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- Ministry of Water Resources, and its Central Water Commission, and Central Ground Water Board;
- Ministry of Urban Affairs and Employment; and
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ABBREVIATIONS AND ACRONYMS

BCM	Billion Cubic Meters
CAD	Command Area Development
CGWB	Central Groundwater Board
CPCB	Central Pollution Control Board
CTU	Central Training Unit
CWC	Central Water Commission
CWPRS	Central Water and Power Research Station
EPA	Environmental Protection Act
GDP	Gross Domestic Product
GOI	Government of India
HA	Hectare
IMD	Indian Meteorological Department
MOEF	Ministry of Environment and Forests
MOUAE	Ministry of Urban Affairs and Employment
MOWR	Ministry of Water Resources
NGO	Non-Governmental Organization
NWB	National Water Board
NWDA	National Water Development Agency
NWP	National Water Policy
NWPO	National Water Planning Organization
NWRC	National Water Resource Council
O&M	Operations and Maintenance
PCB	Pollution Control Board
PHED	Public Health Engineering Department
RBO	River Basin Organization
RGNDWM	Rajiv Gandhi National Drinking Water Mission
RWSS	Rural Water Supply and Sanitation
SEB	State Electricity Board
SGWO	State Groundwater Organization
SPCB	State Pollution Control Board
SWPO	State Water Planning Organization
SWRB	State Water Resources Board
UWSS	Urban Water Supply and Sanitation
WRCP	Water Resources Consolidation Project
WRS	Water Rights System
WSS	Water Supply and Sanitation
WSSB	Water Supply and Sanitation Board
WUA	Water Users Association
WRM	Water Resources Management

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TABLE OF CONTENTS

ACKNOWLEDGMENTS

EXECUTIVE SUMMARY	i
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1. Current Trends, Challenges and Issues	1
A. Introduction	1
B. Current Trends and Developments	1
C. The Costs of Inaction	6
D. The Critical Challenges	8
2. Resource Allocation and Management	12
A. Policy, Legislative and Regulatory Framework	12
B. Institutional Arrangements and Mechanisms	17
State Level	17
Local Level Institutions, Civil Society and the Private Sector	19
Inter-State Institutions	21
Central Level Institutions	22
C. Economic and Financial Incentives and Mechanisms	24
Sub-Sectoral Economic Incentives	25
Inter-Sectoral Economic Allocation	28
Inter-State Economic Allocation Mechanisms	29
D. Technological and Information Systems	29
Technology and Water Productivity	29
Data, performance Information Systems and Analytical Capabilities	29
3. Service Delivery in the Water Sub-Sectors.....	32
A. Sector Achievements and Current Performance	32
Reform is Now Entering the Agenda.....	34
B. The Vicious Circle	37
C. The Reform Needs	43
Institutional Reorientation and Strengthening	45
Economic and Financial Incentives	47
Technology and Information System	48
Policy, Legislative and Regulatory	49
4. The Reform Agenda and Action Plan	51
A. The Reform Agenda	51
B. The Action Plan	54
Improving the Policy, Legislative and Regulatory Framework	56
Strengthen Institutional Arrangements	58
Resource Allocation and Management	58
Sub-Sector Water Service Delivery	59

Rationalize the Economic Incentive Framework	61
Intra-Sectoral	62
Inter-Sectoral	63
Inter-State	63
Strengthen Data, Technological and Information Systems	64
C. Getting Started	64
Resource Allocation and Management	65
Service Delivery in the Water Sub-Sectors.....	66
Detailed Matrices of Recommendations	70
REFERENCES	107
ANNEXES	110
Annex 1. India Water Resources Assessment, Inter-State Issues, and Environmental and Health Issues.....	110
Annex 2. Treating Water as an Economic Good with Private and Public Good Dimensions.....	120
Annex 3. Executive Summaries from the Specialist Technical Papers under the India Water Resources Management Sector Review	124
Intersectoral Allocation, Planning and Management	125
Groundwater Regulation and Management.....	133
Irrigation.....	143
Urban Water Supply and Sanitation.....	151
Rural Water Supply and Sanitation.....	159
TABLES	
Table 1.1 Estimated Costs of Inaction	8
Table 4.1 Intersectoral Water Allocation, Planning and Management – Detailed Matrix of Recommendations.....	70
Table 4.2 Groundwater Regulation and Management – Detailed Matrix of Recommendations	86
Table 4.3 Irrigation Service Delivery – Detailed Matrix of Recommendations.....	89
Table 4.4 Urban Water Supply and Sanitation – Detailed Matrix of Recommendations.....	94
Table 4.5 Rural Water Supply and Sanitation – Detailed Matrix of Recommendations.....	100
Table A2.1 Characteristics of Public and Private Goods, Market Power and Externalities in Water Service Sectors.....	121
Table A2.2 Market Conditions and Public Policy to Assure Efficient Production and Management of Water Resources	122
FIGURES	
Figure 1.1 Sectoral Water Demand Trends	2
Figure 1.2 Population and Water Availability Trends in India	3
Figure 1.3 India - Water Availability and population Share (Present and Projected)	4

Figure 1.4	Water Availability and Ag. Value Added - Select Countries	5
Figure 1.5	Sectoral Water Projection to Year 2025	6
Figure 1.6	Share of Irrigation Deficit in Total - Selected States.....	7
Figure 1.7	Estimated Unit Costs of Supply Augmentation Alternatives in Hyderabad.....	7
Figure 1.8	The Hydrologic and Use Cycle	9
Figure 3.1	The Vicious Circle	37
Figure 3.2	Number of Personnel per 1000 Connections - Selected Cities	40
Figure 3.3	Working Ratios for Urban Water Supply - Selected Cities	41
Figure 3.4	The Virtuous Circle.....	43
Figure 3.5	A Major Paradigm Shift Needed in Water Service Delivery	44
Figure 3.6	Possible UWSS Sector Organization Structure	46
Figure 3.7	Changing Priorities	48

DIAGRAMS

Diagram 4.1	Interacting and Mutually Supportive Reform Areas.....	55
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BOXES

