centre to refer a dispute to a tribunal, rather than waiting for a state to request it, was a modified version of a proposal in the Sarkaria Commission's 1988 report.

A second point concerns the extreme delays that have been a very costly feature of the process of resolving inter-state water disputes in India. Richards and Singh identify three components or dimensions of delay: in constituting tribunals, in the time taken for tribunals to decide (including data gathering as well as hiatuses created by attempts at political solutions), and in notifying the orders of the tribunals in the Government of India's official *Gazette*. The third of these is a general problem with implementing laws as well as tribunal decisions. The first of these would be dealt with by Richards and Singh's first recommendation. The second source of delay has been addressed by previous bodies such as the Administrative Reforms Commission report of 1969, and the Sarkaria Commission in 1988, and the recommendation, repeated in Richards and Singh, for time-bound decisions was incorporated by amending the ISWD Act in 2002.

The ISWD Act was amended in another manner at the same time, to clarify that tribunal decisions have the same force as Supreme Court orders. Earlier this had not been explicit, although the original language proscribed the Supreme Court from overruling inter-state river tribunals (Richards and Singh 1996). The strengthening of the tribunals' legal standing was meant to address concerns raised by the Sarkaria Commission. The commission's report had suggested that the centre could not enforce the tribunal award if a state government refused to implement the award. It noted that an amendment of the ISWD Act in 1980, inserting a section that provided for an agency to implement a tribunal award, was not sufficient because such an agency could not function without the cooperation of the states concerned. Even with the 2002 amendment, however, it is not clear that enforcement is straightforward. The issue is one of how to ensure compliance in the absence of feasible penalties.²⁷ The centre can theoretically deal with a recalcitrant state

²⁷ State governments have sometimes rejected tribunal awards, as in the case of the Ravi-Beas tribunal and the Punjab government. In this case, the central government avoided notifying the tribunal's award to prevent further deterioration of a severely conflictual political situation in Punjab. In the case of the Cauvery dispute, the Karnataka government sought to nullify the tribunal's interim order through an ordinance. Though the Supreme Court pronounced that the ordinance was unconstitutional, the Karnataka government showed no inclination to implement the tribunal's interim order, until a compromise was

by dismissing the state has become less political in the past. Politically charged, ambiguous have the outcome view (2002) offered recommendations beyond inter-state water multiple levels of negoti timely investments, and recommendations are and updated in the co policies in India.

CURRENT DEVELOP

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by dismissing the state government, but this is an extreme action that has become less politically acceptable over time, though it was used frequently in the past. Our argument is that if the rest of the process is politically charged, ambiguous, and non-transparent, it is more difficult to have the outcome viewed as a neutral judicial order. Richards and Singh (2002) offered recommendations for institutional reforms, extending beyond inter-state water disputes, to simultaneously addressing issues of multiple levels of negotiation and rights, the need for coordinated and timely investments, and the political problems of enforcement. These recommendations are discussed in the section on current developments, and updated in the context of the evolution of water management and policies in India.

CURRENT DEVELOPMENTS

Over time, water issues have become more important in the overall policy agenda, and feature in agricultural policy, urban policy, and climate change policy. The history of India's national approach to water policy was briefly reviewed in the section on federal institutions. Here we examine its recent evolution more closely. An overall comparison of recent government documents with those from the 1980s, for example, suggests a broader perspective on, and a more integrated approach to water management. The NWP document of 1987, while quite broad in scope, gave a high-level view of the issues, expressed in eleven pages and less than 3,000 words. The updated NWP of 2002 followed essentially the same approach, albeit with a little more detail, and some reworking of ideas to introduce or expand on concerns about issues such as institutional mechanisms from the national down to the local levels (including participatory management), water quality, and possible private sector roles in the sector. The 2002 policy also called for amending the ISWD Act of 1956 to ensure timely adjudication of water disputes that were

reached through political negotiations behind closed doors. These examples can be taken as supporting the position of Anand (2004) that depoliticization is impossible in such cases. However, we offer an alternative perspective in the section on current developments.

referred to tribunals under the act, and, as noted in the section on analytical review, this was accomplished in the same year.²⁸

The draft NWP of 2012, made available in January of the same year, is marginally longer than its predecessor. However, it is structured in quite a different manner, reflecting the gradual change in thinking about water management challenges in India. It begins with a lengthier and more comprehensive statement of issues, including scarcity, quality, and variability of water resources; institutional problems of coordination and capacity; and the principles of use and allocation that should guide policymaking. Concepts of demand, pricing, and infrastructure maintenance also appear to be stated more clearly and saliently than in past documents. Of course, these are the impressionistic observations of a high-level document, and there are numerous questions of detail that have to be addressed through implementation, as we discuss further in this section. Not surprisingly, the latest NWP draft is quite in tune with the NWM, which was introduced in the earlier section on federal institutions, which will now be discussed more closely.

