
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. The Report draws heavily on a set of twelve 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?

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

India has a highly seasonal pattern of rainfall, with 50% of precipitation falling in just 15 days and over 90% of river flows 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. 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.

India has reaped great benefits from its investments in water infrastructure

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 needs a lot more 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 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% of their economically-viable hydropower potential, in India the figure is

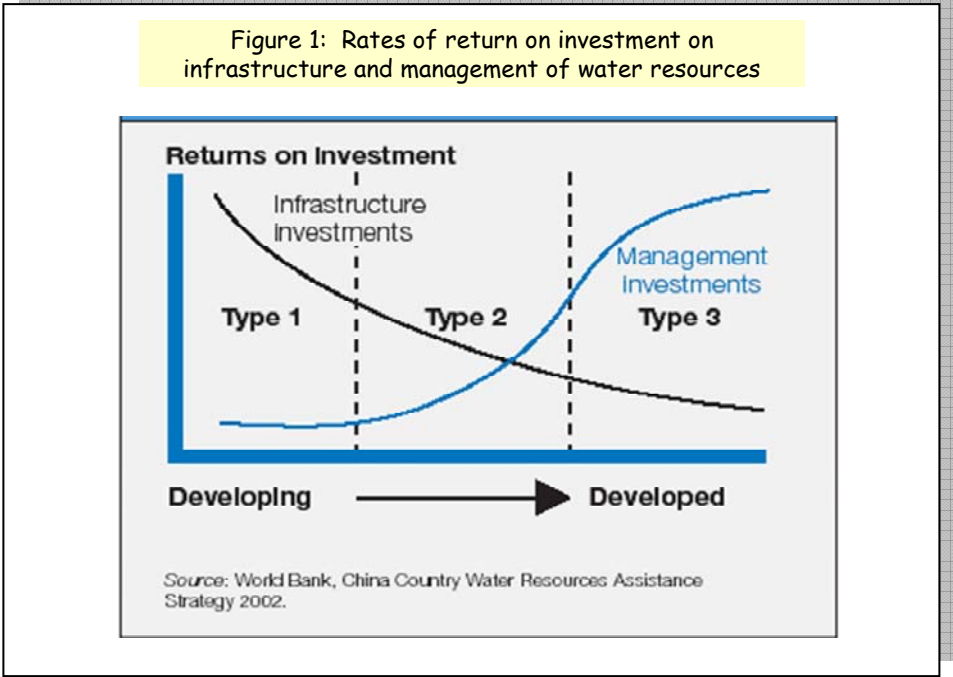
only 20%, despite the fact that the Indian electricity system is in desperate need of peaking power and despite the fact that Himalayan hydropower sites are, from social and environmental perspectives, among the most benign in the world. Especially in the water-rich northeast of the country, water can 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 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 ten times international norms, and most public funds are now spent feeding the 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 described¹ 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.

There is a major financial resources gap

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.

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

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.

- 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% 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 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. 80% 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, a mostly from groundwater. Where aquifers are either not available or exhausted, industries resort very-high cost “captive” alternatives

(including reverse osmosis treatment of wastewater and desalination) to keep their factories running.

Complacency - “we can muddle through” -- is a dangerous illusion, in light of scarcity, groundwater depletion and environmental degradation

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:

- 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 India demands will exceed all available sources of supply. Already about 15% of all aquifers are in critical condition, a number which will grow to 60% in the next 25 years unless there is change. About 15% 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 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 were adopted, the State economy in 2020 would be 20% 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.

Water conflicts are becoming endemic at all levels

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% of Maharashtra’s fiscal deficit is to pay for the construction of dams whose primary purpose was 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.

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’.

Towards a “new water state” at the Union and State levels

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;
- stimulating competition in and for the market for irrigation and 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 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

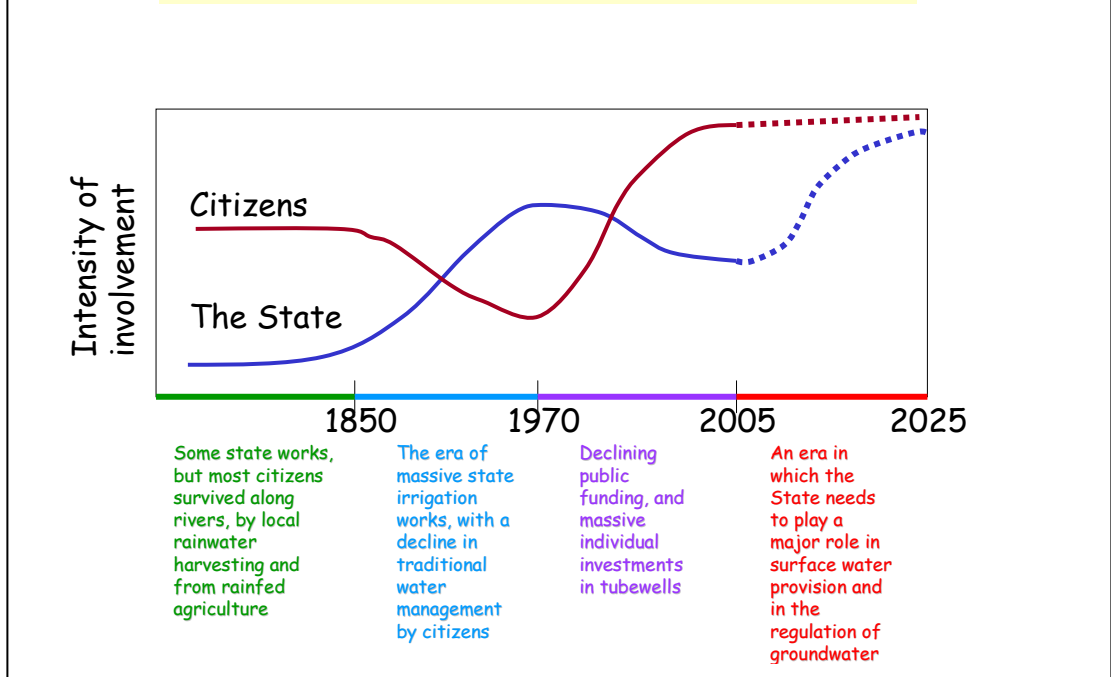
resolution, establishing and managing water entitlements, and the financing of public goods such as flood control and wastewater treatment).

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 entitlements, 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 do – 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.

Figure 2: The evolving role of the citizen and the state in 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 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 four 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.

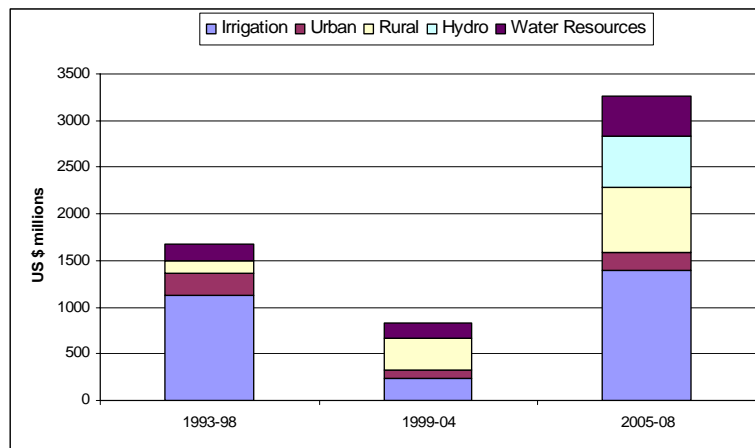


Figure 3: The changing composition and level of World Bank lending for Water in India

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