Box 1.1	Groundwater Sector: Considerations in Defining Public and Private Sector Roles.....	10
Box 2.1	Current Information Systems are not Conducive to Resource Management	30
Box 3.1	WSS Coverage Statistics and the Urban Poor	33
Box 3.2	Decentralization of WSS Operations	36
Box 3.3	The Challenge for India's RWSS Sector	43
Box 3.4	The Challenge for India's Irrigation and Agriculture Sector	44
Box 3.5	The Challenge for India's UWSS Sector	44
Box 3.6	User Organizations in Irrigation	46
Box 3.7	Benefits of Water Saving Technology in China	49
Box 4.1	Big Bang Irrigation Reforms in Andhra Pradesh	60
Box 4.2	Achieving Financial Viability and Sustainability in RWSS	63
Box A1.1 (a)	Regional Diversity in Water Issues: Northeast India	118
Box A1.1 (b)	Regional Diversity in Water Issues: South India	118
Box A1.1 (c)	Regional Diversity in Water Issues: East and Central India	118
Box A1.1 (d)	Regional Diversity in Water Issues: Northwest India	119

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EXECUTIVE SUMMARY

ISSUES AND BACKGROUND

i. *India faces an increasingly urgent situation: its finite and fragile water resources are stressed and depleting while various sectoral demands are growing rapidly.* The historical situation in which relatively plentiful water resources have been used primarily for irrigated agriculture, with demands in other sectors insignificant relative to resource availability, is changing rapidly and will continue to do so in the foreseeable future. Other sectoral demands over water will increase due to population (which is expected to grow by about 40 to 50 percent before eventual stabilization), as well as major changes in the composition of demand resulting from rising incomes, urbanization and rapid industrialization. Industrial needs will be a high economic priority; agriculture—with two-thirds of production dependent on irrigation and accounting for 83 percent of consumptive water use—continues to remain crucially dependent on water; and rural and urban drinking water requirements, being a fundamental societal need, must be met without fail. Conflict between sectoral uses—domestic needs in rural and urban areas, agriculture, industry, energy, ecological, flood control, navigation, fisheries, recreation, ceremonial, religious and other uses—is already a serious problem.

ii. *Water is becoming an increasingly scarce resource in India, yet it continues to be used inefficiently on a daily basis in all sectors,* while sectoral demands (such as in drinking water, industry, agriculture and others) are growing rapidly in line with urbanization, population increases, rising incomes and industrial growth. At the same time, poor and disadvantaged groups remain underserved by the heavily subsidized public services, and must bear increased health risks plus additional costs (in terms of time and money) of obtaining potable water supplies. Women and children are disproportionately affected under these conditions due to their greater role in water collecting activities. There is, furthermore, insufficient water available in most basins to address environmental and ecological considerations or ensure adequate supplies for other non-consumptive uses (such as navigation, religious observances, and leisure needs). The current policies and sectoral arrangements are no longer adequate to ensure full provision of both non-consumptive and consumptive water needs at reasonable costs and prices, nor to safeguard the provision of usable water into the future.

SECTOR ASSESSMENT

Resource Allocation and Management

iii. *The current approach emphasizes development of water resources and construction of new infrastructure under a top-down, supply-oriented and fragmentary framework.* Water has been developed rather than managed. Furthermore, development of water is highly fragmentary, with separate planning and implementation for surface water projects, groundwater programs, and the various water-using sectors. With this approach and current institutional arrangements,

India has been unable to cope effectively with emerging water availability and quality problems under the current and intensifying climate of increasing competition of sectors over water. Comprehensive management—on a river basin basis, multi-sectorally, conjunctively for both surface and groundwater, and incorporating both quality and quantity aspects of water—is largely lacking. Cooperation between states sharing river basins has been limited and sometimes highly contentious. Management of water has been through a top-down approach largely dominated by the government. A supply-side approach—exploiting additional water resources—has been predominantly used. This approach has resulted in major economic, social and environmental costs.

iv. *In recent years, there has been realization and policy pronouncements regarding the need to address these problems; however the policies have yet to be translated into action.* Policy pronouncements include the National Water Policy (NWP, 1987) of the central government, which advocates a holistic and integrated river-basin-oriented approach to water development, the promotion of conjunctive use of surface and groundwater, water-conserving crop patterns and irrigation and production technologies, and recognition of water as an economic good. More recently, the New Economic Policy of 1991 and subsequent policy statements relating to liberalization of the economy, market-based approaches to economic management, privatization of urban water² and decentralization of irrigation management, have established a broader and more economically-oriented environment for water policy debate. The policy statements, though, are not supported by institutional structures and mechanisms, enabling legislation, nor by supporting economic incentive structures. More important, the national policy is neither reflected in corresponding and state-specific water policies, nor in basin-level policies and action plans.

v. The existing constitutional provisions and water legislation in India, furthermore, do not provide an appropriate framework with which to tackle water sharing issues between states, between sectors and between individuals. This is a critical deficiency because it hampers efficient and sustainable use of basin waters in a framework of equitable and efficient access to water. In the present set-up: (i) primary powers are vested at state administrative levels which do not correspond to river basin boundaries; (ii) surface water rights are neither clearly defined nor secure, and such rights cannot be commercially transferred; (iii) groundwater rights are purely private, thereby ignoring externalities, and such rights cannot be transferred independent of land; (iv) environmental laws have not been comprehensively operationalized and regulatory standards are either not enforced or do not exist; (v) inadequate mechanisms are available to ensure effective participation of local populations in management or regulation; and (vi) practical guidance on implementation is largely absent.

vi. *The present institutional arrangements in India, including central, state, and local institutions, and both formal and informal structures, do not enable comprehensive water allocation, planning and management.* The main problems that exist are: (i) inadequacies in necessary institutions for comprehensive water allocation, planning and management,

² For instance, The India Infrastructure Report of the Expert Group on Commercialization of Infrastructure Projects, a.k.a. "The Rakesh Mohan Report," GOI (1997).