As noted in the section on federal institutions, the NWM of 2009 was conceived of as part of a larger, coordinated action plan for dealing with climate change. The 2009 NWM's main document is several times the length of the earlier NWP statements, and is accompanied by appendices made up of several hundred pages of sub-committee reports on NWM's specific aspects. In particular, NWM offers a comprehensive approach to water management issues in India, framed in the context of the challenges of climate change. The executive summary of the comprehensive mission document describes the goals as (Government of India 2009: iii):

The main objective of the National Water Mission is 'conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management'. The five identified goals of the Mission are: (a) comprehensive

²⁸ It is relevant to ask what happened between 1987 and 2002. Government accounts of the period between the two policies suggest that there were quite a few meetings and new committees were formed, but concrete changes in outcomes as a result are not apparent. One additional institution, designed to monitor NWP implementation, was the National Water Board created in 1990.

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 change on water resource; (b) promotion of citizen and state action for water
 conservation, augmentation and preservation; (c) focused attention to over-
 exploited areas; (d) increasing water use efficiency by 20%, and (e) promotion
 of basin level integrated water resources management.

Overall, NWM's projects are meant to be coordinated with the na-
 tional and state planning effort, which amounts to an indicative exer-
 cise in defining priorities and budget allocations, though often without
 effective follow-through in implementation. NWM's implementation
 strategy envisages the passage of state-level legislation, as well as capacity
 building at the level of local governments and local water user associa-
 tions. Plans to improve data collection and national-level efforts in this
 respect through a dedicated mission secretariat are more likely to make
 progress than a top-down process of reaching down to the local level.
 This is simply because of an attenuation of incentives as national ef-
 forts move down the layers of elected governments and bureaucracies.
 However, a specific two-tier (national-state) coordinating mechanism
 has been proposed, with various new committees of politicians and bu-
 reaucrats (Figure 7.2) (Government of India 2009: 22, box 2).

As noted in the section on federal institutions, NWP of 2002 envis-
 aged developing state water policies. Apparently, some states had drawn
 up such policies earlier as well. After the NWP of 2002, states either up-
 dated existing water policies or drew up new ones: eleven states currently
 have them. Several of these can be found on individual state government
 websites, and they bear dates ranging from 2003 to 2008, or later. In
 some cases, these documents are mostly just restatements of NWP, with
 a few state-specific policies or institutional features added in. In other
 cases, they are somewhat more detailed and state-specific. Surprisingly,
 the NWM document makes no mention of these existing documents,
 let alone providing any inventory or analysis of current state water poli-
 cies. The only mention of state water policy is in chapter 3, on goals and
 strategies, where the fifth goal, promotion of basin level integrated water
 resources management, includes as one of six strategies that of 'Review
 of State Water Policy'. This is the only one of the six strategies where
 no further detail is provided. The complete absence of any considera-
 tion of existing water policy approaches—whether articulated or imple-
 mented—at the level of the states, does not augur well for the proposed

