India's Water Economy
Bracing for a Turbulent Future

India faces an unsure water future. Unless fresh policies are adopted and implemented to make water development and management sustainable, India will have neither the means to maintain and build new infrastructure, nor the water required for its survival.

This report focuses on two basic issues—the major water-related challenges facing India, and the critical measures required to address them. It calls for a reinvigorated set of public water institutions to sustain water development and management in India. The study:

- examines the evolution of water management in India
- describes the achievements of the past
- analyses the challenges ahead
- suggests ways of evolving a sustainable water management system

Drawing heavily on background documents by eminent Indian practitioners and policy analysts, it explores various options of managing the transition from past practices in a principled and pragmatic manner.

The report will be essential for practitioners in the fields of water management, development, and economics. It may prove useful for policymakers, government agencies, NGOs, journalists, and general readers interested in India's water economy.

John Briscoe is currently World Bank Country Director for Brazil. Previously, he was Senior Water Advisor with responsibility for the Bank's water portfolio both globally and in South Asia.

R.P.S. Malik currently works with the Agricultural Economics Research Centre, University of Delhi. He has written extensively on water-related issues. Earlier, he worked for The World Bank, World Resources Institute, and Afro-Asian Rural Reconstruction Organization.

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John Briscoe • R.P.S. Malik

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THE WORLD BANK
Agriculture and Rural Development Unit
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The title for this report is stolen—with kind permission from Tushaar Shah—from that of the 2005 annual meeting of the IWMI-Tata Water Program, one of the many fora at which the ideas in this Report were discussed and refined. The IWMI graciously helped with the production of the basin maps. Jacqueline Julian of the World Bank provided excellent assistance. Generous support was provided by the Bank Netherlands Water Partnership Program.

CURRENCY EQUIVALENTS

Currency unit = Indian rupee
US$1= Rs. 45.50

FISCAL YEAR

April 1–March 31

ABBREVIATIONS AND ACRONYMS

CAS	–	Country Assistance Strategy
CII	–	Confederation of Indian Industry
CWC	–	Central Water Commission
DJB	–	Delhi Jal Board
DVC	–	Damodar Valley Corporation
FICCI	–	Federation of Indian Chambers of Commerce and Industry
IMT	–	Irrigation Management Transfer
IPCC	–	Intergovernmental Panel on Climate Change
IWMI	–	International Water Management Institute
NWDA	–	National Water Development Authority
PIM	–	Participatory Irrigation Management
TISCO	–	Tata Iron and Steel Company
TVA	–	Tennessee Valley Authority
WUA	–	Water Users Association

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INDIA'S WATER ECONOMY

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PREFACE

This report was motivated by two ideas. First, an important element of the World Bank's 2003 Water Resources Strategy was to translate the general principles governing Bank engagement in the water sector into 'Country Water Resource Assistance Strategies' which were tailored to the requirements of specific countries. Second, the 2004 World Bank Country Assistance Strategy (CAS) for India signaled a major increase in Bank lending for water (including water resources, irrigation, water, sanitation, and hydropower).

In discussions with the Ministry of Water Resources and the Planning Commission of the Government of India, it was agreed that the Bank would undertake a study of the strategic challenges facing the water sector in India, and provide more specificity than the CAS on what the 'trademark' ideas would be for the Bank's lending and non-lending activities in India.

The Bank commissioned the following background papers by prominent Indian practitioners and policy analysts:

- The evolution of national policies and programs (Mr. A.D. Mohile, former Chair, Central Water Commission)
- The evolution of water development and management: the perspective of the Planning Commission (Mr. A Sekhar, Adviser, Planning Commission)
- The evolution and performance of World Bank work on water in India (Dr. R.P.S. Malik, University of Delhi)
- Water and growth (Professor Ramesh Bhatia, Institute of Economic Growth, University of Delhi)
- Water and poverty (Dr. R.P.S. Malik, University of Delhi)
- Water and environmental sustainability (Mr. George Varughese, Development Alternatives)
- Water and energy (Professor Ramesh Bhatia, Institute of Economic Growth, University of Delhi)
- Pricing and financing (Professor Sebastian Morris, Indian Institute of Management Ahmedabad)
- Water rights and entitlements (Dr. Maria Saleth, International Water Management Institute, Colombo)
- Accountable institutions (Dr. Tushaar Shah, International Institute of Water Management, Anand)
- Moving to scale (Dr. Nirmal Mohanty, Infrastructure Finance Development Corporation)
- The political economy of change (Professor V.S. Vyas, Institute of Development Studies, Jaipur)

The process included a number of consultations. In a Bank-hosted multi-stakeholder consultation in August 2004, the idea of the study was presented, and inputs on substance and process were made by about 50 individuals from the Union Government, Planning Commission, state governments, the private sector, financial institutions, urban water supply utilities, NGOs, academics, professional associations, chambers of industry, bilateral and multilateral aid agencies, and UN agencies. The same individuals were invited to a final consultation on the draft report, held in New Delhi in October 2005. Drafts of the main ideas of the report were also discussed at seminars held by the Confederation of Indian Industry, the Federation of Indian Chambers of Commerce and Industry, the World Wildlife Fund, the International Water Management Institute (IWMI), and the Planning Commission of the Government of India.

In January 2005, the Ministry of Water Resources hosted a major consultation on 'Challenges for Water Development and Management in India and Future Strategies', which was addressed by the Ministers and Secretaries of Finance and Water Resources, the Member for Water and Power of the Planning Commission, and the World Bank Country Director for India. The focus of the consultation was on the emerging themes from the Bank's study, the views of the Union and state governments, and the implications for World Bank involvement in water in India.

EXECUTIVE SUMMARY

India faces a turbulent water future. The current water development and management system is not sustainable: unless dramatic changes are made—and made soon—in the way in which government manages water, India will have neither the cash to maintain and build new infrastructure, nor the water required for the economy and for people.

This Report examines the evolution of the management of India's waters, describes the achievements of the past, and the looming set of challenges. The Report suggests what changes should be considered and how to manage the transition from 'the ways of the past' to 'the ways of the future' in a principled but pragmatic manner. It draws heavily on a set of 12 background documents by eminent Indian practitioners and policy analysts, and addresses two basic questions:

- What are the major water development and management challenges facing India?
- What are the critical measures to be taken to address these?

India has a highly seasonal pattern of rainfall, with 50 percent of precipitation falling in just 15 days and over 90 percent of river flows in just 4 months. Throughout history, people have adapted to this variability by either living along river banks or by careful husbanding and management of water. Until the 19th century, most of this management was at the community level, relying on a plethora of imaginative and then-effective methods for harvesting rainwater in tanks and small underground storages.

Much human ingenuity is required to sustain life and society in India's highly variable climate

Over the past 150 years, India has made large investments in large-scale water infrastructure, much of which brings water to previously water-scarce areas. This has resulted in a dramatic economic shift, with once-arid areas becoming the centers of economic growth, while the historically well-watered areas have seen much slower progress. For the most part, the results of this 'hydraulic infrastructure platform' have been spectacular both nationally (through the production of foodgrains and electricity, for example) and regionally (where such projects have generated large direct and equally large indirect economic benefits). The poor have benefited hugely from such investments. The incidence of poverty in irrigated districts is one-third of that in unirrigated districts.

India has reaped great benefits from its investments in water infrastructure

There are regions of India that can benefit greatly from increased investment in water infrastructure, of all scales. India can still store only relatively small quantities of its fickle rainfall. Whereas arid rich countries (such as the United States and Australia) have built over 5000 cubic meters of water storage per capita, and middle-income countries like South Africa, Mexico, Morocco, and China can store about 1000 cubic meters per capita, India's dams can store only 200 cubic meters per person. India can store only about 30 days of rainfall, compared to 900 days in major river basins in arid areas of developed countries. A compounding factor is that there is every indication that the need for storage will grow because global climate change is going to have major impacts in India—there is likely to

India needs a lot more water infrastructure

be rapid glacial melting in coming decades in the western Himalayas, and increased variability of rainfall in large parts of the subcontinent.

A review of India's hydropower infrastructure reveals a similar picture: whereas industrialized countries harness over 80 percent of their economically-viable hydropower potential, in India the figure is only 20 percent, despite the fact that the Indian electricity system is in desperate need of peaking power and despite the fact that Himalayan hydropower sites are, from social and environmental perspectives, among the most benign in the world. Especially in the water-rich northeast of the country, water can be transformed from a curse to a blessing only if major investments are made in water infrastructure (in conjunction with 'soft' adaptive measures for living more intelligently with floods). Recognizing this, the Prime Minister has recently called for the establishment of 'a TVA (Tennessee Valley Authority) for the Brahmaputra', which would combine major water infrastructure with modern management approaches to make water a stimulus for growth. In many parts of the country there are also substantial returns from investments in smaller-scale, community-level water storage infrastructure (such as tanks, check dams, and local water recharge systems). And there are massive needs for investment in water supply systems for growing cities and for underserved rural populations.

The problems of a developing India, however, are not limited to providing adequate quantities of water. Growing populations, cities, and industries are putting great stress on the aquatic environment. Many rivers—even very large ones—have turned into fetid sewers. India's cities and industries need to use water more effectively, and there will have to be massive investments in sewers and wastewater treatment plants.

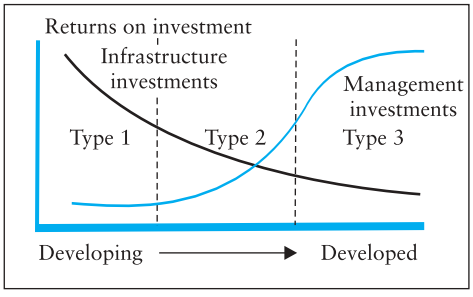
India's development of water infrastructure has not been accompanied by an improvement in the governance of water resources and water services

Global experience shows that the returns to investments in water infrastructure and management follow the broad outlines shown in Figure 1. During the first, development stage, the challenges were predominantly engineering in nature. In India, Sir Arthur Cotton and other pioneering engineers were worshipped as saints, and dams became 'the temples of modern India'. The very success of this enterprise, as in other societies and for other issues, carried the seeds of its own downfall. As an infrastructure platform was built, the 'Type 2' and 'Type 3' challenges of maintenance, operation, and management started to emerge. The uni-functional ('build') and uni-disciplinary ('engineering') bureaucracy adopted the command-and-control philosophy of the early decades of independence, seeing users as subjects rather than partners or clients. The Indian state water apparatus still shows little interest in the key issues of the management stage—participation, incentives, water entitlements, transparency, entry of the private sector, competition, accountability, financing, and environmental quality.

Much of the infrastructure is crumbling

Evidence abounds of the inability of the state water machinery to address even the problems of the provision of public irrigation and water supply services. User charges are negligible, resulting in lack of accountability and insufficient generation of revenue even for operations and maintenance. The gap between tariff and value of irrigation and water supply services has fueled endemic corruption. Staffing levels are 10 times international norms, and most public funds are now spent feeding the

Figure 1: Rates of return on investment on infrastructure and management of water resources



Source: World Bank, China Country Water Resources Assistance Strategy 2002.

administrative machinery, not maintaining the stock of infrastructure or providing services. There is an enormous backlog of deferred maintenance. The implicit philosophy has been aptly described[1] as 'Build-Neglect-Rebuild'. This problem is serious in its own right, but it also means that public financing is not available for the vital tasks of providing new irrigation, water supply, and wastewater infrastructure to serve growing populations and the unserved poor. Most recent irrigation and water supply projects assisted by the World Bank, for example, have not financed new infrastructure, but the rehabilitation of poorly maintained systems.

The sector is facing a major financing gap. The real financial needs of the sector are growing—to meet the costs of rehabilitating the existing stock of infrastructure and to build new infrastructure. These needs are amplified by the fact that large proportions of recurrent budgets are spent on personnel, not on real maintenance, and on electricity, irrigation, and water supply subsidies. On the 'supply side' there are ultimately only two sources of financing—tax revenues and user charges. The budgetary allocations to the water sector is falling, as are payments by users. The net result is a large and growing 'financial gap', which can only be met by a combination of methods which include greater allocations of budgetary resources, more efficient use of those resources, and greater contributions from water users.

There is a major financial resources gap

This decline in the quality of public irrigation and water supply services would normally be expected to produce social unrest and political pressure. But to the (temporary) rescue of Indian society came a simple and remarkable transformational technology—the tubewell. With large areas of India having substantial and easily-accessible aquifers, people were able to ignore the inconvenience of poorly functioning public systems and become self-reliant using groundwater. In many ways, this 'era of the individual coping strategies' has been remarkably successful.

People have shown great ingenuity in 'working around' a poorly governed water system

- Irrigators have either drilled individual tubewells or relied on others' tubewells (giving rise to elaborate informal water markets). This has happened on a massive scale, with 20 million tubewells now installed, and groundwater now accounting for over 50 percent of irrigated area.
- The urban middle class have learned to make do with irregular, unpredictable, and often polluted public water services. They have developed coping strategies which include investments in household storage, purchasing of bottled water for drinking, installation of household water purification

[1] Nirmal Mohanty, 'Moving to scale', Background Paper for this Report, 2005.

systems, purchase of water from vendors, and, like their rural counterparts, private wells to tap the groundwater. Although the costs are high—six times higher than the average payment to the utility in Delhi, for example—this works for the middle class. Around 80 percent of domestic water supply in India now comes from groundwater.

- The situation of the poor in urban areas is far worse. They are powerless and therefore at the end of the line when the inevitable rationing takes place, and they cannot afford to make the same coping investments as the middle class. They depend heavily on water vendors, most of which are, again, supplied by groundwater, and provide water of very high cost.

- Industry, too, has coped by self-providing, mostly from groundwater. Where aquifers are either not available or exhausted, industries resort to very-high cost 'captive' alternatives (including reverse osmosis treatment of wastewater and desalination) to keep their factories running.

In many ways, this private, self-provision strategy has been a success, and has underpinned spectacular gains in agricultural production and the rise of thousands of towns and cities. This has bred an attitude among many—political leaders, industrialists, irrigators, and common people—that 'we have muddled through okay, and we will continue to muddle through'. This is a dangerous complacency, because it is based on three erroneous assumptions:

Complacency—'we can muddle through'—is a dangerous illusion, in light of scarcity, groundwater depletion, and environmental degradation

- that there is limitless groundwater;

- that the environmental debts (including vanishing wetlands and polluted rivers and aquifers) do not seriously constrain human activity; and

- that the financial liabilities inherent in these systems can continue growing indefinitely.

In already-large and rapidly-growing segments of the economy and in many of the most productive regions of the Indian economy, this self- provision model is no longer sustainable. The National Commission on Water of 1999 has shown that overall water balances are precarious, that crisis situations already exist in a number of basins, and that by 2050 demands will exceed all available sources of supply. Already about 15 percent of all aquifers are in critical condition, a number which will grow to 60 percent in the next 25 years unless there is change. About 15 percent of India's food is being produced using non-renewable, 'mined', groundwater. Since aquifer depletion is concentrated in many of the most populated and economically productive areas, the potential social and economic consequences of 'continued muddling through' are huge.

Changes in demands and in climate require a flexible and adaptive water sector

At the same time, Indian society is changing in many profound ways. Industries and cities (which both require water and produce wastes) are growing rapidly. Rural life is changing, with more than half of the people in rural Punjab and Haryana no longer engaged in agriculture. And agriculture itself is evolving. In a growing number of areas, high-value crops are now displacing low-value foodgrains, farmers are investing heavily in drip irrigation, and there are even travel agencies specializing in 'agro-tourism', so that farmers can see how their contemporaries manage with less water in Israel and other places. As incomes rise—100,000 people are joining the middle class every day!—

people are becoming more concerned with environmental quality. The net effect is that the demands for and on water resources are changing substantially, with the effects especially acute in the high-growth regions, most of which are water-scarce.

Confronted with this reality of limited supplies, and growing and changing demands, the need is obviously for a management framework which stimulates efficiency and which facilitates voluntary transfer of water as societal needs change. The traditional command-and-control and construction instruments of the Union and State water bureaucracies address neither of these imperatives. The economic and social costs of rigidity are large—a World Bank study of Tamil Nadu, for example, shows that if a flexible water allocation system was adopted, the State economy in 2020 would be 20 percent larger than under the current, rigid, allocation procedures. A central element of a new approach must be that users have well-defined entitlements to water. The broader messages are that the economic ideas of the 1991 economic reforms must be drilled down from the regulatory and financial sectors into the real sectors (including the water sector) if India is to have sustainable economic growth, and that the role of the Indian water state must change from that of builder and controller to creator of an enabling environment, and facilitator of the actions of water users, large and small.

An important manifestation of the break-down on the current system is the growing incidence and severity of water conflicts—between states, between cities and farmers, between industry and villagers, between farmers and the environment, and within irrigated areas. The state has generally responded by proposing new supply schemes (a new dam, a desalination plant, or a rainwater harvesting scheme) which will 'solve the supply problem'. What is becoming increasingly apparent is that in the growing number of areas where water is already scarce, it is a zero sum game. These schemes increasingly solve one person's problem at the expense of someone 'downstream'. On the more thorny issues where tradeoffs cannot be avoided, the usual response of the state water apparatus has been to hope it rains and, failing that play for time. ('Passing it to the Supreme Court' has become a standard modus operandi for water matters, where the administration cannot muster the necessary imagination or political will to act.) Where inter-state Tribunal awards have been made, they have not helped much. They have taken years to complete, have not followed global good practice, and have stimulated states to focus their attention on 'getting more water next time', rather than on effective use of what they have. The results have been serious economic and fiscal damage. (For example, 18 percent of Maharashtra's fiscal deficit is to pay for the construction of dams whose primary purpose is to lay claims for water from the Krishna in the next Tribunal Award.) In addition, there are no effective mechanisms for enforcing awards or preventing unilateral action or even exit by dissatisfied states. The lack of modern, fair, and enforceable inter-state water compacts has also stymied sensible inter-state 'win-win' water cooperation.

> Water conflicts are becoming endemic at all levels

As in all other federal countries, these issues are complex and political. India has some good models for proceeding—in its own treaties with Pakistan on the Indus and Bangladesh on the Ganga; and in the experience of other arid federal countries. Dealing with these issues is the single most important task facing the Union Ministry of Water Resources. Recent statements by national political leaders show growing awareness of the problem. The Finance Minister has warned about 'a growing set of little civil wars over water', and the Minister of Water Resources notes wryly that he is really 'the Minister of Water Conflicts'.

India needs a re-invigorated set of public water institutions, which are built on the following imperatives:

- focusing on developing a set of instruments (including water entitlements, contracts between providers and users, and pricing) and incentives which govern the use of water;

Towards a 'new water state' at the Union and State levels

- stimulating competition in and for the market for irrigation, water, and sanitation services;
- empowering users by giving them clear, enforceable water entitlements;
- ending the culture of secrecy and making transparency the rule;
- introducing incentive-based, participatory regulation of services and water resources;
- putting the sector on a sound financial footing;
- investing heavily in the development of a new generation of multi-disciplinary water resource professionals;
- making the environment a high priority;
- making local people the first beneficiaries of major water projects.

India is rapidly approaching the end of an era in which society could 'get by' despite the fact that government (a) has performed poorly where it has engaged (in service delivery), and (b) has abandoned major areas where government engagement is critical (such as groundwater management, conflict resolution, establishing and managing water entitlements, and the financing of public goods such as flood control and wastewater treatment).

There are two main corollaries to this diagnosis. First, that a major push is needed—by government and by users working together—to bring abstractions from groundwater in line with recharge. While traditional technologies such as rainwater harvesting and tanks can play an important local role, they also create new and additional demands which often clash with existing uses, and they sustain the wishful thinking that supply-side options (both large and small scale) are what will 'solve the problem'. The simple fact is that in many parts of India demand will have to be brought down to match sustainable supply. Global experience shows that this difficult and essential task will require a partnership between users and government—to form empowered aquifer user associations; to formalize water entitlements which are consistent with the sustainable yield of the aquifer; to develop transparent information and decision support systems. So far the approach of the water apparatus has been to promulgate laws and policies, most of which are not implemented. Here an approach which begins with acknowledgement of and respect for the private interests of individual farmers will be far more successful than approaches which resort to command and control, or ones which are based on a communitarian ideal. The longer this adjustment takes place, the more costly and difficult it becomes.

Second, the end of the era of massive expansion in groundwater use is going to demand greater reliance on surface water supply systems. This is going to require recuperation of the large stock of dilapidated infrastructure and large-scale investment in public infrastructure of all scales (for provision and distribution of surface water supplies, but also for treatment of wastewater). And it is going to require a dramatic transformation in the way in which public water services are provided to farmers, households, and industries, in which the watchwords are water entitlement, financial

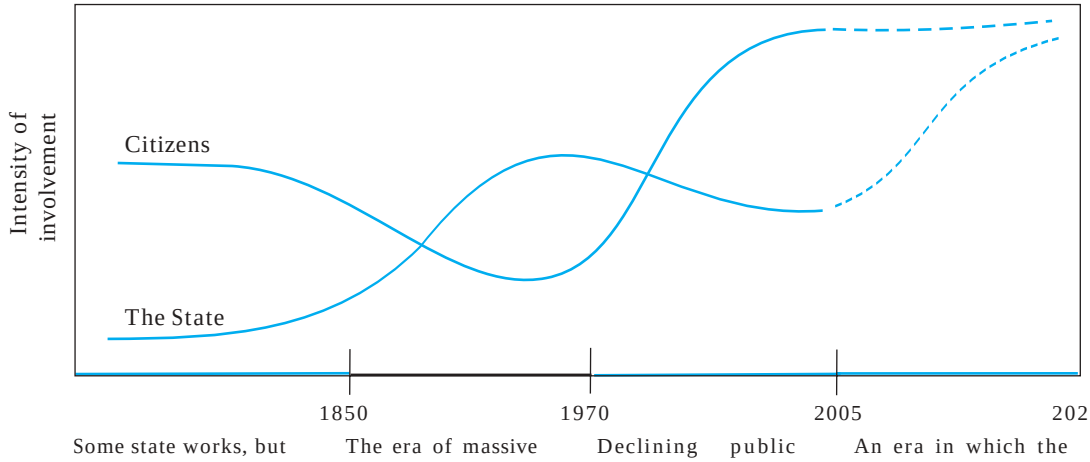
sustainability, accountability, competition, regulation, and entry of alternatives to government provision, including cooperatives and the private sector.

India faces this challenge with many assets and some liabilities. The assets include citizens, communities, and a private sector who have shown immense ingenuity and creativity, attributes which are critical for the new era of water management. The major liability is a public water sector which rests on the laurels of an admirable past, but is not equipped to deal with the central tasks which only the government can—developing an enabling legal and regulatory framework; putting into place entitlement and pricing practices which will provide incentives for efficient, sustainable, and flexible use of water; forming partnerships with communities for participatory management of rivers and aquifers; providing transparent information for use in managing and monitoring the resource and services; stimulating competition among providers through benchmarking and the entry of private sector and cooperative providers; regulating both the resource and services; and financing true public goods, such as flood control and wastewater treatment. Figure 2 provides a schematic sense of the necessary 'next stage' in the evolution of water management in India.

Starting to move from here to there—the political economy of reform

In the eyes of many—including several of the very experienced Indians who wrote background papers for this report—the idea of such a modern, accountable 'Indian water system' is a fantasy, given the dismal performance of the Indian state on water matters in recent decades and the broader challenges of governance. Others point to 'the hollowing out of the Indian

Figure 2: The evolving role of the citizen and the state in water management in India



Some state works, but most citizens survived along rivers, by local rainwater harvesting and from rainfed agriculture

The era of massive state irrigation works, with a decline in traditional water management by citizens

Declining public funding, and massive individual investments in tubewells

An era in which the state needs to play a major role in surface water provision and in the regulation of groundwater

state ... the growing middle-class exit from public services ... and the inability to grapple with the many long-term challenges facing the country'.[2] The glass is, of course, always half empty. But it is half full too. There are some important signs that the need for change is being understood, there are political leaders who are starting to grapple with these realities, and there are a few states which are taking the important first steps down this long and winding road.

India is fortunate, too, in that it is not the first country in the world to face this (daunting) set of challenges. The experiences of other countries suggest that there are a set of 'rules for reformers' in undertaking such a transition. These rules include:

- Initiate reform where there is a powerful need and demonstrated demand for change.
- Involve those affected, and address their concerns with effective, understandable information.
- If everything is a priority, nothing is a priority—develop a prioritized, sequenced list of reforms.
- Pick the low-hanging fruit first—nothing succeeds like success.
- Keep your eye on the ball—don't let the best become the enemy of the good.
- Be aware that there are no silver bullets.
- Don't throw the baby out with the bathwater.
- Treat reform as a dialectic, not mechanical, process.
- Understand that all water is local and each place is different—one size will not fit all.
- Be patient, persistent, and pragmatic.
- Ensure that reforms provide returns to politicians who are willing to make changes.

How the World Bank might be a more effective development partner

In a national workshop to discuss this Report, the Ministry of Finance described what the Government of India expects of the World Bank in the water sector. The World Bank is expected to finance projects which couple high-return investment with reform processes, and which bring knowledge about international good practice to bear on the water challenges facing India. With this guidance, what is it that the World Bank can do to be a better partner to India on water?

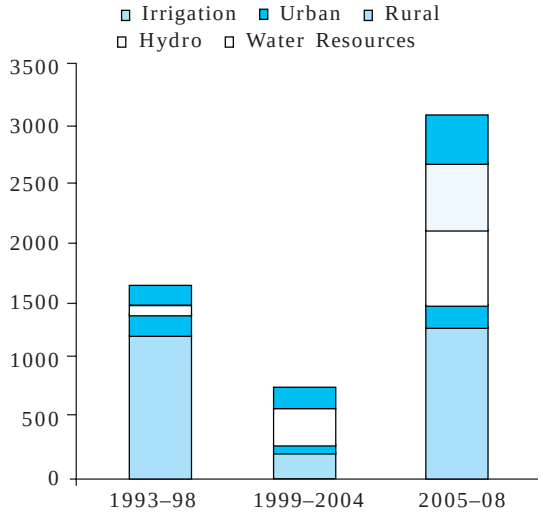
The India Country Assistance Strategy of 2004 outlines the broad features of Bank involvement with India over the next 4 years. This includes:

- lending, which will simultaneously address investments, reforms, and knowledge, transfer;
- a large increase—see Figure 3—in lending for water-related sectors (including water resources management, irrigation, hydropower, and water supply and sanitation), with aggregate lending for these sectors set to rise from $200 million to $800 million a year;
- a willingness to consider financing high-return infrastructure that can be built to reasonable social and environmental standards;
- clear 'guidelines' for engagement with each water-related sector.

The CAS is a living document, with elaborations and adjustments emerging as needs and

[2] Devesh Kapur, 'India's Promise?', *Harvard*, July–August 2005.

Figure 3: The changing composition and level of World Bank lending for water in India



perceptions evolve. Consistent with the guidance from the Ministry of Finance, the Bank will focus more sharply on the institutional reform and global best practice content of Bank-financed activities. This will mean greater emphasis on 'instruments' that stimulate efficiency, accountability, and flexibility (such as water entitlements, information, regulation, competition, and pricing). It will also mean greater attention to the 'hidden groundwater economy'. It will mean more attention on building capacity in the public sector. It will mean being 'principled and pragmatic', following the 'rules for reformers' outlined earlier.

In its internal workings, the Bank will also give more explicit attention to ensuring better cross-sectoral collaboration within the Bank on water resources and to better integration of the Bank's lending and knowledge services—so that there is more explicit learning from projects, and that analytic work feeds back into the design of Bank-financed projects. And the Bank will recruit staff and consultants who have hands-on knowledge in translating reform principles into results on the ground.

CHAPTER 1

THE HUGE ACHIEVEMENTS OF WATER DEVELOPMENT AND MANAGEMENT IN INDIA

India has a highly seasonal pattern of rainfall, with 50 percent of precipitation falling in just 15 days and over 90 percent of river flows occurring in just four months. Throughout history, people have adapted to this variability by either living along river banks or by careful husbanding and management of water. Thousands of minor irrigation tanks were constructed in the 5th century AD by the Cheras, Cholas, and Pandyans.[1] Most of this management was at the community level, relying on a plethora of imaginative and then-effective methods for harvesting rainwater in tanks and small underground storages. But even in ancient times, India had constructed some major water infrastructure. Small storage reservoirs were constructed before the Mauryan era around 300 BC[2] and the Grand Anicut across the Cauvery River was built in the 2nd century AD. The Western Yamuna Canal was built in the 14th century AD.[3] During the Mughal era (16th through 19th centuries) large-scale, run-of-the-river schemes and inundation canals were constructed.

The Era of Large Investments in Major Infrastructure

With British rule came the systematic and large-scale development of water infrastructure in India. As analyzed in Deepak Lal's economic history of India,[4] the British understood that the marginal returns to water development were higher in regions of relatively low rainfall than in the higher rainfall areas, and thus emphasized hydraulic works which would 'make the deserts bloom'.[5] The results were spectacular. The Godavari Barrage, built in the mid-19th century, transformed the famine-wracked districts of the Godavari Delta into a granary (and the builder of the Barrage, Sir Arthur Cotton, into a saint whose image is revered throughout coastal Andhra Pradesh—Figure 1.1). And the Periyar Dam, a major turn-of-the-century inter-basin transfer scheme which sustains agricultural productivity in the Vaigai Basin in Tamil Nadu to this day, brought similar fame to another British engineer, the equally-evocatively named Colonel John Pennyquick (Figure 1.1, too.) 'In recent years, portraits and statues featuring Pennyquick's ramrod posture … have rapidly proliferated throughout the region, lending a rather surprising tint to a Tamil monumental landscape peopled otherwise by film stars and political leaders … Pennyquick (is venerated) as the very symbol of attentive and effective government'.[6]

After Independence, the Government of India gave high priority to the construction of major

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1 A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.
2 A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
3 A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.
4 Deepak Lal, Cultural Stability and Economic Stagnation: India 1500 BC – 1980 AD.
5 In the evocative phrase of Arthur Maass and Raymond L. Anderson, *And the Desert Shall Rejoice: Conflict, Growth, and Justice in Arid Environments*, MIT Press, 1978.
6 Anand Pandian, 'An ode to an engineer', in *The Penguin Book of Water Writings*, ed. Amita Baviskar, Penguin India, 2003.

Figure 1.1: British water engineers who are revered as saints in southern India

Statue of Sir Arthur Cotton in the Godavari Delta, Andhra Pradesh

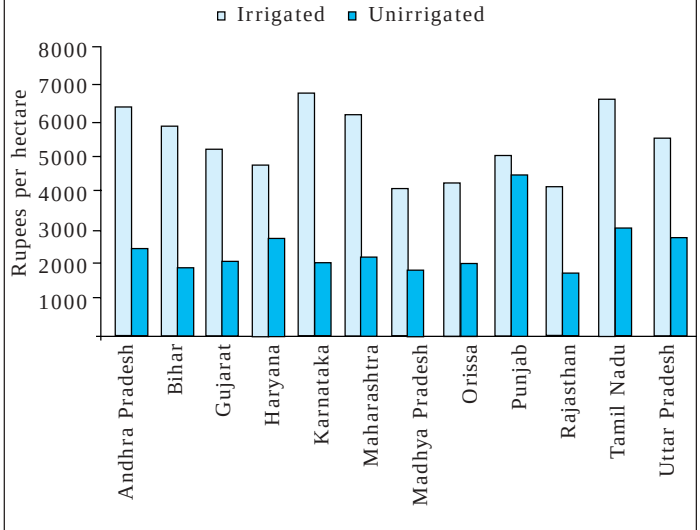
Statue of Col. John Pennyquick in Madurai, Tamil Nadu

water infrastructure. Today, India has a capacity to store about 200 billion cubic meters of water, a gross irrigated area of about 90 million hectares, and an installed hydropower capacity of about 30,000 megawatts (MW).[7]

These investments transformed the economic and social development of India (as documented in detail in the background papers on 'Water and Growth' by Ramesh Bhatia, and 'Water and Poverty Reduction' by R.P.S. Malik). Most obviously and directly, assured supplies of water meant that crop yields on irrigated land were consistently much higher than yields from rainfed agriculture (Figure 1.2), providing the basis for the achievement of national food security and associated affordability of food. Many of the large dams also provided the underpinnings for Indian industrial growth and groundwater irrigation, with hydropower accounting for over half of India's installed generation capacity in the 1960s.

Important as these direct effects are, they tell only part of the story of the impact of major infrastructure. The irrigation and hydropower are the 'direct benefits', which in turn generate both inter-industry linkage impacts, and consumption-induced impacts on the regional and national economy. Water released from a multipurpose dam provides irrigation that results in the increased output of agricultural commodities. Changes in the output of these commodities require inputs from other sectors such as seeds, fertilizers, pumpsets, diesel engines, electric motors, tractors, fuels, and electricity. Furthermore, increased output of some agricultural commodities encourages setting up of food processing (sugar factories, oil mills, rice mills, bakeries, etc.) and other industrial units. Similarly, hydropower produced from a multipurpose dam provides electricity for households in urban and rural areas and for increased output of industrial products (including fertilizers, chemicals, and machinery). Changes in the output of these industrial commodities require inputs from other sectors such as steel, energy, and chemicals. Thus, both increased output of electricity

Figure 1.2: Output on irrigated and unirrigated farmland



Source: Bhatia, 2005.