particularly at state and basin levels where they are frequently absent; (ii) lack of coordination between institutions, duplication of responsibility and responsibility gaps; (iii) inadequate fostering of grass-roots institutions; and (iv) lack of involvement of civil society—i.e., local communities, NGOs, the private sector and academia.

vii. *Existing organizations, furthermore, lack capacity in key management areas as well as effective mechanisms for implementation.* Management is not primarily a technical challenge but depends heavily on social, economic, legal and other considerations. At present, most water organizations are dominated by engineers. Even in the technical arena, most of the capacity in the Ministry of Water Resources and state water organizations is concentrated on exploration and basic resource monitoring, rather than on the types of system analysis essential for management. An additional constraint is the lack of integrated approaches or effective communication between the various water and environmental organizations. Without effective institutional mechanisms to implement an integrated approach, sustainable management will be unattainable.

viii. *Appropriate economic incentives for efficient water use and conservation are lacking on various levels, thereby impacting negatively on water provision and usage in these sub-sectors.* At the sub-sector level, the system of prices and other economic incentives affecting water demand and supply are inadequate. Direct water pricing for irrigation, rural water supply and urban water supply does not fully reflect the costs of production and delivery of water, nor the underlying scarcity value of water. The structure of incentives to control pollution and encourage water saving or reuse technology is also underdeveloped. Indirect pricing policies at the sub-sector level, have also had a serious impact on water use. This is particularly the case for electricity pricing for groundwater, where low (and in some cases zero) non-volumetric electricity charges provide little incentive to conserve either water or power. Additionally, the application of agricultural pricing and marketing policies has distorted cropping patterns, and thereby water use. The net effect of these direct and indirect pricing policies is enormous fiscal burden on the states and inability to cover full costs, resulting in inadequate funding of operations and maintenance, poor water service by providers, and service dissatisfaction and water-use inefficiencies on the users end.

ix. *The absence of appropriate direct water pricing, and lack of adequate application of other economic and financial incentives at the sub-sector level, have also served as an obstacle to the smooth transfer of water between sectors and states.* Furthermore, economic incentives for efficient inter-sectoral allocation—introduced either through negotiation or “automatic” market mechanisms—largely do not exist in India, with the core problems being: (i) an absence of an economic-value-based administrative mechanism, or a market-based mechanism, to facilitate reallocation of water (with compensation) from lower-valued to higher-valued uses; (ii) an absence of institutional, legal, administrative and technological mechanisms to enable development and operation of formal water markets for sale or lease of water between users and sectors.

x. *Supporting technological and informational systems, to enable effective planning and management of water, are also weak.* Inadequate maintenance contributes to the low efficiency and reliability of the water delivery infrastructure in India. For irrigation this has had a

significant impact on the potential yields attainable by farmers, due also to the untimeliness of deliveries relative to crop water needs. The weakness in the agricultural extension program, including information delivery on improved water application methods and technologies, further depresses attainable yields of India's farmers. As regards planning and management, professional capabilities in river basin modeling are very limited in most Indian states, and modeling tends to be used for investment proposals rather than for comprehensive basin planning or resource management. There is no mechanism to share data or the limited basin modeling work with the general public, nor is such information easily accessible by concerned users. Furthermore, such data or basin plans often have limited relevance to user needs since users are not involved in the decision-making process regarding the type of data collected, data quality or data networks.

Service Delivery for Irrigation and Domestic Use

xi. Being a vital resource for the lives and livelihoods of all India's citizens, and having contributed significantly to India's economic growth since independence, water sector investments have rightly been accorded high priority in India's development plans. Expenditures on irrigation in India have been as high as 23 percent of government spending following independence, and averaged 11-15 percent of government spending in the 70s and 80s, declining to about seven percent of total government expenditure in the 1990s reflecting the declining need for new construction. India likewise has devoted substantial resources to the water supply and sanitation sector, significantly increasing its commitment since 1980 with the launch of the International Drinking Water Supply and Sanitation Decade. Drinking water investments have increased and presently constitute about three percent of the national budget, with a 40-60 split between urban and rural areas.

xii. These significant water sector expenditures have yielded important achievements: a four-fold increase in irrigated area which substantially increased and stabilized the incomes of millions of farmers throughout the country; an increase to 85 percent of India's urban population (about 210 million people) that have access to public water supplies, and to over 75 percent of the rural population (or 520 million people) that are now provided with public water supply facilities; and, an increase to about 48 percent of the urban population and 3.6 percent of the rural population that have access to sanitation services.

xiii. Achievements in the water service delivery sub-sectors have mostly been accomplished following a target-driven, supply-oriented and government-dominated approach with minimal user involvement. In an environment, however, of increasing scarcity of water, land and financial resources that characterizes India today, the disadvantages of this approach have become increasingly evident. All three service sectors—irrigation, urban water supply and sanitation, and rural water supply and sanitation—are facing problems in ensuring quality water supplies or reliable access of all citizens to water at sustainable costs of provision, affordable prices to consumers, and to the full satisfaction of users.

xiv. *The current situation in water service delivery in India is in general characterized by a vicious circle of inadequate financial allocations to the sector (particularly for operations and*

maintenance) and inefficient and bloated service institutions, which have led to poor quality and unreliable services, user dissatisfaction with the services they receive, and an unwillingness of users to pay for those services. The inadequate resources generated by the sector due to low prices and user unwillingness to pay for services, further undermines sector financial resources, contributing to a perpetuation of the circle. The end result is a sector that has become unsustainable.

xv. *This general vicious circle syndrome is evident in all three service delivery sectors, though slight variations in sub-sector specifics can be inserted in the story.* In the case of irrigation, a starting point in the circle is the frequently found poor quality of the service. Farmers typically have no participation in irrigation decision-making and, thus, no control over the amount of water they receive, when they receive it, nor whether they will receive it at all. Combined with poor quality agricultural extension services, this leads to low crop yields and low incomes, which in turn generate farmer dissatisfaction with the irrigation system, bureaucracy and state government. Under these conditions, water rate revisions are politically resisted and payments on water bills are postponed, resulting in low cost recovery and ensuing political pressure by farmers not to pay for a service that lacks responsiveness to their needs. Low cost recovery, in turn, is linked to underfunding of the operations and maintenance of the conveyance systems which, coupled with the poor quality and state of most systems, and compounded by the inappropriate structure, policies and staff skills of many state irrigation departments, closes the circle by providing poor quality service.