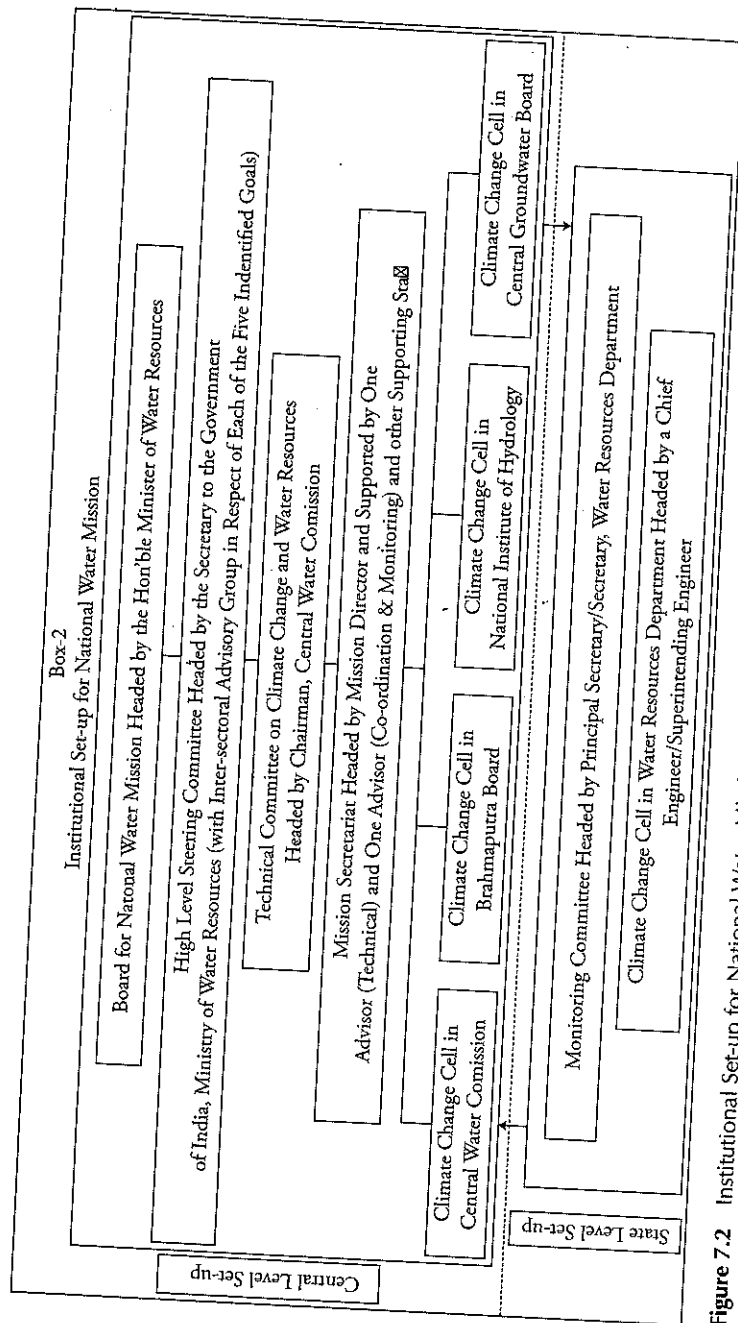


Figure 7.2 Institutional Set-up for National Water Mission

Source: Government of India (2009: 22).

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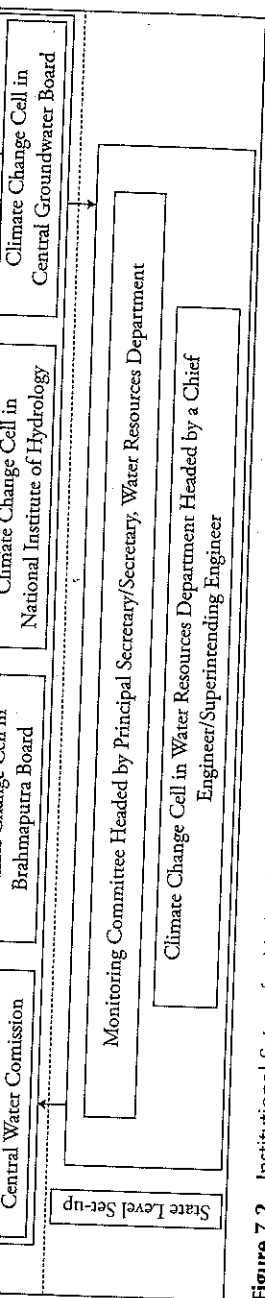


Figure 7.2 Institutional Set-up for National Water Mission

Source: Government of India (2009: 22).

two-tier coordinating mechanism illustrated in Figure 7.2, though it is entirely possible that new institutions of that sort may be precisely what is needed to fill NWM's vacuum with respect to state-level policies.²⁹

Turning from issues of vertical coordination to those of horizontal coordination, NWM itself is under the Ministry of Water Resources, but issues such as watershed development, micro-irrigation, and 'water planning for agriculture' come under the Ministry of Agriculture, so coordination across ministries is also necessary in NWM. Several other ministries also have charges that impinge upon water management (footnote 14). The NWM proposes incorporating representatives from the various ministries, as well as the Planning Commission, in a high-level steering committee. Whether this will lead to successful horizontal coordination remains to be seen, but at least there is proximity in status and physical space in the case of such committees.

Greater challenges may lie in the vertical aspects of coordination. The NWM document notes that much of the expenditure and management required will have to take place at the level of the states. One of the sub-committee's reports (Government of India 2009, volume 2: I/65) floats the idea of incentives to state and local governments for implementing reforms in water management, with a set of possible criteria for evaluation, including subsidy reduction and the creation of new regulatory institutions. Clearly, these ideas are mostly in a formative stage. A partial exception to this is the Accelerated Irrigation Benefit Programme (AIBP), which was modified in 2002 to provide incentives to reforming states.³⁰ The programme itself involved central assistance for expedited

²⁹ Warghade and Wagle (2011) offer a very critical review of both the national and state water policies, arguing that they have led to centralization and to policies that increase inequities in access to water. They are concerned about the process and content of new state-level laws that create regulatory agencies for water use: these are seen as promoting high tariffs for users as a result of external pressures from the World Bank. The draft 2012 NWP seems to make social justice and equity in water access and use a more salient concern as well, but it also highlights water pricing as an option for improving efficiency of use. It would be interesting to see proposals being developed for water tariffs that favour small users—clearly such pricing can address both efficiency and equity.

³⁰ The AIBP is discussed in one of NWM's sub-committee reports, but there is no linkage made to the discussion on the provision of incentives in the main document.

completion of irrigation projects that were behind schedule, and the incentive of greater central assistance was tied to operations and the maintenance cost recovery efforts of the states. However, as noted by Rao and Sen (2011), continued tinkering with the programme may have undermined the force of the intended incentive provision.