[7] A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.

and irrigation from a dam result in significant backward linkages (i.e. demand for higher input supplies) and forward linkages (i.e. providing inputs for further processing). In addition, as incomes rise, there is a further feedback loop deriving from increased demands for goods and services.

There have been two major studies in India which have examined these indirect impacts. A study by the International Food Policy Research Institute of the impact of the Green Revolution in the North Arcot region of Tamil Nadu[8] showed that:

- the multiplier was large—each rupee increase in value added in agriculture stimulated an additional rupee of value added in the region's non-farm economy;
- about half of the indirect income gain was due to agriculture's demands for inputs and marketing and processing services, and the rest due to increased consumer demands as a consequence of higher incomes;
- the multipliers for basic productive infrastructure were much higher than for social spending and other sectors.

A recent, major study[9] by Ramesh Bhatia and Ravinder Malik has used an input-output model combined with a social accounting matrix for Punjab to make a similar assessment of the impact of the Bhakra Dam, which was conceived of as a cornerstone of the development of Northwest India and which irrigates 7 million hectares and provides 2800 MW of hydropower. The study found that the direct benefits were higher than anticipated when the dam was built and that the dam did, indeed, serve to transform this region. For every 100 rupees of direct benefits, Bhakra generated 90 rupees of indirect benefits for the regional economy and ripples well beyond the region.

Several important studies have examined the deeper, transforming role of the provision of water infrastructure in India. In a classic study in the 1970s, the eminent economist K.N. Raj examined the interaction of 'infrastructural', 'human', and 'financial' capital, by comparing the fate of Punjabi and Gurkha military retirees. Both groups had similar 'human' and 'financial' capital, but returned to radically different settings in terms of 'infrastructural capital'. Whereas the Gurkha veterans invested in jewelry (with little effect on their society), the Punjabis invested in pumps and seeds, which provided the fuel for rapid economic growth.

More recently, Pritchett[10] has examined the circumstances under which investments in education provide economic returns. In India, the results were striking—in districts where there was agricultural transformation (viz. irrigated districts) the returns to five years of education were 32 percent, whereas in unirrigated rural districts there were no economic returns to primary education.

How then, do such investments stack up in a new era, in which attention to poverty reduction is much more overt and explicit? As noted by in the background paper by Malik,[11] 'such investments have generally been justified for realizing broad-based growth, for increasing agricultural production and achieving food security, for increased hydropower generation, for making drinking water available to rural and urban areas … not as poverty-reducing strategies per se ….' Such invest-

[8] Peter Hazell and C. Ramasamy, *The Green Revolution Reconsidered: The Impact of High Yielding Varieties in South India*, Baltimore, Md.: The John Hopkins University Press, 1991.

[9] Ramesh Bhatia and R.P.S. Malik, *'Indirect Economic Impacts of Bhakra Dam' in* Ramesh Bhatia, Monica Scatasta, Rita Cestti, and R.P.S. Malik, *Indirect Economic Impacts of Dams,* (2 vols.), The World Bank, Washington DC (forthcoming 2006).

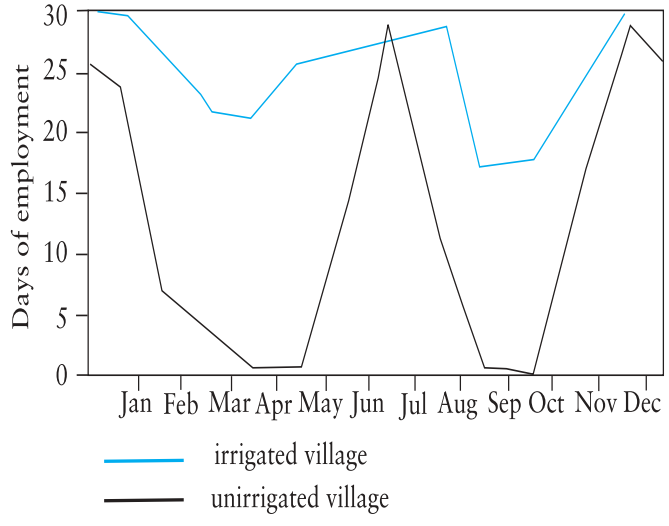
[10] Lant Pritchett, 'Where has all the education gone', *World Bank Economic Review*, vol. 15, no. 3, pp. 367–91.

ments in major water infrastructure have been criticized (including, by the Operations Evaluation Department of the World Bank[12]) on equity considerations: 'the benefits of development are reaped by relatively better-off landowning households and non-land-holding and poor households are left out'. Fortunately, there is a large literature in India on the distributional aspects of such projects, a literature which reveals a quite different reality.

The first important fact is that (as shown in Figure 1.3) irrigation in India is not dominated by 'big landlords'.

More importantly, the central factor is not who gets the water, but how that water transforms the demand for inputs, most strikingly labor (which is provided primarily by the landless and marginal farmers). The fundamental driver is that the demand for agricultural labor is 50 percent to 100 percent higher on irrigated land.[13] As Robert Chambers[14] has shown through village-level work (Figure 1.4), irrigation has meant higher and much more stable employment, with the poor as the major beneficiaries.

Figure 1.4: Average number of days of employment for adult casual laborers each month

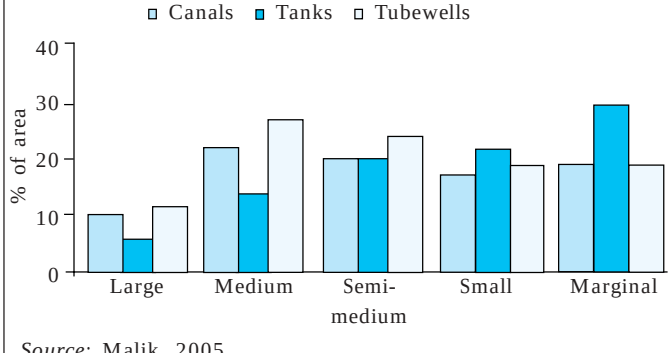


Source: Chambers, 1988.

There have also been numerous analyses at the project level, showing similar results. Figure 1.5, for example, compares the actual situation of farmers and agricultural laborers within the massive Nagarjunasagar Project on the Krishna River with that of similar groups who did not get water from the scheme. It shows that 'the poor'—small and marginal farmers and agricultural laborers—benefited proportionately about as much as did large farmers.

Two recent, much more sophisticated analyses (which used input-output matrices and Social Accounting Matrix methods) have shown similar results. The study (Figure 1.6),

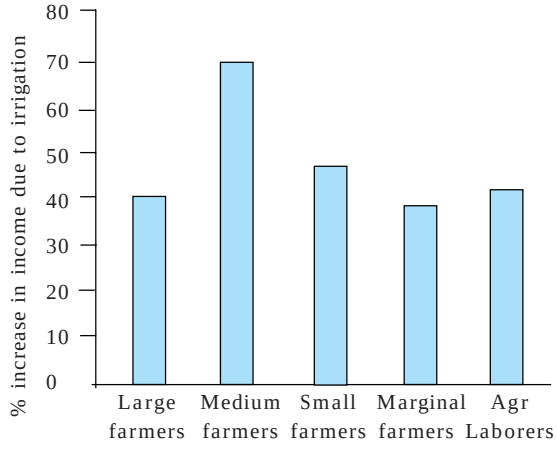
Figure 1.3: Percentage of irrigated area by farm size



Source: Malik, 2005.

[11] R.P.S. Malik, 'Water and poverty', Background Paper for this Report, 2005.
[12] J. Peliekaan, 'India: Evaluating Bank Assistance for Poverty Reduction', The World Bank Operations Evaluation Department, Washington DC, 2002.
[13] Ramesh Bhatia, 'Water and Growth', Background Paper for this Report, 2005.

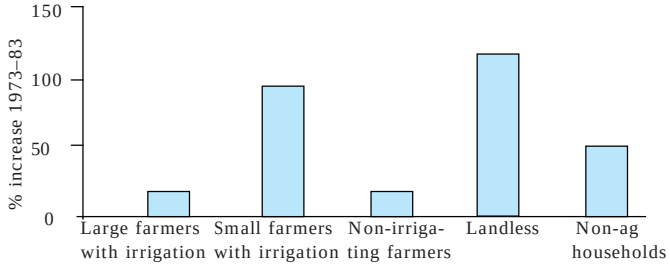
Figure 1.5: The effect of Nagarjunasagar irrigation on per capita income



Source: Malik, 2005.

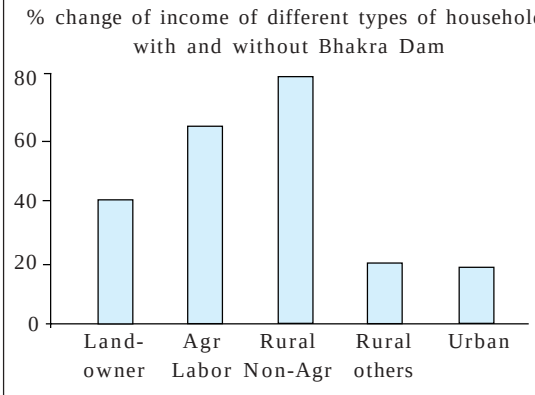
by the International Food Policy Research Institute of the impact of the Green Revolution in the North Arcot region of Tamil Nadu,[15] showed that the biggest winners were the landless whose incomes increased by 125 percent as a result of the large increase in demand for their labor.

Figure 1.6: The effect of irrigation and Green Revolution on income in Tamil Nadu



Source: Hazell *et al*, 1991.

Figure 1.7: The effect of Bhakra Dam on different social groups



Source: Bhatia, 2005.

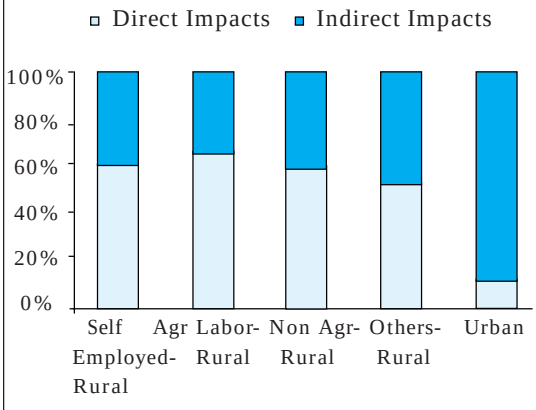
The major study (Figure 1.7) by Bhatia and colleagues of the effect of Bhakra,[16] again shows that the rural poor have benefited hugely from the project. (And this analysis, being confined to the regional economy, does not include the benefits for the very poor million seasonal migrants from Bihar, or the urban poor who benefited from lower food prices.) Figure 1.8, from the same study, shows that it was the indirect effects which had the major impact on urban areas (and therefore on urban poverty reduction).

Finally, all these effects show up strongly at the national level. Figure 1.9[17] shows the results of an analysis of the association between poverty and levels of irrigation in 54 national sample survey regions. In irrigated districts, the prevalence of poverty is about one-third of that in unirrigated rural districts.

Similarly, the relationship between electricity availability (much of which came

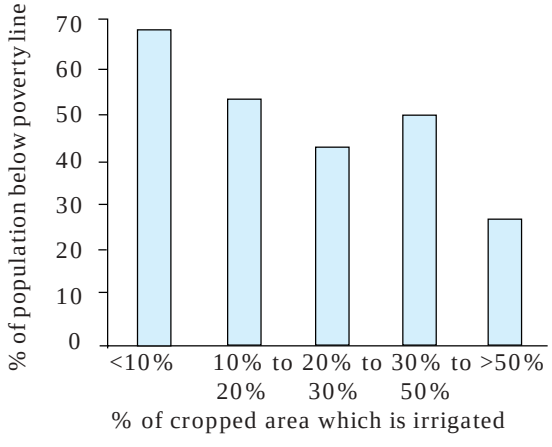
[14] Robert Chambers, *Managing Canal Irrigation*, New Delhi, 1998.
[15] Peter Hazell and C. Ramasamy, *The Green Revolution Reconsidered: The Impact of High Yielding Varieties in South India*, Baltimore, Md.: The John Hopkins University Press, 1991.
[16] Ramesh Bhatia and R.P.S. Malik, *'Indirect Economic Impacts of Bhakra Dam' in* Ramesh Bhatia, Monica Scatasta, Rita Cestti, and R.P.S. Malik, *Indirect Economic Impacts of Dams*, (2 vols.), The World Bank, Washington DC (forthcoming 2006).

Figure 1.8: Income gains from directly and indirectly impacted sectors—Bhakra Dam



Source: Malik, 2005.

Figure 1.9: How irrigation reduces poverty in India



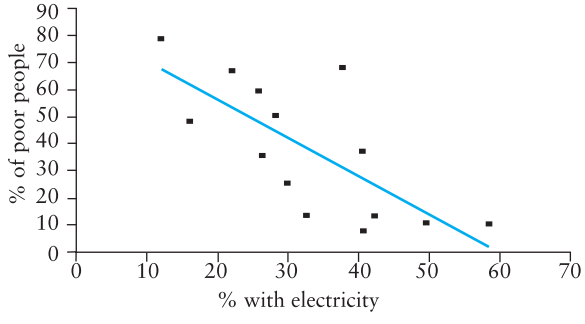
Source: Rao 1988, in World Bank 1991.

from hydropower) and poverty is strong (Figure 1.10).

Overall global analyses show a very close relationship between economic growth and poverty reduction (Figure 1.11). In the case of India, growth did not generate more inequality.[18] And it is abundantly clear that major water infrastructure, designed to provide a platform for regional and national economic growth, has been an important platform for the remarkable reduction in poverty in India (Figure 1.12).

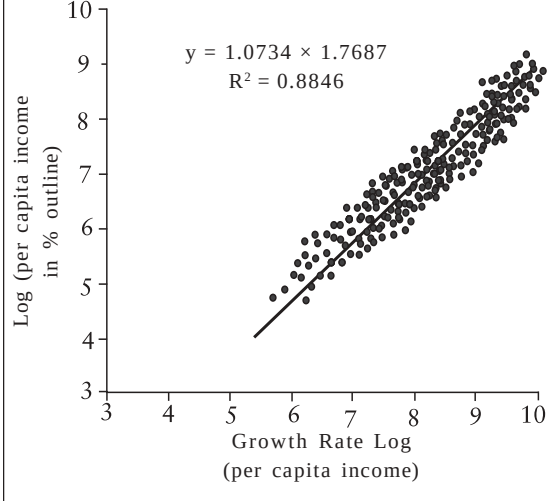
So, at the end of the day, it is less material (a) whether such projects are justified in terms of poverty reduction, or (b) whether the primary recipients of the 'first-round benefits' are those with

Figure 1.10: Electrification and rural poverty by state



Source: Malik, 2005.

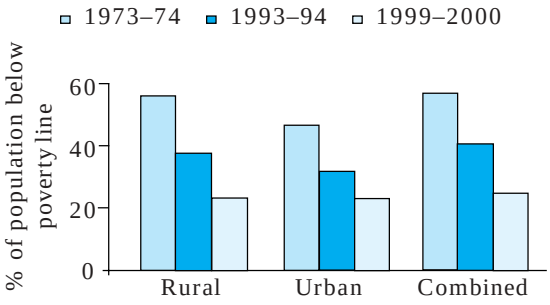
Figure 1.11: Economic growth and poverty reduction—the global relationship



Source: Dollar and de Kraay, World Bank 2002.

[17] World Bank, *Indian Irrigation Sector Review*, 1991.
[18] Francois Bourgignon, Chief Economist of the World Bank, 'High growth has not generated more inequality, says

Figure 1.12: The decline in poverty in India , 1973–2000



Source: Malik, 2005.

land. Because the record is overwhelmingly clear—investments in water infrastructure in India have resulted in massive reduction in poverty, and it is actually the poor and landless who have been the biggest beneficiaries—the appropriate metaphor is not 'trickle down' but 'a rising tide lifts (almost) all boats'.

The Era of Groundwater Exploitation

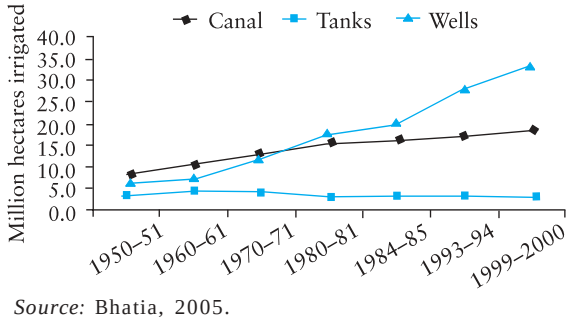
The 1960s was a turning point in India's agricultural development. The Green Revolution provided great benefits to those who could adopt new seeds and fertilizers—for which water control was an essential pre-condition.

Large investments in surface water projects were undertaken to provide assured water supply to a larger number of farmers. Starting in the 1960s, however, a couple of critical changes took place. First, electricity supply expanded in rural areas (itself often linked to water, since hydropower provided over 50 percent of installed capacity until the mid-1960s). Second, in areas where waterlogging and salinity were growing problems (such as parts of Punjab), it was realized that encouragement of groundwater pumping provided an effective mechanism for lowering the groundwater table and reducing the severity of waterlogging and salinity. Third, modest new modular well and pump technologies became widely available, as did subsidized credit. Fourth, farmers realized that groundwater was abundant, especially in the large alluvial basins. Fifth, farmers realized they could apply water 'just in time' from groundwater sources, something which was not possible in the institutionally-complex and increasingly corruption-ridden canal systems.

The result was an extraordinary 'quiet revolution', in which, beginning around 1960, groundwater irrigation developed at an explosive rate (as shown in Figure 1.13), while tank irrigation almost disappeared and surface water irrigation grew much more slowly.

Over time, two other pressures developed. Irrigators who used tubewells argued that they were disadvantaged relative to those who received virtually free canal water. In Uttar Pradesh, for example (where electricity charges are relatively high, as shown in Figure 1.14), irrigating a hectare of wheat during the rabi season would cost about Rs 2,800 from groundwater, whereas farmers pay only about Rs 70 per hectare—about 2 percent of the cost of pumping for canal irrigation.[19] Politicians responded, and soon there was a widespread culture

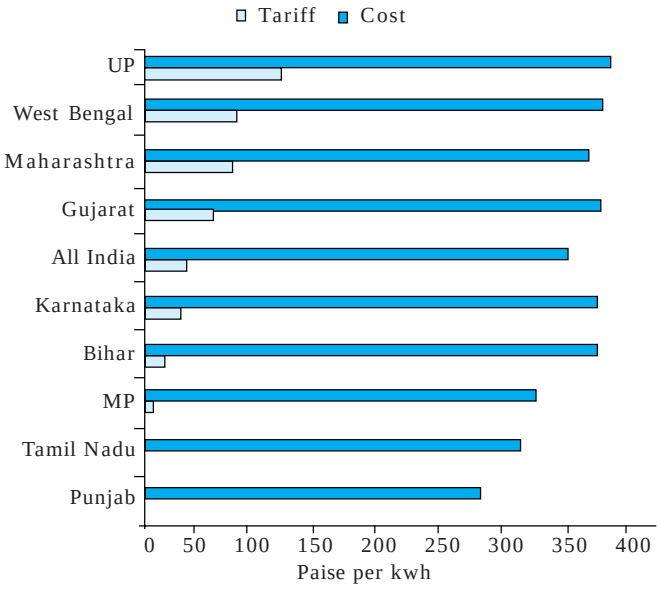
Figure 1.13: The evolution of forms of irrigation in India, 1950–2000



Source: Bhatia, 2005.

WB', *Financial Express*, January 2004.

Figure 1.14: Electricity tariffs and generation cost in different states



Source: Bhatia, 2005.

of 'free or nearly free' electricity for irrigators (see Figure 1.14).

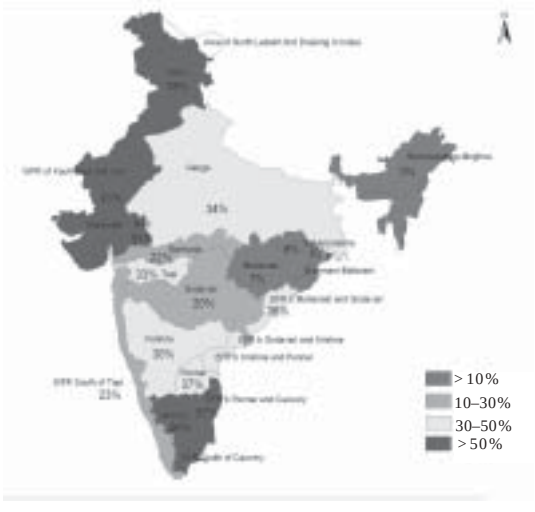
Simultaneously, the reliability of canal water supplies deteriorated, as systems were not maintained and as corruption became more widespread and the historic allocation systems such as 'warabandi' and 'shejpali' no longer functioned as effectively. This, too, motivated farmers to turn to groundwater. In large areas, a primary function of surface water systems evolved into 'involuntary' recharge of groundwater. In East and West Punjab it is estimated that 50 percent and 80 percent, respectively, of groundwater is recycled canal water.

Over the last two decades, 84 percent of the total addition to net irrigated area came from groundwater, and only 16 percent from canals. Thus, as shown in Figure 1.13, at present the net area irrigated by private tubewells is about double the area irrigated by canals.

The fact is that groundwater now provides for about 70 percent of the irrigated area, and about 80 percent of domestic water. As emphasized in the background paper by Tushaar Shah,[20] 'we need to recognize that self-provision of water is the best indicator of the failure of public water supply systems. Tubewells proliferate in canal commands because public irrigation managers are unable to deliver irrigation on demand. Urban households want their own boreholes because municipal service is inadequate and unreliable'. Figure 1.15 shows the proportion of groundwater potential which is developed in each of the major river basins of India.

As discussed elsewhere in this report, the poor quality of public infrastructure is a pervasive problem in India. Studies throughout

Figure 1.15: Level of groundwater development by basin



Source: Tyagi data—GIS work, courtesy of IWMI.

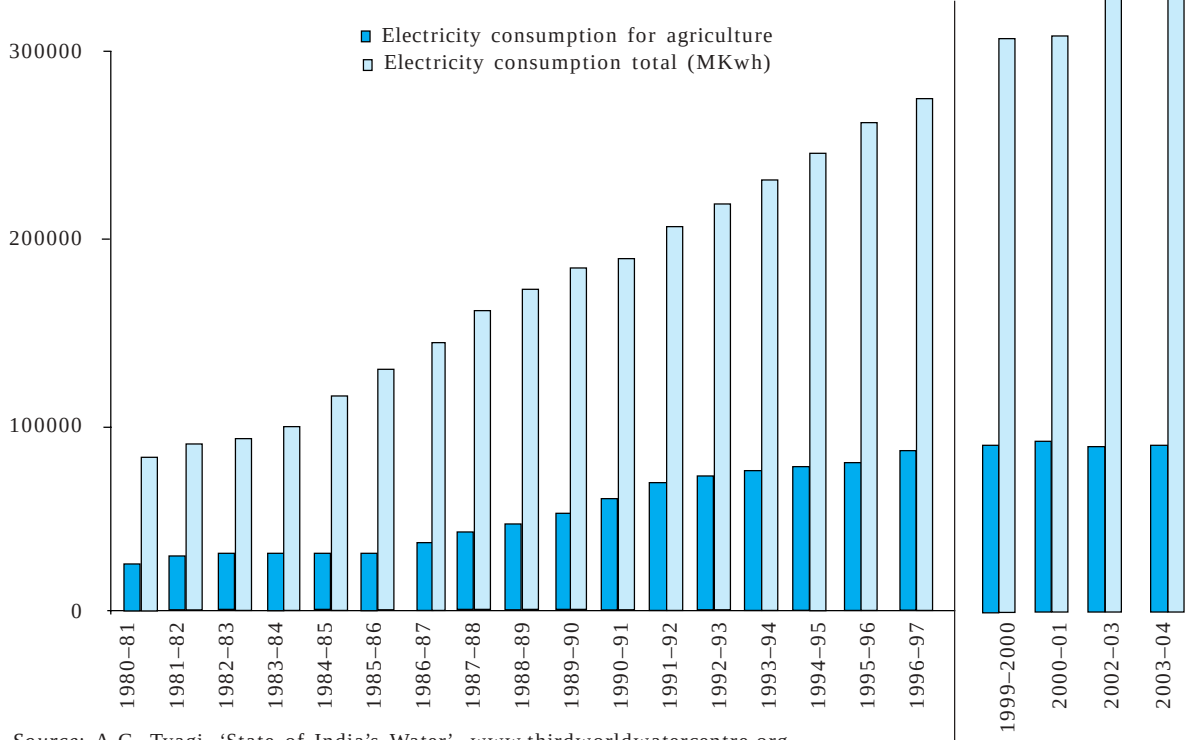
[19] Ramesh Bhatia, 'Water and energy', Background Paper for this Report, 2005.

the world[21] have shown that where industries have to self-provide, costs of production go up sharply, competitiveness is reduced, and economic growth is dampened. The self-provision of water supplies is just one manifestation of a far broader breakdown of public infrastructure in India. A recent[22] survey shows that 60 percent of Indian manufacturing entities have captive power generating units—a figure which is just 16 percent for China, 17 percent for Brazil, and 42 percent for Pakistan.

This groundwater revolution brought immense benefits to India, playing a major role in the 'irrigation/rural development/poverty reduction' achievements. That said, it is increasingly clear that the groundwater revolution has run its course in the most productive agricultural and urban areas of the economy. There are, more specifically, two major sustainability challenges.

First is the contentious issue of the energy subsidies, and their inexorable increase (as the amount of electricity used in agriculture grew, as shown in Figure 1.16) to farmers for groundwater irrigation. Estimation of the real economic value of these subsidies is a cottage industry. Some see it as the fundamental problem facing the electricity sector. According to the Planning Commission,[23] while the agriculture sector accounts for nearly one-third of the sales of the State Electricity Boards, the revenues from farmers account for only 3 percent of the total revenue. Others (as described in the

Figure 1.16: Increase in electricity consumption for agriculture

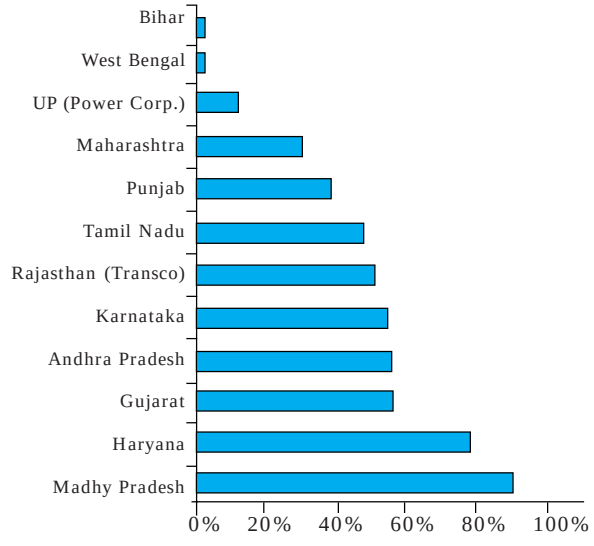


Source: A.C. Tyagi, 'State of India's Water', www.thirdworldwatercentre.org.

[20] Tushaar Shah, 'Accountable institutions', Background Paper for this Report, 2005.
[21] Kyu Sik Lee, 'Costs of infrastructure deficiencies in manufacturing in Indonesia, Nigeria and Thailand', Policy Research Working Paper WPS1604, The World Bank, 1996.
[22] Omkar Goswami, 'The urgent need for infrastructure', *The Economic Times*, Delhi, 25 April 2005.

background paper by Bhatia[24]) have a different view, pointing out that simplistic estimates vastly overestimate the value of electricity subsidies to agriculture. This is so because first, the large transmission and distribution losses (colloquially known as 'theft and dacoity') are routinely counted as free supplies to farmers. And second, because the supplies to farmers are, in fact, off peak and highly unreliable and thus do not cost the electricity system anything like the marginal or average cost of supply. The estimates of the total annual cost to the economy of subsidized power to farmers vary by a factor of 4. The World Bank estimates that subsidies to farmers account for about 10 percent of the total cost of supply, or about Rs 240 billion a year.[25] This is equivalent to about 25 percent of India's fiscal deficit and two and a half times the annual expenditure on canal irrigation,[26] with large impacts on fiscal deficits at the state level, as shown in Figure 1.17.

Figure 1.17: Electricity subsidy to agriculture as percentage of gross fiscal deficit , 2000–01

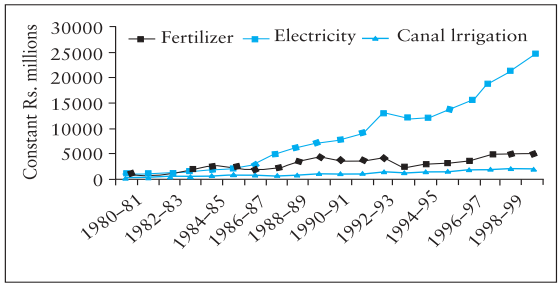


Source: Bhatia, 2005.

And, it is clear that things are getting worse, not better, in most states, in part driven by the deeper and deeper depths from which farmers have to pump water. In Gujarat, for example (as shown in Figure 1.18), electricity subsidies now dwarf other forms of farm input subsidies, and are equivalent to 20 percent of state agricultural domestic product.[27]

Second is the sustainability of the resource itself. Average figures of water availability show that the annual replenishable groundwater resources of India amount to about 430 billion cubic meters (bcm), and that net withdrawals amount to about 160 bcm per year. There would, therefore, appear to be little problem 'on average'. But in fact, all water issues are local issues, and averages flatter to deceive. At local levels many of the most highly productive localities are already under severe groundwater stress. For example, in Punjab groundwater in about 60 percent of blocks is either already being, or very near to being, overdrawn, while for Haryana and Tamil Nadu the figure is already around 40 per-

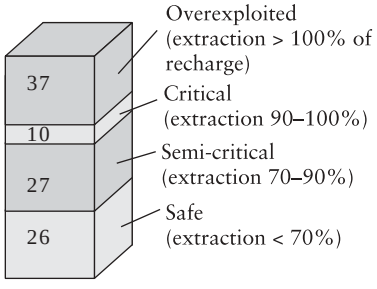
Figure 1.18: Farm input subsidies in Gujarat



[23] Ramesh Bhatia, 'Water and energy', Background Paper for this Report, 2005.
[24] ibid.
[25] ibid.
[26] ibid.

cent. Figure 1.19[28] gives a sense of how grave the situation is for the state of Tamil Nadu. In Rajasthan, the proportion of over-exploited blocks has risen from 17 percent to 60 percent over the last seven years. For the country as a whole, about 14 percent of all blocks are either over-exploited or critical, a number which is expected to reach 60 percent in just 25 years time (Sekhar, background document).

Figure 1.19: The precarious state of groundwater in Tamil Nadu



Source: Mitra, 2005.

Bad as each of these situations—electricity subsidies, and plummeting groundwater tables—are, the combination is lethal. Sooner or later, abstractions are going to have to come into balance with the sustainable yield of an aquifer. If this happens when the groundwater table is, say, at 5 meters, then use of the sustainable yield of the aquifer could proceed with modest pumping costs. If, however, abstractions come into balance with sustainable yield and the depth is, say, 150 meters, then this makes irrigation impossible without large and permanent energy subsidies.

This is a grave situation, the implications of which form the heart of the water challenges facing India in coming decades and which frames the central themes of this report.

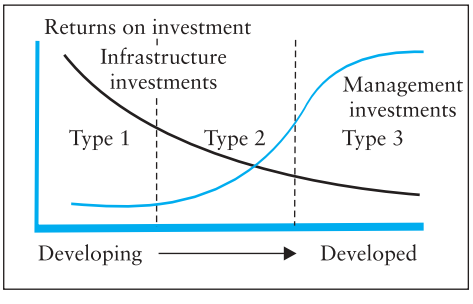
[27] Gujarat, Agricultural Development for Growth and Poverty Reduction, World Bank, 2005 (draft).
[28] Smita Misra, 'Groundwater Challenges for Rural Water Supply in Tamil Nadu', powerpoint presentation to South Asia Water Day, World Bank, February 2005.

CHAPTER 2

CURRENT AND LOOMING CHALLENGES

Implicit in the discussion in the previous chapter was the notion that the emerging water challenges which India has to face are quite different from those which it has faced in the past. In the words of the Planning Commission (Sekhar, background paper): 'Policies and practices have to come to grips with this basic fact—to face the future and not the past'. In exploring what some of these challenges might be, it is useful to consider the experience of water transitions in other countries. As part of a similar exercise which was done recently with the Government of China, Figure 2.1 is instructive. It suggests that the focus on the provision of infrastructure has to, in various ways in different parts of India, be supplemented by more effective management of that infrastructure and of the underlying water resource base.

Figure 2.1: Rates of return on investment on infrastructure and management of water resources



Source: World Bank, China Country Water Resources Assistance Strategy, 2002.

Adjusting to the Needs of a Changing Society

It is broadly recognized that India is currently in the early stages of a profound demographic, social, and economic transition. The proportion of the population which is urban has doubled over the last 30 years (and is now about 30 percent); agriculture now accounts for only about 25 percent of GDP; and the economy has been growing at around 7 percent a year.