xvi. *The vicious circle of the drinking water sectors (both rural and urban) varies slightly due to the varied and disaggregated institutional structures that make up the RWSS and UWSS sub-sectors within India's states.* Service providers are typically financially unviable, and are unable to maintain services without extensive subsidies. Existing services—whether standpipes, small piped rural systems, or large piped municipal systems—fall short of full coverage of the population, and are often of low quality due to insufficient funding of O&M. Sanitation services, in particular, are generally inadequate and access to acceptable urban services is extremely limited for those in poorer neighborhoods. The resource, under current utilization practices, is increasingly insufficient and over-exploited, leading to increasing environmental degradation. The lack of adequate pricing levels charged to consumers contributes to the financial weakness of the agencies, and failure to levy rates based on O&M costs or actual water-use levels prevents efficient use and conservation of water.

xvii. *Proposed reforms at sub-sector level (i.e. in irrigation, RWSS and UWSS) and distinguished by jurisdiction and agency responsible for implementation, necessarily center around transforming the vicious circle into a virtuous cycle.* The transformation will enable sustainable and quality service delivery that is responsive to user needs, and has affordable prices to users and viable costs to providers. The key need is to change the incentive structure currently perpetuating the vicious circle, both at the levels of the service provider (the present government agencies) and the users (farmers, villagers and urban dwellers). Both groups presently have no incentives to change the status quo. For government, a low level of accountability to users means that all incentives are internal to the department, and based on bureaucratic survival and on pleasing vested interests who are seldom at the grassroots. There is little incentive to be cost

efficient in providing services, to pursue and collect revenue from all (potential) sources, to be financially self-sufficient, to improve the technical quality of services, to satisfy the client, or to link up with other government services, the private sector and civil society. For users, there are also few incentives for pushing reform. Because users are heavily subsidized, are not involved in sector operations and are not even consulted by government, they are detached from decision making and feel they can have little influence on improving the service. Their only leverage is through political pressure to resist increases in the charges for water service delivery.

xviii. Significant restructuring is thus required of the institutional and financial environment in order to create the incentives to initiate a continuous and vigorous process of change. Since the problems facing the sub-sectors are inter-related and reinforce each other, resolving one or the other alone will not remedy the earlier deficiencies. It is thus necessary to attack them simultaneously or in a well thought out (and politically feasible) sequence. The strategy calls for *a major shift in the current paradigm governing sub-sector water development in India: from the current heavy emphasis on physical expansion to a much greater emphasis on performance improvement.* The performance improvement approach entails achieving: the devolution of operations and maintenance to lower administrative levels and user groups; financial viability and sustainability of the service agencies; more appropriate technology and information systems; and a demand- and client-orientation in the service agencies.

THE REFORM AGENDA AND ACTION PLAN

xix. Addressing India's water sector concerns needs to take account of the current resource situation and the issues that have emerged in recent decades. The issues are cumulative in impact and progressively exacerbated by the narrowing scope for maneuver. A finite resource base has been subjected to rapid development, primarily for irrigation, over the past few decades. Water service delivery has focussed heavily on putting in place the infrastructure toward achieving maximum coverage of the population, and has been unable to attend adequately to the need for quality service, efficient delivery, efficient water use, or responsiveness to the using clients. Resources are no longer plentiful and constraints exist in most basins. Meanwhile, water demand has grown rapidly, and particularly rapidly in the case of the non-irrigation sectors.

xx. *Fundamental reforms are needed now in India in how water is captured, allocated between sectors, delivered to users and managed.* Water sector reforms take sustained effort as demonstrated by such countries such as Australia, and implementation of the reforms will need to commence now and be sustained if significant improvements in water quality and availability are to be achieved. The costs of not doing so are staggering. The deleterious impact of the present approach include: large foregone mutual benefits to various sectors; high fiscal costs of investment without full corresponding achievement of coverage and service objectives; increasing cost of future provision of services; closure of various income-generating water uses and activities; and continued high incidence of many severe water-borne diseases. Estimates of some of these costs amounted to about US\$15.9 billion in 1994-95, or about 5% of GDP as a lower bound. Given India's many other social and economic needs and the current concerns over sustainability of fiscal structure, this 5% of GDP cost is a high price to pay for a weakly performing sector.

xxi. *There are two broad issues that need addressing if constraints are to be overcome.* **First**, solutions must be found to improve resource allocation and management, both between competing intersectoral uses and between states sharing the same river basin. Mechanisms must be developed for integrated treatment of surface and groundwater, including quality and environmental considerations, and for efficiently and equitably allocating scarce water resources between competing uses—i.e., irrigation, rapidly expanding domestic and industrial needs, hydropower, environmental and navigational requirements. **Second**, reforms to improve service delivery in the water sub-sectors (i.e. irrigation, urban water supply and sanitation, and rural water supply and sanitation) must be implemented.

xxii. Tackling and resolving India's water resources management problems will not be easy. By its nature, water resources management is multi-dimensional and complex. It involves: users from different sectors with widely different needs; millions of individual households and firms, each acting in its own interest in response to the physical and incentive environment within which it is situated; multi-layered levels of social organization and public administration, ranging from village and societal groupings to local administrations, such as panchayats, and to larger units such as blocks, municipalities, districts, states and the nation as a whole; government administrations where executive responsibilities for water are typically and perhaps necessarily split between many different government departments; and a question of the respective roles of government, civil society, and the private sector. India's task is made all the more difficult by its enormous population and its federal administrative structure. The undoubted virtue of democracy, which is one of India's blessings, can sometimes make decision-making more difficult. Pragmatic and often unique solutions will need to be found by India.