The main NWM document also makes a mention of engaging with local governments and water user associations, but the discussion is brief and general: 'The first and foremost action is to put in place appropriate mechanism for coordinated actions followed by intensive capacity building and awareness programme up to lower most level of management i.e., Panchayati Raj institutions, urban local bodies, Water User Associations etc.' (Government of India 2009, volume 1: iv). However, the sub-committee reports in volume 2 provide some more detail on local level participation and water user associations. The sub-committee on efficient use of water goes back to the exhortations of the National Water Policy of 2002 for 'effective and decisive involvement of stakeholders particularly Water Users Associations (WUAs), local bodies and gram Panchayats in various aspects of management of irrigation system', (p. V/18) and recommends funding for WUAs, as well as a discussion of operational models and supporting legislative changes.³¹ The sub-committee on groundwater management also emphasizes the importance of WUAs, and gives examples of successful cases, especially where canal irrigation is jointly managed for groundwater recharge. This integrated perspective on groundwater and surface water management is particularly relevant for India, which relies heavily on groundwater for irrigated agriculture.³²

³¹ According to this report, there were 41,200 WUAs in India covering 8.68 million hectares at the time of writing. However, the area covered is a relatively small fraction of India's total irrigated area. Other figures in the Ministry of Water Resources documents report almost 57,000 WUAs, covering about 13.5 million hectares (Bhamoriya and Gandhi 2011: table 9.3). Bhamoriya and Gandhi point out that the names of organizations may differ, and be called irrigation cooperatives or partnerships, for example. They situate all these types of organizations within the government-defined objective of 'participatory irrigation management' (PIM). Their analysis also brings out the variety of sizes and legal arrangements that come under the broad category of WUAs.

³² However, cooperative institutions for groundwater recharge do not have to be tied into more complex WUAs that also deal with canal irrigation. Gandhi

Bhamoriya and Gandhi of a few states in creating the irrigation department three tiers, depending on tiers consist of committees are elections for WUA has emphasized the open smaller scale than in Andhra Pradesh. These two states, as well as Karnataka, are identifiable features of institutions that lead to better differences across states. To distill several institutional openness of processes, training and institution the adaptability and success.

One further weakness is the disconnect between national policy and local implementation on all the way down from the state level (Singh 1996, 2000).

and Bhamoriya (2011b) emphasize the need to move towards groundwater recharge. These institutions are unclear. Some of the horizontal fragmentation (Shah 2011) makes the problem a concern for recharge and the potential for bureaucratic infrastructure.

³³ The framework of institutional reform (section on analytical review) and externalities in judging the issue of how to analyse

³⁴ This is not to say that the sub-committee on groundwater management mechanisms from state to local organizations (Government

s that were behind schedule, and the assistance was tied to operations and the needs of the states. However, as noted by tinkering with the programme may have added incentive provision.

also makes a mention of engaging with associations, but the discussion is brief. The most action is to put in place appropriate actions followed by intensive capacity building up to lower most level of management, urban local bodies, Water User Associations (WUAs), local bodies (Government of India 2009, volume 1: iv). However, volume 2 provide some more detail on Water User Associations. The sub-committee follows the exhortations of the National Commission on Water and decisive involvement of stakeholders (WUAs), local bodies and aspects of management of irrigation and funding for WUAs, as well as a need for supporting legislative changes.³¹ Water management also emphasizes the need for successful cases, especially those managed for groundwater recharge. This approach to water and surface water management is one that relies heavily on groundwater for

are 41,200 WUAs in India covering 8.68 million ha. However, the area covered is a relatively small area. Other figures in the Ministry of Rural Development (almost 57,000 WUAs, covering about 10 million ha (Gandhi 2011: table 9.3). Bhamoriya and Gandhi (2011) note that organizations may differ, and be called irrigation committees, for example. They situate all these types of organizations within the broad objective of 'participatory irrigation management'. This also brings out the variety of sizes and types of WUAs. Organizations for groundwater recharge do not have to be separate from those that also deal with canal irrigation. Gandhi

Bhamoriya and Gandhi (2011) provide a recent analysis of the efforts of a few states in creating WUAs. Andhra Pradesh has nominally made the irrigation department accountable to WUAs, which can have up to three tiers, depending on the size of an irrigation project. The higher tiers consist of committees made up of WUA representatives, and there are elections for WUA governance. Maharashtra's approach to WUAs has emphasized the operation and maintenance of irrigation canals at a smaller scale than in Andhra Pradesh. The authors of this study also surveyed perceptions of institutional characteristics and of performance in these two states, as well as in Gujarat. Their analysis indicates that there are identifiable features of structure, processes, and governance of institutions that lead to better performance, and institutional and legislative differences across states have measurable impacts on performance. They distill several institutional design principles: completeness of structure, openness of processes, autonomy and participation in governance, and training and institution building.³³ Together these are seen as enhancing the adaptability and successful performance of WUAs.

One further weakness in discussions on NWM is the relative disconnect between national and state policies on the one hand, and local implementation on the other,³⁴ particularly with respect to linking all the way down from river basin to local level management. Richards and Singh (1996, 2002) had specifically discussed the idea of devel-

and Bhamoriya (2011b) examine the experience of water user groups that work towards groundwater recharge through building check dams. Interestingly, these institutions are under the Ministry of Rural Development, illustrating some of the horizontal fragmentation highlighted by Mandal and Rao (2005). Shah (2011) makes the point that individual groundwater extraction without concern for recharge and sustainability has undermined canal irrigation, and the potential for bureaucratic control as well as cooperative management of that infrastructure.

