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## India's Water Economy: Bracing for a Turbulent Future

For 150 years India has made major investments in large-scale water infrastructure, bringing water to areas that previously lacked it. The results have been spectacular, both nationally, through the production of food grains and electricity, and regionally, as projects have generated direct and indirect economic benefits. Once-arid areas have become centers of economic growth, while historically well-watered areas have seen slower progress. The poor have benefited greatly from such investments. Poverty in irrigated districts is one-third that in unirrigated districts.

But India's water management system is not sustainable. Without significant increases in investment and profound changes in the way India's water institutions are run, the country will face water shortages and environmental problems that will gravely affect its people and its economy.

India needs more water-storage capacity, appropriately scaled. The present system is capable of storing only 30 days of rainfall, compared with some 900 days in the major river basins of arid areas of developed countries. And the need for storage will grow, as global climate change begins to be felt: rapid glacial melting is likely to occur in the western Himalayas in coming decades, accompanied by greater variability of rainfall in large parts of the subcontinent.

India's hydropower infrastructure is similarly undeveloped. Industrialized countries harness over

80 percent of their hydropower potential, but India manages just 20 percent, even though demand for power is high and the Himalayan hydropower sites are, socially and environmentally, among the most benign in the world. 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 other measures to avoid damage from flooding. In many parts of the country, growing cities and underserved rural areas require massive investment in water supply systems, sewers, and wastewater treatment plants if India's rivers are not to become fetid sewers.

### **Crumbling infrastructure, a bloated administrative system, and a growing financing gap**

In the early stages of development of India's water infrastructure, engineers were worshipped as saints; dams were "the temples of modern India." As the stock of infrastructure grew, however, the challenges of maintenance, operation, and management began to emerge. In the early decades after Independence, India's water authorities shared the command-and-control philosophy that pervaded the government, viewing the users of infrastructure as subjects rather than partners or clients. That legacy endures. Today, the Indian state water apparatus shows little interest in the key issues of participation,

This note summarizes the findings of *India's Water Economy: Bracing for a Turbulent Future*, by John Briscoe and R. P. S. Malik (New York and Oxford: Oxford University Press, 2006). The background papers for this study are available in the *Handbook of Water Resources in India: Development, Management, and Strategies* (2007) from the same publisher. More information on how to purchase these papers can be found at [www.worldbank.org/water](http://www.worldbank.org/water).

incentives, water entitlements, transparency, competition, accountability, financing, and environmental quality—in short, little interest in modernization. The implicit philosophy has been aptly described as “build-neglect-rebuild.”

The effects are many. Negligible user charges generate insufficient revenue for operations and maintenance, creating a backlog of deferred maintenance and investment. The gap between tariffs and the 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 administrative structure and subsidizing user charges. Public financing is not available for the vital tasks of rehabilitating the existing stock of infrastructure and building new infrastructure to serve growing populations, especially the unserved poor.

Both sources of financing for the water sector—tax revenues and user charges—are shrinking. The result is a large and growing financing gap that eventually will have to be bridged by a combination of larger budgets, greater efficiency, and higher prices for water.

In the meantime, as the quality of public irrigation and of water supply services declines, India’s people have used their ingenuity to survive. A simple and remarkable transformational technology, the tubewell, may have staved off social unrest and political pressure. With large areas of India having large, accessible aquifers, people have used tubewells to become self-reliant by tapping groundwater. On a massive scale, growers have drilled individual tubewells for irrigation or relied on others’ wells, giving rise to elaborate informal water markets. Some 20 million tubewells now supply for about half of the irrigated area in India.

The urban middle class, like their rural counterparts, have sunk private wells to tap groundwater, even though the costs of doing so are much higher than the average payment to the utility. They supplement their wells by installing household water purification systems and purchasing water from vendors or in bottles. The urban poor lack these options. When the inevitable groundwater shortages occur, the poor are powerless. As it is, they depend heavily on water vendors, who provide groundwater at a very high cost.

Industry, too, has resorted to self-provision, mostly from groundwater. Where aquifers are not

available or are exhausted, industries fall back on high cost alternatives (including reverse osmosis treatment of wastewater and desalination) to keep factories running.

## Complacency—a dangerous delusion

In many ways, self-provision has been a success, underpinning spectacular gains in agricultural production, for example. That success has led many to believe that India can continue to muddle through, despite the failure of its water institutions. But groundwater is not limitless, and the strategy of tapping it does not address the health and environmental problems associated with inadequate treatment of wastewater.