xxiii. *A comprehensive approach is required, simultaneously combining mechanisms in several subject fields (e.g. policy, institutions, pricing, technology).* Permeating all of the mechanisms are four overarching factors. First, there should be a *shift from supply-driven to demand-oriented approaches*, with further exploitation of additional resources where appropriate, balanced by demand management. Second, recognizing that water is an economic good with both public and private good characteristics, *sector responsibilities should be divided between government and the non-government stakeholders*, as appropriate. The present almost exclusive domain of the public sector must broaden out to include the private sector—civil society groupings, academics, NGOs, industry, etc.—in decision-making and implementation. Third, effective participation of non-government and grassroots stakeholders will be achieved only by *decentralizing decision making, and explicitly including non-government stakeholders in sector activities*. Fourth, *achieving financial viability of service delivery is essential*. Until all water service delivery entities are financially viable and self-financing, the sector will be unsustainable, further development will be hindered, and private sector funding for investment activities will not be forthcoming.

xxiv. *The role of government should be reoriented from one of provider and financier of services, to one of facilitator and enabler.* The overall orientation should be towards decentralization, unbundling of agency activities, commercialization and corporatization, devolution of responsibilities to users, and involvement of civil society in sector operations. Specifically, the new roles envisaged for the state, sub-state, and central governments, as well as

civil society, are as follows. The *state governments* will necessarily play a major role as initiators of reform, and in addition they will facilitate and enable change at sub-state levels. *Sub-state administrations* (i.e., cities, towns, villages, districts, blocks, river basin organizations) will take on new responsibilities for water service provision in their jurisdictions, delivering services through commercially run public utilities or overseeing the operations of contractors. They will facilitate community organization and involvement in decision making, in addition to capacity building in smaller and weaker jurisdictions.

xxv. The *central government* will have a more indirect role, focusing on facilitating and encouraging state governments to undertake the reforms and evolve appropriate state strategies. Specific aspects of the central government's role are: to collect and disseminate examples of, and expose sector specialists to, best practices in India and other countries; to develop and provide standard formats and model legislation; to leverage limited government resources through appropriate mechanisms; and to promote comparative competition between states and between water service agencies. *Other non-governmental actors and stakeholders* such as universities, NGOs, and the private sector, will work with government to contribute their talents to the reform agenda and facilitate participation of community user groups in sectoral decision making. Over time, the stakeholder should become the most important actor. Irrigation and rural water supply facilities should be owned and managed, respectively, by farmer water user associations (as in Mexico, Chile, Turkey and commencing in Andhra Pradesh), and by village water supply and sanitation committees (as is commencing in Uttar Pradesh and Karnataka). Urban consumer interest groups should be established to play an active part in the decision making process of the urban water agencies.

xxvi. Based on the lessons of other countries, a *long term vision* is required to set the tone and provide guidance for India's water sector reforms, which will be undertaken in the following four topic areas: (i) strengthening the policy, legislative and regulatory framework; (ii) rationalizing the economic incentive framework, including introduction of financial management and measures to ensure financial viability and sustainability; (iii) strengthening public-user-private partnerships in planning, management and service provision, and rehabilitating institutional arrangements and procedures to enhance performance; and (iv) strengthening of technological and informational systems. Commitment to reforms and strong political will to implement reforms will be critical. Also critical for effective implementation of reforms will be a broad-based public consultation process to explain the need for and implications of reform and strengthen the forces for change. A detailed matrix of recommendations has been prepared for the five specialist areas of: (a) intersectoral water allocation, planning and management; (b) groundwater regulation and management; (c) irrigation; (d) urban water supply and sanitation; and (e) rural water supply and sanitation. Start-up actions for state, sub-state (municipalities, towns, etc.) and central governments are also articulated in the report. A summary of the comprehensive reform program, grouped under the four topic areas, follows.

Improving the Policy, Legislative and Regulatory Framework

xxvii. The policy, legislative and regulatory framework requires updating and strengthening, as follows:

- *Preparation and adoption of supporting policy and action documents*, including updating of the 1987 National Water Policy and preparation of complementary state water policies and action plans.
- *Strengthening the legislative and regulatory framework* to support systematic approaches to improved allocation, utilization and management of water. This will include review, revision and, in some cases, augmentation to enable: (i) the creation of new water allocation and sharing institutions and arrangements, such as multi-sectoral water stakeholder associations or participation of private sector and civil society; (ii) strengthened regulations and enforcement mechanisms, particularly for pollution control measures but also to facilitate emergence of well-functioning price-based reallocation mechanisms, including water markets; (iii) new forms of water tariffs, including volumetric charging in all water sub-sectors and power sector delivery for groundwater pumping; (iv) passage of a groundwater legislation and establishment of a regulatory framework for groundwater management; and (v) assessing options for defining transferable surface and groundwater rights.
- *Amend the River Board's Act and the Inter-State River Disputes Act*, to enable the center to play a stronger catalyzing role in the creation of river basin organizations. The amendments should include provisions to enable: (i) the center to establish a Tribunal one year after receipt of a grievance from a riparian state, if agreement is not reached between the concerned riparian states; and (ii) following a Tribunal decision, to establish a mechanism for monitoring and implementing the award allocation.

Strengthening Institutional Arrangements

(a) Resource Allocation and Management

xxviii. Institutional mechanisms need to be created or strengthened, in particular at state, grass-roots and basin levels:

- *Enhance non-governmental stakeholder participation*, as a core to all institutional initiatives. Initially government will have to take substantial lead, given its present dominant role. Civil society, NGOs, academia, industrialists and water user groupings, including traditional marginalized groups such as women and the poor, should be engaged in brainstorming discussions and decision-making processes as quickly as possible. As non-governmental stakeholder participation is developed through public awakening and capacity building, and additional responsibilities are shouldered, the center and state institutions should modify their role accordingly.