³³ The framework of the authors is quite different from economic criteria (section on analytical review) which tend to focus on incentives, information, and externalities in judging institutional design. This gap is part of a much larger issue of how to analyse organizational design.

³⁴ This is not to say that there is no attention to this issue. For example, the sub-committee on groundwater management explicitly recommends delegation of mechanisms from state to district to local governments and water management organizations (Government of India 2009, volume 2: III/25).

oping a hierarchy of specialized water management associations. One justification they provided for improving water allocation at the local level before resolving inter-state disputes was the greater efficiency of the multi-level bargaining that would result because of this (see the section on analytical review). They also provided a second, separate justification, arguing that a key deficiency in water management institutions, especially at the river basin level, was the subsuming of inter-state water disputes into the general political process. They argued that in India, federalism, and perhaps the political economy in general, has been characterized by an over-reliance on discretionary allocation, and high influence costs as a result, with the pattern of inter-state water disputes as a prime example of this problem. The solution they proposed was the creation of specialized permanent institutions to regulate the allocation of water across states, including the resolution of water disputes. These institutions would respect the federal structure of the country, but with a greater degree of independence and transparency than the current situation.

Richards and Singh noted that the idea of creating a hierarchy of specialized water management associations had been developed in the context of local WUAs, and federations of such associations (for example, Meinzen-Dick et al. 1997). In such cases, the base level units are small groups of farmers, and the higher level is that of the shared water source. The higher level of such a federation of WUAs can provide coordination, dispute resolution, and training. The higher level can also act as a channel for communication and an aggregator of political voice for collections of units that would individually be too small. Meinzen-Dick et al. (1997) provide several examples of user federations, and note the variations in roles within and across levels. They do, however, emphasize the crucial role played by federations in giving WUAs effective organizational control of water resources at the system level. Similar issues are brought up in considering attempts to create federations of WUAs in India (Mollinga 2001; Narain 2003), in particular the need to federate in order to balance the power and control of government irrigation agencies.

Richards and Singh proposed state and national level institutions as linking up and continuing this kind of hierarchical, federated structure, with a national level institution providing an umbrella for actual river boards or river basin authorities. The legislative framework for such bodies exists, and NWM appears to provide policy thinking that can

proceed along these lines. governments that they would like, and indirectly ceding power. The proposed solution with respect to water sharing without tilting power toward management institutions, and down from the national level. This multilayered approach hierarchy in Figure 7.2, the bargaining versus operational ma-

Richards and Singh's proposals are still relevant. river basins, and the dispute imposing time limits and solutions was done in 2002, have not conflicts (for example, the disputes). The idea here is separation of water management manoeuvring. As an analogy centre-state transfers from lobbying and political influence technical approaches, independent.³⁵ The linkage to local measures is also a crucial management institutions. theorem in the section on institutional mechanisms

³⁵ Another example at the Tars Treaty of 1960, which India and Pakistan. These commissions: coordination and cooperation between the two countries.

³⁶ A further idea, albeit reducing transactions costs can trade or bargaining once produced larger gains increases the income allocation.

water management associations. One improving water allocation at the local level was the greater efficiency of the result because of this (see the section on water management institutions, especially the subsuming of inter-state water disputes). They argued that in India, federalism, in general, has been characterized by high influence costs as a prime example of water disputes. The proposed solution was the creation of special institutions to regulate the allocation of water across the country, but with a greater efficiency than the current situation.

The idea of creating a hierarchy of such associations had been developed in the case of such associations (for example, in such cases, the base level units are at a higher level is that of the shared water allocation of WUAs can provide coordination. The higher level can also act as an aggregator of political voice for which would be too small. Meinzen-Dick discusses the idea of user federations, and note the benefits of such federations. They do, however, emphasize the importance of giving WUAs effective organization at the system level. Similar issues are raised in the context of creating federations of WUAs in the context of government irrigation

and national level institutions as a form of hierarchical, federated structure, providing an umbrella for actual river management. The legislative framework for such institutions can provide policy thinking that can

proceed along these lines. One challenge would be the concern of state governments that they would be ceding too much power to such bodies, and indirectly ceding control of their water resources to the centre. The proposed solution would uniformly remove a set of decisions with respect to water sharing and use outside the general political orbit, without tilting power towards the centre. Thus, the hierarchy of water management institutions, with river basin authorities being the next step down from the national commission, would continue down to WUAs. This multilayered approach can be contrasted with the two-level NWM hierarchy in Figure 7.2, though the purposes are different (roughly, planning versus operational management).