Life in rural areas is already in the process of large-scale change, particularly in the higher-productivity areas. In parts of Maharashtra, for example, the transition to high-value agriculture is already underway for some time, with major implications for the use of technology, including water technology. Where a decade ago there was just one lonely company providing drip irrigation techno-logy, the market is expanding very fast, with half a dozen such suppliers now in Maharashtra alone. While state extension services stagnate, the private sector is meeting the rapidly-growing demand: the original supplier of drip irrigation technology in the region is now a major one-stop-shop for farmers, providing not only equipment but training on a large scale. And there is now a travel agency in Pune which specializes in 'agro-tourism', organizing study tours for private farmers to go to Israel and other countries to learn about the latest in 'precision agriculture'.[1]

With these developments, a remarkable change is coming in the way Indian agriculture is viewed.

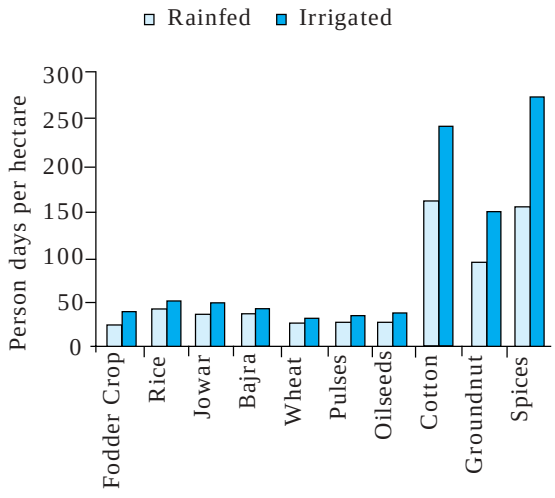
[1] Pravan K. Varma, *Being Indian*, Penguin, 2004.

Rather than being seen as a dead-end and poverty trap, new visions of Indian agriculture are emerging. For example, one of India's telecom moghuls[2] has said: 'to my mind, the next big wave—which will be bigger than telecoms or outsourcing—is in agriculture. India's strength lies in its huge area of arable land, with great weather conditions. For three, four, or five months Europe doesn't grow a fig—but we can grow anything. I want to connect India's farms to the world.... I believe an Indian farmer's income can jump from Rs 5000 per acre to Rs 20,000 straight away, just by moving away from rice and wheat ... tomatoes sell for just Rs 2 a kilogram at the farm gate in India, and more than 50 times that on the shelves of UK supermarkets.' These shifts from low-value to high-value agriculture have profound implications for the demand for labor and therefore for the wellbeing of the poor. Figure 2.2 shows the dramatic differences in direct labor demand between staples and many cash crops.

In many parts of the country (including the Communist Party-ruled West Bengal[3]) 'contract farming' is becoming increasingly important, and shows great promise (as it has in other countries[4]) as a mechanism for bringing unified packages of technology, services, and marketing, in making the transition to high-valued agriculture, and in lifting large numbers of people—both those who stay in agriculture and those who move into the associated service sectors—out of poverty.

The *Financial Times*[5] has captured the essence of the changes underway in rural areas: more than a third of India's rural households already derive

Figure 2.2: Employment generation by crop



Source: Bhatia, 2005.

their income from manufacturing or services, not from farming; in the successful farming states of Punjab and Haryana already over half of all rural households have escaped agriculture altogether, and 'the best way to escape poverty is to escape agriculture'.[6]

These transformations are, of course, happening organically on a massive scale—in coming years close to 100,000 people a day will enter the middle class.[7] Many of these people will live in revitalized rural areas, but many will inevitably live in towns and cities.

These changes have profound implications for the ways in which water needs to be allocated and used. It is essential that the availability of water does not constrain the development of new types of

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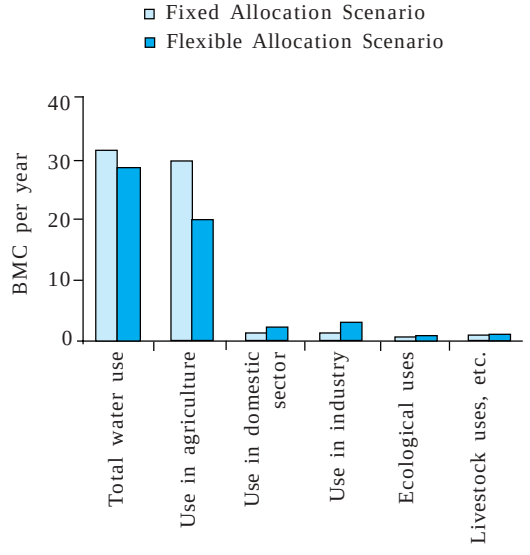
[2] John Riding, 'Heard it on the grapevine—Sunil Mittal made his billions by bringing phones to India. For his next project, the entrepreneur aims to connect his country's food producers to the rest of the world', *Financial Times*, 5 February 2005.
[3] 'Marx or McKinsey', *Indian Express*, 18 April 2005.
[4] For example Brazil, as documented in World Bank Water Resources Sector Strategy 2003.
[5] Edward Luce, 'Cure for India's rural woes lies in ability to escape the farm: Old family plots are withering as a new report highlights exodus to cities and to manufacturing jobs', *Financial Times*, 7 December 2004.
[6] Ibid.
[7] Pravan K. Varma, *Being Indian*, Penguin, 2004.

economic activity in new places. And here there is a serious mismatch between the water ideology of the past in India—one that operates on a paternal system of command-and-control, with little transparency and little accountability—and the requirements of the present and future. As summarized by V.S. Vyas (background paper): 'With increase in population and changes in lifestyle, the gap between water demand and supply is getting aggravated, leading to disputes among various users'.

As a part of this report, the World Bank, working with a group of eminent Indian scholars, undertook a major analytic study to examine the economic impact of flexible rather than rigid water allocation practices in Tamil Nadu[8] where there is already strong evidence of the effect of water shortages on industrial choices. In a drought during the 1990s, for example, major chemical and fertilizer plants outside of Chennai were closed for six months[9] because they could not get water; and it is clear that decisions on the location of industries in the state is being affected by water availability.[10]

Figure 2.3: Total and sectoral water use in 2020 under two management scenarios



Source: Bhatia *et al*, 2005.

The results of the study are striking, suggesting that if flexible rather than rigid water allocation procedures were adopted:

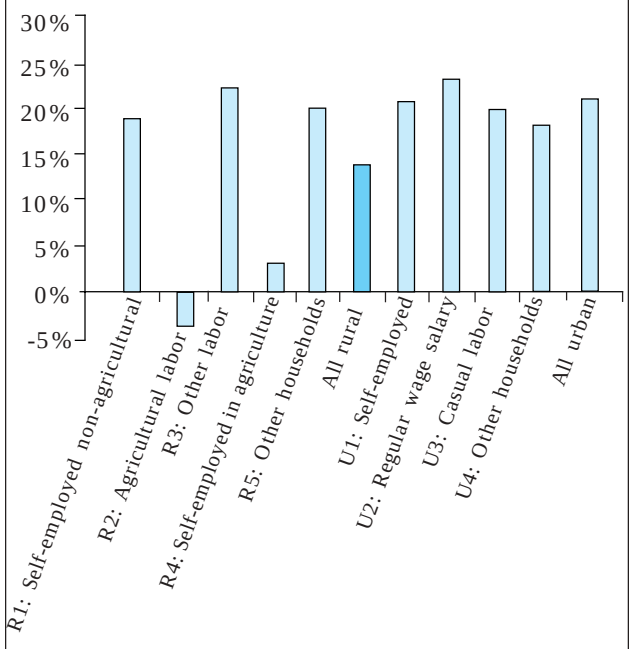
1. Water use would be dramatically different:
   - total water use would be 15 percent lower (Figure 2.3);
   - abstractions from aquifers (which are already under great stress in the state) would be 25 percent less;
   - water use in agriculture would be sharply reduced, while water for industry and urban uses would increase substantially (Figure 2.3).
2. Economic performance, too, would be quite different (Figure 2.4):
   - state income in 2020 would be 20 percent higher;
   - urban household incomes would be 15 percent to 20 percent higher for all four categories included;
   - there would be small losses in income for families who remained self-employed farmers and for laborers who stayed as agricultural workers, but rural incomes would be 15 percent to 20 percent higher for self-employed and non-agricultural labor.

[8] Ramesh Bhatia, John Briscoe, Ravinder Paul Singh Malik, Lindy Miller, Smita Misra, Harshadeep Rao, and K.S. Palinasami, 'Water in the Economy of Tamil Nadu: Flexible water allocation policies offer a way out of water-induced economic stagnation, and will be good for the environment and the poor', World Bank, New Delhi, October 2004.

[9] John Briscoe, 'Raw Water Supplies for Chennai', World Bank, Back to office report, 1996.

[10] 'SIMA for allotment of additional land for Textile Processing Park', *Business Standard*, 25 April 2005.

Figure 2.4: Differences in income in Tamil Nadu in 2020—flexible compared to fixed water allocations



Source: Bhatia *et al*, 2005.

The writing, then, is on the wall: India is changing very fast, and there are great environmental and economic benefits from transforming the Indian water economy into one that is far more flexible and adaptive.

As this transition takes place, the development of a vital and efficient urban water supply and sanitation sector is a major challenge. A companion report by the World Bank[11] examines the challenges that India faces in meeting the millennial development goals. A succinct summary is that India's water and sanitation sector is woefully ill-equipped to meet this growing challenge. The sector has no identity, is bankrupt, is not developing the required human resources, and focuses primarily on adding infrastructure, not improving services.

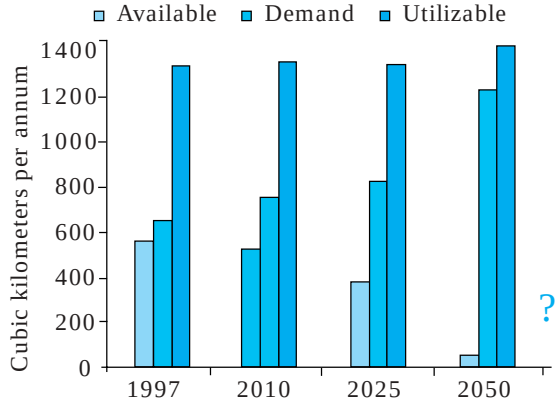
Adjusting to Scarcity and Greater Variability

In 1999, the National Commission on Water[12] assessed the overall availability of water, the likely demands, and the implied 'water available for future use' (Figures 2.5 and 2.6).

These figures are a stark and unequivocal portrayal of a country about to enter an era of severe water scarcity. And there are a host of realities which make the situation far worse than depicted in Figures 2.5 and 2.6.

First, water is not a national issue, but an intensely local one. Aggregates thus conceal much more severe situations in many localities (and less severe ones in others). Already 15 percent of aquifers are in critical condition, a number which

Figure 2.5: Utilizable water, demand, and residual which is available but not used

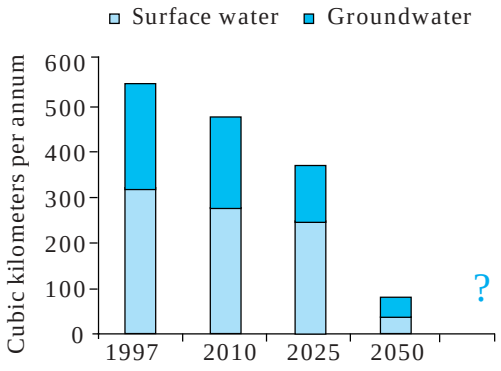


Source: National Commission on Water, 1999.

[11] Alain Locussol, 'Halving by 2015 the Proportion of the People in India without Sustainable Access to Safe Drinking Water and Basic Sanitation', World Bank, 2005 (draft report).

[12] 'The Report of the National Commission for Integrated Water Resources Development', Ministry of Water Resources, New Delhi, 1999.

Figure 2.6: 'Unused' surface water and groundwater



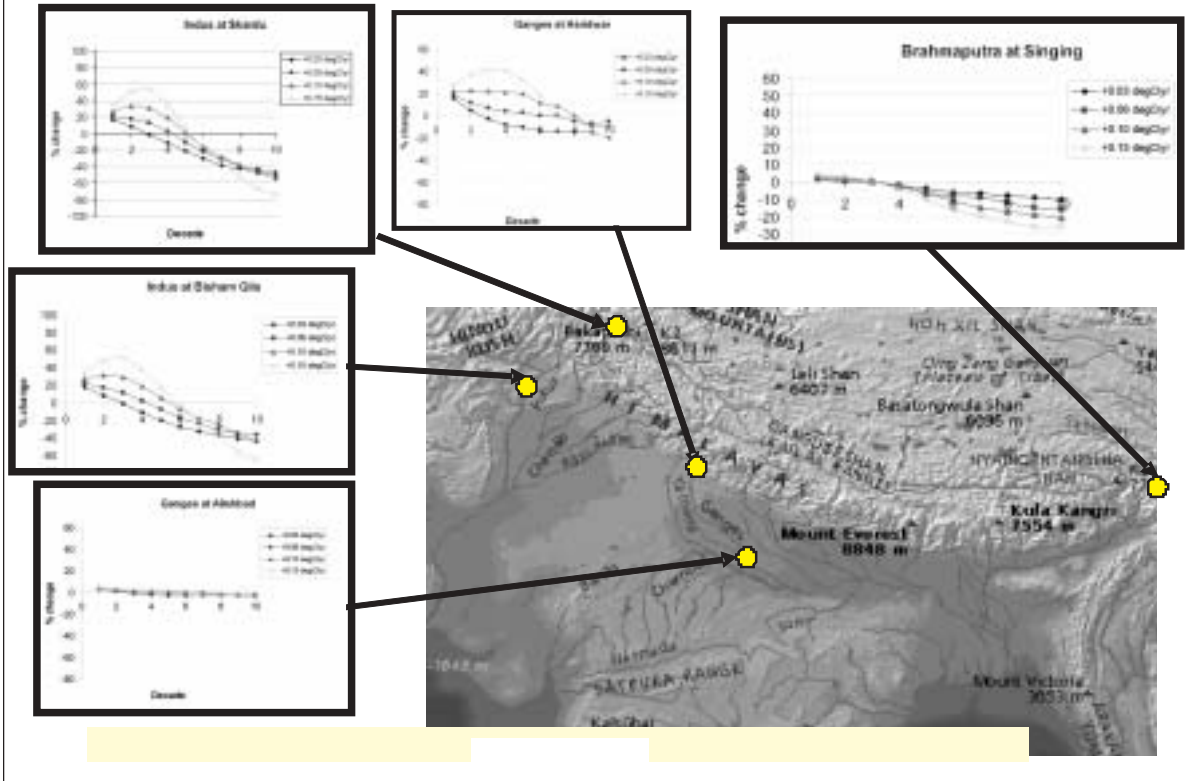
Source: National Commission on Water, 1999.

is projected to increase to a frightening 60 percent by the year 2030.

Second, in its deliberations the National Commission on Water gave little attention to environmental realities and needs.[13] It, therefore, implicitly assumed that the quantum of available water would be constant, despite the fact that ever-larger stretches of rivers in India are becoming so polluted that their water can be used for fewer and fewer uses and the quality of water in an increasing number of aquifers is being similarly degraded by human use and saline intrusion.[14]

Third, there are strong indications that climate change is likely to affect India in a number of

Figure 2.7: Simulated effects of deglaciation on Himalayan river flows over 10 decades



Source: Gwyn Rees *et al*, 2005.

[13] A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.
[14] George Varughese, 'Water and environmental sustainability', Background Paper for this Report, 2005.

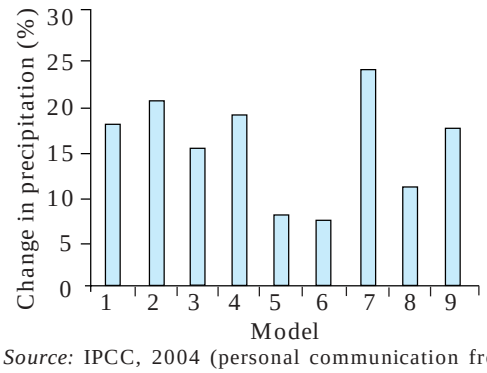
ways. There is little uncertainty about some of these impacts.

As global temperatures continue to rise, this will affect the 'water banks' (glaciers) which are a prominent part of the Himalayan water systems. While there is clear evidence of deglaciation across the whole of the Himalayas, the effect on river flows is likely to be substantially different in different areas,[15] as shown in figure 2.7.

In the eastern Himalayas, high levels of snowfall appear to retard glacial retreat, and runoff generated in the non-glaciated areas rapidly lessens the downstream impacts (see, for example, the modest impacts on the Brahmaputra, before the river disgorges from the Tibetan Plateau into Arunachal Pradesh). In the west, as illustrated by the Indus, where precipitation is lower and the volume of snow at high elevations does not protect the glaciers in the hot summer months, deglaciation is more rapid (see Skardu, for example, where there are large increases in flows for the next half-century, followed by upto 50 percent reductions from contemporary levels of runoff), and the impacts are felt for a considerable distance downstream (with Indus flows predicted to be around 30 percent less in the northern plains of Pakistan). In the Ganges there would be large impacts of deglaciation in the mountains (see Haridwar in Figure 2.7), effects which are mitigated by non-glacial forms of runoff in the plains (as illustrated for Allahabad in Figure 2.7).

Deglaciation is, of course, not the only way in which climate change is likely to affect the availability and timing of runoff in the subcontinent. The Intergovernmental Panel on Climate Change (IPCC) uses 10 General Circulation models, 9 of which project that precipitation during the summer monsoon will increase substantially (Figure 2.8).

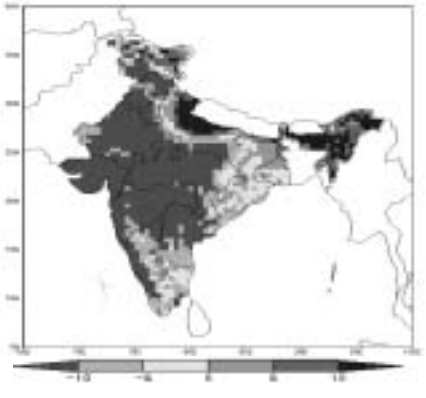
Figure 2.8: Change in South Asia summer rainfall predicted by 10 General Circulation climate models



Source: IPCC, 2004 (personal communication from Robert Watson).

The IPCC has used a regional model (curiously based on the one global model which showed reduced precipitation) to explore possible changes in the number of rainy days and in extreme rainfall. This model predicted a decrease in the number of rainy days (Figure 2.9) but substantial increases in extreme precipitation events (Figure 2.10).

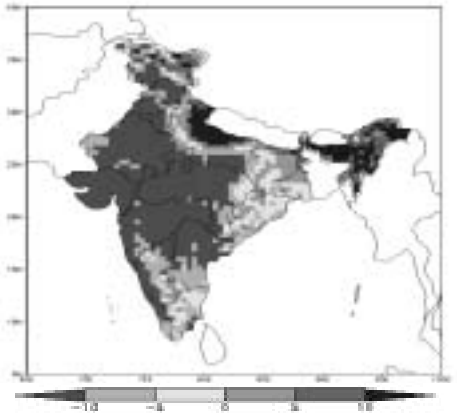
Figure 2.9: Predicted change in number of rainy days from the 'decreased rainfall' IPCC model



Source: IPCC, 2004 (personal communication from Robert Watson).

[15] Gwyn Rees and David Collins, 'An assessment of the potential impacts of deg-laciation on the water resources of the Himalayas', Draft Report, HR Wallingford, April 2004.

Figure 2.10: Predicted change in rainfall intensity (in mm per day) from the 'decreased rainfall' IPCC model



Source: IPCC, 2004 (personal communication from Robert Watson).

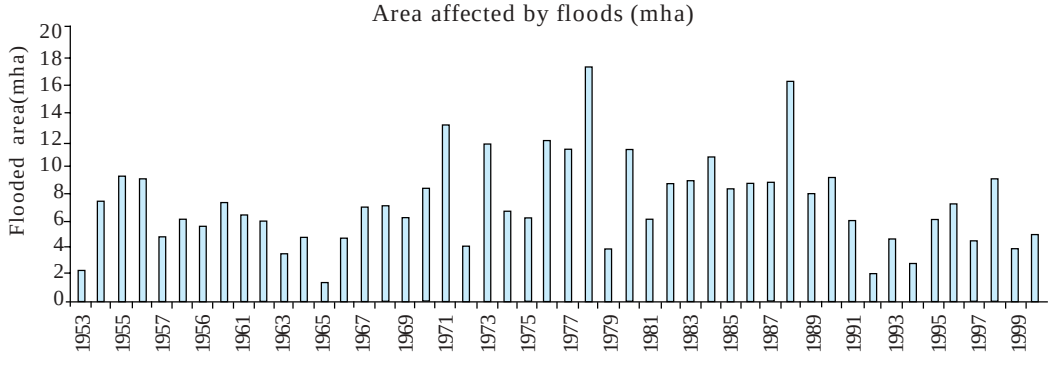
Figure 2.12: Areas subject to flooding are vulnerable to climate change

Source: A.C.Tyagi, 'State of India's Water', www.thirdworldwatercentre.org.

What does seem likely is that climate change will increase the variability of already highly-variable rainfall patterns, requiring greater investments in managing both scarcity and floods.

- The area affected by flooding, which has not changed systematically in decades (Figure 2.11) is likely to increase substantially since many of the flood-prone areas (Figure 2.12) will be affected by changes in glacial behavior and precipitation in the Himalayas.
- There are major regions, including many of the most highly productive agricultural and industrial regions of India, where water scarcity is already a fact of life (illustrated with increasing frequency in cartoons in Indian newspapers, such as Figure 2.13, by Binay Sinha in *Business Standard*).
- Water scarcity is going to become widespread in India in a future which is, given the fact that changing water use habits takes decades to effect, just around the corner.

Figure 2.11: Area flooded has been relatively stable



Source: A.C.Tyagi, 'State of India's Water', www.thirdworldwatercentre.org.

Figure 2.13: Running out of groundwater

Source: Cartoon by Binay Sinha, courtesy of *Business Standard*.

- Deglaciation is going to result in inadvertent 'mining' of the water banks of the Himalayas. This will lead to a runoff windfall for a few decades, to be followed by major, permanent, reductions in runoff.
- Climate change is likely to substantially increase overall monsoonal rainfall in India, but this is likely to be poorly distributed in the sense that much of the additional rainfall will probably be in high-intensity storm events.

What, then, are the implications of these changes? Despite the many uncertainties, they include:

- A need for large investments in water storage. As described earlier, India actually has relatively little capacity to store water. For example, whereas there is about 900 days of storage capacity on the Colorado and Murray-Darling Rivers, there is only about 30 days of storage capacity in most of India's river basins. Accordingly, major investments need to be made to increase capacity to store water, in both surface water and groundwater reservoirs, in projects small (like local rainwater harvesting) and big (such as large dams). In so doing, however, there is a need for concomitant adoption of quite different development and management strategies. In addition to expanding irrigated area (the principal justification for most projects), care needs to be taken to safeguard existing downstream uses, and attention also needs to be paid for improving the reliability of supplying existing demands and for meeting historically deprived environmental uses.
- The melting of the glaciers offers India a window of opportunity, first, to make productive use of this 'windfall', but also to understand that this window should be used to prepare for the very hard days, with substantial flow reductions in the Himalayan region, which lie ahead.
- While the exact shape of the future climate regime is uncertain, it is very likely that there will be greater variability—both of droughts and floods. As was shown in a detailed examination by the National Atmospheric and Oceans Administration of US water practices, the best preparation for managing unpredictable future changes is to put in place a water resource infrastructure and management system which is driven to a much greater degree by knowledge (including but not limited to hydrologic knowledge), and which is designed and operated to be much more flexible and adaptive.
- Flooding, which already affects large areas of the poorest parts of India (including Bihar and the Northeast), has yet to be effectively addressed. The standard response in India has been to build embankments and to advocate the construction of large dams and embankments as the solutions to the problem. India is only now starting to explore

the combinations of 'hard' interventions (to protect high-value infrastructure) and 'soft' interventions (smart adaptation to living with floods, including changing land use patterns and cropping patterns, and construction of emergency shelters for people and animals), which have been used to considerable effect in countries as diverse as the United States[16] and Bangladesh,[17] and are globally-accepted best practices.

- With respect to scarcity, there is a pervasive complacency—'we have muddled though up to now and we will find a way to muddle through in the future'—on the part of many in government and citizens. This has been compounded by the recent perception (which is likely to be temporary) that 'the Indian economy is no longer dependent on the vagaries of the monsoon'.[18] This muddling through has worked because it has been possible for farmers, city-dwellers and industries to 'exit'[19] from unsatisfactory public supply systems by tapping once-abundant groundwater. But now the well is running dry, and with it the exit option is becoming tenuous in more and more parts of the country. The challenges, to which we return later in this report, are: to greatly improve the robustness and flexibility of water resource management systems; to improve the flexibility and quality of service provided by the major public water supply and irrigation systems; and to develop government/citizen partnerships for managing groundwater in a sustainable manner.

Dealing with Growing Conflicts

Conflicts over water are so ancient that the idea is incorporated into language: the word 'rivals' is derived from the Latin 'rivalis', meaning 'the one using the same stream as another'.[20] In the subcontinent, too, there is a long history of water conflicts. The origin of Buddhism is related to a water dispute between the kingdoms of Shakya and Koliya. Prince Siddharth tried to resolve this by negotiation and compromise, but failed. The Peoples' Assembly of Shakya declared war on Koliya and asked Siddharth to leave the state.[21]

So conflicts over water are not new, either in the world or in India. But there is no question that the incidence and severity of conflicts has increased sharply in recent times. Over the past year, the Union Minister of Water Resources has remarked that 'I really am not Minister of Water Resources but Minister of Water Conflicts', and the Union Finance Minister has noted a 'growing set of small civil wars' over water at all levels in Indian society.[22]

It is useful to unbundle this growing set of conflicts, from the international down to the local level.

Conflicts at the International Level

At the international level, India has been a party to several water treaties which are widely considered to be global good practice. Most notable, of course, is the Indus Treaty of 1960 which allocates the waters of the Indus, Jhelum, and Chenab to

16 Barbara A. Miller, A. Whitlock, and R.C. Hughes, 'Flood Management—the TVA experience', TVA, Oak Ridge, 1998.
17 Ainun Nishat, powerpoint presentation on Flood Management in Bangladesh, World Bank Water Week 2005.
18 'Growth surge: No longer a gamble on the monsoon', *The Economic Times*, March 2005.
19 Albert O. Hirschman, *Exit Voice and Loyalty: Responses to Decline in Firms, Organizations, and States*, Harvard University Press, 1971.
20 *The Oxford Dictionary of English Etymology.*
21 M.A. Chitale, 'The fight for water', ICID, New Delhi, 1997.
22 'Water Ministry seeks World Bank funding for reforms', *The Hindu*, 13 January 2005.

Pakistan (while allowing run-of-the-river hydro on the headwaters before the rivers enter Pakistan), and the waters of the Ravi, Beas, and Sutlej to India. The central feature of the Indus Treaty is that the rights (and obligations) of both parties are unambiguously defined. This clarity and the permanence of the assignment of rights has meant that the two countries have concentrated most of their attention on using what is theirs effectively, rather than haggling over their entitlements.[23] Similarly important is the Ganga Water Treaty between India and Bangladesh of 1986, which once again rests on an agreed-upon allocation of low flows among the parties and in which seasoned bilateral diplomats were able to find an 'acceptable second-best' solution for both parties.[24] A somewhat different but equally interesting case is that of 'benefit-sharing' arrangements for development of the hydropower resources of Bhutan,[25] which has shown the way for mutually beneficial development between India and its smaller Himalayan neighbors. In the international arena, then, India has forged a number of examples of good practice; now there is a need to modernize some elements of these treaties (especially the conflict resolution mechanisms) and to put into place more such agreements on the substantial number of rivers where agreement between India and her neighbors has not been reached.

Conflicts at the Inter-state Level

At the next level down, among the states of the Indian Union, the situation is much less satisfactory. The issue is pervasive, since 90 percent of the land area of India is drained by inter-state rivers. Under the Constitution, authority is conferred on the Union Government with respect to regulation of inter-state rivers: Entry 56, List I states that '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 law to be expedient in the public interest.' In the words of the Planning Commission:[26] 'The Central Government has not so far exercised this authority ... (and) ... inter-state conflicts over water sharing have been the bane of water resources development in the country. Tribunals have been constituted in the past for Narmada, Godavari, and Krishna. Tribunals for Cauvery, Ravi-Beas, and Krishna (second Tribunal) are presently engaged in adjudication. Although time limits have now been prescribed for Tribunals, still the adjudication process is a long drawn affair. Tribunal decisions are interpreted differently by co-basin states and this again leads to disputes in the operation of the Award.' And in the words of the former Chair of the Central Water Commission:[27] 'Various alternate doctrines based on, say the riparian principle, the chronology of use, the principle of causing no harm to the downstream entities, on the contribution of the state to the basin waters, as also those based on the principle of equitable distribution are available in the literature about international water law. These are cited during the process of negotiations or adjudication, with each party normally preferring the doctrine which serves its interest. Apart from the doctrines, there are many other common contentious issues, which are often discussed, but about which no agreed guidelines are available in India.'

This anarchic situation means that in most cases there is no clarity about who can use what amount of water. And when there are awards, they are

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23 N.D. Gulhati, *Indus Waters Treaty: An Exercise in International Mediation*, Allied Publishers, New Delhi, 1973.
24 Tariq Karim, 'The Bangladesh-India Treaty on Sharing of the Ganges Waters', Bangladesh High Commission, Pretoria, November 1997.
25 Jeremy Berkhof, 'Hydropower in Bhutan and Nepal: Why the Difference?', 2003 (draft paper).
26 A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
27 A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.

incompletely specified and have no accompanying enforcement mechanisms. Unilateral actions are the norm, with the instructions of the Tribunals and even the Supreme Court routinely flouted. (As noted by Maria Saleth:[28] 'as a point of contrast with these inter-state squabbles, one notes a high degree of respect and stability of water-sharing provisions in international water treaties'.) The consequences are wide-ranging and serious.

There are major political consequences. There is a high level of vitriol in the endemic clashes between states on inter-state water issues. In some cases, inter-state water disputes have contributed to terrorist and secessionist movements.[29] Because anything can be claimed in inter-state waters, politicians raise the specter of such 'popular responses' when justifying non-compliance with water agreements. And the very basis of a federal state are put into question (as in the case of the 2004 unilateral abrogation by Punjab of all water-sharing agreements with other states).[30]

And there are major economic consequences. The lack of clear, permanent allocations means that states often spend more time and resources over 'securing our future rights' than they do to using what is theirs. Three cases illustrate this general point.

First, is economic waste in an upstream state, as described by Nirmal Mohanty:[31] 'The problem of poorly established property rights in the tribunal awards ... has encouraged states to secure inter-state claims to the headwaters of rivers by building large dams regardless of the financial and environmental consequences, and impact on downstream states. Maharashtra, for example, spent heavily on the Maharashtra Krishna Valley Corporation to create storage capacity to get prior appropriation rights to Krishna water; because if it did not do so, its share in Krishna awarded by the Krishna Water Dispute Tribunal would have been subject to revision. Interest and equity payments for these dams accounted for 17 percent of the state fiscal deficit in 2003/4.'

Second, is economic waste in downstream states. The Government of Tamil Nadu does not make investments in improving water efficiency in the water-starved lower Cauvery Basin, because it perceives that any demonstration of greater efficiency would weaken its bargaining power vis-à-vis Karnataka during the next Cauvery Tribunal award.

Third, are the foregone opportunities for win-win projects between states. During the vigorous debate in 2004 on inter-basin transfers ('linking rivers'), a major obstacle to translating any sensible projects into practice was that of state water entitlements. A reported interaction between the Chair of the Task Force on Linking Rivers and Laloo Prasad Yadav, showed the only way in which 'surplus states' would agree to share water with 'deficit states': 'Laloo warned that not a glass of water will be allowed to be diverted from the Ganga basin. A few days later, however, the de facto ruler of Bihar declared that water was like oil—if the right price was offered, he may be ready to sell'.[32]

And finally, there are major environmental consequences. Indian water managers continue to perceive of any water not directly used for human purposes to be 'wastage'. As described by the former Chair of the Central Water Commission:[33] 'The

[28] Maria Saleth, 'Water rights and entitlements', Background Paper for this Report, 2005.
[29] 'Terrorism will be back if verdict goes against Punjab in SYL row', *The Times of India*, 27 July 2004.
[30] Maria Saleth, 'Water rights and entitlements', Background Paper for this Report, 2005.
[31] Nirmal Mohanty, 'Moving to scale', Background Paper for this Report, 2005.
[32] Himanshu Thakkar, 'Flood of nonsense: How to manufacture consensus for river-linking', *Himal*, 16 August 2003, p. 27.
[33] A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.

need to balance the use of water with its deliberate non-use in order to maintain environmental balance of the riverine, estuarine, and the coastal ecosystems is negated (in at least parts of the 2002 National Water Policy)'. Given the lack of specification of states' water entitlements, this means that any water releases to estuaries, for example, would be the basis for other states to claim 'wastage' and therefore an appeal to reduce the share of the offending state.