In large and rapidly growing segments of the economy, including many of the most productive regions of the Indian economy, self-provision is already unsustainable. Crisis points have been reached in a number of aquifers and basins, and by 2050 India’s demands for water will exceed all available sources of supply. Already about 15 percent of all aquifers are in critical condition; that number will grow to 60 percent in the next 25 years unless there is change. Aquifer depletion is concentrated in the most populated and economically productive areas. About 15 percent of India’s food is being produced using nonrenewable groundwater.

India’s people do not have to settle for a tepid and ultimately unsuccessful strategy of muddling through. Better options are available. India is approaching the end of an era in which the country could get by despite the fact that government has performed poorly in service delivery and abandoned major areas where government engagement is critical, such as groundwater management, conflict resolution, establishing and managing water entitlements, and financing public goods such as flood control and wastewater treatment.

A major push is needed—by government and by users working together—to bring abstractions from groundwater in line with recharge rates. While traditional technologies such as rainwater harvesting and tanks can play an important local role, in many parts of India demand will have to be brought down to match sustainable supply. Global experi-

ence shows that this difficult and essential task will require a partnership between users and government—to form effective associations of aquifer users; to formalize water entitlements that are consistent with the sustainable yield of the aquifer; and to develop transparent systems of information and decision support.

An important manifestation of the breakdown in the current system of water allocation is the growing frequency 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 Minister of Finance has drawn attention to “the growing number of little civil wars over water”. The government has generally responded by proposing new supply schemes—a new dam, a desalination plant, or a new way to harvest rainwater. But such schemes tend to solve one party’s problem at the expense of another. On thorny issues where trade-offs cannot be avoided, the usual response of the state water apparatus has been to pray for rain or play for time. Referring water disputes to the courts has become a standard tactic where the administration cannot muster the necessary imagination or political will to act. But even where interstate tribunals have rendered decisions, they have taken years to complete, have not followed global good practice, and have encouraged states to focus their attention on “getting more water next time,” rather than on making better use of what they have. The lack of modern, fair, and enforceable interstate water compacts has stymied sensible interstate cooperation on water.

So far the approach of the water apparatus has been to promulgate laws and policies that resort to command and control or are based on a communitarian ideal—most are never implemented. An approach that began by acknowledging the private interests of individual farmers would be far more successful.

### **From here to there—the political economy of reform**

The end of the era of massive expansion in groundwater use will mean greater reliance on surface water supply systems. Dramatic transformations will be needed in how public water services are provided to farmers, households, and industries. Substantial

investments, and equally substantial changes in management philosophy, will be required. India’s water authorities must grow beyond their traditional role as builders and controllers of infrastructure to become the stewards of an enabling environment that facilitates transactions by water users large and small.

India faces this challenge with many assets and some liabilities. The assets include citizens, communities, and a private sector that have shown immense ingenuity and creativity. The major liability is a public water sector that rests on the laurels of an admirable past but is not equipped to deal with the tasks that only the government can tackle—developing an enabling legal and regulatory framework; putting into place entitlement and pricing practices that will provide incentives for efficient, sustainable, and flexible use of water and put the sector on a sound financial footing; forming partnerships with communities for participatory management of rivers and aquifers; providing transparent information for use in managing and monitoring and regulating resources and services; stimulating competition among providers through benchmarking and by permitting the entry of private sector and cooperative providers; financing true public goods, such as flood control and wastewater treatment; and ensuring that local people become the first beneficiaries of major water projects. Some important, initial and tentative, steps are starting to be taken, including those in Maharashtra, where the State Government has put in place a modern institutional framework which includes a regulatory authority and the central idea of water entitlements.

The World Bank’s current country assistance strategy for India includes a large increase in lending for water-related sectors (including water resources management, irrigation, hydropower, and water supply and sanitation). The Bank will consider financing high-return infrastructure that can be built to reasonable social and environmental standards, while focusing sharply on institutional reform and global best practice. This will mean greater emphasis on building capacity in the public sector, by investing in a new generation of multidisciplinary water resource professionals, and on implementing instruments that stimulate efficiency, accountability, and flexibility (such as water entitlements, information, regulation, competition, and pricing).

As in all other federal countries, these issues are complex and political, but India has some good models close to home—such as its treaties with Pakistan on the Indus and with Bangladesh on the Ganga. Dealing constructively with interstate issues

is the single most important task facing the national Ministry of Water Resources, where the previous minister described himself wryly as “the minister of water conflicts.” One hopes that this title will not pass down to too many more of these successors.

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