- *Reorganize and strengthen state-level institutions*, to institute and strengthen mechanisms for integrated multi-sectoral planning, allocation and management of water along river basin lines and across the various concerned sectoral departments.
- *Establish grass-roots mechanisms for water management*, to enable stakeholders to discuss water resource issues, problems and solution options, and to implement local-level resource allocation and management initiatives.
- *Create inter-state river basin organizations (RBOs)*. Riparian states on all inter-state basins should, as a matter of priority, endeavor to establish RBOs of some form. The center should strongly encourage RBOs, through provision of financial incentives if necessary.
- *Strengthen, reorient and better coordinate central institutions*, to enable the center to provide leadership and guidance on implementing reforms to the states, including provision of information on best practices and eliciting public participation through public dissemination of information, stakeholder awakening or empowerment campaigns, and capacity building for local and state level institutions.

(b) Water Service Delivery

xxix. The proposed strategy focuses on establishing an enabling environment to support strengthening of institutions and financial viability, which will serve the broader objectives of public administration reform. The general approach focuses on several themes. During a transition phase from public delivery to commercial client-oriented and self-financing agencies, financial conditionality with the allocation of central and state funds will need to be the major force driving the reform process at both state and local levels. Conditionality for disbursement of funds must be explicitly defined, and strictly adhered to. This will be used to phase out the target-driven approach and government subsidies, and to phase in a demand-driven approach and full cost recovery. Public education and widespread communication will set the stage by convincing voters and politicians of the need and benefits of making and implementing difficult cost-sharing and recurrent cost recovery decisions. Implementation of a participatory demand-driven approach will ensure that users can directly influence the level of service they desire and can afford; and full cost recovery will ensure financial viability and sustainability. Finally, supporting public sector reforms, and institutional strengthening measures, will ensure sustainability. External agencies can facilitate by supporting these reform efforts.

- *Decentralizing service operations* to the lowest appropriate level, e.g. municipalities and the panchayat raj institutions and, in particular, community water user groups for RWSS, and to basin-oriented farmer water-user associations for irrigation. Transfer of responsibility would require corresponding provision of management and financial autonomy to local administrations and user communities, as adequate and appropriate for their roles.
- *Strengthening capabilities of decentralized entities and user groups*. All decentralized units and groups will require basic capacity strengthening for their new roles.

- *Strengthening capabilities of the restructured higher-level entities* at state and basin-level irrigation agencies, and state and local WSS agencies, while at the same time restructuring those organizations so that they may implement a delivery system oriented toward customer service.
- *Commercializing operations at all levels*, to improve efficiency and effectiveness of the service agencies, and contribute to enhancing their viability.
- *Fostering participation of NGOs and the private sector*, to enable enhanced efficiency and improve service delivery.

Rationalizing the Economic and Financial Incentive Framework

xxx. *Measures to strengthen the intra-sectoral incentive framework* are:

- *establish meaningful water prices* (usually requiring significant price increases) for irrigation, urban and rural water supply, at least reflecting the costs of service provision and charged volumetrically, with any subsidies being explicit and well-targeted. This is a pre-requisite to increasing private financial flows to the sector. Tariff levels should further reflect efficient levels of service, and in particular, costs of excess agency staff should not be included in the tariff rates. Tariff increases should be undertaken periodically, and be indexed to inflation.
- *establish specific targeted measures to protect the poor*. This could include life-line blocks and community-based credit systems to enable the poor to spread capital cost payments over time.
- *enhance economic and financial capabilities* in financial management, project preparation and appraisal skills. With financial management in place and financial viability enhanced, further efforts to enable access of service providers to new finance sources are likely to be needed from state governments and financial intermediaries already involved in the sector.
- *increase agricultural power tariffs* and charge volumetrically to establish incentives for groundwater and power conservation;
- *remove agricultural price and marketing distortions* in commodity and input markets that currently encouraging excessive water use and regional imbalances;
- *establish pollution taxes* and other incentives to encourage adoption of water conservation, treatment, reuse and pollution control practices, including utilization of “polluter pays” approaches and price structures.
- *enable access to private funding sources*, such as through development of community credit systems, or direct borrowing from the capital markets for the more advanced entities.

xxxii. Measures to strengthen the *inter-sectoral incentive framework* are:

- *develop economically-based water reallocation systems* by: (i) introducing economic analysis and compensation packages in administrative reallocations; (ii) developing the brokering of compensated water trades (between, for instance, agricultural water user associations and industries or municipalities); and (iii) piloting water transactions through formal water markets, supported by a appropriate institutional and regulatory framework to safeguard social and environmental needs.

xxxiii. Measures to strengthen the *inter-state incentive framework* are:

- *encourage multi-component (including non-water investments) basin development plans* for inter-state river basins, which would expand the scope for achieving net positive gains for each state.

Strengthening Data, Technological and Information Systems

xxxiiii. Measures to strengthen the data and technological and informational systems are:

- *Public awareness campaign.* A major public information program should be launched to educate and enlist the support of the general public for the reform agenda.
- *Strengthen data collection and monitoring,* to enable more effective management. Given the role data and information play in formulating major investment programs and management decisions, there is a need to fill the critical gaps in data availability and assessment. data collection and analytical systems should be transparent and accepted as reliable by all actors, to enable reaching the common social consensus essential for effective management.
- *Reorient data collection, planning and analysis to actual needs* of effective water management. Data collection and analysis should now be on hydrologic basis such as watersheds and aquifers, rather than on administrative units. River basin plans, state water plans and environmental management plans should also be prepared.
- *Enable access to technologies for efficient water use and allocation,* to enable improvements in water-use productivity. A major drive should be launched in all sectors to: (i) increase water-use efficiency; (ii) improve productivity of end use; (iii) employ water conservation, water treatment and water recycling and reuse technologies; and (iv) enable transfer and reuse of water between sectors.