Richards and Singh's proposals on national and river basin level institutions are still relevant today. Subsequent developments in the major river basins, and the disputes associated with them, have shown that imposing time limits and strengthening tribunals' statutory authority, as was done in 2002, have not been enough to defuse the most contentious conflicts (for example, the Cauvery, Ravi-Beas, or the reopened Krishna disputes). The idea here is not one of complete depoliticization, but of separation of water management and allocation from broader political manoeuvring. As an analogy, the Finance Commission which decides on centre-state transfers from the Consolidated Fund of India, is subject to lobbying and political influence, but also has a reputation for following technical approaches, independence, and creating and respecting precedents.³⁵ The linkage to local user management and efficiency-increasing measures is also a crucial part of a potential reform of India's water management institutions. In the context of the discussion of the Coase theorem in the section on analytical review, these ideas can be viewed as institutional mechanisms to reduce transaction costs.³⁶

³⁵ Another example at the international level is provided by the Indus Waters Treaty of 1960, which led to the formation of commissions in India and Pakistan. These commissions shared information and managed some degree of coordination and cooperation without being caught in the political tensions between the two countries.

³⁶ A further idea, albeit speculative in terms of formal analysis, is that reducing transactions costs can increase the net gains from mutually beneficial trade or bargaining once property rights have been assigned. The possibility of larger gains increases the incentive to resolve the conflictual situation of rights allocation.

Some evidence for the possibilities and challenges for a federation of water management organizations comes from Narain (2003), who looks at examples from Maharashtra and Andhra Pradesh. He notes that individual WUAs have been unable to achieve much in a situation where state-level irrigation departments retain control of funding and essential allocation decisions. Federations of local user associations have been formed to be able to increase their voice, but otherwise lack explicit authority.³⁷ Hooja (2003) notes that India's relatively new rural local governments (panchayats) have been attempting to assert control over local WUAs, to solidify their role in the chain of governance institutions. However, the panchayats themselves are underfunded and lack capacity in other ways. In particular, they do not have appropriate expertise or incentives in the main concerns of WUAs.

Interestingly, in contrast to the case of WUAs, there is a three-tier chain of rural local governance, going up to the block and district levels, with the membership of state-level politicians at these higher levels also potentially connecting local and state government decision-making. This may not be the best model for federating WUAs, since it has tended to cement state-level control, rather than provide two-way communication in a more decentralized governance system. WUAs, on the other hand, have the potential to provide a more bottom-up structure. Another complication that works against aligning federations of WUAs with the tiers of local governance is, of course, that water system boundaries do not match the existing political boundaries. This discussion highlights the challenges of creating any new hierarchy of specialized water management institutions in India, in the context of existing and evolving governance structures. The precise way of overcoming these challenges is not mapped out here, but it is important to point out the gap in NWM's analysis and institutional proposals in this regard. The contention in this chapter is that without some vertical coordination of water management efforts that includes the local level, NWM's goals will not be achievable. At the same time, Bhamoriya and Gandhi's (2011) analysis, summarized earlier in this section, reminds us of the importance of getting the institutional design details right for the WUAs themselves, before considering hierarchies of institutions.

³⁷ Meinzen-Dick et al. (1997) note that government irrigation agencies typically retain control at the river basin level and often also at any levels higher than that of the local watercourse.

Returning to the overall water recharge, and rainwater interlinking and desalination, there may be any prioritization of the kinds of cost calculation, the Group, or any other calculation for significant new research on aging water resources and (5). The additional funds during the eleventh Five Year plan are billion. Half of this amount goes to irrigation projects, including the modernization of existing irrigation infrastructure. The *five-year* amount is about 10% of the *annual* expenditure. Micro-irrigation practices that make up a significant portion of water issues are not prioritized; they show up in the eleventh plan efforts, albeit with relatively low funding (2008: appendix).

Turning to NPF (Government of India, 2008), comprising that they both cover irrigation, including better water management, may be concrete in terms of funding, but do not provide any budgetary responses, beyond the two documents do not exist in a single document, illustrating some of the challenges that exist across central government

³⁸ As discussed earlier in this section, and it starts with the AIBP (2011) consider AIBP in the context of water reform at the state level had mixed success. The water sector has had no assessment of what might be done for irrigation projects, or to incentivize

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Returning to the overall NWM report, water recycling, groundwa-
ter recharge, and rainwater harvesting all receive attention, as do river
interlinking and desalination. At this stage, there does not appear to
be any prioritization of these methods of water management based on
the kinds of cost calculations performed by the 2030 Water Resources
Group, or any other calculations for that matter. There are proposals
for significant new research on technical options with respect to man-
aging water resources and use (Government of India 2009: chapter
5). The additional funds estimated to be needed under NWM dur-
ing the eleventh Five Year Plan (2007–12) are approximately US\$ 6.3
billion. Half of this amount is for 'expeditious' completion of irri-
gation projects, including extension, renovation, and modernization
of existing irrigation infrastructure.³⁸ To benchmark this figure, the
five-year amount is about 2.5 per cent of the central government's
annual expenditure. Micro-irrigation would receive approximately an
additional US\$ 220 million under the NWM scenario. Agricultural
practices that make up almost the entire list discussed in the section
on water issues are not part of the NWM funding framework, though
they show up in the eleventh Plan as the Ministry of Agriculture's
efforts, albeit with relatively low allocations (Government of India
2008: appendix).