The lack of Union Government action on inter-state waters has become a subject on which the government is widely ridiculed, sometimes even by the government itself. The Union Secretary of Water Resources wonders[34] how it is that, 50 years after the passing of the River Boards Act, the Union Government has not once used that Act to deal with inter-state river development. The Chief Minister of Tamil Nadu describes the Cauvery River Authority[35] as 'a toothless wonder'. Sunita Narain of the Centre for Science and the Environment sums up the situation as follows:[36] 'In the political minefield of river disputes, the government ... just watches, waits for God to bring rain and temporary relief, or scurries about for a new appeasement package. All in all, it makes a farce of the issue staring it in the face: how the country is to live and share its now-scarce water resources.' And, as always, cartoonists (Figure 2.14, showing the Chief Ministers of Karnataka and Tamil Nadu discussing water sharing on the Cauvery) cut to the quick.

Figure 2.14: Chief Ministers of Karnataka and Tamil Nadu resolving the conflict over the waters of the Cauvery River

Source: Courtesy of *The Hindu*, 2003.

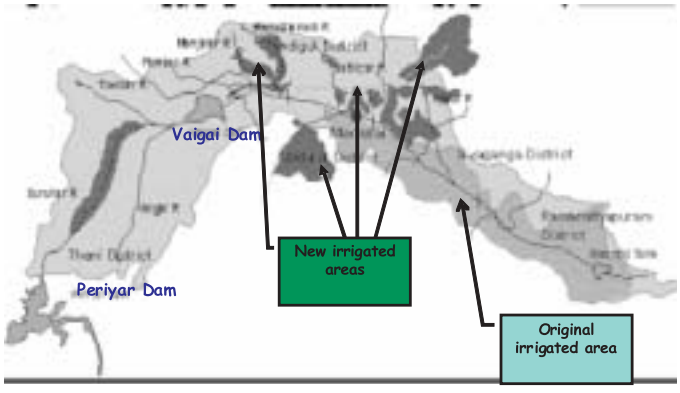
Conflicts between Upstream and Downstream Riparians in Intra-state Rivers

As scarcity becomes a fact so there is growing conflict between existing and new users of water, even within single-state basins. The Vaigai Basin in Tamil Nadu was a beneficiary of the century-old Periyar scheme, whereby part of the water of the western flowing Periyar River in Kerala was diverted by the revered Colonel Pennyquick over the Western Ghats to the Vaigai Basin in Tamil Nadu (Figure 2.15).

Periyar water was used to establish major canal commands in the lower Vaigai Basin. In the 1960s, the Vaigai Dam was built to harness the natural flow of the Vaigai. It was immediately apparent to those who had benefited from the Periyar water that this posed a threat to their water entitlements. Accordingly and quite remarkably, the authorities at the Vaigai Dam keep two sets of books—one of which records the inflows and releases of Periyar water (which is of high reliability) and the other which records the inflows and releases of the much-less-reliable Vaigai River water. Over the years,

[34] D.V. Duggal at Ministry of Water Resources, Workshop on River Basin Management , New Delhi, 27 January 2004.
[35] Jayalalitha in *The Hindu*, August 2003.
[36] Sunita Narain, 'The drought within', *Business Standard*, New Delhi, 3 August 2004.

Figure 2.15: Water entitlements in the Vaigai Basin



however, there has been an ineluctable increase in the dams in the basin. Each of these has been built to provide water to a new command area. For example, the Sothuparai Reservoir in the headwaters was recently built (with World Bank funding) to the delight of farmers in the couple of thousand hectares served by the dam. But the waters of the Vaigai Basin were, if accounts were kept, already fully allocated. This was, in short, nothing more than a project (of considerable cost) which added little to overall water availability, but simply robbed downstream Peter to pay upstream Paul.

While the basics of water balances apparently elude many of the state water engineers, they do not elude the downstream farmers. At a meeting of the incipient 'Vaigai River basin committee' in Madurai this was the main topic of conversation, with one downstream farmer (dubbed 'the water lawyer of the basin') making a cogent (and widely-understood) presentation on water balances and creeping expropriation of water rights. In 1934, the Madras High Court, in the case of Setharama lingam vs. Ananda Padayachi[37] 'asserts that in case the lower riparian feels that there has been an actual decrease in the supply of water to him he has a cause for action'. But because water accounts are not kept and there are no formal entitlements, the de facto law of water here (as elsewhere in India) is 'what the state gives, the state may take away (without informing you)'.

Conflicts between Communities and the State

A major phenomenon of the last five years has been an explosion in community-based projects for 'rainwater harvesting' schemes, which involve rehabilitating and building small check dams and tanks, and household groundwater recharge structures, with over $150 million a year spent on such projects in recent years.[38] The initial impetus was from the Sukhomajri project in Punjab, with a host of other celebrated and less celebrated community projects, and a substantial number of large-scale, state-sponsored projects (including the multi-state World Bank-financed Shivalik Hills project and large state-financed projects in Andhra Pradesh and Tamil Nadu). The performance of such projects varies widely. Objective evaluations show that performance is mixed (with only 10 of 27 Hill Resource Management Societies functioning in Haryana,[39] for example, and only 40 percent in Maharashtra,[40] and other evaluations showing only

[37] Chattrapati Singh, 'Water Rights in India', *Water Law in India*, pp 8–30.
[38] Sudhirender Sharma, 'Rainwater harvesting has yet to protect India from drought', *Waterlines*, vol. 21, no. 4, April 2002 (also published in *Water Policy* (8), February 2006).
[39] Arya, Swaran Lata and J.S.Samra, 'Revisiting Watershed Management Institutions in Haryana Shivaliks, India', Chandigarh: Central Soil and Water Conservation Research and Training Institute, 2001, and Kerr John, Ganesh Pangare, V.K.Pangare, and P.J.George, 'An evaluation of Dryland Watershed Development Project in India', EPTD Discussion Paper 68, International Food Policy Research Institute, Washington DC, 2000.
[40] R.P.S. Malik, 'Water and poverty', Background Paper for this Report, 2005, and Kerr John, Ganesh Pangare, V.K.Pangare, and P.J.George, 'An evaluation of Dryland Watershed Development Project in India', EPTD Discussion Paper 68, International Food Policy Research Institute, Washington DC, 2000.

25 percent or even 15 percent of such projects successful[41]).

Virtually by definition, these projects 'take hold' only in areas where water is already very scarce. And in all cases communities will only participate, reasonably, if they can use the water, primarily to irrigate their crops. This means that the rainwater harvesting schemes have two impacts—increased storage of water, and increased use of water. Since there are already very low outflows from most of the highly-stressed basins, this means that the net additional storage is probably small. The result, in zero-sum cases, is that the new uses mean yet another set of additional claims on limited water, claims which are honored only by reducing the availability for some anonymous downstream user.

This has led to conflicts between the state and the communities. Tarun Bharat Sangh is a rainwater harvesting NGO led by the charismatic Rajendra Singh. In one well-publicized incident, community activities led to the revival of a local stream, the water of which was then claimed by the state, which, under the Indian Easement Acts of 1882 has the sole right to collect, retain, and distribute surface water.[42] So not only does the state claim the right to take away that which it has given, but it also exercises the right to take away that which it has not given (but owns anyway).

Conflicts between Farmers and the Environment

As water allocation in particular basins approximates a zero-sum game, without rules and institutions for managing who gets what, conflicts are inevitable. In an increasing number of cases this pits farmers against nature.

The Ghana National Park in Bharatpur is India's most famous bird sanctuary and a Ramsar wetland. (Like many such sites, it has a checkered history. The wetland is entirely artificial, having been created by a Maharaja who liked shooting birds in very large numbers but who later had a conversion and turned it into a sanctuary for hundreds of species of endemic and migratory birds, including Siberian cranes.) Water for the wetland is provided by a canal from a dam which is also used by irrigators. In recent years, competition for water has heated up. The competition in this area has been exacerbated by the new claims arising from the Laava ka Baas Dam, a 'rainwater harvesting structure', constructed in the catchment. Existing farmers claim that they have been squeezed by this and other abstractions and by drought, and have refused to allow releases of water for the Bharatpur Sanctuary. As can be seen in Figure 2.16, the previously lush and teeming wetland has been turned into a cattle pasture, leaving the migratory birds to the vagaries of unprotected wetlands and threatening a flourishing local tourism industry.

The point is that in an increasing number of cases new entitlements (sometimes large, sometimes each small in themselves but substantial in aggregate) adversely affect existing users. In an increasing number of cases there are vigilant 'water accountants' downstream who know exactly what is happening and can see the results before their eyes. Without a framework for allocating entitlements and mediating claims, conflicts are inevitable and growing.

Conflicts within Irrigation Projects

Finally, there are an increasing number of serious disputes among farmers within canal commands.

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[41] Sudhirender Sharma, 'Watersheds', *Waterlines*, 2004.
[42] The National Commission for Integrated Water Resources Development, Ministry of Water Resources, New Delhi, 1999.

Figure 2.16: The demise of the Bharatpur Bird Sanctuary

Before—India's greatest bird sanctuary

After—a cattle pasture

An important recent case is that of the Indira Gandhi Canal in Rajasthan[43] (the major project for using the substantial quantity of waters allocated to Rajasthan under the Indus Water Treaty). The farmers, in the first half of the project to be completed, were allowed to share the water for the whole project on a temporary basis, with this water to be gradually reduced to their design share as the other command areas were completed. But this fact was either communicated informally to the farmers or not communicated at all. They thus became accustomed to having plenty of water and planted water-intensive crops.[44] When the time came for them to reduce their water to the originally envisaged amount, they perceived this as 'confiscation' and revolted. Four farmers were killed in the summer of 2004. Once again, the core issue was lack of clarity and certainty about entitlements.

Vijay Vyas[45] has summarized the situation well: 'It will be infinitely better to avoid conflict situations rather than seek mechanisms for conflict resolution. Two preconditions for minimizing conflicts at the local level are: clear definition of usufructory rights, and dependable estimates of the water availability over time and over space. If the usufructory rights are clearly defined they can be used as an explicit provision in formal or informal contracts among different water users and among water users and water providers. Ambiguity in proprietary rights is at the root of several disputes.'

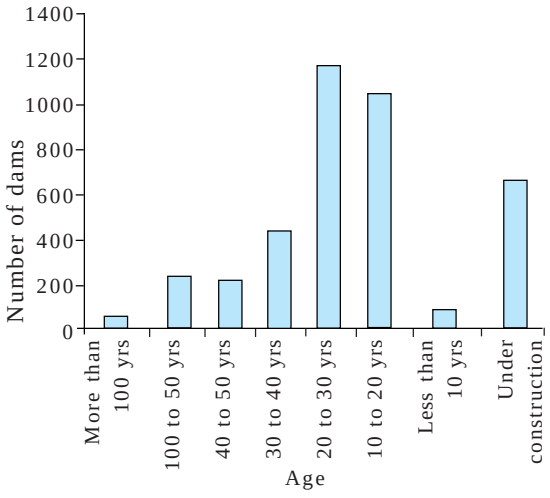
Maintaining and Renewing Existing Infrastructure

India has a large stock of hydraulic infrastructure: since 1960, the Union Government has invested of the order of $120 billion in water resources and irrigation,[46] with the approved outlays for irrigation alone in the Tenth Plan being $10 billion for irrigation and $1 billion for flood control.[47] As described earlier, the services provided by this infrastructure are critical for economic growth. But the services are only forthcoming if this enormous asset—which is now aging, as illustrated in Figure 2.17—is maintained and replaced. And the evidence is palpable that this is not happening.

No state in India has a modern Asset Management Plan, and thus there are no reliable estimates

43 'Three farmers killed, thirty hurt in police firing', *The Indian Express*, 27 October 2004.
44 V.S. Vyas, 'Principled pragmatism, or the political economy of change', Background Paper for this Report, 2005.
45 Ibid.
46 G.T.K. Pitman, OED, 'India: World Bank Assistance for Water Resources Management', 2002. Bank investment has been about 10 percent of India's investment, and the Bank has invested $12 billion since 1960.
47 A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.

Figure 2.17: The stock of major water infrastructure (large dams in this case) is aging



Source: A.C.Tyagi, 'State of India's Water', www.thirdworldwatercentre.org.

of the cost of replacing and maintaining this infrastructure. From international experience, a typical figure—assuming regular maintenance—of replacement and maintenance is about 3 percent of the value of the capital stock of water infrastructure.[48] This would imply that the cost of replacement and maintenance of India's stock of water resource and irrigation infrastructure would be about $4 billion a year, which is about twice the annual capital budget in the Five Year Plan. It is abundantly clear that not more than a tiny fraction of this is actually being spent on asset maintenance and replacement.

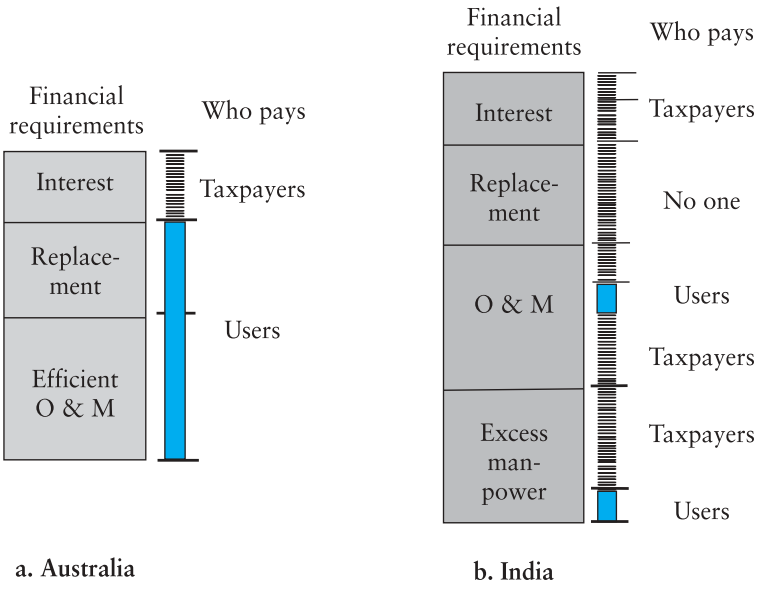
There are a series of distortions which are leading to the erosion of this asset base. The first distortion is that the public agencies which provide these services are hugely over-staffed. Mumbai Municipal Water Corporation, for example, has about 35 workers per thousand connections, whereas well-functioning utilities have about 3 workers per thousand connections. And the UP Irrigation Department employs an astonishing 110,000 people. The politics of these public enterprises is such that salaries have the first call on revenues—in Haryana, for example, 83 percent of the allocation for irrigation operation and maintenance goes to paying salaries.[49]

The second distortion is that revenue collection is low and declining. Gross recoveries as a proportion of working expenses declined from 85 percent in 1975 to 42 percent in 1988[50] and to 35 percent (for a sample of states) in 1998.[51]

The result of this pattern of declining revenues and rising personnel costs is a pattern illustrated schematically in Figure 2.18. In a financially-well-structured irrigation system (such as that in Australia), users pay for efficient operations and maintenance and for the replacement costs of the assets which provide their services. The government pays (reluctantly!) the interest on debt accumulated in the past. The system (see part (a) on Figure 2.18) is clean and the incentives right (for the users to demand efficient operations and maintenance (O and M), and replacement only of essential assets and that at least cost). The typical Indian system is much more complex (see part (b) on Figure 2.18). First, there is an extra 'block of payment' to be made for the extra costs incurred by having large numbers of unnecessary workers. Second, the user payments represent only a small

[48] The Australian experience shows that the average 'renewals annuity', which includes the cost of both replacement and operations and maintenance, 'is about 3 percent to 4 percent for older, and 2 percent to 3 percent for newer assets'. Personal communication, Golbourn Murray Water and the Murray Darling Basin Commission, 2005.
[49] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
[50] R.P.S. Malik, 'Water and poverty', Background Paper for this Report, 2005.
[51] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.

Figure 2.18: The financing of water services in India



Source: The World Bank.

fraction of the total money available for O and M (including salaries). Most of the O and M allocations are from the budget (that is, paid for by all taxpayers), but these amounts typically do not cover what is required for O and M, leaving an unfilled 'deficit' for O and M. At the top end the interest on past investments is paid for by taxpayers. What this means is that there is a yawning gap, paid for neither by users nor taxpayers. This means that O and M is not done adequately and—since it is last in the queue—there is no investment in replacing aging assets.

There is no doubt that only a very tiny fraction of this required expenditure for rehabilitation is actually being made. The end result is the familiar sight for virtually all water infrastructure in most parts of India—crumbling, rusting, leaking dams, canals, and pipes. The situation is serious even for infrastructure where failure would be catastrophic, such as large dams. Where these are revenue-generating hydropower facilities, the situation is generally much more satisfactory than for the irrigation dams which are totally at the mercy of budgetary financing.

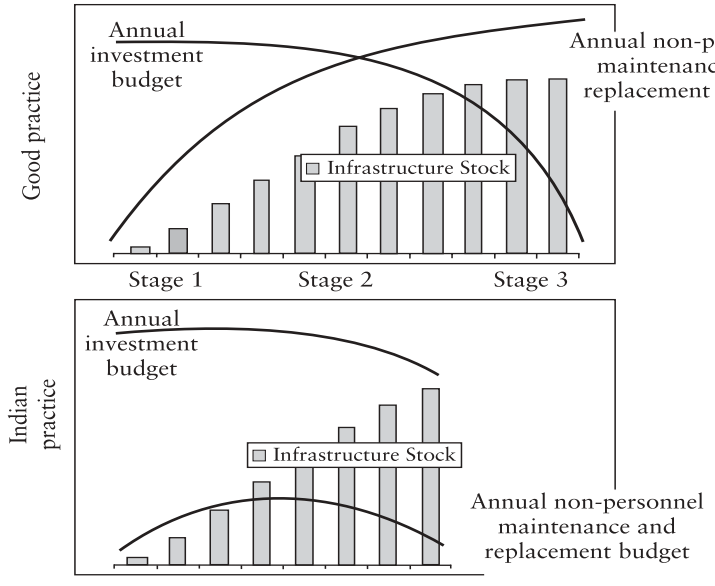
And it means that much of what masquerades as 'investment' is, in fact, a belated attempt to rehabilitate the crumbling infrastructure, both for irrigation and for municipal water supplies. (Most World Bank 'investments' in water infrastructure are, in fact, not investment in new infrastructure, but an attempt to make some inroads into the huge liabilities from deferred maintenance, while simultaneously aiming at modernization of the infrastructure and developing institutional and financial practices which will help break out of this vicious cycle.) The contrast between globally-accepted good maintenance-and-replacement practice and that of the systems in India—accurately described by Nirmal Mohanty[52] as 'Build-Neglect-Rebuild'—is represented schematically in Figure 2.18.

Two examples illustrate how serious the situation has become. In the 1980s, the Government of Tamil Nadu paid for the construction of a canal from the Krishna River in Andhra Pradesh to bring water to Chennai. Twenty years after construction, and as a result of the usual practice of deferred maintenance, the canal was in very bad shape. Since the state was unable to pay for rehabilitation, the rehabilitation had to be 'privatized'—it was left to the religious leader Sai Baba to pay for the rehabilitation of the canal. And, in a recent national meeting on water, the CEO of India's biggest pump manufacturer told of his bit-

[52] Nirmal Mohanty, 'Moving to scale', Background Paper for this Report, 2005.

tersweet view of the burgeoning number of lift irrigation schemes. The state of Maharashtra had bought 34 large pump sets from his company. 'I was, of course, quite pleased by this for our business. But I am also a taxpayer, and when I know that just 2 of these 34 pump sets are actually functioning it breaks my heart.'[53]

Figure 2.19: Depleting India's infrastructure stock



Source: The World Bank.

Again it is instructive (Figure 2.19) to compare reasonable global practice with that in India. In the 'good practice' case, the stock of infrastructure grows fast in 'Stage 1' (referring back to the 'Stages' illustrated in Figure 1) and then tails off in Stages 2 and 3. But as this stock grows, so the financial demands for maintaining and replacing this stock increase. In the Indian case—arguably in Stage 2—the stock is still growing, but the finance available for maintaining and replacing that stock has fallen rather than risen.

In the context of social services, it has been estimated that no more than 15 percent of allocations actually end up being delivered to those for whom the funds were intended. While the parallel is not precise, and numbers are not available, it is clear that the infrastructure system is similarly leading to hugely ineffective application of resources. Much of what is built is not being maintained, and that which does still function, delivers services of a low quality. This, in turn, reinforces the vicious cycle—users who are receiving such poor services reasonably refuse to pay, meaning that revenues decline still further and the maintenance and replacement gaps widen still further. The end result is that people, supposedly being served by public irrigation and water supply services, vote with their feet (or, more accurately, with their tubewells) so that they have alternative sources of supply.

Later in the report, we look at some ways of trying to approach the difficult but vital challenge of moving from a vicious to a virtuous cycle. There is no silver bullet for this—it will need dramatic increases in the efficiency of the providers of the public services, it will require 'transition plans' so that improved services can induce greater confidence in the services and willingness to pay for them, and it will require recognition of a simple financial fact. In the words of Rakesh Mohan: '... ture—from taxes or from user charges. As long as India is not prepared to do either or both of these, there is no hope for building and maintain-

[53] Mr. Kirloskar, CEO of Kirloskar at FICCI seminar on Linking Rivers, New Delhi, 2004.

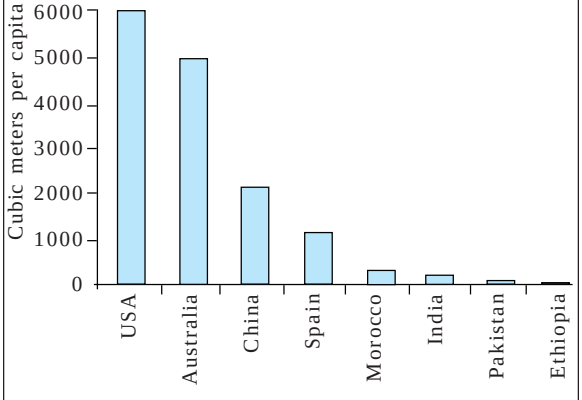
ing the infrastructure necessary for a more productive economy.'[54]

Building Infrastructure in Under-served Areas and for Under-served Public Purposes

In addition to the major financial challenge of rehabilitating and maintaining its stock of water infrastructure, India also has to make major investments in additional water infrastructure. The need for these new investments can be seen from several perspectives.

Looking at India in a global context, the country has remarkably small stocks of water infrastructure. As shown in Figure 2.20, the amount of water storage capacity in India is very low for a semi-arid country—whereas the United States and Australia have capacity to store over 5000 cubic meters for every citizen, China 2500 cubic meters per capita, and Morocco and South Africa 500 cubic meters per capita, India's storage capacity amounts to just 200 cubic meters per capita.

Figure 2.20: Storage per capita in different semi-arid countries

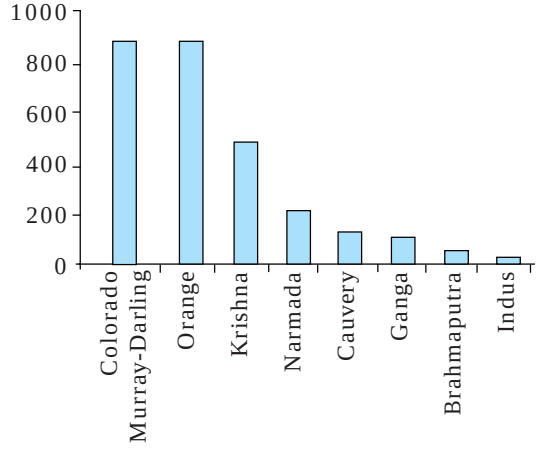


Source: ICOLD database.

A different perspective is the quantum of water that can be stored as a proportion of average river runoff. In the Colorado River Basin and in Australia's Murray-Darling Basin this figure is 900 days; in South Africa's Orange River Basin it is 350 days; but overall, India can store just 50 days of average runoff, with wide variations—from 220 days in the Krishna to just 2 days in the Brahmaputra/Barak Basin (Figures 2.21).

A complementary perspective is that of the degree to which India has utilized its substantial hydropower resources. Again, international comparisons are useful—Figure 2.22 shows that rich countries have developed about 80 percent of their economically-viable hydroelectric potential. India has substantial economically-viable hydropower potential, but has developed only about 25 percent of this potential.

Figure 2.21: Days of average flow which reservoirs in semi-arid countries can store in different basins

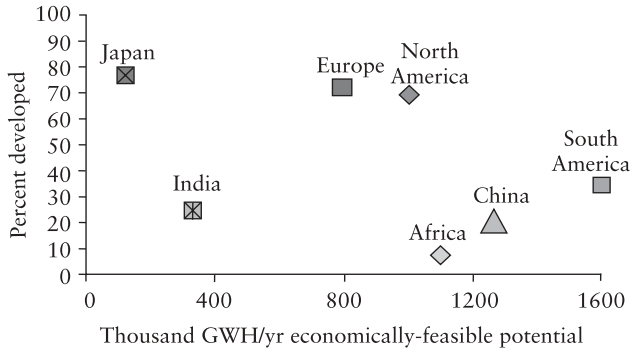


Source: The World Bank.

Most of India's hydropower potential is in the Himalayas (Figure 2.23), an area which has many

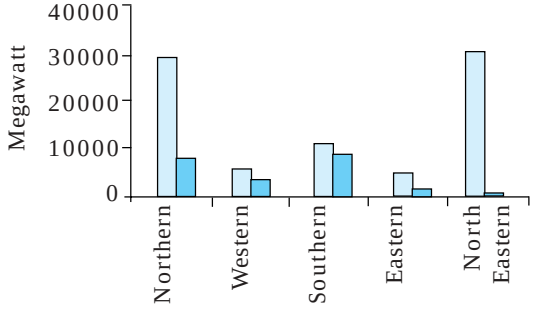
[54] Rakesh Mohan, then Deputy Governor of the Reserve Bank of India, at the Mumbai RBI Conference on Infrastructure, 2004.

Figure 2.22: The development of economically-feasible hydropower potential in India in international context



Source: The World Bank.

Figure 2.23: Status of hydropower development in different regions



Source: Ministry of Power, 1998.

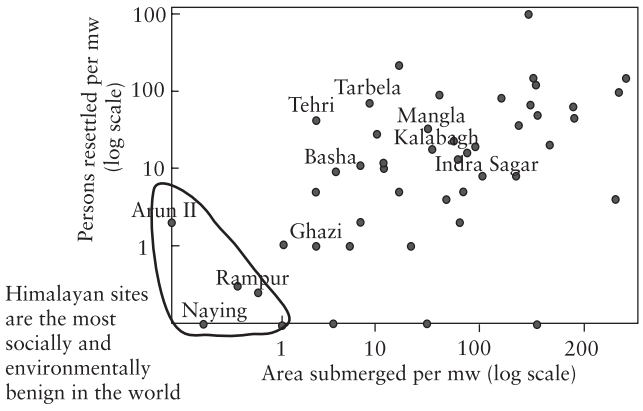
of the world's most environmentally and socially benign sites for hydropower (Figure 2.24).

Figure 2.25 shows how the level of hydropower has fallen relative to other sources. (Over the past 6 years, installed hydropower capacity has increased by about 8500 MW, raising the percentage of hydro to 26 percent in 2005.) Over the past decade it has become clear that the availability of electricity is emerging as a serious constraint to Indian economic growth. Given the particular importance of peaking power (a unit of which is estimated to be worth about four times the value of a unit of base load[55]), India has appropriately embarked on an accelerated hydropower development program.

The accelerated hydropower program has brought to the fore two serious water resource challenges, which have yet to be effectively addressed. Many of the world's most successful river basin development programs—ranging from the legendary Tennessee Valley Authority of the 1930s[56] to the present-day Yangtze Basin development project[57]—have relied on hydropower to generate the resources necessary to fund 'public goods', such as navigation and flood control. (The Three Gorges Dam, for example, is operated as a flood control dam, at an opportunity cost of a massive $1.5 billion a year in foregone power revenues.) While there is a history of successful multipurpose projects in India (including the Bhakra Dam discussed earlier), the Government of India now does not have an enabling framework which facilitates the same socially-optimal outcomes. In the Brahmaputra Basin, for example, there are large benefits from multipurpose storage projects that are being foregone[58] because power companies are licensed to develop 'power-only' projects, which are typically run-of-the-river projects with few flood control or navigation benefits. This difficulty is exacerbated by the fact that 'host states' get very large royalties (12 percent of gross power sales) from hydropower sales. This is best illustrated by considering the situation with

[55] Ramesh Bhatia, 'Water and energy', Background Paper for this Report, 2005.
[56] B. Barbara, A. Miller, A. Whitlock, and R.C. Hughes, 'Flood Management—the TVA experience', TVA, Oak Ridge, 1998.
[57] Qiu Zhongen of the Changjiang Water Resources Commission titled 'Study on the Comprehensive economic Benefits of the Three Gorges Project', presented at the UN Conference on Hydropower and Sustainable Development, October 2004.
[58] George Varughese, *Waters of Hope*, Oxford and IBH Publishing, New Delhi, 1999.

Figure 2.24: Environmental and social indicators for hydropower dams



Source: The World Bank.

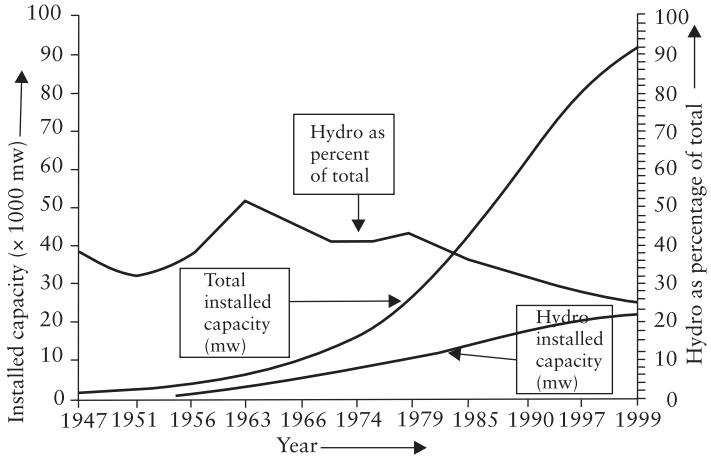
projects in Arunachal Pradesh. The Government of Arunachal Pradesh gives no weight to flood control and navigation benefits (which would benefit the much larger populations in downstream Assam) and gives high weight to any submergence (which would displace people in Arunachal). The Union Government has not found a formula for getting good multipurpose outcomes from such development opportunities.

As described earlier, while overall levels of reservoir capacity in India are low in international terms, there is wide variation. Figures 2.26a and 2.26b show, for each Indian basin, the annual flows and the number of days of flow that can be stored in reservoirs.

Noting that there are sharply diminishing additional yield from a unit of storage once there is substantial reservoir capacity,[59] these figures suggest:

- that there is little value to additional storage in most of the peninsular river basins, (the Cauvery, Krishna, and Godavari) and in the Narmada and Tapi;
- there are likely to be a number of attractive possibilities for storing water in some of the 'low storage basins' (including especially the Brahmaputra, Ganga, Brahmani, and Subarnarekha, as well as the west-flowing rivers south of the Tapi and, to a lesser degree, the Mahanadi and Godavari).

Figure 2.25: The declining role of hydropower in India



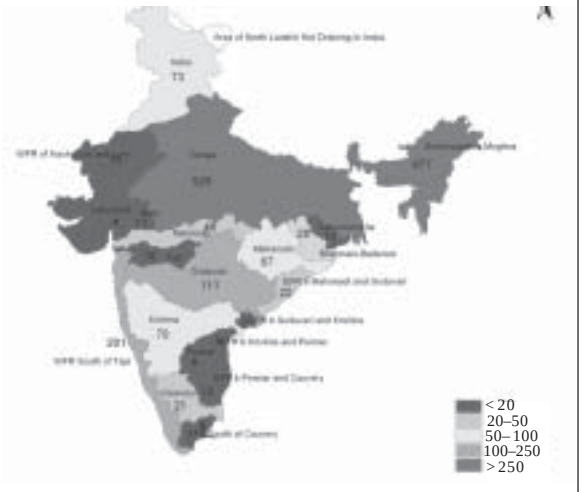
Source: National Commission on Water.

The idea of 'linking rivers' has surfaced several times in India's history. In 1984, the National Water Development Authority (NWDA) was set up to identify appropriate inter-basin transfers and to undertake feasibility studies for these. Figure 2.27 shows the links being considered by the NWDA.

The idea of these inter-basin transfers has provoked much discussion and controversy in India. On the one hand, the idea seems obvious to most lay people who observe annual cycles of simultaneous drought in some parts of

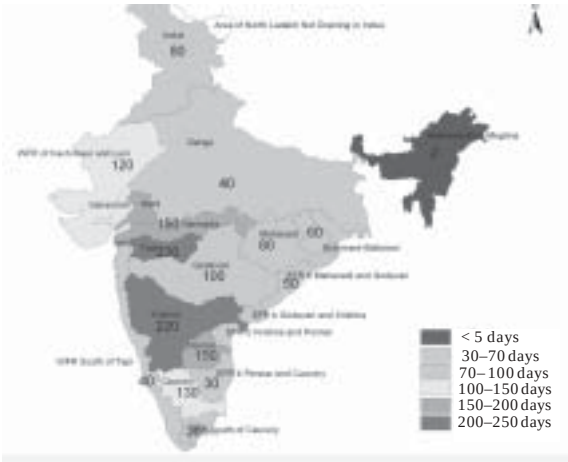
[59] Walter Langbein, 'Water Yield and Reservoir Storage in the United States', USGS Circular, Washington DC, 1959.