Chapter I. Current Trends, Challenges and Issues

A. INTRODUCTION

1.1. This report synthesizes the analysis, assessment and recommendations of five specialist reports—two on resource management and three on sub-sector service delivery, which were all jointly produced with the relevant Government of India (GOI) Ministry under the India Water Resources Management (WRM) Sector Review exercise. Earlier drafts of each specialist report were the focus of five joint GOI-World Bank national workshops to discuss each report's assessment and reach consensus on the recommendation for the reform. Workshop outcomes were subsequently incorporated in each of the final versions of the reports. The five specialist reports—(i) Intersectoral Water Allocation, Planning and Management, (ii) Groundwater Regulation and Management, (iii) Urban Water Supply and Sanitation (UWSS), (iv) Rural Water Supply and Sanitation (RWSS), and (v) Irrigation (World Bank, 1998a through 1998e, respectively)—form the base for this synthesis paper, which will not present the full details contained in the five reports. The specialist reports, therefore, should be referred to for more detailed discussions of the specialist sub-water-sector issues, assessment and recommendations. For convenience the Executive Summaries of these papers are reproduced in Annex 3.

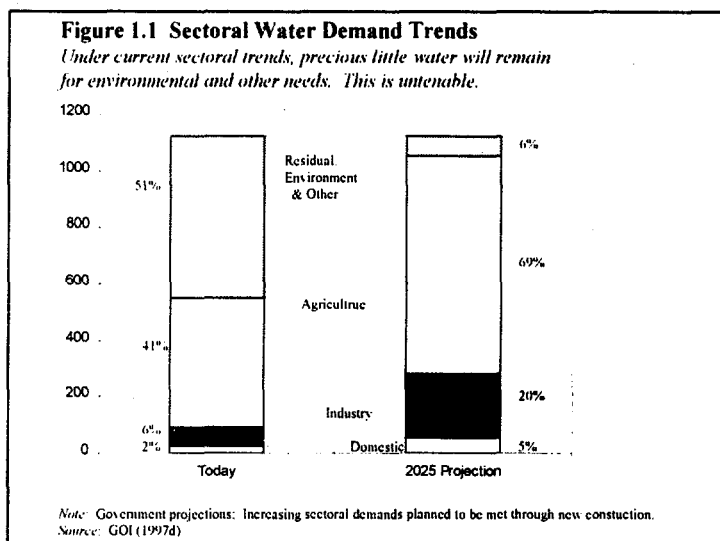
1.2. The first two reports assess the policy, legislative, regulatory, institutional, economic and technological issues hindering sustainable management of surface and groundwater development and utilization. The remaining sub-sector reports (UWSS, RWSS and Irrigation) focus on the institutional and financial incentives critical for effective and reliable water service delivery. All five reports conclude by articulating reform agendas and implementable action plans for improving effectiveness, efficiency and sustainability of water. This report follows a format that groups the discussion in the technical reports into two main headings: resource allocation and management, and service delivery in the water sub-sectors, in Chapters II and III, respectively. Chapter IV concludes with a discussion of the reforms. This chapter continues with an exposition of the context in which water sector reforms are now critical for future sustainability and productive use of water resources in India.

B. CURRENT TRENDS AND DEVELOPMENTS

1.3. India faces an increasingly urgent situation: its finite and fragile water resources are stressed and depleting while various sectoral demands are growing rapidly. The historical situation in which relatively plentiful water resources have been used primarily for irrigated agriculture, with demands in other sectors insignificant relative to resource availability, is changing rapidly and will continue to do so in the foreseeable future. Population is expected to grow by about 40 to 50 percent before eventual stabilization, and will be combined with major changes in the composition of demand resulting from rising incomes, urbanization and rapid

industrialization. Industrial needs will be a high economic priority; agriculture—with two-thirds of production dependent on irrigation and accounting for 83 percent of consumptive water use—continues to remain crucially dependent on water; and rural and urban drinking water requirements, being a fundamental societal need, must be met without fail. Conflict between sectoral uses—domestic needs in rural and urban areas, agriculture, industry, energy, ecological, flood control, navigation, fisheries, recreation, ceremonial, religious and other uses—is already a serious problem.

1.4. Summing up the various sectoral projections reveals a total annual demand for water increasing from 552 billion cubic meters (BCM) in 1997 to 1050 BCM by 2025 (Figure 1.1). This would represent virtually the entire utilizable water resources of the country, casting some doubt on the realism of the projections, particularly that for irrigation. What is clear, however, is the rapid increase in non-irrigation demands. Consumption for industry and domestic purposes is expected to realize about a three-fold increase and its share in overall water consumption to increase from 8 to 25 percent.



1.5. Alterations in the water requirements and relative claims by the various sectors over time are partly a reflection of their changing significance in the economy and India's process of development. Although industrial development was quite slow in the years following Independence, industrial growth rates have accelerated in recent years, exceeding agricultural growth and peaking at 11.6 percent in 1995-6. This trend is resulting in a role reversal between the industrial and agricultural sectors as regards their relative contributions to the economy. Although agriculture remains the major employer in India's economy—with about 67 percent of the Indian labor force, compared with 13 percent for industry³—the industrial sector now exceeds the agricultural sector (in rupee value) as regards its contribution to India's economy. Industrial growth will be the main contributor to future economic growth and employment generation. This trend notwithstanding, agriculture will maintain an important role in society and the economy, particularly in overall employment, poverty alleviation and in meeting the growing and increasingly diverse food needs (through productivity improvements and diversification of crop production). As the principal engine of growth for the agricultural sector, irrigation will thus remain crucial, though it will need to evolve into an efficient farmer-oriented service in order to serve agriculture effectively into the future.⁴ If India's aspirations for continued economic growth and improved social and environmental conditions are to be met, fundamental changes in how

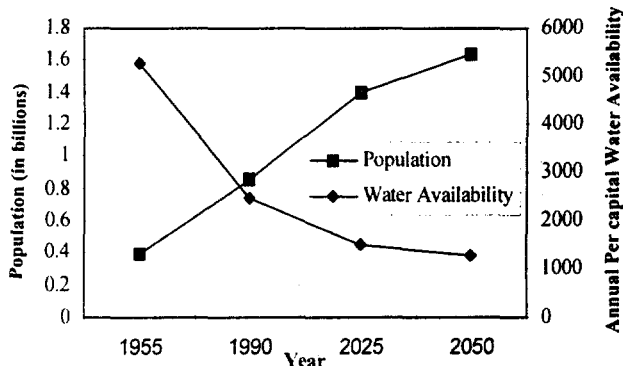
³ "India: 1997 Economic Update" (World Bank, 1997).