Turning to NPF (Government of India 2007) and NMSA, it is unsur-
prising that they both cover issues related to improved farming practices,
including better water management. Again, there is little that seems to
be concrete in terms of priorities, and unlike NWM, these documents
do not provide any budgetary guidance, or much in the way of institu-
tional responses, beyond noting the importance of local action. These
two documents do not appear to be well-coordinated with the NWM
document, illustrating some of the gaps in horizontal coordination that
exist across central government ministries.

³⁸ As discussed earlier in this section, AIBP has already attempted to achieve
this outcome, and it started in 1996–97, well before NWM. Rao and Sen
(2011) consider AIBP in the larger context of attempts by the centre to incen-
tivize reforms at the state level. Their overall conclusion is that such efforts have
had mixed success. The weakness of the NWM document is that it provides
no assessment of what might be learnt from past efforts to accelerate irrigation
projects, or to incentivize reforms in other sectors of the economy.

Perhaps the government proposal that has received the most attention and caused the most debate has been that for interlinking India's rivers. The proposal in its best-known form involved two components, one linking the northern rivers flowing from the Himalayas, and the second linking southern, peninsular rivers. The entire plan was projected to cost US\$ 125 billion, and was formulated under the NDA government in 2002, but received continued consideration under the UPA government that came to power in 2004 and was re-elected in 2009. While the plan in its full form has been dropped (Dancewithshadows.com 2009; Indianexpress.com 2009), the possibility of implementing some of the links remains alive. Specific river-linking projects in the south have been approved, and Tamil Nadu's DMK, a key UPA constituent party, has argued in favour of river linking projects that would bring more water to that state. In keeping with our earlier discussion, it seems there are unanswered questions about the cost-benefit analysis of interlinking, even for the most water-stressed regions, especially without considering the alternative of conservation measures and measures for increased water efficiency. NWM is almost totally silent on river interlinking, apart from a single passing mention.

Finally, we briefly discuss urban water use and infrastructure.³⁹ JNNURM is concerned with urban infrastructure generally, including roads, though excluding power and telecommunications. Through this effort, the central government is providing project-based assistance to cities. Again, this is technically through state governments, to respect the constitutional division of powers (local government being a state subject), but effectively another example of centralization in the working of the Indian federal system. General urban renewal also includes water supply and waste management infrastructure (Government of India 2005: 10):

- (1) Urban renewal, that is, redevelopment of inner (old) city areas [including widening of narrow streets, shifting of industrial and commercial establishments from non-conforming (inner city) areas to conforming (outer city) areas to reduce congestion, replacement of old and worn out pipes by new and higher capacity ones, renewal of the sewerage, drainage, and solid waste disposal system etc.].

³⁹ Several chapters of IDFC (2011) cover aspects of this topic in some detail.

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The mission also includes water and sewerage more specifically (Gov-
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- (2) Water supply (including desalination plants) and sanitation.
- (3) Sewerage and solid waste management.
- (4) Construction and improvement of drains and storm water drains.

The mission also covers community baths and toilets in urban slums
as these projects also have a water supply component.

In terms of mitigation options for India's potential water shortages,
urban water supply and sewerage is a necessary corollary of growth, but
at the same time is not a critical contributor to future potential short-
falls. Sanitation and waste management are vital needs in urban India,
where access to water is below the levels available in cities in comparable
developing countries. JNNURM channels funds to municipal govern-
ments that may not have adequate tax revenues of their own, and which
are often not receiving adequate transfers from their respective state
governments. Some of the larger cities are in a position to raise funds
for investments through municipal bonds, but that channel is relatively
underdeveloped in India. Overall, while measures that are enabled by
JNNURM are not the most cost-effective in terms of India's aggregate
water-marginal cost curve (Figure 7.1), they make sense based on a
broader economic and social calculus. Finally, the driver of JNNURM is
the need to prepare India's cities for continued urbanization of the coun-
try, and issues of water availability are peripheral from that perspective,
though ultimately actions elsewhere in the economy will be required to
release enough water for urban expansion.

While JNNURM has been in operation for several years, NWM and
the broader action plan for climate change are very much at the stage of
conceptualization and discussion. The Government of India approved the
NWM charter in July 2011 (iGovernment 2011). Meanwhile the Ministry
of Water Resources unveiled a draft of a new NWP in January 2012. A
series of consultations took place in 2010–11, eliciting a wide variety
of suggestions. The background note for the consultations (Government
of India 2010) provides useful perspectives from previous reports from
academics and industry associations, as well as from a committee on cen-
tre–state relations that, reminiscent of the Richards and Singh ideas, rec-
ommended that 'a hierarchical but coordinated set of watershed agencies

need to be set up by joint action of the Centre and States and participation of local bodies with inter-State basins as the focus.'

CONCLUSION

India faces severe but potentially manageable challenges with respect to water resources over the next two decades and beyond. In the section on water issues, we outlined the magnitude and multiple dimensions of the challenges. We also noted that relatively low-cost measures could provide significant benefits in terms of increasing effective water availability. Of course, aggregate water availability is just one aspect of the problem, with access, quality, and variability all being complex dimensions of water resource management. Systematic treatment of the range of issues with respect to water resources is a challenge prior to the difficulties of implementing solutions to problems.