Figure 2.26a: Flows in billions of cubic meters per year in the major river basins of India



Source: GIS presentation by IWMI.

Figure 2.26b: The number of days of average flow that can be stored in different river basins in India

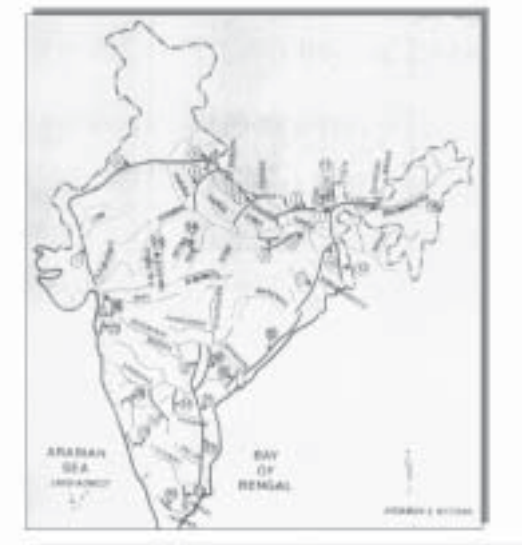


Source: GIS presentation by IWMI.

the country and floods in others. On the other hand, there are many legitimate (and some less legitimate) causes for concern. The legitimate concerns are that each 'link' needs to be evaluated not just from an engineering perspective but from economic, financial, environmental, social, and political perspectives. The politics are important both domestically and internationally. Domestically, because such links could only materialize if there are willing 'givers'(who would need to be compensated) as well as 'takers' (who would need to compensate). And internationally, because such inter-basin transfers would affect neighboring countries, who would necessarily have to be consulted and have their concerns taken into account.

The less legitimate concerns are those which consider any inter-basin transfers to be 'un- natural' and even 'causing mutation in the DNA of rivers'! In fact, many arid countries have invested in major inter-basin transfers. In South Africa, for example, 7 of the 9 provinces get more than 50 percent of their water from inter-basin transfers.[60]

Figure 2.27: Possible inter-basin water transfers



Source: NWDA.

[60] Thinus Basson, Department of Water Affairs and Forestry, Pretoria, personal communication.

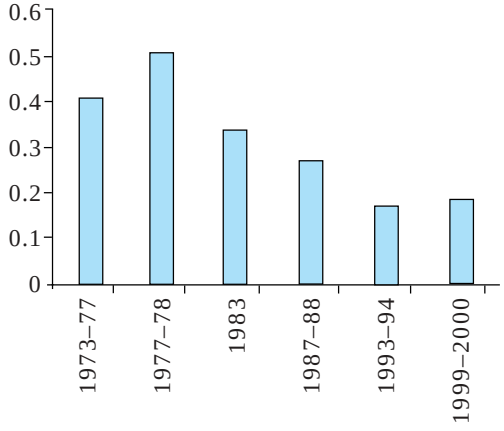
And India itself has benefited from a substantial number of beneficial inter-basin transfers (some old, like the Periyar project and some more recent such as the Bhakra-Beas system). The Linking Rivers Task Force headed by Suresh Prabhu, MP, functioned in a refreshingly different manner from the normal, 'behind-closed-doors' approach taken to water issues in India. There were dozens of public hearings and much public debate. Unfortunately, the quality of this debate was compromised because, despite numerous assurances to the contrary, the NWDA has never made public (with one recent exception) the feasibility studies which it says exist.

There remains very substantial 'unfinished business' in the provision of irrigation and water and sanitation services, too.

Noting that there were a large number of irrigation projects which had been started and not completed (some for 50 years!), and that there were other situations where headworks were constructed but command area development was incomplete, the Union Government wisely gave and gives high priority to the completion of that which has already been started. The Accelerated Irrigation Benefits Program is designed to complete projects which would eventually serve 10 million hectares, with about 2 million hectares completed to date. It will take about $10 billion to complete this program.[61] Similarly, the Command Area Development and Water Management Program is designed to complete distribution services in another 10 million hectares.

Figure 2.28: The poverty-reducing impact of irrigation is declining

How much percentage of the poor is reduced when there is a 1 percent increase in the proportion of cropped area which is irrigated



Source: Analysis of 14 states by Dr. R.P.S. Malik, 2005.

While the returns to new irrigation investments are declining (Figure 2.28), it is clear that government will still need to make very substantial investments in new irrigation in coming decades. The 'India Water Vision 2025'[62] estimated that government would need to invest about Rs 80 billion a year for irrigation for the next 20 years.

As shown in Figure 2.29, the proportion of plan expenditures allocated to these sectors has been falling over time, with the Ninth Plan allocations to irrigation and flood control being about Rs 80 billion a year.[63] The Tenth Plan, however, represents a large increase, with annual allocations averaging about Rs 170 billion a year.[64] In addition to these allocations, the water-related sectors absorb substantial sums of hidden subsidies (Figure 2.30).

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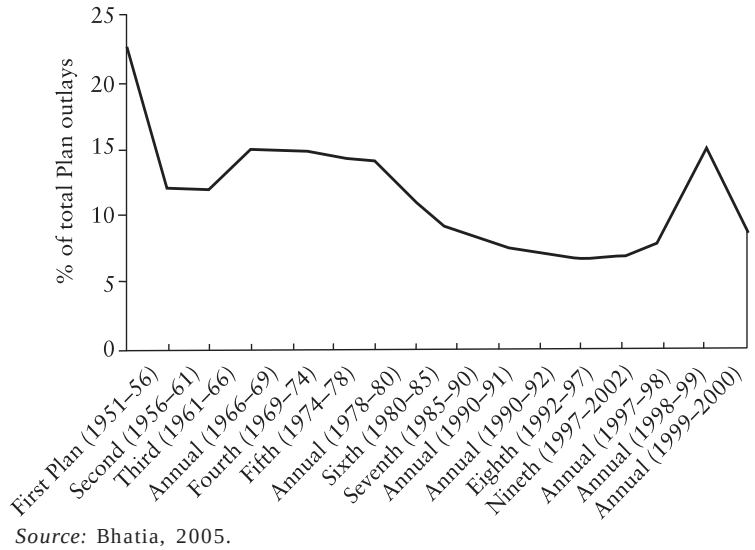
[61] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005. Gives the data: up until March 2003, Rs 85 + Rs 30 = Rs 115 billion had been spent to create 2 million hectares of irrigated area. Unit cost is thus about Rs 60,000 per hectare. The remaining 8 million hectares would therefore be expected to cost roughly Rs 480 billion, or roughly $10 billion.

[62] India Water Partnership and Institute For Human Development, 'India Water Vision 2025', IHD, 2000.

[63] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.

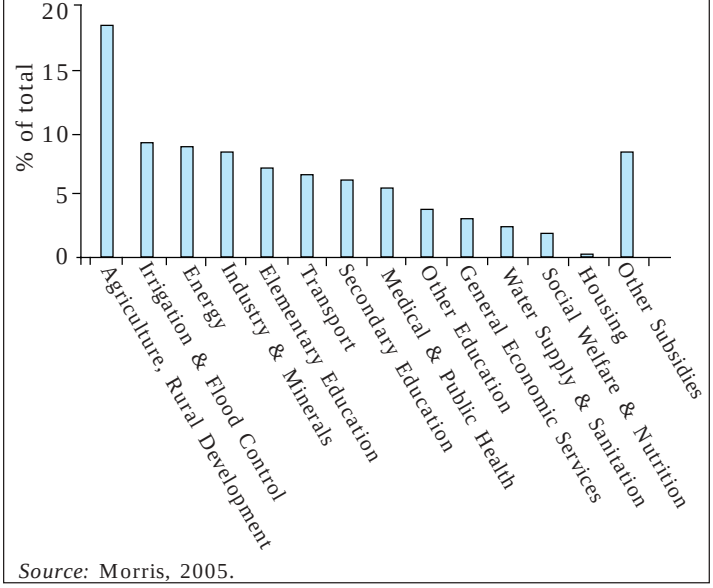
[64] Ibid.

Figure 2.29: Allocations to major water infrastructure are declining



Source: Bhatia, 2005.

Figure 2.30: Subsidies to water-related sectors



Source: Morris, 2005.

On the water supply and sanitation side, official figures show coverage with water supply to be 94 percent in rural areas and 90 percent in urban areas, and sanitation 24 percent in rural and 62 percent in urban areas. These numbers are probably a better indication of the infrastructure that has been built than the services that are actually provided[65]—there are large numbers who do not have adequate services. The large subsidies, justified in the name of the poor, in fact benefit those who get water (people who can exert influence on rationed supplies, and are therefore not the poor) and those who use a lot of water (the middle class and rich). The primary immediate challenges for the water and sanitation sector are to extend services to the unserved, to improve the quality of services to those who are nominally served, and to do this through utilities which are efficient and accountable. Most of the revenues for these services are going to have to come from users, because (as discussed later) the urban authorities are going to have to invest massive amounts of public money in the sewerage systems needed to clean up the polluted rivers.

The India Water Vision has estimated that it will require about $1.6 billion a year for the next 25 years, if all are to be provided with water supply services, and about $0.8 billion a year for household sanitation.

Finally, it is obvious that there are huge financial needs for addressing the water environment. There is no systemic study of what the aggregate 'needs' are, or what the priorities are. And there are only very patchy data—the report of the National Commission on Integrated Water Resources Management, for example, does not give a single piece of hard data on water qual-

[65] Smita Misra, World Bank, personal communication

ity. The magnitude of the organizational and financial challenge for dealing with the major issue of river pollution is illustrated in a brilliant recent study by the Centre for Science and the Environment[66] of the Yamuna Action Plan (see Box 2.1).

The Yamuna case shows the dismal and deteriorating state of one of India's major and most sacred rivers. It also shows the scale of the organizational, planning, and financial effort required to even make a dent in the problem, and suggests both the importance and limitations of a litigation-based approach to dealing with these issues. It does show that there is a rising awareness about the importance of environmental issues, and a growing willingness to use financial and other tools to address these.

In summary, the water sector in India faces a massive financial challenge. The annual requirements for rehabilitating the existing infrastructure probably amounts to Rs 200 billion. The India Water Vision projects need new investments—with very modest allowances for sewage treatment—of about Rs 180 billion a year.[67] Annual allocations in the recent past have varied between Rs 90 and Rs 170 billion a year.[68] At the same time, there are heavy (and reasonable) demands for public investments in other infrastructure. It is estimated, for example, that the investments needed in roads, ports, railways, airports, and telecoms for the next decade will average Rs 2000 billion a year, and that the government will be about to finance, at most, around two-thirds of this.[69]

Box 2.1: Water environment challenges—the case of the Yamuna River around Delhi

There are several bits of 'good news'. First, that India has such competence in the environmental watchdog sector that produces first-rate analyses, such as this piece on the Yamuna, and gets it into the public domain and to the attention of politicians, the courts, and the government. Second, that over the past 15 years the Supreme Court has played an active role in pushing for greater attention to environmental issues, not least on the Yamuna. Third, that in some instances at least—and the Yamuna Action Plan is one of these—the government, with the support of donors (the Government of Japan, in this case), are investing heavily in environmental improvement projects, with about Rs 1500 crore invested in the Yamuna Action Plan (about Rs 600 crore of which were invested in Delhi).

There is, however, 'bad news', too, and lots of it.[70] First, is the fact that this important start has barely scratched the surface of what is needed. Repairing the plumbing that feeds into sewage treatment plants is a huge and very difficult task. A large portion of the 5600 kilometers of sewers are silted or settled, with only an estimated 15 percent of the 130 kilometers of trunk sewers in order. And the 17 sewage treatment plants have a capacity to treat only about half of the sewage produced, which in turn covers only about 60 percent of the population of Delhi. Second, are the problems of operation—only about 60 percent of the capacity of the existing treatment plants is actually used. The end result is that less than 20 percent of the pollution load into the river is actually

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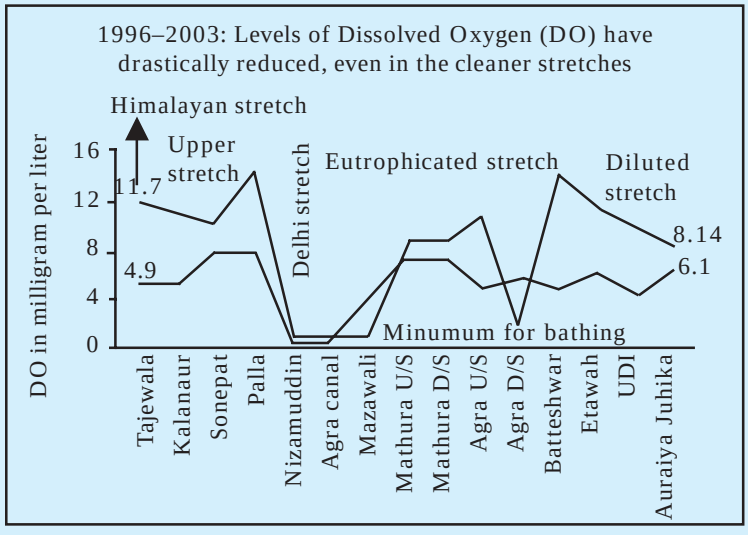
66 Sunita Narain and Suresh Babu, 'The political economy of defecation', *Down to Earth*, 30 April 2005, pp. 22–33.
67 A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.
68 A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
69 Omkar Goswami, 'The urgent need for infrastructure', *The Economic Times*, Delhi, 25 April 2005.
70 The Sarkaria Commission, in A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.

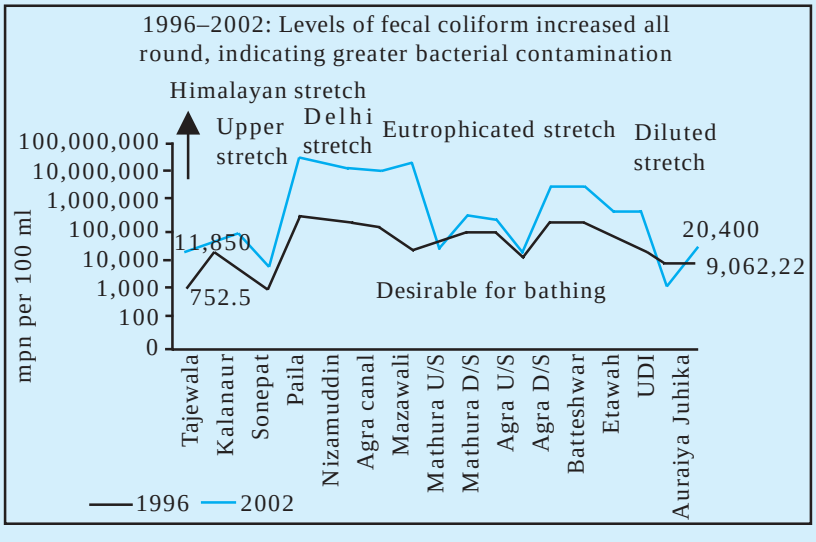
treated. Since the BOD load on the river has more than doubled in the last 10 years, it is no surprise that conditions in the 22-kilometer stretch of the Yamuna around Delhi have gone from terrible to appalling. As shown in Figures B2.1 and B2.2, the river is dead (there is no dissolved oxygen in the water), and there are more than 10 million fecal coliforms per 100 ml, a level over 10,000 times what is considered a threshold for 'bathable water'. Third, there are questions about the implementability of the rulings of the Supreme Court. In 1985, the court ordered

Figure B2.1: Yamuna River dissolved oxygen



Source: CSE, 2005.

Figure B2.2: Yamuna River quality—fecal coliforms



Source: CSE, 2005.

the construction of Common Effluent Treatment Plants to treat 190 mld of industrial sewage; 20 years later, only 53 mld can be treated. In 2001, the Supreme Court ordered the government to ensure a level of dissolved oxygen of 4 parts per million within 2 years; today, the level of dissolved oxygen is zero. In 1992, the Supreme Court heard a plea to ensure that all of the waters of the Yamuna could not be diverted before it reached Delhi—the 'minimum flow case', 'is still on'. The lessons are that judicial activism can not and should not be a substitute for effective government action.

CHAPTER 3

AN INVIGORATED INDIAN WATER STATE FOR THE 21st CENTURY

A State in Disrepute

As described in detail in chapter 2, India faces a daunting set of water-related challenges. There is still much new infrastructure to be built, but by far the most important and serious challenges are those of management—of existing infrastructure, and of the water resources itself. And here there is a major problem—governments at both the Union and state levels remain focused, in the words of the Planning Commission 'on the problems of the past', and (with a few notable and partial exceptions) are yet to even initiate a discussion of the changes which are necessary to confront the urgent and major new challenges of water management in India.

As the problems with the current system become more clear and serious, numerous high-level commissions have been appointed over the past 15 years—among others to examine Union responsibilities on inter-state rivers,[1] pricing,[2] and dealing with integrated water management[3]—and new national and state policies have been promulgated. In many cases the recommendations are sensible, but in most instances the commissions come and go, the policies are promulgated, and the machine grinds on unchanged. In the words of a major Government of India/World Bank review in 1998: 'in recent years there has been realization and policy pronouncements regarding the need to address these problems; however, the policies have not been translated into action'. Some experienced commentators have argued that reform of government machinery for managing water in India is a hopeless case. Tushaar Shah[4] suggests that, 'in designing water governance strategies for India, it seems sensible (in the intermediate run) to take the 'nature of the state' as given ... rather than assume that the nature of the state will change to resolve water sector problems'.

This disconnect between problem/pronouncement and practice has led to widespread loss of legitimacy and credibility of the state apparatus for water development and management. This is evident most obviously in the fact that most citizens have come to rely on informal mechanisms for getting the water they need to grow their crops and for their household needs. It is patent in every encounter between the state and citizens on water matters, and it is expressed acerbically every day in the press—'(government) makes a farce of the issue staring it in the face: how the country is to live and share its now-scarce water resources'[5]—and in the numerous water-related cartoons.

To an observer who has interacted with India over the last 30 years, the greatest and most promising change has been that the standard response to any discussion of reforms has changed from 'well

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1 The Sarkaria Commission , in A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
2 Vaidyanathan Committee, Report of the Committee on Pricing of Irrigation Water, Planning Commission, New Delhi, 1992.
3 The National Committee on Integrated Water Resources Management, 1999.
4 Tushaar Shah, 'Accountable institutions', Background Paper for this Report, 2005.
5 Sunita Narain, 'The drought within', *Business Standard*, New Delhi, 3 August 2004.

that cannot work here, because India is such a special case' to 'why not?'. Regrettably, much of the water bureaucracy of India still lives in the 'not here' rather than the 'why not?' world.

To a large degree, this crisis of the water state is a reflection of the general set of challenges facing the government in a rapidly evolving India. A recent book, *Governance*, by a prominent minister in the last Union Government states the general case:

'The malaise affects all the institutions of state.... The malaise is well known to those in the system, too. Proposals for reforming that system are adopted from time to time and decrees go out to implement the measures 'in a time-bound manner'. But in every case the proposal is put through the same mill ... and ground to dust.... Mere announcements amounted to reform.... (many) spelled a major advance ... but now actual governance has to be changed ... and the way to reform the system is not to tinker with this procedure or that institution, but to jettison the function, to hack away the limb whenever this is possible.... Continue to transfer functions and power from the state structure to society. A leaner machine, like a leaner body, will then be easier to improve. For we need to improve the state (because) there are several tasks that only the state can discharge'.[6]

The Central Institutional Challenges in Building 'the new Indian water state'

Water management is one of these 'several tasks which only the state can discharge'. Chapter 2 of this report describes a wide range of tasks which (a) the state currently undertakes and performs poorly (maintain stocks of infrastructure and ensure that they provide good services in a financially sustainable way), and (b) only the state can perform, but about which it does little (including, clarifying who has an entitlement to use water at all levels, from the inter-state to the canal distributary; regulating groundwater; providing public goods including flood protection and sewerage treatment).

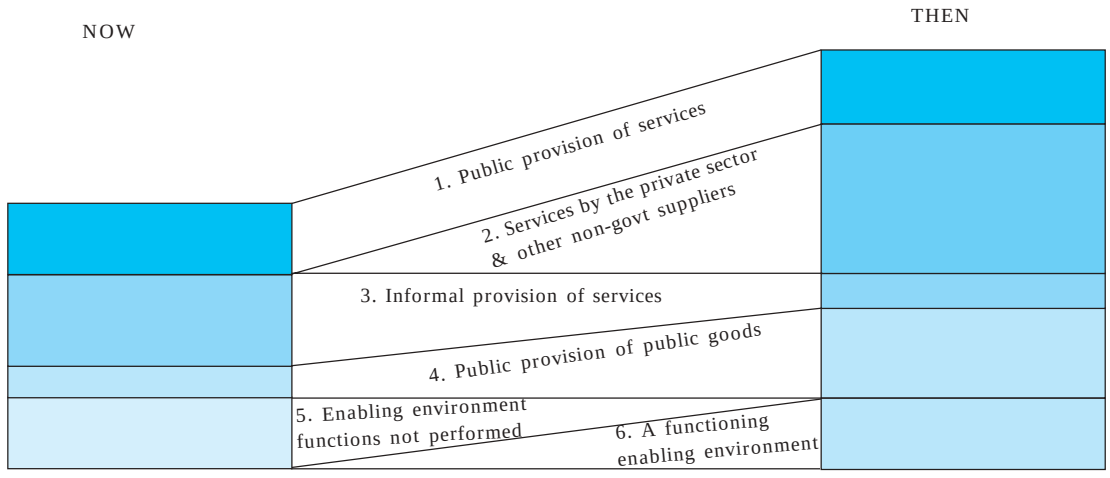
Chapter 2 also describes the coping mechanisms which farmers, households, and industry have developed to 'work around' a poorly functioning public water sector, and how these 'exit options' are becoming less and less feasible as resources—and especially groundwater, which has been the 'safety valve'—become scarce.

If it were easy to change the way in which the state performs, this would have been done some time ago. There is ample evidence that changes in organizational arrangements within the existing system of incentives is akin to shuffling the deck of chairs on the Titanic, and will make no difference. For this reason this report will not examine propositions such as the much-discussed one of 'creating a single Union Ministry which will deal with all water issues', because such a change would make little fundamental difference in the way in which the state operates.

The only way in which change will take place is if reform-minded political leaders shift the balance of power between the state machinery on the one hand, and users (farmers, citizens, industries) on the other. The state needs to surrender those tasks which it does not need to perform to others, and develop the capacity to do the many things which only the state can do. Figure 3.1 gives a schematic representation of how the Indian water sector looks 'now', and a vision of how, on the basis of what works in well-performing water sectors in other countries, it might look 'then', after the needed changes.

[6] Arun Shourie, *Governance and the Sclerosis that has set in*, Rupa & Co, New Delhi, 2004, p. 21.

Figure 3.1: The desired evolution of functions and actors



The main features of the changes are:

1. that the public sector will continue to have an important role in providing irrigation and water supply services but;
2. this will now be in competition with a large and vibrant non-governmental sector—including the private sector, NGOs and cooperatives—for provision of formal irrigation and water supply services;
3. as service provided by this mixed service sector improves, large numbers of people will move from the informal, self-providing, water economy into the formal service sector;
4. the public sector will play an expanded role in the financing and provision of public services (such as flood control and sewage treatment);
5. the government will develop a set of laws, policies, capacities, and organizations for defining and delivering an enabling environment, with special emphasis on the establishment and management of water entitlements, and the regulation of services.

Keeping this desired evolution in mind, and building on the analysis presented in chapter 2, this section describes some of the critical changes which can get this reform started, discusses some of the areas in which progress is being made in India, shows what changes other countries faced with similar challenges have made and how they have managed the process, and offers some 'rules for reformers' who are part of this change process.

Instruments, not Organizational Forms, are Key

Discussions about 'water strategy' in India are typically dominated by 'we need to spend more on flood control, or on rehabilitating tanks, or linking rivers, or on rainwater harvesting or on desalination', with the answers usually depending on the regional experience of the minister or bureaucrat who is leading the discussion. In some instances, these are supplemented by extensive sets of recommendations of a very specific nature—what crops should be grown where, how tariffs should be manipulated to achieve a host of objectives. The nature of these discussions reflects, in

the words of the former Chair of the Central Water Commission, a view of water that is embedded in the command-and-control view of the economy.[7] The dialog within the water sector, with some important exceptions, has not adjusted to either the broad liberalizing economic changes initiated in the Indian economy in 1991, and has not internalized the lessons from water management reforms throughout the world.

These discussions have seldom involved an assessment of the incentives which give rise to present performance and what must be done to change those incentives (and thus behavior). The member of the Planning Commission who is responsible for water and power has said it well: '... it is the absence of sound incentives which is the fundamental problem facing water management in India'.[8] What would such an incentive-based approach to water reform in India involve?

Most fundamentally it would involve, as suggested in Figure 3.1, a major change in the role of the state. The government would allow others (including the private sector) to compete for the right to supply water and irrigation services, while the government would turn its attention to the financing (and in some cases the delivery) of flood control, sewage treatment, and other public goods and would have as its central task the development and implementation of an integrated package of instruments—entitlements, pricing, regulation—which would structure the relationships among water users so that water is used efficiently, and environmental and financial sustainability is assured.

Many discussions of water reform in India (and elsewhere) focus on organizational issues—the perennial favorites being Participatory Irrigation Management (PIM)and a single ministry covering all water (for water resource management). The perspective of this report is that the primary emphasis for institutional reform should be, in the words of Nobel Laureate Douglass North,[9] 'on the rules of the game' that shape behavior. That is, the primary focus should be on instruments, rather than organizational forms. (Organizations do, of course, matter. For example, all well-functioning water systems separate the providers of services from the overall water resources management authority. But this is something that is much more about the instruments that govern the relationships between regulator and user, than it is about new names and separation of cadres, the issues which too often occupy center stage in discussions of Indian water reforms.) Accordingly, this section describes each of the central instruments that would form part of an institutional package of reforms, stressing continuously that this is an integrated package in which the whole is more than the sum of the parts.

Consider, for example, the issue of irrigation services. In his excellent book on the political economy of water in peninsular India, David Mosse[10] describes the necessary set of interlocking changes well: 'Since irrigation involves wider hydraulic systems which are beyond the control of WUAs and which inevitably render them dependent upon the state, farmers organizations have little chance of surviving as independent self-managed social organizations. The next step therefore does not lie in knowing how to organize farmers organizations ... but how to overhaul the administrative system so that the state irrigation departments and farmers can be bound into

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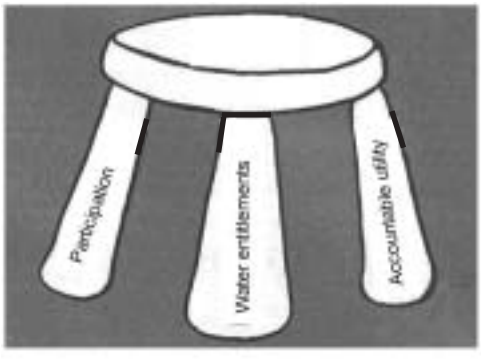
[7] A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.
[8] Kirit Parikh, at the Ministry of Water Resources National Meeting with the States, New Delhi, 2004.
[9] Douglass C. North, 'Economic Performance Through Time', Nobel Prize Lecture, 9 December 1993, in *Nobel Lectures, Economics 1991–1995*, Torsten Persson, World Scientific Publishing Co., Singapore, 1997.
[10] David Mosse, *The Rule of Water: Statecraft, Ecology, and Collective Action in South India*, Oxford University Press, New Delhi, 2003.

productive relations. PIM cannot become a reality nor can it become self-sustaining without the restructuring of state irrigation departments.... What is striking in India's IMT/PIM programs is how little attention is given to water rights. The government's rights to water are unchallenged, while its obligations to deliver water to WUAs is rarely legally binding ...'. In short, as illustrated in Figure 3.2, a sound irrigation service model requires mutually-reinforcing changes in all three 'legs of the stool'.

Figure 3.2: The basis for sound irrigation service provision



Stimulating Competition in and for the Market of Water Supply Services

As described in chapter 2, the provision of formal irrigation and water supply services in India is the virtual exclusive monopoly of government agencies, which do not provide services to many—especially the poor—and provide poor quality services to those who do have access. As Tushaar Shah[11] has noted, the large-scale self-provision of irrigation and water supply services is the most damning testimony to the failure of the government-dominated formal service provider model. There are a couple of exceptions—TISCO in Jamshedpur,[12] for many years, and recently the textile town of Tirapur in Tamil Nadu—where industry has such a dominant presence in a particular town, that it has simply taken over the responsibility for providing water supply services to households. In these cases, service quality has improved substantially. But they have largely been seen as anomalies rather than models on which to build. The situation in India remains one in which public monopolies face no competition either 'in the market', or 'for the market' (where head-to-head competition is not possible).

The one over-riding lesson from the global revolution in the provision of public services is that competition matters. In some cases competition 'in the market' is possible. For example, it is technically quite conceivable, in the large irrigation systems, to unbundle the bulk and distribution functions and then have a variety of forms—cooperatives, the private sector—for providing distribution services to farmers. As has happened elsewhere (in the airlines and telecoms sectors in India, for example, and in a plethora of public services around the world) such changes would unleash a chain of healthy systemic changes which would transform the business of the provision of public services. First, it would require a clear contract between the bulk provider (the Irrigation Department) and the non-governmental provider which would define the rights and responsibilities (for water and for payments) of both parties. (Such a contract between the Delhi Jal Board and the private operator of the Sonia Vihar water treatment plant in Delhi, shows this process at work.

[11] Tushaar Shah, 'Accountable institutions', Background Paper for this Report, 2005.
[12] R. Bhatia, R. Kumar, S.Misra, and N. Robins, 'Full Cost Pricing of Water—Options and Impacts: A Case Study of the Impacts of Moving to Full Cost Pricing on Freshwater Demand, Recycling and Conservation at the Tata Steel Company, Jamshedpur, India, UNIDO-IIED, 2000, (draft)

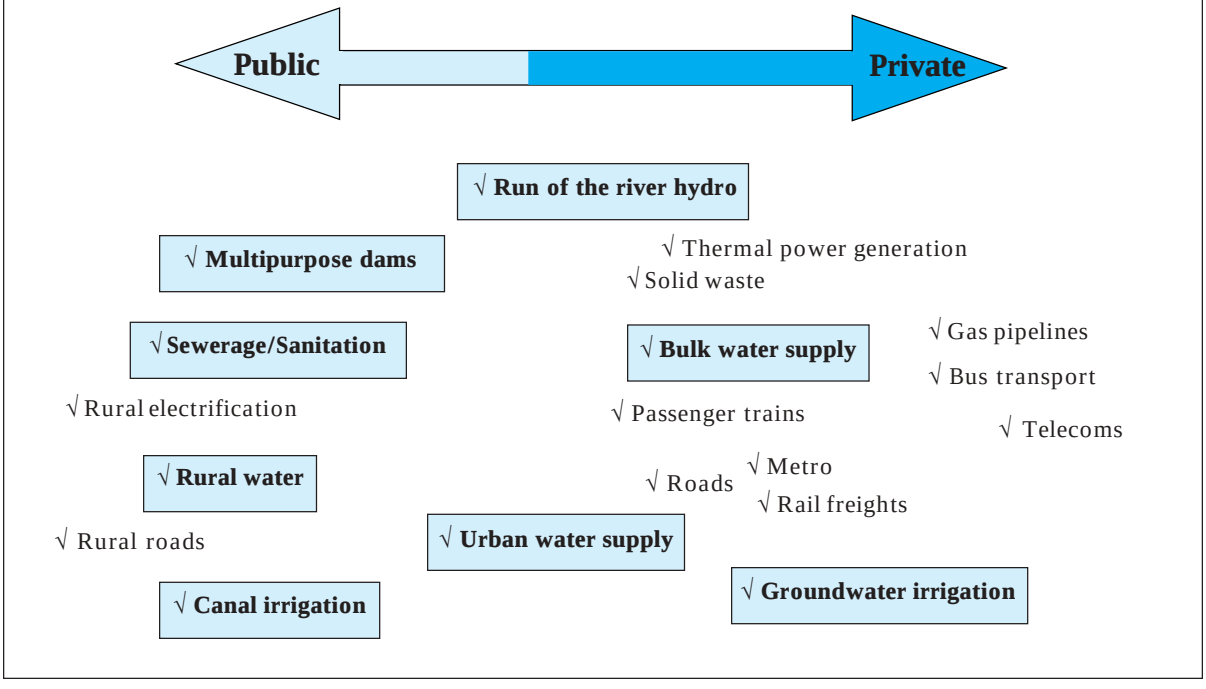
Delhi Jal Board is responsible for ensuring the bulk water supply for the plant, and pays a fine of Rs 50,000 a day if the bulk supply is not provided. This has led to the DJB making unusually energetic efforts to ensure provision of bulk water supply for the plant[13] and, coincidentally for the people to be served. That said, these efforts remain fraught with the usual problems arising from lack of clarity about water entitlements—one day the Government of Uttar Pradesh says it is committed to supplying water to Delhi, the next day the situation has changed,[14] with the fate of water supply to one of the world's largest cities depending on short-term political haggling.) Second, it would require a clear contract between provider and those who receive services (probably Water Users Associations in most irrigation cases). The absence of such contracts is one of the major reasons why the monopoly-providers remain unaccountable to users, and information remains so poor and opaque. As always, discretion and lack of accountability is the handmaiden to corruption. (In Klitgaard's[15] famous equation 'corruption = monopoly + discretion – accountability'.) The Vaidyanathan Commission on the Pricing of Irrigation Water[16] puts this clearly in the Indian context: '... the discretionary powers of the bureaucracy ... provided by the existing system are powerful reasons for the functionaries to oppose any change which reduces their power and enhances the role of user in decision-making'. Third, it would require that costs are 'revealed', as also the distinction between legitimate costs and those—such as massive overstaffing—which should not be passed on to users. Fourth, the entry of private and other non-governmental providers would naturally lead to comparisons between the costs and quality of services provided by different providers, and thus pressures—for the first time—on public providers to improve their performance. (This latter factor has, arguably, been the single biggest advantage of the introduction of the private sector in other countries. In the US, for example, public water utilities have improved, in large part, as described in a study by the US National Academy of Sciences,[17] 'because if public utilities did not improve they would be taken over by the private sector'.)

Until quite recently, it was assumed that the private sector could play a role in the provision of formal water services in cities and towns, but that this would never happen in irrigation. Indeed, the mix of public and private financing for the provision of services does vary widely for different types of infrastructure (Figure 3.3).

But recent developments have shown that while most canal irrigation services will remain in public hands for the foreseeable future, the private sector can play the same stimulating, competitive role that it plays in water supply. Pakistan is considering experimenting with 'professional management' contracts, whereby a canal command would be given under management contract to a private sector operator who would operate under license to provide farmers' organizations with their water entitlements. In other countries—Chile and Morocco—for example, the authorities have gone further and given out 'reverse concessions' whereby private operators operate public irrigation systems, with the 'winning operator' being the one that requires the smallest subsidy to provide the services. There are many advantages of such delegation to the private sector, and it is an approach which has worked well in other sectors—such as highways—in India, as described by Nirmal

[13] 'Delhi seeks Uttaranchal Water', *Asian Age*, Delhi, 23 April 2005.
[14] 'Day after, UP turns tap off, on', *Hindustan Times*, 17 June 2005.
[15] Robert Klitgaard, *Controlling Corruption*, Berkeley and Las Angeles: University of California Press, 1988.
[16] Report of the Committee on Pricing of Irrigation Water, Planning Commission, New Delhi, 1992.
[17] National Research Council, 'Privatization of Water Services in the United States: An Assessment of Issues and Experience', Washington DC, 2002.

Figure 3.3: Typical public and private roles in the provision of infrastructure



Mohanty[18] and Sebastian Morris.[19] These and other 'special purpose vehicles' were being explored as part of the work of the now-disbanded Task Force on Linking Rivers. Important as such innovations are, it is important to realize that they do not create something out of nothing and that the basic financial arithmetic remains that revenues still have to come from either users or taxpayers.

Similarly, in the historically-public business of wastewater treatment, there is much innovation taking place. In relatively advanced developing countries, typically less than 25 percent of sewage treatment plants actually function.[20] Three years ago, the Federal Government in Brazil took an innovative approach to this problem. It set up a fund called 'Compra de Esgoto' (or 'buying treated sewage'), whereby municipalities are paid for the production of treated sewage, not for the construction of treatment plants. The program is working well, and producing much better outputs than the traditional 'pay for inputs' approach.

Sebastian Morris[21] has described in detail some of these possibilities and their advantages, and Nirmal Mohanty[22] describes how such arrangements have performed well where they have been tried in India (for example, with annuity contracts in the National Highways Development Program). And Vijay Vyas[23] notes that the model of having 'bulk water provided to private parties who can retail it to actual users has worked well with cooperative institutions'.

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18 Mohanty, Background paper for this Report.
19 Morris, Background paper for this Report.
20 World Bank, 'The Environment and Development', *The World Development Report*, Washington DC, 1992.
21 Sebastian Morris, 'Pricing and financing', Background Paper for this Report, 2005.
22 Nirmal Mohanty, 'Moving to scale', Background Paper for this Report, 2005.
23 V.S. Vyas, 'Principled pragmatism, or the political economy of change', Background Paper for this Report, 2005.

As described by Sekhar,[24] in recent years there has been a lot of discussion about 'benchmarking' in irrigation services, worldwide and in India. The International Commission on Irrigation and Drainage and others have developed a useful set of practical tools for 'benchmarking' of irrigation services,[25] and the Asian Development Bank has produced similarly important material for comparing the performance of water utilities across Asia.[26] The common reaction to these materials has been for the public utilities to see these as technical inputs to be considered by the engineers of the agencies when considering if and how they might change their modus operandi.

This misses the central value of such tools, which is to expose monopolies to forms of 'comparative competition', and in which public discussion and transparency are as important as the technical information. In some cases, technical benchmarking information has been supplemented by 'accountability' scorecards in which users are directly asked their perception of critical service issues. These have been done by the Public Accountability Center in Bangalore.[27] The Irrigation Department, which participated in this experiment, saw this initiative as a threat and refused to cooperate in disseminating the information or in extending the idea.

The stimulation of 'competition in the irrigation distribution market' is of high priority. It will require a lot of technical assistance from professionals from countries who have done this (with Australia being a 'best practice' case). Important questions include: How does one ensure a level playing field? How might workers in the Irrigation Departments be encouraged, as was done in Mexico City,[28] to form their own irrigation services companies, thus ensuring that their expertise is put to work, that resistance to the change is reduced, and even that this helps retrench a heavily over-staffed state? How should auditing of performance and flows of water and money be done so that audits are trusted by all? How does one write enforceable contracts 'up'(between the service provider and the government), and 'down' (between the service department and the users)? Nothing like this has been done in India, but some states which are working with the World Bank—including Maharashtra and UP—are now considering such experiments. It is essential that these efforts be given high priority and supported with the necessary technical assistance and capacity building support.

Empowering Users by giving them Clear, Enforceable Water Entitlements

Chapter 2 argued that the absence of clear, enforceable water entitlements at all levels is at the root of many of the service shortcomings, water use inefficiency, corruption, financial problems, and conflicts which plague the water sector in India.

In a definitive legal review of water rights in India, Chattrapati Singh[29] provides an elegant overview of the history and politics of water rights in India. Singh notes that '... right over water has existed in all ancient laws, including our own dharasastras and the Islamic laws ...'. He notes that 'the pre-capitalist customary conceptions of group rights have competed with a parallel set of post-capitalist individual rights', and that the vari-

[24] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
[25] ICID and others benchmarking.
[26] Asian Development Bank, *Utilities Data Book*, Manila, 2003.
[27] Public Affairs Centre, 'Towards user report cards on irrigation services: Learning from a pilot project in India', Bangalore, December 2002.
[28] Manuel Contijoch, personal communication.
[29] Chattrapati Singh, 'Water Rights in India', *Water Law in India*.

ous 19th century irrigation and canal acts 'implicitly recognize individual rights in granting that the government will grant compensation for damage done in respect of any right to water'.

In India, there are excellent cases of clear entitlements at the international level (the Indus and Ganga Treaties). In India, as in all parts of the world where water is scarce, informal water markets have arisen, in which those who have (implicit) rights sell water to those who need it.

Moving towards a formal water entitlement system first requires clarifying that water is publicly owned and that a water entitlement is usufructory—it is a right to use, not a right to own water.[30] As stated by Chattrapati Singh: '... the only kind of rights that can become operative for anyone are usufructory rights, that is right to use water. The real question is who has what kind of right to use water, and what corresponding duties attached to it.'

In all cases, including in India, the ownership of water resides, and must continue to reside, with the state. The essence of the change to a formal system is that water entitlements (of individuals and communities, including traditional users) are separated from land rights (although land rights, along with traditional rights of non-landholders[31] would logically be the major factor in the assignment of the original rights[32]), and then enjoy the same legal certainty as land and other property rights.

Experience throughout the world[33] has shown that, after lengthy debates about entrenching existing privileges, the only politically-feasible solution to the establishment of initial entitlements is to recognize de facto existing rights, making adjustments where the sum of existing uses exceeds sustainable use (which is the case in many aquifers). As described by Maria Saleth,[34] the usual mechanism is for users to apply, within a specified period, for a formal entitlement or license, based on proof of their water use over the preceding 5 years. Licenses are generally waived for small abstractions for meeting immediate domestic uses.

Once established, such entitlements give rise to a series of fundamental and healthy changes. First, those requiring additional water (such as high-value agriculture and people living in growing cities) will frequently be able to meet their needs by acquiring the entitlements of those who are using water for low-value purposes. (As described in Box 3.1, there is an important recent example of such 'trades' in India. In 2003, 70 percent of all water used by the city of Chennai was leased from the wells of nearby farmers.)

Second, there are strong incentives for low-value water users to voluntarily 'forebear' from use, making reallocation both politically attractive and practical. For example, in the pioneering watershed management project in Sukhomajri, initial entitlements were distributed to all in the village, giving people a valued new asset. Many of the poor later chose to cash in their entitlements by selling them to landowners who could put the water to better use.

Third, the establishment of formal water entitlements gives rise to strong pressures for improving the data required to manage the resource. And fourth, this reduces the pressures of a 'race to

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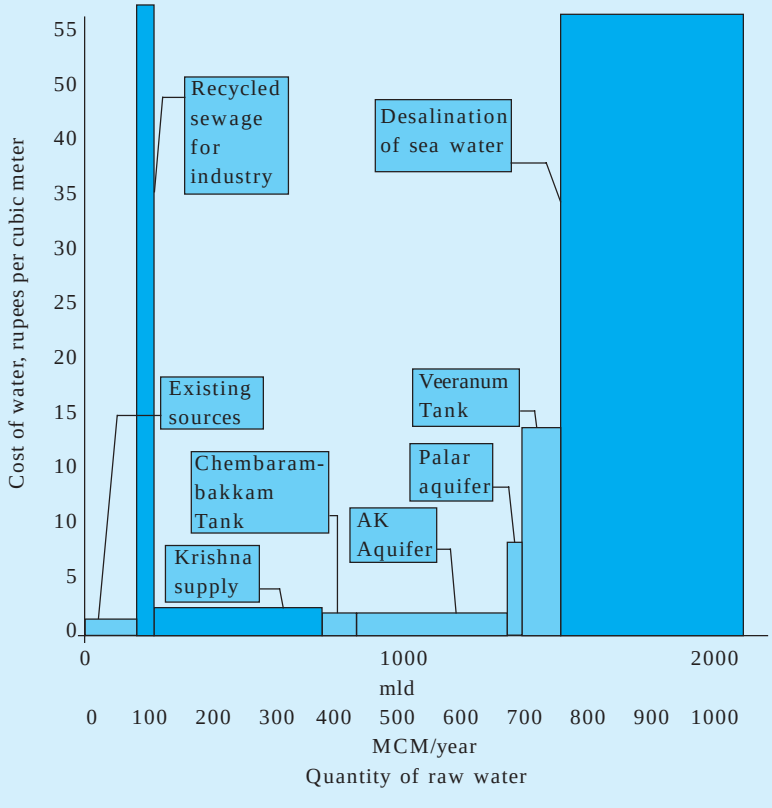
30 World Bank, Water Resources Strategy 2003, Washington DC.
31 Chattrapati Singh, 'Water Rights in India', *Water Law in India*.
32 Ibid.
33 Maria Saleth, 'Water rights and entitlements', Background Paper for this Report, 2005, and John Briscoe, 'Managing water as an economic good: Rules for reformers', *Water Supply*, 15 (4), 1997.
34 Maria Saleth, 'Water rights and entitlements', Background Paper for this Report, 2005.

Box 3.1: Incipient water trading around Chennai

The city of Chennai suffers from chronic and severe water shortages. In the past it has meant that major industries (fertilizer and chemical factories) have closed for months because of water shortages. And it has meant, and means, that people in this city have learned to live with small amounts of water for a few hours a day. The standard coping strategy—sinking household tubewells—became ineffective as water tables dropped and as salt water from the sea intruded into the aquifer under the city. There were a number of different proposals for augmenting the meager supplies of water to the city (in addition to strenuous efforts to repair leaks, and more generally improve the quality of the utility—Metrowater—and its infrastructure). In 1996, Metrowater and the World Bank did an assessment of the feasible alternatives for supplying additional bulk water to the city. The major sources being considered by the city were the Veeranum Tank (which required the construction of a 250 kilometer pipeline) and desalination, both of which were very expensive, especially relative to the domestic tariff of Rs 2 per cubic meter. But what was striking was that, while the city suffered from water shortages, there were large areas growing paddy just north of the city, using water from the AK aquifer. A detailed prior hydrogeological study indicated that the sustainable yield of the aquifer was very large, and back-of-the-envelope calculations showed that the water would cost the city just a small fraction of the cost of water from any other source, as shown in Figure 3.4.

'This is all well and good,' explained the Metrowater officials, but 'that water is used by farmers, who are a strong lobby and who will not permit us to take their water' (showing, incidentally that the ubiquitous Indian

Figure 3.4: Cost and quantity of raw water from different sources for Chennai



policy of 'priority for drinking water then agriculture' was impossible to implement in practice). 'But what if you bought the water from the farmers,' they were asked. 'No, our farmers are very wedded to growing paddy, they would not be interested in giving up their water ...'. The seed of this idea was, nevertheless, planted, and in 2003, 70 percent of the raw water for the city came from buying water from farmers in the AK aquifer! 'Did the farmers react unfavorably as you thought?' Metrowater was asked. 'The farmers are not happy,' was the reply. 'Why?' 'Because all the farmers want to sell their water, and we cannot buy from all of them!' was the reply.

There is both good news and bad news in this story. The good news is that the experience unequivocally showed that farmers were quite willing to accept 'forbearance payments' to desist from irrigated crops, when they got more money that way than from planting water-guzzling crops like paddy. And in this is one of the very rare cases where a ban on additional wells is actually enforced. However, there is a darker side to the story, too. Eight years ago, Metrowater had funding for a major study which would look both at the hydrogeology (how much water could the aquifer yield on a sustainable basis?) and at institutions (how to set up formal water entitlements which would add up to the sustainable yield and which could be leased or sold to the city?). As is standard for Indian water institutions, Metrowater showed little interest in the second, which has not yet been done. In fact, they did worse—they pumped far more from the wells than could be sustained over time, and did nothing to put in place arrangements to safeguard the aquifer.

the bottom', since those who have entitlements have a powerful interest in the sustainability of the resource base. This is not to suggest that there is unanimity on the concept of water entitlements, for some see this as an unhealthy commodification of public goods. Nor is it meant to imply that it is simple to introduce entitlements-based systems for a fugitive resource with deep cultural implications in administratively weak environments and in ones in which there are millions of small users. Nonetheless, the last 10 years have seen enormous progress globally in the use of formal water entitlements—with well-functioning systems now working in Australia, Chile, Mexico, Argentina, and South Africa. (Box 3.2, from Australia, provides a particularly clear description of the central but quite different roles of water entitlements and pricing in sustainable water management.) It is noteworthy that all such established systems are working, often after initial adjustments, and are

BOX 3.2: Water entitlements are the principal mechanism for ensuring efficiency, sustainability, and voluntary reallocation of water

Letter to the Editor (Unpublished), *The Economist*, July 2003:

Your special survey on water ('Priceless', 19 July) embodies in its title a prejudice that experience from the real world rarely justifies. You refer specifically to the experience of the Murray-Darling (M-D) basin.

In the M-D, water use is constrained to equal the sustainable supply through a complex system of water rights, defined in terms of volumes and security of supply. In this drought year—the worst for more than a century—many users are receiving less than 16 percent of their 'normal' entitlement, and that restriction is enforced entirely through the water rights system—not through pricing mechanisms.

Formally codifying these property rights—in systems that were already well managed and orderly; where customers were educated and accustomed to following rules; and allocation rules were already broadly in place and enforced—took a number of decades. Once this process was complete, it was possible to introduce a system of trading in these codified property rights, allowing managers the flexibility to better manage their enterprises (in some areas last year as much as 80 percent of water delivered was traded). The water rights system also provides the basis for improved environmental management. The parallel system of charging for water services in the M-D is quite separate from the sale and purchases of water rights, and exists to ensure that the income of water supply agencies is adequate to cover ongoing maintenance and projected major capital replacements.

Three lessons may be drawn from this successful achievement of sustainable financial management and sustainable resource use: First, the primary means of balancing supply and demand for water resources is definition of water rights consistent with available supply. This is the approach followed in Australia, Israel, the US, and elsewhere. Second, defining water rights is contentious and difficult at the best of times. Where water is already over-allocated so that 'tail enders' often get no water, or fresh aquifers are consistently overdrawn to meet current demand, defining and enforcing sustainable water rights is an enormous political and social challenge. This is the case in many water-short developing countries. Third, the primary role of water pricing in irrigation is not to balance supply and demand, but rather to achieve sustainable financing. Implying, as the Economist article does, that pricing water has a central role in achieving the required resource balance is to grossly mislead policymakers facing the challenge of reducing water consumption to a level consistent with long term availability and proper environmental management. The solution inevitably requires stable and well specified access rights to water, institutions with the capacity to manage the water access regime, and appropriate water pricing to ensure the long term operation of the infrastructure.

Don Blackmore, Chief Executive, Murray-Darling Basin Commission, Australia.
Chris Perry, Professor, Economics of Irrigation, Cranfield University, UK.

Box 3.3: The Maharashtra Water Resources Regulatory Authority Act of 2005[35]

As described in the background paper by Maria Saleth: 'The creation of water entitlements system is at the heart of the MWRRA bill. The bill clarifies the legal issues and contemplates the establishment of the institutional arrangements needed for the distribution, enforcement, and monitoring of the entitlements. While the establishment of individual and transferable water entitlements is the long term strategy, the bill adopts a politically and administratively pragmatic intermediate strategy of establishing bulk water entitlements for entities such as water user organizations, urban and rural water supply agencies, and industries. Notably, water entitlements are not ownership rights but only usufructory rights defined in volumetric sense. Such entitlements cover both surface and sub-surface water sources. The water quota implied in the water entitlements can be transferred, sold, and bartered either in part or in full. Water entitlements also carry with them the correlated duties including payments, efficient use, and quality maintenance. The bulk water entitlements will be defined and implemented within a basin and sub-basin framework. While the MWRRA will allocate bulk rights, the basin organizations and user organizations at lower level will have responsibility in the day-to-day monitoring and enforcement. Adequate provisions are also made for resolving conflicts and grievances both at the local and regional levels.'

[35] Maria Saleth, 'Water rights and entitlements', Background Paper for this Report, 2005.

performing well. In none of the countries that have adopted such systems is there any thought to returning to the previous government-managed allocation procedures.

In India, there are pressures at all levels for clarity and formalization of entitlements to use an ever-scarcer resource. This ranges from the local level (villagers who have stored rainwater in Rajasthan, and downstream irrigators in the Vaigai Basin, for instance, as described in chapter 2) to the international level (between India and its neighbors, for example).

After years of academic discussion of water entitlements, there has recently been an important development, since the state of Maharashtra has, after years of study and extensive consultations with community and all political parties, passed (in April 2005) the Maharashtra Water Resources Regulatory Authority Act, the heart of which is the creation and management of a water entitlement system (Box 3.3).

The issue of water entitlements is a sensitive and controversial one, in India and elsewhere. The experienced Indian consultants who contributed to this report—several of whom served or serve in high positions in the Union Government—consider this issue to be central, and one that has to be addressed and resolved. And every discussion with users comes back to the pervasive question of lack of clarity of who has the right to use what water.

There is no issue more central for the effective management of water in India, and more important in reducing what the Finance Minister has described as the 'growing number of little civil wars'[36] over water. This is an issue on which the Union Government should be taking aggressive leadership, since, in the words of Chattrapati Singh 'to make the state accountable and make water use equitable for all, a number of amendments are required in the Easement Act, the Irrigation laws, Panchayat and Municipal Corporation laws, Water Supply Acts and other laws related to water'.[37] Far from doing this, the position of the Union Government is to actively discourage public discussion of water entitlements, 'because it is too sensitive'.

One of the great transformations in India over the past 15 years is that there are large areas of the economy in which the response to new ideas is no longer 'no, that will not work in India' and is rather 'why not?'. But in the government-dominated water sector, this change of perspective is partial at best and most new ideas are rejected as 'this is okay for advanced economies, but cannot be done here'. In this context, it is instructive to note that China is now committed to putting in place a system of water entitlements,[38] and to see that in neighboring Pakistan Punjab a better-defined water entitlements system has been in place since 1991 at both the provincial and canal command levels, and that, as described in Box 3.4, the federal and provincial governments are moving to make the implementation of this water entitlement system more transparent and verified.

One of the many virtues of an entitlement system is that, once started, it induces a strong demand from users for better measurement, transparency, regulation, and information—issues which are an integral part of 'the water instrument package' and to which we now turn our attention.

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[36] 'Water Ministry seeks World Bank funding for reforms', *The Hindu*, 13 January 2005.
[37] Chattrapati Singh, 'Water Rights in India', *Water Law in India*.
[38] Wang Shucheng, Minister of Water Resources, People's Republic of China, 'Promote Sustainable Social and Economic Development with Sustainable Utilization of Water Resources', Address at the Ministerial Conference of the 3rd World Water Forum, 22 March 2003, Kyoto.

Box 3.4: Towards a transparent water entitlement regime in Punjab, Pakistan

The Indus Waters Treaty shows very clearly that a well-defined set of entitlements, which are monitored by both stakeholders, and which have clear enforcement mechanisms, can provide a high (not perfect) level of trust, even when the parties involved have literally gone to war several times. The IWT is a great example of how 'good fences make good neighbors'.

Within Pakistan the issue of provincial water entitlements is, as in India, a controversial issue. In 1991, Pakistan's four provinces concluded a 'Water Accord' which allocates the waters of the Indus Basin, and defines the way in which additional assured water will be shared. There have been important deficiencies in the transparency with which the Accord has been implemented, deficiencies which Pakistan is now moving to overcome.

A very important element of the Accord is that it formalized the entitlements at the intra-provincial level. Consider the case of Punjab as an example. The allocations to the 24 canal commands are specified for 10-daily periods in both the *kharif* and *rabi* seasons in the annex to the Accord, based on the historic allocations for a five-year period in the late 1970s (Figure 3.5).[39] The administrators of the allocation system in Punjab apparently respect these, for the most part. The Irrigation Department keeps detailed records of the entitlements for each season, of the amounts of water actually delivered, and of the 'balances' for each canal command. (For example, as can be seen in the first few entries for the current season, a number of canal commands did not wish to receive their full shares, but they get 'credit' for this, and can use these saved amounts later in the season.) This system is very close to something that would be ideal. The one big missing piece is the transparent, verified, implementation of the allocations, a direction in which Punjab is now committed to move.

Table 3.5: Pakistan Punjab canal entitlements from the 1991 Water Accord

10-day seasonal system wise adjusted allocations (excluding flood flows & future storages)

Punjab-Kharif

Period		F.I.C.	MR INT	CBOC	S.Y.C (Upper)	S.V.C (Lower)	Taimmu	Panjnao	Thal	Taunsa	Dabc	Greater Thal	Total Noo% Cs
APR	1.	24.2	0.1	1.8	8.3	3.9	2.9	4.3	6.0	4.9	1.3	2.6	60.3
	2.	24.7	0.3	1.8	10.8	3.7	3.4	5.1	6.4	4.3	0.18	3.4	64.7
	3.	28.1	1.1	2.0	13.3	5.5	5.5	7.3	6.4	7.9	0.5	4.9	82.5
MAY	1.	30.1	1.3	2.1	16.0	8.0	5.9	7.6	6.6	10.0	0.7	5.4	93.7
	2.	30.8	2.0	2.1	17.2	8.7	6.1	9.0	6.8	11.5	1.1	5.5	100.8
	3.	31.6	2.4	2.2	18.1	9.2	6.3	9.5	6.8	11.9	1.3	5.5	104.8
JUN	1.	32.3	2.6	2.3	18.5	9.4	6.6	10.5	6.8	13.0	1.7	504	109.1
	2.	33.2	3.6	2.2	18.7	9.7	6.7	10.4	6.9	13.5	1.8	5.5	112.2
	3.	34.0	4.0	2.2	19.2	9.6	6.7	10.7	6.7	14.0	1.8	5.7	114.6
JUL	1.	32.7	5.4	2.2	19.2	9.9	6.6	10.4	6.6	14.3	1.7	5.8	114.8
	2.	29.6	5.0	2.0	17.9	8.7	5.7	0.0	6.3	12.5	1.7	9.1	104.4
	3.	27.8	6.1	1.8	16.8	8.7	5.1	9.6	5.8	11.8	1.8	4.7	100.0
AUG	1.	28.2	5.8	1.7	17.4	8.2	5.3	9.6	6.0	11.5	1.8	4.8	100.3
	2.	31.5	6.1	1.8	19.3	9.3	6.3	10.6	6.3	11.3	1.8	5.4	109.7
	3.	34.6	4.9	2.0	20.6	10.1	6.8	11.1	6.6	13.9	1.8	5.9	118.3
SEP	1	33.9	4.4	2.1	21.0	10.0	6.8	11.1	6.8	14.4	1.8	5.9	118.2
	2.	33.9	3.7	2.1	20.6	9.8	6.8	10.8	6.8	14.0	1.8	5.8	116.1
	3.	33.1	2.3	2.2	19.6	9.9	6.9	11.0	6.8	13.0	1.8	5.5	112.0
Total Maf		11.18	1.24	0.74	6.31	3.07	2.15	3.40	2.37	4.19	0.55	1.87	37.07

Source: Government of Pakistan, 1991.

[39] Indus River System Authority, 'Apportionment of Waters of Indus River System between the Provinces of Pakistan: Agreement 1991 (A chronological expose)', undated.

Ending the Culture of Secrecy and Making Transparency the Rule

A central feature of modern water management in a liberalized economy and democratic environment is that of openness and transparency. In most countries now all relevant information—hydrological, performance, planning—is available publicly, on the web and in real time. Representative web sites show this clearly: TVA in the US (www.tva.gov), the Murray-Darling Basin Commission in Australia (www.mdbc.gov.au), the Ministry of Water and Forestry in South Africa (www.dwaf.gov.za), the National Water Agency in Brazil (www.ana.gov.br), to cite just a few examples.

Despite being one of the world's IT centers (and thus having immense capacity), India has been slow and uneven in adapting to this changed information environment. It remains very difficult for a user to even find out what data might be available—the web site for the Ministry of Water Resources (http://wrmin.nic.in) does not provide any disaggregated or real-time hydrologic information. After much diligent enquiry, a persistent and connected user is directed to a web site set up by the Central Water Commission under the World Bank-funded National Hydrology Project (www.india-water.com). And then, even a user with a high-speed connection and moderate skills, finds it impossible to located what data are actually available and how to get them. The situation for state governments is the same, even for the leading IT states (http://waterresources.kar.nic.in, and http://www.aponline.gov.in).

In India, the 'hydrologic data secrecy' culture has changed slowly in recent decades, even by standards of the subcontinent.[40] The state of affairs is illustrated by the most highly-discussed water issue in recent years in India—that of 'linking rivers'. The NWDA had been studying possible inter-basin transfers since 1984. Those who championed the idea, and the many who had reservations, quite reasonably requested to be shown the data, the analysis, and the plans. Despite 20 years of study, none of the data were made available. This denial of information naturally leads to suspicion about 'secret plans', and about incompetence and poor performance hiding behind the mantra of 'national security'.

Recently, there has been some modest progress. Now the 'linking rivers' web site does have the feasibility study for one of the proposed links (the Ken-Betwa link) online (www.riverlinks.nic.in). Under the National Hydrology Project '... the Hydrology Information System data is currently generally accessible to the user community, except in situations where data is considered sensitive and higher-level authorization is required.'[41] 'Generally available' is a relative term—a Google search turns up no reference to these data on the web, and requests have to be made in writing to the government.

In other areas, Indian practice is changing—as illustrated by Indian Railways. To someone familiar with the drama of getting tickets on Indian Railways in the past, the current system was unimaginable. Now reservations can be made easily online, in which tickets are delivered to Delhi addresses within 12 hours, and in which electronic refunds take place in a week. If other democratic countries (who also have neighbors with whom they share water, and several of whom have federal structures with complex inter-state water matters) can make all water data—including hy-

[40] An interesting illustration of this relates to a Ph.D. thesis done on the process of negotiating the Indus Water Treaty. Pakistan gave the researcher access to their archives; India refused such permission. Undula Alam, 'Water Rationality: Mediating the Indus Waters Treaty', Ph.D. dissertation, Durham University, 1998.

[41] *Implementation Completion Review*, National Hydrology Project, World Bank, 2004.

drological data, reservoir status and operation, water deliveries, budgets, costs, agency performance, etc.—easily accessible in a user-friendly format on the web in real time, why can this not be done in India? It is obviously not a question of capability, but one of will and attitude. There is no doubt that this change would stimulate a chain reaction of accountability, participation, and demand for more and better data which would transform the culture of water management in the country.

Finally, there is a powerful feedback loop between data availability, quality, and support for data collection activities. Global experience shows that hydrology data systems will be maintained only when there are users who can get easy access to the information, who find the data they need in a user-friendly way, and who then become pressure groups on government to commit the necessary funding to the data collection activities. Making this change is a central objective of the follow-on World Bank-supported National Hydrology Project.

Introducing Incentive-based, Participatory Regulation of Services and Water Resources

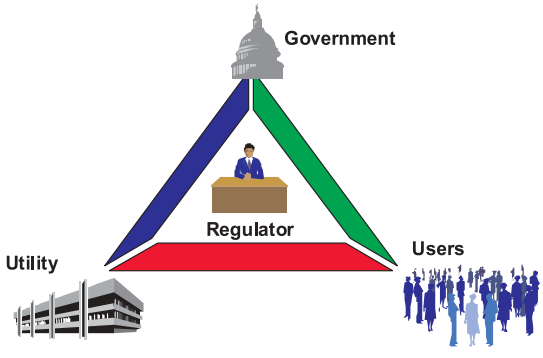
This report has made clear that in the future there will be two primary challenges facing the Indian water sector—first, to improve the quality and coverage of formal public water supply and irrigation services, and second, to regulate the use of groundwater. In both cases, the government has to play a significantly different role from that which it currently plays. On the provider side the government has to corporatize the government-run service providers, and allow the entry of private and cooperative service providers. This means that the service sector will increasingly be characterized by contracts between (public and private) providers on the one hand, and users on the other. These contracts will describe the rights and responsibilities of the two parties, in terms of both water and money. A key requirement, therefore, is that government develop regulatory capacity for balancing the disparate interests of the providers, the users, and the government itself (as shown in Figure 3.6). There is now growing experience in India with independent regulation (in the telecommunications and electricity sectors). The Maharashtra Water Resources Regulatory Authority is an important first step towards building such capacity.

It will take some years and a process of trial and error to find the right forms for such regulation, especially in a sector in which the notion of contracts, competition, and transparency have been almost entirely absent. It is critical to take a learning approach to this, and not see the first signs of difficulties as a reason to go back to 'the old ways'.

On the second great challenge—groundwater management—the issue of regulation is also very important. Global experience shows that moving from an anarchic groundwater management system to one where there is a balance between abstractions and recharge is a very difficult one, which is less than perfect even in very good governance environments. Experience also shows that command-and-control type of approaches—'prohibiting more abstractions'—simply do not work, again even in relatively easy environments.[42] The essential ingredients of 'the least unsuccessful approach' are clear.[43] Groundwater management requires: a legal framework which constrains the rights of people to pump as much water as they wish from their land; the separation of land rights and water entitlements, with the latter usually based on his-

[42] Stephen E. White and David E. Kromm, 'Local groundwater management effectiveness in the Colorado and Kansas Ogallala Region', *Natural Resources Journal*, vol. 35, 1995.
[43] Karin Kemper and John Briscoe, *Mexico: Policy Options for Aquifer Stabilization*, World Bank, 1999.

Figure 3.6: Participants in modern regulation



torical use; strong government presence to give legal backing for the development of participatory aquifer management associations, and to provide the decision-support systems which enable aquifer associations to monitor their resource; and, above all, clarity that the primary responsibility for the maintenance of the resource on which they depend is with those who have entitlements to use water from a particular aquifer.

There are many difficult technical details to be worked out—for example, the tradeoff between hydrological reality (which would suggest large aquifer associations in the many extensive aquifers) and the transactions costs of including large numbers of small farmers (which argues for smaller associations). Experience in other very large aquifers (such as the Ogallala aquifer which runs from Minnesota to Texas and in Mexico) shows that it is perfectly practical to chop a single aquifer up into a large number of 'semi-independent' aquifers which are run by a reasonable number of users.[44] In this case, it is very important that the best does not become the enemy of the good!

Putting the Sector on a Sound Financial Footing

As described in chapter 2, the 'water sector' in India is in severe financial distress. Nirmal Mohanty has aptly described the prevailing model as 'Build-Neglect-Rebuild'. There is an enormous liability from deferred maintenance. And the stock is such that even, once rehabilitated, the annual requirement for maintenance and rehabilitation would be about equal to all public funds currently invested. But then there are also major new needs—for providing services to those who do not have services, for meeting the needs of a growing population and economy, and for the massive investments needed to meet the 'debt to the aquatic environment'.