One of the biggest hurdles in tackling India's water management challenges is the creation of appropriate institutions for analysing problems and implementing solutions. Overall, the Indian government's responses to current and future water challenges have been quite broad but rather superficial, and only now display the beginnings of an integrated approach to water management. The quality of analysis of specific issues with respect to managing water resources is higher than in the past, but prioritization and rigorous cost-benefit analysis remains to be accomplished. Thus, the ideas and analysis that can guide institutional reforms still need to be developed and clarified. The sections on analytical review and current developments in this chapter offer some possibly fruitful ways of thinking about the problems faced by India's water sector, as well as potential institutional reforms that might create structures within which the problems can be tackled. A key conceptual point in the section on analytical review was that national and state-level reforms for water management will be sub-optimal without prior attention to improving local institutions of collective action with respect to water resources.

The federal dimension of water resource management has been recognized in the past, given the fact of India's many inter-state river basins. However, this recognition has not been complete with inadequate attention to state and local level policies and allocation mechanisms. Even with increasing recognition, translating national policies and strategies

into state and local in many other sectors progress, but only of the biggest gaps management through coordination as well as state river disputes probably are best management and away from components in this vertical coordination

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into state and local action remains a major challenge, as it has been in many other sectors. Local management of water resources is making progress, but only covers a fraction of the nation's water resources. One of the biggest gaps is in connecting river basin management with local management through a chain of institutions that achieves vertical coordination as well as incentive efficiency through decentralization. Inter-state river disputes continue to present challenges for India's polity, and probably are best addressed by shifting the focus to continuous management and away from dispute resolution. The section on current developments in this chapter offers some ideas on achieving more effective vertical coordination in the context of managing India's water resources.

The analysis in this chapter does not present a complete solution, and it is not clear that one is immediately available, or even feasible. Development of institutions takes time, and different circumstances across different states will require different approaches. What is worth noting is that for many decades national and state governments did not pursue all the opportunities for institutional development that were available to them. In particular, the creation of river basin authorities and of lower-level participatory water management organizations has been relatively limited, so the building blocks for hierarchies of institutions are not even in place. One positive development over the last two decades has been the creation and gradual strengthening of elected local governments. However, it is not clear whether these local governments are well-positioned to manage local water resources, as they lack the necessary financial resources as well as human and organizational capital. Of course, these can be provided or built over time but another issue is the differences between political and natural boundaries for water resource management. As has been highlighted in this chapter, some states have been attempting institutional innovations, with new legislative frameworks for WUAs, and new regulatory bodies for water resources. Researchers have started comparing the impacts of these innovations across states, to draw lessons for institutional design. This chapter argues that national-level policy documents do not have sufficient analysis of data from the states, nor enough attention to local-level issues of water resource management.

Horizontal coordination across ministries, particularly those responsible for agriculture and water resources, will also be a difficult task in formulating and implementing national-level water policies. Although the Planning Commission provides mechanisms for sectoral

views across ministry-level boundaries and for national-state coordination, its ability to influence and monitor implementation remains severely limited. The problem of ineffective or insufficient horizontal coordination is pervasive in Indian governance, but its implications are particularly acute in the case of water as Mandal and Rao (2005) have highlighted in their analysis of environmental policy in India's federal context.

Returning to the vertical dimension of the challenges of water management, there are a well-known set of general problems with Indian federalism (Rao and Singh 2005). Getting funds down to the level where they are best spent,⁴⁰ building the capacity for appropriate spending decisions, reducing spending distortions due to rent-seeking, coordinating complementary innovations, and designing policy to appropriately influence behaviour are all significant dimensions of what needs to be accomplished. These are long-standing problems of Indian federalism and the management of water resources from national considerations all the way down to day-to-day local issues exemplifies these structural challenges of India's federal system. In the last analysis, therefore, if India is to have any hope of meeting its severe challenges with respect to water resources, it will need reform of the federal system as well as reform through the pathways of the existing system.

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⁴⁰ This aspect of aligning revenue and spending, whether through assigning revenue authority or through fiscal transfers, is of course the heart of fiscal federalism, and has been analysed extensively elsewhere, so has not received much attention in this paper, where the focus is on institutional innovation. Clearly, new governance institutions need appropriate sources of revenue. This is an ongoing struggle for India's newish local governments, and has arisen in the context of innovations for water management institutions as well. For example, Bhamoriya and Gandhi (2011) note the different financial arrangements legislated for WUAs in Andhra Pradesh and Maharashtra.

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INTRODUCTION

Political scientists have long studied power arrangements. Recently started pay institutions and the socio-economic development. Kaufmann et al. 2000 and Tabellini 2000; performance has been a result of a combination of various factors, both of which are a burgeoning literature on economic performance characteristics, but that in a changing environment in which

In the discourse of federalism, the argument is made that the interests are ultimately determined through government intervention of public actors in society. The interests have a function in this commonly accepted