In addressing this issue, there are some 'red herrings' which have to be addressed. First, although the massive distortions in the pricing of water services are justified 'in the name of the poor', it is, paradoxically, the poor who are the major victims of these distortions. And, as pointed out by Vaidyanathan,[45]it was 'in the era of redistribution (from 1964 onwards) that prices began to get out of line with costs'.

Rajiv Gandhi famously said that no more than 15 percent of the benefits of public distribution programs actually reached the beneficiaries, a figure which is believed to have changed little. In the case of water subsidies this is probably true, too, because the subsidies go where the water goes, and this is to those who can manipulate the system and get access. Those without power—the poor—are rationed out of the system. Far more equitable, as described by Sebastian Morris,[46] would be a system which provides subsidies to people, not providers, along the lines of the 'water stamps' program in Chile. In this program, the poor are

[44] Stephen E. White and David E. Kromm, 'Local groundwater management effectiveness in the Colorado and Kansas Ogallala Region', *Natural Resources Journal*, vol. 35, 1995.
[45] A. Vaidyanathan, 'Managing Water', *Economic and Political Weekly*, Mumbai, January 2004.
[46] Sebastian Morris, 'Pricing and financing', Background Paper for this Report, 2005.

given vouchers for the purchase of water, for which all pay the tariff required to cover operation, maintenance, and capital costs.

The disconnect between prices and costs induces very large overall economic costs. As pointed out by Sebastian Morris,[47] 'price based subsidization has the major infirmity that it robs prices of their crucial role ... of informing investment and input choices and the direction of technical change'. Morris[48] also points out that 'arbitrage of the difference between tariffs and willingness to pay' is the fundamental source of the endemic corruption in these services.

Again, there is a massive and growing gulf between principles, policy statements, and practice. The 1991 report of the Vaidyanathan Commission on Irrigation Pricing lays out most of the critical issues:

- 'much of the information which is crucial for a proper assessment of the performance of irrigation systems is hardly even compiled regularly, much less analyzed';
- 'the all-round deterioration in the financial performance of irrigation projects is stark and nearly universal';
- 'it is difficult to accept the case for subsidizing such a user-oriented (sector) as irrigation';
- 'the government is not in a position to sustain subsidies on irrigation on the present scale';
- 'it is not possible to determine how much of the implicit subsidy is attributable to inefficiency and how much really benefits farmers because of the underpricing of water';
- 'the discretionary powers of the bureaucracy and the attendant opportunities for "rent-seeking behavior" provided by the existing system are powerful reasons for the functionaries to oppose any change which reduces their power ...'

So what can be done to start the arduous but central process of arresting the rot and putting the water sector in India back on track?

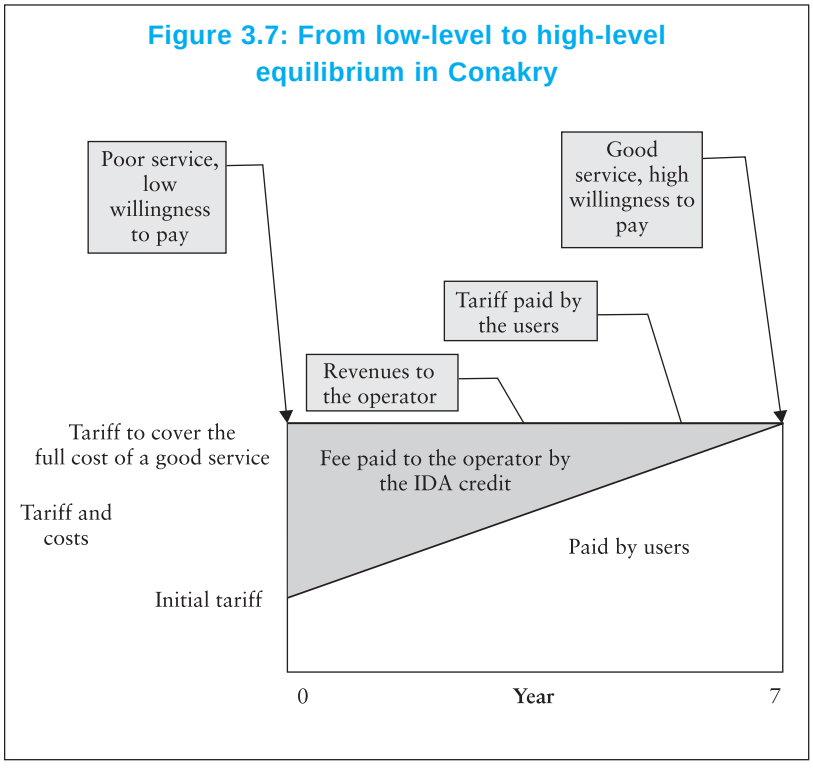
First, is a realization that there is no such thing as free lunch. There are only two sources of revenue to pay for the (rising) costs of these services—taxes or user charges. If governments are not willing to raise either of these then, as emphasized by Rakesh Mohan,[49] there is simply no way forward. For the foreseeable future, there will be need to budget support (taxpayers' money) for irrigation. But it is also obvious that user charges simply must be increased, for a host of reasons. That said, it is clear that starting with the idea of increasing charges (for bad services provided by corrupt and inefficient agencies) will quite reasonably be resisted. For this reason, the idea of bringing tariffs into balance with costs must be the third leg of a triangle in which the first two legs must be 'improve services first', and 'provide those services in an efficient and accountable manner'. 'You will pay for the costs of those services' can come only after the first two have been clearly done and are so perceived by users. Figure 3.7 gives an interesting example of how this was done in an urban water project in Africa. Providing subsidies for the 'transition costs' for moving a low-level to a high-level equilibrium (the triangle in the figure) is what the Union Government, the World Bank, and other agencies should be supporting.

[47] Ibid.
[48] Ibid.
[49] Rakesh Mohan, then Deputy Governor of the Reserve Bank of India, at the Mumbai RBI Conference on Infrastructure, 2004.

A particular challenge in India is that households have made such large personal investments in 'coping with poor public services'. This has not worked badly—a middle-class family in any of the major cities actually gets water 24 hours a day, even though the water from the utility comes for just an hour or two. Middle-class families have done this by making large investments to cope. But the existence of these 'sunk costs' poses a particular challenge, because these users would actually benefit little in the short run from more reliable supplies. This means that, again in the short run, they would oppose higher user charges, even if service quality improved (as is evident in Delhi in 2005). They would only become supporters in the medium run when they understand that they do not need to replace their assets (their pump, overhead tanks, and water filters) because they could now rely on the piped distribution system. At the very least, this requires that information on improvements, and the savings this brings in the short run (lower electricity costs) and medium run (no replacement of equipment for coping) needs to be made clear and communicated effectively. It also means that the time span for bringing tariffs in line with costs needs to be tailored to this reality.

An additional factor that needs to be factored into the design of tariff reform is the fact that the status quo is quite satisfactory to many in the public agencies who profit from the discretion which they exercise. This is (see the last quote from the Vaidyanathan Commission) a central, perhaps the central challenge for a progressive government. As David Mosse notes in his book on water management in Tamil Nadu:[50] 'Only the rare engineer supports PIM. Most consider it a fad that should wear itself out in time ... with fear for the loss of gratuitous incomes should farmers begin to function independent of the irrigation department.'

Figure 3.7: From low-level to high-level equilibrium in Conakry



The anti-reform rhetoric of 'increased tariffs will hurt the poor' and 'this will cost jobs' have been honed to a fine art, and have the strong support of some political parties. There is no easy answer to this issue, but it is clear what some of the elements that need to be addressed are. On the 'carrot' side, there are creative ways of providing new opportunities for those in the public sector agencies to participate in a new service arrangement. As was done in a successful process in Mexico City, public workers were given training, capital, and preferential

[50] David Mosse, *The Rule of Water: Statecraft, Ecology, and Collective Action in South India*, Oxford University Press, New Delhi, 2003.

access in setting up firms who could compete for contracts which were handed over to the private sector. On the 'stick' side, the government itself is complicit in, and even the architect of the present arrangement, and is unlikely to be an effective change agent. What is needed, as described earlier, is to bring as much as possible 'into the light of day'—Who has entitlements to the water? What is the contract between the provider and the user? What are the penalties for non-performance? What is the performance of the different providers?

Finally, it is important to note that, as Sebastian Morris[51] has aptly noted: 'the issues of pricing, subsidies, water rights, and financing (and he might have added inefficiency, lack of accountability, and corruption) are deeply interlinked'. An illustration of this is that, as described earlier, the lack of definition of entitlement to Krishna River water has led to ill-advised investments in Maharashtra which contribute to about 18 percent of the fiscal deficit of the state.[52]

Investing Heavily in Human Resource Development

India has a long and justly-proud tradition of building and managing some of the largest and most complex hydraulic engineering works of the world. And India, justifiably, takes great pride in the world standing of some of its institutions of technical education.

Yet the fact is that, compared with all developed and middle-income countries, India has not developed the human resources necessary to meet the water needs of a growing and changing country. The mindset of the state bureaucracies is one that may have been appropriate 40 years back, but it is not well adapted to the new challenges.

The major reason why this is so is, of course, the set of incentives which stultify individuals in the public water organizations of India today. The Planning Commission[53] has described some of the things that need to change: 'The approach of the government is normally hierarchical rather than functional, and the lack of due importance to professional and functional aspects tends to blur responsibilities and inhibits specialization. Inter-disciplinary teamwork, which is so essential in the water sector is absent. The links between academic institutions and water sector personnel are poor, with the result that the academicians are kept away from important practical issues and problems, and water managers are not exposed to latest technologies.' To this list could be added another stark contrast with many other developing countries. The water professionals of India, with few exceptions, have had no protracted exposure to modern water management practices in other countries, either through education, post-graduate training, work experience, or even study tours. The weltanschauung of the Indian water sector is parochial.

Unquestionably, the change in the way in which government water organizations function is at the heart of the needed water reforms in India. And as these organizations evolve, they will need quite different types of water professionals. Vijay Vyas[54] notes: 'Till recently water management was identified with irrigation management, and within irrigation department, irrigation engineers dominated in controlling and supervising water resources. Even now, the role of other disciplines is not fully appreciated.'

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[51] Sebastian Morris, 'Pricing and financing', Background Paper for this Report, 2005.
[52] Nirmal Mohanty, 'Moving to scale', Background Paper for this Report, 2005.
[53] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.
[54] V.S. Vyas, 'Principled pragmatism, or the political economy of change', Background Paper for this Report, 2005.

As with most other statements on a country so complex and large, this is not exactly true. In the 1970s, there was a substantial Ford Foundation-funded program managed by the Harvard Water Program and involving Indian water professionals from some of the elite institutions (such as the CWC) and universities (including Roorkee, the Delhi University Institute for Economic Growth, and the IITs). A substantial and impressive cadre of multi-disciplinary Indian professionals was trained and returned to India. They describe, 30 years later,[55] a great personal experience that somehow died upon their return. The factors appear to be complex. There are 'pull' factors, including the spectacular opportunities in IT which most of the best students cannot resist. And there are 'push' factors, because bright students do not want to be condemned to a lifetime stuck in antiquated government institutions.

Whatever the cause, the bottom line is that a central part of any reform program would be a massive investment in improving the quality and diversity of professionals engaged in the water sector.

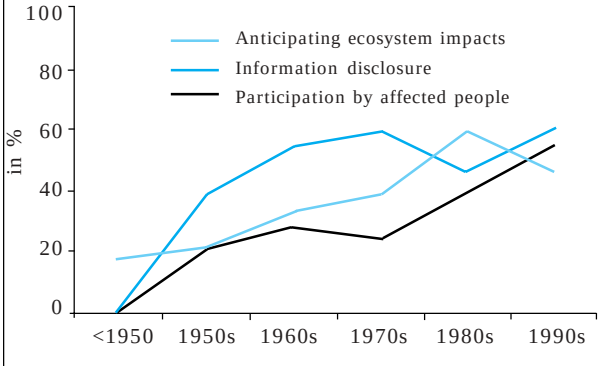
Ensuring that Local People are the First Beneficiaries of Major Water Projects

The era in which major water infrastructure was built in India was one in which the hegemonic idea was that the adverse effects on affected people was a price that had to be paid for the progress of the majority. In the intervening decades this tradeoff has proved to be false, on both ethical and practical grounds. As shown by World Commission on Dams (Figure 3.8), there have been major improvements in the ways in which affected people participate in and are affected by major water projects.

India remains a country in which there are serious issues about how affected people—many of whom are from Scheduled Tribes—are dealt with in major infrastructure projects. There has been considerable progress, especially by modernizing hydropower companies, but there is still a long way to go before practice in India can compare favorably to practice in, say, China, where resettlement is considered to be 'a development opportunity' rather than a cost.[56]

Much of the major water infrastructure which will be built in India in coming decades includes hydropower. Hydropower projects generate large revenues, and in most cases the number of people to be resettled by hydropower projects in India will be relatively small (Figure 2.29). It is therefore a doable task, with few difficult tradeoffs, to ensure that local people are major beneficiaries of such projects. This is not only ethically the right thing to do, but it means that costly delays in project implementation can be avoided.

Figure 3.8: How social and economic performance of dams has improved globally



Source: World Commission on Dams, 2000.

[55] Conversations with Professor Chaturvedi of IIT Delhi, Professor Ramaseshan of IIT Kanpur, and Professor Bhatia of the Institute of Economic Growth.

[56] Operations Evaluations Department, *Recent experiences with involuntary resettlement: Overview*, Washington DC, 1998.

This means that developers need to see the economic and social development of local communities to be as important as the technical aspects. Dam developers in India need to recruit and value excellent community developers, just as they recruit and value excellent engineers.

There are important issues of responsibility which need to be worked out between project developers and state governments (to whom non-state developers pay massive royalties of 12 percent of the gross value of the power generated). Prior to project approval, developers and state governments must agree on who will finance and manage local development activities so that affected people become the first beneficiaries of such projects.

The bottom line is that these new hydropower projects should be a big boost to local economies, and that the aspiration of developers and host governments should be to make such projects so attractive to local people that communities compete with each other to become 'host communities' for such projects.

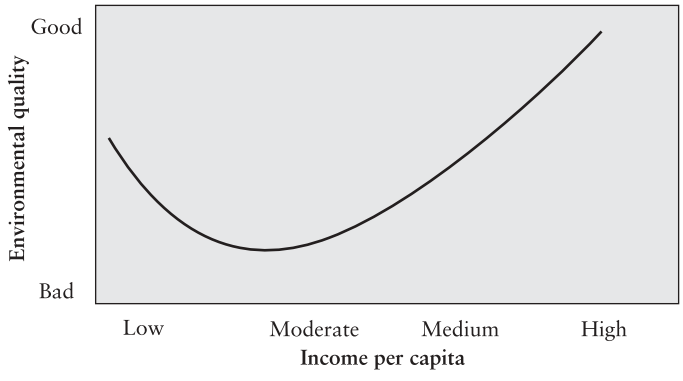
Making the Environment a High Priority

As demonstrated in this report, the primary water challenges facing the Union and state governments include: to dramatically improve the quality of public irrigation and water supply services; to modernize the systems for allocating and monitoring surface water and groundwater resources, and to improve the quality of the poor and deteriorating water-related environment.

It is instructive to differentiate two different water-related environmental challenges. Category One are issues of environmental degradation that would improve dramatically if water were used and managed more effectively and efficiently; and Category Two are issues that require supplementary actions and resources.

Two messages come out of the background paper on the environment by George Varughese.[57] First, if the recommendations discussed in earlier chapters of this report—water entitlements, water pricing, accountable institutions, effective regulation—were implemented, the majority of water-related environmental problems in India would be ameliorated to a significant degree. Specifically, this would mean an end to wasteful water use in both agriculture and urban areas, it would mean reductions in mining of aquifers and the consequent quality problems. It would also mean shifting the focus of government attention away from the traditional areas (of constructing and operating water supply infrastructure) and 'creating fiscal space' for investing in environmental quality and other public goods.

Figure 3.9: The 'Kuznets Curve' for environmental quality



Source: World Bank, 1992.

[57] George Varughese, 'Water and environmental sustainability', Background Paper for this Report, 2005.

An important area where mindsets have to change is that of instream flows. Any water flowing out of a river basin is still seen by many water engineers as 'wastages'. But this is changing, with the Government of Andhra Pradesh, for example, recognizing that some flow into the Godavari Delta is necessary for the preservation of the coastal zone and the fisheries on which substantial numbers of people depend.[58]

Global comparisons show that there is something like a 'Kuznets Curve' for many indices of environmental quality. As illustrated schematically in Figure 3.9, in the early phases of development there is typically a sharp decline in environmental quality. As economic growth is sustained, however, societies place a higher value on environmental quality, and they have more resources to spend on the environment. For many measures of environmental quality there is then a slow but steady climb out of the environmental abyss. The example of the Yamuna (in chapter 2) suggests that parts of India and for some measures of environmental quality, the long climb is starting.

[58] World Bank Water Resources Strategy, 2003.

CHAPTER 4

PRINCIPLED PRAGMATISM AND 'RULES FOR REFORMERS'

This report (and many other documents) make it clear that India has to make major changes in the way in which it develops and manages its water resources, and that this process has to start soon.

Tushaar Shah[1] has described several types of reform initiatives in India, all of which have 'failed to produce broad and deep changes'. They include:

'[a] a reformist measure is proposed, discussed, and shelved. The draft Groundwater Regulation bill is the case in point. It is tossing around for 35 years; yet has found few takers because few political leaders are willing to absorb the transaction costs (including political costs) of seriously implementing it.';

'[b] a bold reformist measure is proposed, discussed, and diluted by removing all difficult-to-implement elements, resulting in paper reform. India's Water Policy announcements of 1987 as well as 2002 are good examples. Nothing in the way India's water sector functions has changed as a result of these.';

'[c] a bold reformist measure is proposed, discussed, and launched but cold-stored in the face of popular opposition or insurmountable difficulties in implementation. Efforts by many Chief Ministers to meter electricity supply to tubewell irrigation during recent years is a good example. So are Maharashtra's 10-year-old law to protect drinking water wells from groundwater overdraft by irrigation wells, and Andhra Pradesh's more recent land, water, and trees act.';

'[d] a bold reformist measure is introduced and enforced to produce desired outcomes. Examples of this are rare; Chennai's groundwater law, which has begun to bite, is an example. Another is West Bengal's enforcement of permits for new electricity connections for irrigation wells. In Chennai's case, extreme water scarcity has likely created popular support for strong measures. In West Bengal's case, restrictions began to be enforced long before well irrigators organized into a powerful political force.';

'[e] finally, there are examples of reform ideas that refuse to die despite recurring evidence of their failure to deliver. Participatory Irrigation Management is one such; India has been trying farmer management for irrigation for nearly 150 years. While there are islands of excellence, there is no evidence of WUAs having produced sustained performance improvements on a significant scale. Similar communitarian models have dominated for decades institutional discourse in culture and capture fishery, watershed management, and water supply systems. Countless studies show that fishermen cooperatives are almost always fronts for contractors, that watershed associations seldom maintain structures after funding runs out.'

Review of similar water reform efforts throughout the world suggests that the guiding mantra

[1] Tushaar Shah, 'Accountable institutions', Background Paper for this Report, 2005.

must be 'principled pragmatism'.[2] 'Principled', because principles matter a lot. And 'pragmatic', because principles can only be translated into practice by following a step-by-step, persistent process which 'fits' with the local culture, people, and environment. This chapter reflects on some of the lessons of 'principled pragmatism' in water reform processes elsewhere,[3] and from reform processes in other sectors in India. They are presented in the form of 'rules' (really suggestions) which a reforming government might keep in mind.

Rule #1: Water is Different

There is much that aspiring water reformers can learn from reforms in other sectors—such as power, telecommunications, and transport. But it is also true that water is, and is perceived to be, different from these other 'created' sectors in many fundamental ways. The resource economist Kenneth Boulding's ode to water[4] captures many of these distinctions very well.

Water is far from a simple commodity
Water's a sociological oddity
Water's a pasture for science to forage in
Water's a mark of our dubious origin
Water's a link with a distant futurity
Water's a symbol of ritual purity
Water is politics, water's religion
Water is just about anyone's pigeon
Water if frightening, water's endearing
Water's a lot more than mere engineering
Water is tragical, water is comical
Water is far from the Pure Economical.

This specialness does not mean that reform is impossible, or that water reformers cannot learn from reforms in many other areas of public service provision. What it does mean is that there has to be a particular emphasis on public discussion and on addressing the many concerns which people legitimately have about water.

Rule #2: Initiate Reform where there is a Powerful Need and Demonstrated Demand for Change

Habits of water management and use, and the organizations and practices involved, have evolved over time and have, at some time, 'fitted' the particular prevalent economic, social, and environmental circumstances. Change is not easy or welcomed, unless there is a very strong need for it. Abstract and idealized statements (such as 'river basin management' or 'integrated water resources management', the mantra of the international community in recent years) have some resonance with professionals, but do not constitute a reason for organizations and people to change the way water is managed.

Because changes are difficult and often wrenching, they will be undertaken only when there is a powerful need and a demonstrated demand for change. Global experience[5] shows that the impetus for change is usually either a serious breakdown in services, an environmental failure which affects large numbers of people, or a fiscal crisis which makes the status quo untenable.

Today, in India, there are a number of settings where there is a powerful need and demonstrated demand for change, and which are, accordingly, the areas where reformers should put their initial efforts. These include:

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[2] World Bank, Water Resources Sector Strategy, Washington DC, 2003.
[3] John Briscoe, 'Managing water as an economic good: Rules for reformers', *Water Supply* 15 (4), 1997, supplemented by the observations of many people and politicians who have led reform processes around the world. Reference: Hague session.
[4] Kenneth Boulding, 'The Economist and the Engineer', *Economics and Public Policy in Water Resources Development*, ed. S.C. Smith and E.N. Castle, Iowa State University Press, 1964, pp. 82–92.
[5] John Briscoe, 'Managing water as an economic good: Rules for reformers', *Water Supply* 15 (4), 1997.

- Cities, where individual households are facing greater and greater difficulties in making their 'coping strategies' work, because the groundwater option is no longer tenable. The case of Chennai (described in Box 3.1) is such a case, where the political pressures are great and the state government is being forced to confront the systemic issues. In some cases these responses are of the 'silver bullet' variety (for example, hoping that institutional changes can be avoided by getting someone else—Union Government, as always—to pay for the very costly desalination and thus resolve the problem[6]). But it is increasingly clear that Chennai has to seek a range of new sources of supply, as well as greatly improve the functioning of the distribution system within the city. It is, therefore, not surprising that Chennai emerges in several places in this report—in establishing incipient 'water markets' for the voluntary transfer of water from farmers to the city; in 'purchasing' water from the neighboring state of Andhra Pradesh (albeit, in such a poorly-specified contract that the city seldom gets the water); in mobilizing new forms of finance (from the Sai Baba philanthropic foundation); and in pushing for new forms of inter-state agreements on water (including 'river linking'). The number of cities and towns falling into similar circumstances (including the metropolitan area around Delhi, where the groundwater table is falling almost a meter a year[7]) is growing rapidly, and the political pressure to find new institutional arrangements to meet their needs is similarly strong. Dealing with urban bulk water issues is thus an opportunity for reform in water allocation practices.

- Fiscal constraints will, sooner or later, constitute a heavy pressure to improve the financial performance of public irrigation and water supply systems, both of which are major sources of red ink. This will force cities to look for lower-cost sources of supply—calculations by the Hyderabad Metro Water Supply and Sewerage Board, for instance, show that the city could buy water from farmers in the Singur area at less than half of what it would cost to bring water from Nagarjunasagar on the river Krishna.

- Industries in areas where water availability is a serious constraint. It is a commonplace in India that the availability and quality of infrastructure is one of the major threats to the continued health of the Indian economy. In the words of the Finance Minister: 'India's most glaring deficit is its infrastructure deficit.'[8] Until recently, 'infrastructure' meant ports, railways, roads, and electricity. Now there is a palpable sense that water is joining this list, with the two major industrial associations—FICCI and the CII—both becoming very active on water issues. Industry leaders have a major role to play in local politics, and can become powerful voices pushing for improved water management at the local level. An example of this is the path-breaking takeover by the textile industry of the Tirapur urban water supply in Tamil Nadu.[9]

- Agricultural areas, where water security is of high importance. Agrarian India is undergoing a quiet but rapid revolution—contract farming is happening in many places, high-value crops are displacing food grains, and aquaculture is increasing. In each case, the importance of a predictable supply of

[6] Shantanu Sharma, 'Who will bear the cost of water', *The Economic Times*, 20 November 2004.
[7] 'Water Crisis hits Gurgaon', *The Times of India*, 29 April 2005.
[8] Edward Luce, 'Modest dream is crucial for future', *Financial Times*, 22 March 2005.
[9] Nirmal Mohanty, 'Moving to scale', Background Paper for this Report, 2005.

water becomes vital. There has been a rapid uptake of drip irrigation and other new technologies, but these 'exit options' will not be sufficient, and there will be pressures to allow water to move more flexibly and voluntarily from low-value to high-value uses. As Maria Saleth[10] details in his background paper, much of this now takes place in informal water markets but as agricultural production moves to scale there will be pressures to formalize such relationships. Again, this is an important area where there will be demand for changes in water management practices.

The key message is that there are many windows of opportunity opening up for water reforms which will constitute specific, practical solutions to local problems. It is these which will show what can be done, and will, by producing tangible results, constitute a pressure on, and example for, others to follow. The centrality of 'demonstration' has been well stated in a similar context: 'We don't need the Government of India to transform every aspect of Indian infrastructure,' says Ratan Tata, head of the Tata companies which comprise India's largest private-sector group. 'All you need is for a private company to take over one airport and then show by results what everyone else is missing.'[11]

Rule #3: Involve those Affected, and Address their Concerns with Effective, Understandable Information

People are, for good reasons, always apprehensive about changes which will be thrust upon them. And when it involves something as sensitive as water, communication, discussion, and information become central elements for any reform process. What would this mean in India?

First, there is a general tendency for government-led discussions of water policy to take place among water professionals, the vast majority of whom are engineers, and most of whom have little exposure to changing global good practice. This community of practice is still (see the discussion in Chapter 2) very much a part of the 'this will not work in India' school of thought, one which still thinks in terms of command and control (Mohile, background paper[12]) and which tends to look backward, not forward (Sekhar, background paper[13]). This means that discussions of reform are often severely truncated, and often quite at odds with the reality on the ground. To take just one example: the engineers of Chennai Metrowater were emphatic that farmers would never lease their water to the city because it is 'against their culture'; once the trading was started the farmers were, indeed, unhappy, because almost all farmers wanted to trade some of their water (and the city could not buy from all).

Second, there is often an attitude by the government that 'there should not be discussion of issues of water entitlements or water reforms because these are too sensitive'. And when there is a forum for discussion it is exactly these issues which people want to discuss, because they are sensitive and central.

Things are, however, changing. The process followed by Suresh Prabhu, the Chairman of the (now-disbanded) Task Force on Linking Rivers was a model of open communication in many respects. Prabhu held literally hundreds of public meetings throughout the country to apprise people of what

[10] Maria Saleth, 'Water rights and entitlements', Background Paper for this Report, 2005.
[11] Edward Luce, 'Modest dream is crucial for future', *Financial Times*, 22 March 2005.
[12] A.D. Mohile, 'The evolution of national policies and programs', Background Paper for this Report, 2005.
[13] A. Sekhar, 'The evolution of water development and management: the perspective of the Planning Commission', Background Paper for this Report, 2005.

was at stake, and to listen to their concerns and get their suggestions. This led to enormous amount of public discussion, not just of linking rivers, but of virtually all the major challenges facing the water sector in India. It put some of the most critical issues—like the need for a new, modern approach to state water rights in a federal system—on the front burner. (The major caveat was that the machinery of government was not equipped to do its part, and the process suffered from the paucity of material available to both the task force and the public on the specifics of what was being proposed, and the results of the 20 years of work that the NWDA had undertaken on this subject.)

There is a palpable sense of a looming water crisis in India, and an opportunity and need for the Union Government to undertake a major, multi-stakeholder dialog-cum-campaign.

Such a campaign would need to engage farmers with the hydrological reality of the aquifers that they currently rely on. Farmers know that suicides are increasing because, even with massive electricity subsidies, increasingly larger numbers of farmers simply cannot afford to drill deeper. They need to know that there is simply no alternative to adjusting aggregate abstractions to the level of sustainable yield. They need to know that other countries have made such transitions, often remarkably, with positive economic outcomes. They need to understand the combination of government regulation, user involvement, and packages of 'virtuous subsidies' that could reasonably substitute for the vicious subsidies that are driving their aquifers (and them) to ruin. They need to be informed that formal water entitlements would not harm them, but provide them with assets which they currently do not possess.

Irrigators must realize that in the future surface supply systems—now so discredited—must again play a central role. This means that there must be a new social compact for public surface irrigation systems—a compact in which users have clear entitlements, in which they pay for reliable services provided by accountable, transparent, and efficient suppliers. Irrigators must also understand that with limited resources and growing cities and industries, there must be transfers of water from the farm to the city. They must understand that many countries have developed mechanisms for this to happen in a way that such transfers are transparent, voluntary, and to the mutual benefit of both parties. They must understand that if such mechanisms are not put into place, then these transfers will happen by stealth, without any compensation.

Such a campaign would need to engage the urban middle class, who have 'exited' from public water supply systems by self-provision. They need to understand that with massive urban growth and rapid aquifer depletion, these 'coping strategies' will not work for much longer. They need to realize that they will, as do people in all large cities of the world, rely on effective, accountable providers of public water services. They also need to understand that there are large demands for tax revenues for true public services (such as cleaning up the rivers which have turned into sewers in all the cities of India), and that they must be willing to pay for water supply services (provided, of course, the provider is efficient and accountable).

Such a campaign must engage industry, so that it understands that the standard industrial response (of 'captive generation of water', mostly by groundwater pumping, but also increasingly through expensive recycling and desalination) is inherently limited. Industrialists must exert their considerable pressure on government for putting in place systems—which work well in many countries—whereby they can purchase the water they need from willing sellers (often farmers) for whom the value of water is much lower than it is for the industry.

Such a campaign must engage the leadership of state governments. They must be made to realize that there is an alternative to the current anarchic inter-state system. They must be presented with the data on the huge costs which this system imposes on all parties (upstream and downstream alike) and must come to understand that there is an alternative for sharing waters (and sometimes sharing benefits) that works well in developed arid federal countries and which has worked well in India's international water treaties with Pakistan and Bangladesh.

Finally, and pulling all these strands together, such a campaign must engage national political leadership, again with complacency as the greatest enemy. A common commentary on India's economy was, in the memorable words of a Finance Minister, 'every budget is a gamble on the monsoon'.[14] A feature of India's recent economic growth was captured in a newspaper headline stating that 'India's economy is no longer a gamble on the monsoons', noting that India's growth in the bad monsoon year of 2004–05 had been reduced only by about 2 percent (to 6 percent overall growth). Political leaders must be aware that this may be a brief and temporary escape from hydrological constraints, and that unless the economy is put on a sustainable water platform, the 'water brake' on the economy—working through the industrial, agricultural, and urban economies as discussed earlier—will become endemic rather than sporadic. The urgency of this transformation is accentuated by the likely effects of climate change. The best projections suggest, for example, that in the western Himalayas, where precipitation and snow deposition are relatively low, glaciers are particularly vulnerable and are likely to result in a runoff 'windfall' during the next couple of decades, followed by flow reductions which may be of the order of 20 percent for the Ganga at Haridwar by the year 2100. As for so many other reasons, this requires the establishment of a water management system which is flexible and robust.

Rule #4: Reform is Dialectic, not Mechanical

Ideas like 'river basin planning' and 'integrated water resources management' have sound conceptual roots, and appeal to technicians, many of whom perceive implementation of these ideas as the path towards better water management. Useful as they are, in the words of the Operations Evaluations Department of the World Bank, 'progress takes place more through "unbalanced" development than comprehensive planning approaches'.[15] As Karl Marx (had he addressed the subject!) might have said it: water reform is a dialectic, not mechanical, process.

Improvements in water management occur when there are tensions (between users, between users and the environment, between the water agencies and the finance ministries) which can no longer be accommodated within the existing institutional arrangements. But reforms do not lead to 'mukti' (liberation for ever)—they simply mean that 'lower-order tensions' are replaced by higher-order tensions.

Again, Tamil Nadu provides a useful illustration. State-wide approaches to water reform have built some important building blocks, but have made few contributions to actually resolving specific problems. These general reforms therefore lack legitimacy and 'demonstration power'. But when the textile manufacturers of Tirapur actually resolve the problem of their own water service, this has a powerful demonstration effect. It does not mean that 'water problems in Tirapur are now over', but it means that as the issue of getting

[14] Alexander Frater, *Chasing the Monsoon: A Modern Pilgrimage through India,* Henry Holt, London, 1987.
[15] Operations Evaluations Department, *Bridging Troubled Waters*, World Bank, Washington DC, 2002.

water delivered to industries and households is largely resolved, the focus will inevitably and appropriately shift to the 'higher-order' problems of ensuring adequate supplies of bulk water and of dealing with water pollution from the town and industries.

Rule #5: It's Implementation, Stupid

Lawrence Summers has observed[16] that the great distinction between developing countries which have progressed over the last 30 years and those that have stagnated is not the ability to formulate perfect policies, but the ability to translate reasonable policies into actions on the ground. Paraphrasing Bill Clinton's famous election mantra, 'it's implementation, stupid'.

And so it is with water in India and elsewhere—policies and recommendations abound, some very good (such as the recommendations of the 1991 Vaidyanathan Commission). But as Tushaar Shah[17] has emphasized, what matters is identifying improvements that can actually be implemented.

Rule #6: Develop a Sequenced, Prioritized List of Reforms

Any journey requires a knowledge of the destination and a road map for getting there. However, the journey itself is taken step by step. And so it is with water reforms—there must be a long-term vision, but immediate attention must be on putting first things first—to sequencing and prioritization. The practice of (aborted) water reform by government agencies in India (reinforced by some of its external supporters) has often been to make everything (and therefore nothing) a priority. A major recent water commission for an advanced state in India came up with a set of over 340 'recommendations', ranging from major legal changes to what crop should be grown in what district. Similarly, a major 1998 World Bank report on the water sector in India[18] made 170 recommendations, all presumably to be done simultaneously.

A relevant example of a principled but pragmatic approach to sequencing relates to that of 'cost recovery' for irrigation services. Cost recovery is, of course, an appropriate aspiration, but it is almost never the place to start. Farmers will not and should not, pay for the costs of poor services which are delivered by inefficient and corrupt agencies. The first step must be to address the issues of accountability and efficiency (as described earlier in this report). Once services are improved and there is trust in the service provider, then tariff increases to bring revenues in line with costs. As shown in Figure 3.6 on the urban water supply example in Guinea, Africa, public funding will generally be necessary, on a declining basis, to 'finance the transition'.

Rule #7: Be Patient and Persistent

Water reform processes are never short, decisive affairs. A review of the experience of rich countries by the OECD[19] shows that progress in water reforms takes place over decades, not years, and that even the most advanced of countries is only about half-way towards the ideal forms of water management described in declarations of intent by the countries themselves and by the international community.[20] In the case of a vast, federal democratic country like India, as described by the Deputy Chairman of the Planning Commission,[21] 'plural-

[16] Lawrence Summers in 'Practitioners of Development' series at the World Bank, www.worldbank.org.
[17] Tushaar Shah, 'Accountable institutions', Background Paper for this Report, 2005.
[18] Keith Oblitas, *India Water Resources Management Sector Review*, Report 18356 IN, Washington DC, 1998.
[19] OECD, 'Water management: Performance and challenges in OECD countries', Paris, 1998.
[20] The International Conference on Water and the Environment, Dublin, www.wmo.org and the World Bank Water Resources Management Policy Paper, Washington DC, 1993.
[21] Montek Ahluwalia, 'Practitioners in Development', World Bank, 2004.

istic and highly participatory processes force one to gradualism....'

Rule #8: Pick the Low-hanging Fruit First—Nothing Succeeds like Success

The world over, citizens are either concerned or skeptical about announcements of 'reform', with some advocating abolition of the word from the public policy lexicon. 'By casting their agendas as reforms, political advocates don't aim to stimulate debate and discussion. They aim to suppress it. They aim to stigmatize adversaries as nasty, wrong-headed, selfish, or misinformed. The trouble is that as a society, we need debates over principles and practicality. All reforms are not desirable, at least not to everyone.'[22]

The corollary is that public support will only build if there are visible, tangible results from the changes which are advocated. The key is 'show me'.

It certainly can help to show opinion leaders that these changes have been effected in other countries. The formation of the famous French River Basin management system in the 1960s was strongly influenced by the successful experience of the Ruhrverband, established in neighboring Germany in 1916. And the political leaders of the water reform process in Brazil ascribe high importance to a study tour of Mexico and Colorado at a critical time. But there is nothing like demonstration on home territory. And, since changes are always difficult, it is imperative to start changes where conditions are propitious—where there is a real demand for change, where there are champions, and where it is possible to show results. For example, there were real gains from the organization of Water Users Associations in Andhra Pradesh in recent years, gains which were appreciated by visiting Haryana farmers who found in the AP 'success' some inspiration for similar efforts in their home state.[23]

On the central but complex issue of water entitlements, the embryonic experience in Chennai (Box 3.1) was a relatively 'low hanging fruit'. So too would the use of water entitlements to resolve the water conflicts afflicting the Bharatpur Bird Sanctuary. If and when these and other 'easy cases' mature, they will provide a beacon for tackling the bigger and more difficult challenges of water entitlements.

Rule #9: Keep your Eye on the Ball—Don't let the Best become the Enemy of the Good

Almost any progress is progress worth making, whether or not it measures up to some abstract global notion of 'excellent'. The idea that practice can go from terrible to perfect in one fell swoop is one that is attractive to outsiders and is sometimes adopted by financial agencies (so-called Volvo instead of Volkswagen standards[24]). But it fits poorly with the one-step-at-a-time gradualism which characterizes water reforms everywhere.

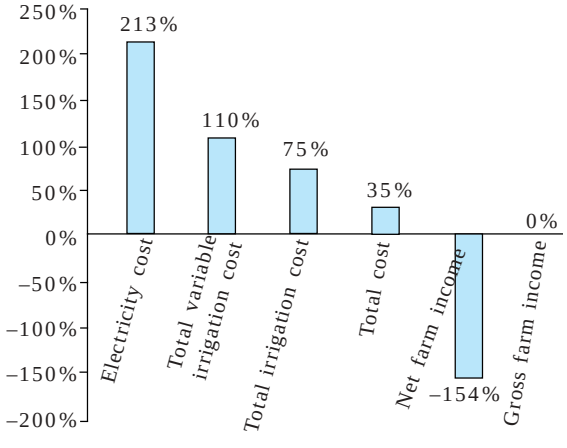
Consider the case of subsidies for electricity for groundwater. There is no doubt that this is a problem which must be addressed, and that the longer it takes to address the deeper the groundwater, the greater the subsidies and the more difficult it will be to find a way back. But the fact is that farmers are now so heavily dependent on electricity subsidies that drastic elimination of these would simply put many farmers out of business (see Figure 4.1), and, for this reason, is politically not feasible. The

[22] Robert Samuelson, 'Reform ain't what it used it be', *The Washington Post*, 5 June 2004.
[23] World Bank, 'Making Services Work for Poor People', *World Development Report*, Washington DC, 2004.
[24] Sebastian Mallaby, *The World's Banker*, Penguin, 2004.

task must be to address this issue on multiple fronts, which in this case would include an improvement in the quality of electricity, the appropriate pricing of the low-opportunity-cost electricity which farmers use, and the introduction of a set of 'virtuous subsidies' (as was done in Mexico, for example, in refurbishing inefficient equipment and for adoption of water-efficient technologies) as electricity subsidies are reduced.

A good example of 'the best is the enemy of the good' rule at work is the justly-famous Indus Treaty, which has, since its inception, had its detractors in both India and Pakistan as 'not fair'.[25] Confronting the Pakistani detractors of the Treaty, Ayub Khan gave advice which is relevant for all would-be water reformers: '... very often the best is the enemy of the good and in this case we have accepted the good after careful and realistic appreciation of our entire overall situation.... the basis of this agreement is realism and pragmatism....'[26]

Figure 4.1: Impact of eliminating electricity subsidies on marginal farmers in Haryana



Source: Bhatia, 2005.

Rule #10: There are no Silver Bullets

The challenges which India faces in water management are environmentally, socially, and technically complex. There is a justifiable, human fantasy that there is a single 'silver bullet' which will 'solve the problem'. Today, in some parts of the India water establishment, there is still faith that the old remedy—more dams, and variants of this—will solve all water problems and should be given near-exclusive priority. In situations where this remedy is patently impractical, there are a host of other 'supply side' solutions ranging from high-tech (cloud seeding and desalination) to low-tech (rainwater harvesting and desilting of ancient tanks), most of which have an important niche but are falsely marketed as 'the solution'.

Take the case of 'restoration of traditional water bodies'. There is a great attraction to the notion that rediscovery of 'Dying Wisdom' (the title of a book[27] by Anil Agarwal and Sunita Narain of the Delhi Centre for Science and the Environment) will provide the cures to the water ills that afflict modern India. There is a large and active movement which sees community 'rainwater harvesting' as the solution, everywhere and for almost all problems. Deeper investigations show that it is not quite so. David Mosse's detailed anthropological investigation[28] into the social ecology of the tanks of southern India draw a much more complex picture, showing that the tanks were in steep decline long before the advent of canal irrigation (the ostensible cause of the loss of traditional wisdom) and that they were a solution well

[25] N.D. Gulhati, *Indus Waters Treaty: An Exercise in International Mediation*, Allied Publishers, New Delhi, 1973.
[26] Undula Alam, 'Water Rationality: Mediating the Indus Waters Treaty', Ph.D. dissertation, Durham University, 1998, p. 340.
[27] Anil Agarwal and Sunita Narain, *Dying Wisdom*, Earthscan, 1997.
[28] David Mosse, *The Rule of Water: Statecraft, Ecology, and Collective Action in South India*, Oxford University Press, 2003.

suited to a particular demographic and social situation which has long gone. Similarly, objective evaluations (described earlier) of watershed management efforts in India show some, but rather limited, success. Applying the powerful words of Judith Tendler[29] from another context (the analysis of social funds): 'The reason for (their) popularity ... relates to their effectiveness as a powerful "development narrative". In environments with great ambiguity as to cause and effect, such narratives offer convincing and simple explanations for the causes of certain problems and provide appealingly straightforward blueprints for action. Because of their power as narrative, these accounts are rather invulnerable to empirical evidence that challenges their accuracy'.

The point is not that these community-based efforts have no role to play—they do, and an important one at that in some circumstances. The point here is that they can never be a 'silver bullet' in an increasingly urbanized and industrial society which needs a host of different kinds of actions.

What is clear is that the most effective responses to the water challenges in India are going to vary very widely and are going to require a host of interventions, of different scales. As suggested by 'Stages of water development' in Figure 1, the major instrument is not going to be infrastructure alone, but management supported by both old and new types of infrastructure. 'Management' is going to mean systemic sets of legislation, capacity building, organizational change, and the use of entitlement, pricing, and regulatory instruments. And it is not going to be the task of the government alone, but concerted and reinforcing actions by a host of stakeholders. But that there were a silver bullet!

Rule #11: Don't throw the Baby out with the Bathwater

A corollary of the previous rule is that there is a tendency when the silver bullet does not work (mixing metaphors badly) to throw the baby out with the bathwater. Dams (or rainwater harvesting or tank restoration) are propagated with missionary zeal, and when they do not deliver communities to the promised land, they are stigmatized and it is argued that they should no longer be part of the 'toolkit'.

Take the example of dams. There is an energetic and resourceful anti-dam lobby in India. Spurred by legitimate issues of inadequate resettlement, these groups—with their message magnified by Arundhati Roy's powerful prose[30]—have identified dams as one of the ultimate evils in the world. There is, in their minds, no dam which should ever have been built in India—even Bhakra,[31] which as described earlier, has been shown to have brought such massive benefits to the people of northwest India and beyond.

Take another example, that of Water Users Associations. The idea of WUAs transforming irrigation services has been and is, a powerful and persistent one, despite mounting and long-standing evidence that reality is a bit more complicated. The Vaidyanathan Commission of 1991, for example, reports that 'there is a general consensus that efforts to actually organize farmers' groups and make them participate have not really made much of an impact'. Similar evidence from around the world notwithstanding, the idea has had remarkable staying power in the global water community, again, 'because of their power as narrative, these accounts are rather invulnerable to empirical evidence'.

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[29] Judith Tendler, 'Why are Social Funds so Popular?', *Local Dynamics in an Era of Globalization*, ed. Shahid Yusuf, World Bank, Washington DC, 2000.
[30] Arundhati Roy, *The Common Good*, Modern Library, 1999.
[31] 'Punjab's prosperity not linked to Bhakra', *The Hindu*, 19 April 2005.

For some, the case is clear: the idea of WUAs is partly a cruel trick played so that the more difficult issues—of real reform of the irrigation agencies—can be avoided. But the fact is that organized farmers do play a role in all successful irrigation schemes throughout the world, but only as part of a set of reinforcing instruments, which always include water entitlements and accountable service delivery agencies. The WUAs should not be thrown out with the bathwater, but propagated as part of an overall reform package. The distinction between necessary and sufficient conditions for progress is a vital one.

Rule #12: Reforms must Provide Returns for the Politicians who are Willing to make Changes

Politicians may not be the most revered figures in India (or elsewhere), but it is they who are 'in the game', who are elected to make crucial tradeoffs, and who have the critical role as judges and champions of reform. A discussion with politicians who have led water-related reforms throughout the world[32] found general agreement in a 'rule' articulated by Digvijay Singh, then Chief Minister of Madhya Pradesh: 'If it is to work, water reform must be good politics'. There is evidence that this was, indeed, the case for community-based watershed management projects for Mr. Singh in Madhya Pradesh. And the intensive formation of WUAs in Andhra Pradesh was certainly politically useful to Mr. Chandrababu Naidu (former Chief Minister of Andhra Pradesh), because farmers perceived this to be a reform which moved in the right direction.

The bottom line is that an essential element of any reform program is that it must be viewed as a 'good thing' by sufficient numbers of people who will consider voting for the politician championing the reform.

There are two important riders to this 'rule'. First, it is often quite difficult to judge how actions relating to water are being received by citizens. For example, anyone reading the English language newspapers of India would perceive that the Sardar Sarovar Project on the river Narmada is almost universally opposed. However, a detailed analysis of press coverage by Sussex University[33] showed that the picture was considerably more nuanced: 'Environmental debate in India is governed by the language in which it is presented and understood. The message coming out of India, most likely to be heard by the developed world, comes out of its English language media, representing just 2 percent of the population. This elite group has adapted a pro-environment stance and is more likely to protest against new dams.... But inside India, the far bigger local language media representing the vast majority and poorer sections of society are expressing the heart-felt cry for development'.

Second and related, is the fact that on any reform proposal there will be a cacophony of voices. Montek Ahluwalia[34] has described this well: 'Sometimes I feel as if there's a completely false assumption that if only you talk to everybody you will get an agreement. Only on a very boring issue or in a very boring country would you find that. To my mind the debate ... Does not eliminate the need for political risk ... At the end the government has to take the risk....' In short, while all voices must be heard, much greater weight must be given to the voices of those who have responsibility and face the voters, and less weight to those who are self-appointed or who represent small special interests.

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[32] World Water Forum, Hague, 2000.
[33] Graham Chapman, Keval Kumar, Caroline Fraser, and Ivor Gaber, *Environmentalism and the Mass Media: The North-South Divide*, Routledge, 1997.
[34] Montek Ahluwalia, 'Practitioners in Development', World Bank, 2004.

CHAPTER 5

THE EVOLVING ROLE OF THE WORLD BANK

What the Bank has Done in the Past

The World Bank has been involved in the water sector in India for 50 years and has lent about $14 billion for water projects in India.[1] The very first Bank-financed project, the Damodar Valley Project, approved in 1954, was inspired by the TVA model, and aimed at building water infrastructure and institutions which would provide a springboard for economic growth and poverty reduction in a poor region.

From the Bank's perspective, this was (and would be today) an ideal project—it was a vehicle for bringing the best ideas from other countries and adapting them to India; it was a combination of infrastructure and institutional developments.

There were very clear benefits. The project did finance infrastructure which has provided power, flood protection, and irrigation services to the region. And the project was instrumental in the formation of the Damodar Valley Corporation (DVC) in the 1950s.

But there were failures, too. The DVC turned out to be quite different from the TVA, with states clawing back major activities and the DVC ending up as basically a power generation company with little responsibility for water management.[2] And there was no demonstration effect, with no other river basin organization following the DVC model. (In fact not a single river basin authority has been established under the 1956 River Boards Act.)

In many ways, the Damodar Valley Project presaged half a century of Bank experience with water development and management in India, an experience in which the defining quality is the contrast between lofty aspirations and modest achievements.

Paraphrasing Akhter Hameed Khan, the great Pakistani reformer,[3] it might be said that the Bank's involvement in water in India has been one in which the Bank 'has chased the rainbow of well-functioning institutions and dreaded the nightmare of further institutional decay.... and that only the boldest among us can say that we may not be similarly engaged tomorrow'.

Over the last 5 years there have been two major reviews, one by the Bank in the context of the new Water Strategy[4] and one by the Operations Evaluation Department. In both cases, the reviews included major consultations with a wide variety of stakeholders in India. Since these earlier reports have been published, and the results presented in detail in the background paper by Malik, in this report it is necessary only to summarize the main messages and lessons.

First, there are different perspectives about the influence of the World Bank on the water sector in India. On the one hand there is the view that since

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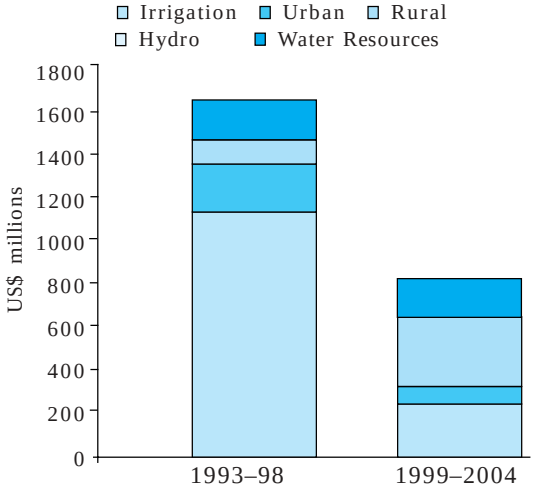
[1] Operations Evaluations Department, *Bridging Troubled Waters*, World Bank, Washington DC, 2002.
[2] Albert Hirschman, *Development Projects Observed*, Brookings Institute, Washington DC, 1970.
[3] Akhter Hameed Khan, 'A History of the Food Problem', The Agricultural Development Council, 1973.
[4] World Bank, 'External Views on the World Bank's Water Strategy', www.worldbank.org/water, Washington DC, 2003.

the Bank accounts for only between 6 percent (Sekhar, background paper) and 10 percent[5] of what is spent in the water sector in India, the Bank is a minor actor. On the other hand, since most of the water expenditure by the Union and state governments in India is for fixed costs (especially personnel), the Bank funds a much larger portion of discretionary expenditure and of new investments. And the Bank has been, and continues to be, by far the biggest external donor, accounting for 72 percent of donor lending and grants for water.[6] Where there is general agreement is that, as it should be, the Union and state governments are the ones who determine what will happen and how it will happen. The Bank's role is necessarily and properly one of trying to put ideas on the table, to be a partner to efforts at improving performance. This is an important role, but necessarily and properly control is in the hands of the elected governments at the national and state levels.

Second, mirroring a similar pattern for World Bank lending worldwide,[7] there was a sharp decline (Figure 5.1) in the proportion of lending going to water projects—from 25 percent in the early 1990s to about half that amount over the last 5 years.

There was also a marked shift in Bank lending (see Figure 5.1) out of complex areas which were perceived to be 'reputationally risky' for the Bank (especially in the light of the controversies surrounding the Bank's engagement with the Sardar Sarovar Project). There was no lending for hydropower (with the last project financed by the Bank being approved in 1987, the 1500 MW run of the river Nathpa Jhakri Project on the Sutlej River). There were sharp reductions in lending for irrigation, urban water supply, and stand-alone water

Figure 5.1: The decline and changing composition of World Bank lending for water in India



Source: Malik, 2005.

resources project, with the only increases being in the uncontentious area of rural water supply. There was great dissatisfaction among government officials in India who believed, as did developing countries throughout the world,[8] that the Bank was walking away from the area where the needs were great (infrastructure) and where the Bank had a strong comparative advantage, namely in addressing complex, difficult issues such as water resources development and management. A subsequent major 'global poll' of opinion-makers throughout the world reaffirmed (see Figure 5.2 for South Asia) that this is where countries perceived the greatest need, and the strongest case for World Bank involvement.

Third, these reviews, earlier major analytic assessments by the World Bank in 1991[9] and 1998[10] and the assessment in the 12 background papers by

[5] Operations Evaluations Department, *Bridging Troubled Waters*, World Bank, Washington DC, 2002.
[6] Ibid.
[7] World Bank, Water Resources Sector Strategy, Washington DC, 2003.
[8] World Bank, 'External Views on the World Bank's Water Strategy', www.worldbank.org/water, Washington DC, 2003.
[9] World Bank, *India Irrigation Sector Review*, Washington DC, 1991.
[10] Keith Oblitas, *India Water Resources Management Sector Review*, Report 18356 IN, Washington DC, 1998.

eminent Indian professionals, have concluded that the infrastructure constructed with Bank funding has made major contributions to India's food security, energy production, and urban development, but that all efforts at improving institutional performance have been only modestly successful, at best. A few quotes from the latest OED report give the flavor:

a) of persistent institutional shortcomings:

- '... performance of completed Bank water projects has been unsatisfactory because of over-optimistic appraisal.'
- '... the states' unwillingness to tackle institutional and financial reform ...'
- '... much still remains to be done on developing sustainable mechanisms for water allocation and management ...'
- '... sooner or later state governments must address subsidy issues and right-size public sector agencies to increase efficiency.'
- 'For fiscal reform to succeed, sooner or later state governments must address reducing the size of public sector agencies and ensuring good governance that allows the private sector, including users groups, to take a greater stake in water planning and management.'

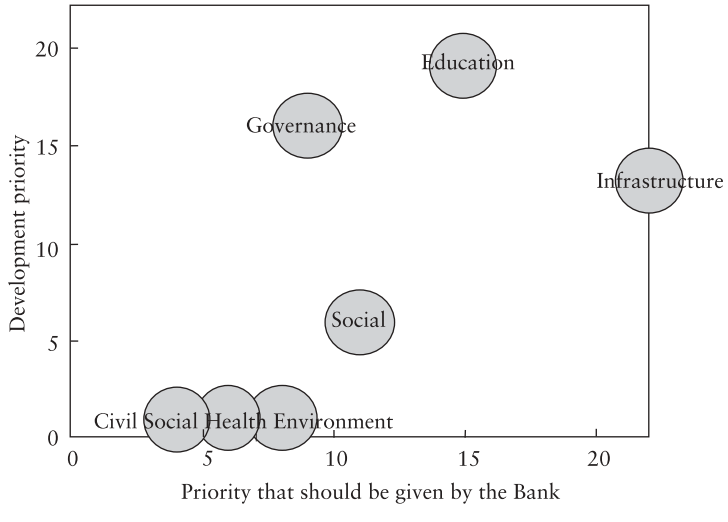
b) of recommendations by the Bank that specified large numbers of priorities and did not focus on a practical reform path:

- 'The Bank's 1998 review lays out a very ambitious and detailed agenda that ... contains more than 80 national and intersectoral recommendations aimed at the central and state governments, and more than 170 for the main subsectors.'
- '... institutions and practices that have remained unchanged for decades are to be tackled and changed quickly—an approach to institutional reforms that flies in the face of institutional realities and the political will such as they exist in India today.'
- 'The Bank risks spreading its resources too thinly to be effective. A more selective and incremental approach to key policy and institutional reforms might be more productive.'

c) of a slow movement away from a normative approach to one which focuses on incentives and the political economy of change:

- 'The 1998 review found that little had changed since 1991: "in recent years there has been realization and policy pronouncements regarding the need to address these problems; however, the policies have not been translated into action."'

Figure 5.2: The 'global poll' results for South Asia, showing that infrastructure and education were the two areas which were of high development priority, and priority for the World Bank



- 'There has been headway on reform of water institutions in the few reformist states where there is political will to change after decades of malaise—but in some, the reforms appear to be cosmetic.'

- 'The missing element is how to identify and promote incentives that will lead to sustainable and effective reform. Only then can the critical next step be achieved: agreeing on the three to five short- to medium-term priorities on which to focus efforts.'

The Bank's New Water Strategy

In parallel with these reviews of World Bank engagement in water in India, and influenced by them, the World Bank developed a new Water Strategy, which was approved by the Board of the Bank in 2003, and set a new direction for Bank engagement in water throughout the world. The main messages of the 2003 Water Strategy are:

- Water resources management and development is central to sustainable growth and poverty reduction and therefore of central importance to the mission of the World Bank.

- Most developing countries need to be active both in management and development of water resources infrastructure.

- The main management challenge is not a vision of integrated water resources management, but a 'pragmatic but principled' approach that respects principles of efficiency, equity, and sustainability, but recognizes that water resources management is intensely political, and that reform requires the articulation of prioritized, sequenced, practical, and patient interventions.

- The World Bank needs to assist countries in developing and maintaining appropriate stocks of well-performing hydraulic infrastructure, and in mobilizing public and private financing, while meeting environmental and social standards.

- The World Bank will re-engage with high-reward/high-risk hydraulic infrastructure, using a more effective business model.

- The Bank's water assistance must be tailored to country circumstances and be consistent with the overarching Country Assistance Strategies.

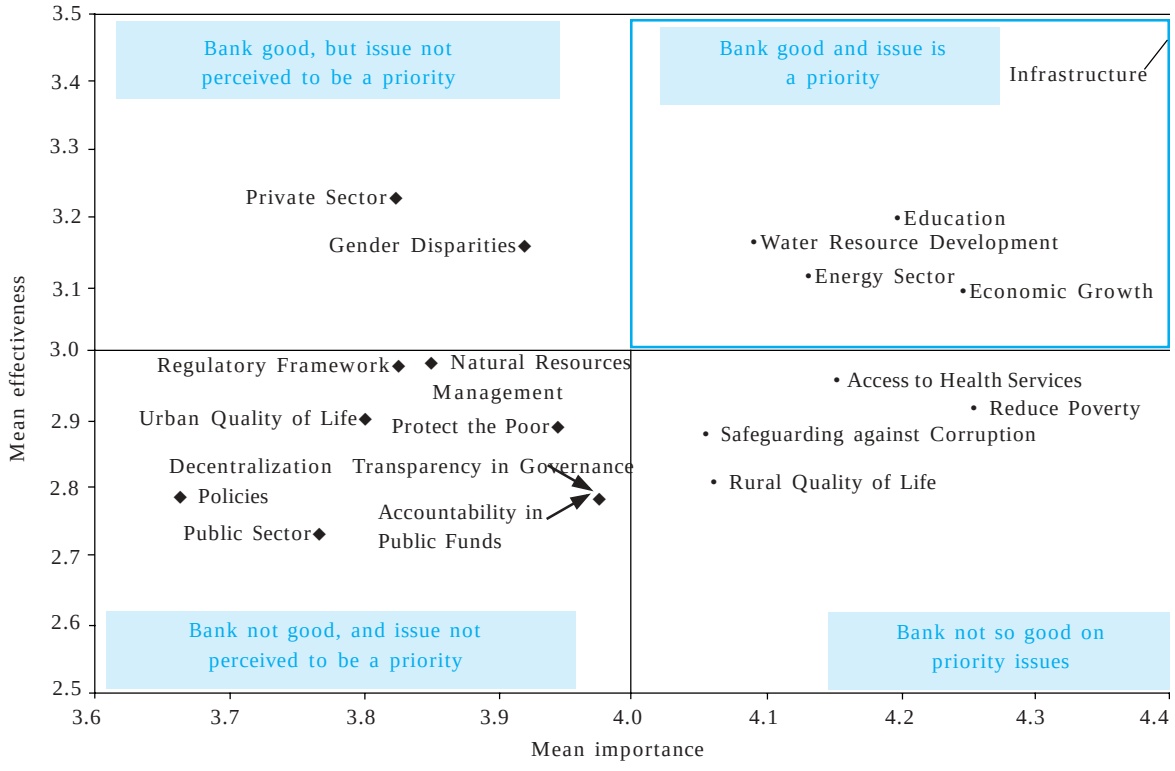
The 2004 World Bank Country Assistance Strategy for India

The World Bank has recently commissioned major surveys of opinion leaders to help identify areas which were of high development priority and where the Bank was perceived as having a comparative advantage. Confirming the results of the 'global poll' discussed earlier, these surveys (Figure 5.3 shows the South Asian poll of 2005; the Indian poll of 2004 produced very similar results) again showed the areas associated with water to be of high priority and high Bank effectiveness.

In September 2004, the Government of India and the World Bank finalized a Country Assistance Strategy, the 'contract' which spells out indicative Bank lending for the period 2004–08. The CAS represents a dramatic change in the Bank's engagement with water (Figure 5.4), with overall water lending predicted to rise from about $700 million over the previous 4 years to about $3200 million in the next 4 years. As shown in Figure 5.4, too, there are major changes in composition, with the Bank expecting to sharply increase irrigation and water resources lending, and re-engaging with large hydropower projects.

The 2004 CAS makes two other important strategic shifts which affect water. In the last CAS period the Bank focused heavily on 'reforming states' which were mostly in the south and mostly among the better-off and better-governed. (In this

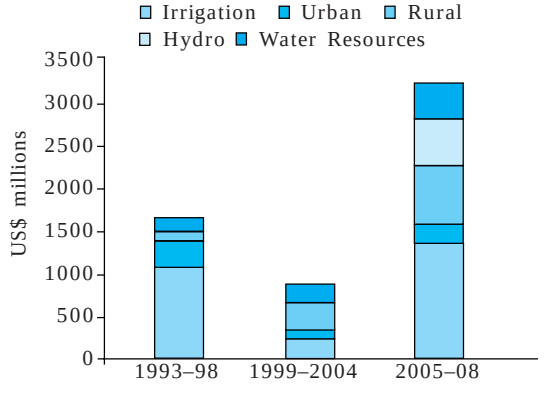
Figure 5.3: Development priorities and comparative advantage of the World Bank



Asked on a scale of 1–5; 1 being not important at all/not effective at all, 5 being very important/very effective.

Source: World Bank South Asia Client Survey, 2005.

Figure 5.4: World Bank re-engagement with water in India



Source: Malik, 2005.

period about 50 percent of Bank water lending went to the southern states, who contain only 20 percent of the population.) Now the Government and the Bank have agreed that the Bank will re-engage more intensively with the poorer states (where needs are greater but governance is also worse). This adjustment is understandable, but it also implies even greater difficulties for the institutional reform agenda which lies at the heart of Bank engagement. This is so because it is unrealistic to expect water governance to be good when overall governance is poor; and thus, it is likely that the already-difficult task of reforming water governance (which has not been very successful even in the 'advanced states') will become more difficult. In the current CAS, then 'rules of engagement' for different sectors have replaced 'focused states' as the primary filter which will determine whether or not the Bank engages. The 'rules of

engagement' for the various water-related sectors are as follows:

- *irrigation*: de-linking irrigation services and water resources management, reforming irrigation agencies, strengthening cost recovery, regulation, beneficiary participation, increased productivity of water, water entitlements;
- *urban water and sanitation*: utility reform, improving services to the poor, and private sector participation;
- *rural water and sanitation*: continue demand responsive approach, moving from pilots to scale through Centrally Funded Schemes (SWAPs);
- *hydropower*: one element in an overall energy program; Bank will engage with hydro that has limited environmental and social impacts;
- *water resources*: developing information systems, rehabilitating and modernizing major infrastructure, watershed management, water rights, capacity building.

The analysis in this report suggests that these 'filters' are generally appropriate, with minor adjustments. The first adjustment would be to de-emphasise some of the recommendations on organizational form (such as de-linking agencies responsible for irrigation and water resources management) and putting greater emphasis on (a) instruments, including entitlements, contracts between providers and users, transparent monitoring and benchmarking, and regulation, and (b) on charting sequenced, prioritized paths for making pragmatic improvements.

The Ongoing Evolution of Bank Engagement in the Water Sector in India

As part of the process involved in developing this report, the Ministry of Water Resources held two major consultations with the Ministry of Finance and other Union Ministries, and with state governments, to discuss the evolving role of the Bank. The second of these consultations culminated in a set of agreed 'recommendations'.[11] There was strong endorsement of the re-engagement of the Bank in the full range of water-related issues, including the big and the complex. There was agreement that the government needed to complement its traditional focus on infrastructure with a growing emphasis on management. It was agreed that the Bank needed to continue to emphasize institutional reform, and much discussion (and differing views) of some of the key instruments such as water entitlements and user charges. It was agreed that the Bank would consider a variety of capital investments (in flood control, tank rehabilitation, completion of irrigation projects, recharge, etc.) in the context of state projects, with the critical test being the economic and social returns to such investments.

Finally, two comments by senior Government of India officials at recent consultations held by the Government of India capture much of the essence of this report.

The Member of the Planning Commission responsible for water and energy stated: 'when we do address management problems we still think only in terms of instruments of command and control, not in terms of incentives that affect the behavior of users, and the instruments—usufructory rights, prices, compensation—that affect this behavior.'[12]

[11] Ministry of Water Resources, 'Recommendations of the National Workshop on Challenges of water development and management in India and future strategies', New Delhi, 13–14 January 2005.
[12] Kirit Parikh at the Ministry of Water Resources National Meeting with the States, New Delhi, 2004.

And the Secretary of Finance stated: 'the government will request Bank involvement only where the Bank adds value by bringing new knowledge and contributing to reform processes'.

These senior Government of India officials captured well the essence of this report—of the challenges awaiting India as it faces an uncertain water future, and the World Bank as it tries to be the best partner that it can be.