⁴ See India WRM Irrigation Report (World Bank, 1998e) for exposition of India's irrigation reform needs.

water is allocated, planned and managed—intersectorally and within sectors—must occur today in view of the already present water availability and quality problems.

1.6. The development of water constraints in India has been incremental, but the cumulative impact on present and future water availability is nevertheless dramatic. At Independence, population was less than 400 million and per capita water availability over 5000 cubic meters per year (m^3/yr). Today, fifty years later, population has grown to 945 million and water availability has fallen to about 2000 m^3/yr per capita (Figure 1.2). By year 2025, per capita availability is projected at only 1500 m^3/yr or thirty percent of availability levels at Independence.⁵ Such aggregate indicators, which do not reflect local

Figure 1.2. Population and Water Availability Trends in India



Sources: Population Action International, 1995; World Bank, 1997a.

conditions or seasonal variability, only partly illustrate the development of water constraints in India. While resources may be plentiful in such areas as Eastern and Northeastern India, in other areas rainfall is unreliable and/or acutely short (refer Annex 1). At basin and local levels the water availability situation is already critical—six of India's 20 major river basins have less than 1000 m^3/yr per capita,⁶ and localized shortages are endemic in all basins (Figure 1.3). By the year 2025, five more basins will become water scarce, and by 2050, according to one estimate, only the Brahmaputra, Barak, and west-flowing rivers from Tadri to Kanyakumari would be water sufficient.⁷ Exacerbating the inequalities in water resource endowments between basins and regions are the concentrated nature of human settlement and economic growth. Rapidly developing water requirements do not necessarily coincide with the natural distribution of water resources.

⁵ The water availability index does not incorporate factors which affect effective water supply, such as surface water pollution and other water quality considerations, or availability of groundwater resources. Groundwater resource availability is discussed in paras. 1.7-1.8. As regards water quality, studies have found surface water pollution in India to be linearly correlated with GDP, and the latter has increased substantially since Independence. It is, therefore, reasonable to assume that the water availability index represents an upper bound on per capita water availability.

⁶ These are: the Sabarmati; east-flowing rivers between Pennar and Kanyakumari; the Pennar; east-flowing rivers between Mahanadi and Godavari; the Cauvery; and west-flowing rivers of Kutch and Saurashtra including Luni.

⁷ See "River Basin Management: Issues and Options," Paper for Water Resources Day (Indian Water Resources Society, 1997). These water availability indices are for surface run-off only. Groundwater resources are not taken into account. Counteracting this, actual surface water availability is only about 37% of the total run-off figures used for these estimates.

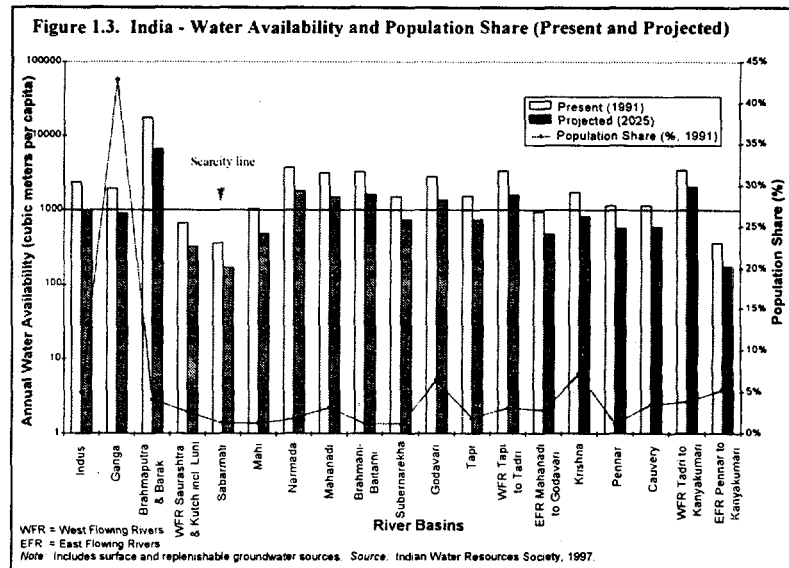
1.7. The water availability index includes surface water only, yet groundwater is an important component of water availability that factors significantly in the Indian economy. Groundwater is an important source of drinking water and food security for India's 950 million inhabitants, supplying about 80 percent of water for domestic use in rural areas and perhaps 50 percent of water for urban and industrial uses. Over the last three decades, the rapid expansion in use of

groundwater primarily for irrigation, has contributed significantly to India's agricultural and overall economic development. Groundwater irrigated area, the number of wells, and the number of energized pump sets have grown exponentially since the early 1950s. With more than 17 million energized wells nationwide, groundwater now supplies more than 50 percent of the irrigated area and, due to higher yields under groundwater irrigation, is central to a significantly higher proportion of total agricultural output. In addition, in drought years, groundwater is often the most reliable source of irrigation.

1.8. This rapid development of groundwater has had a price. In many arid and hard-rock zones, increases in overdraft areas are emerging. Blocks classified as "dark" or critical increased at a continuous rate of 5.5 percent over the period 1984–85 to 1992–93. At this pace, and without regulatory or recharge measures, over 35 percent of all blocks will become over-exploited within 20 years.

1.9. Water availability of both surface and groundwater is further reduced by problems of pollution and inappropriate waste disposal practices on water quality. There are now few states or river basins in India where water quality issues are not present. Environmental problems include water quality degradation from agro-chemicals, industrial and domestic pollution, groundwater depletion, waterlogging, soil salinization, siltation, degradation of wetlands, ecosystem impacts, and various health-related problems. Environmental and health related issues are less evident than the more visible quantity-related problems, but are critically important to social welfare and resource sustainability.

1.10. There is a unique mix of water constraints in each locality, as earlier mentioned (para. 1.6). Four broad regions in India may be classified—the Northwest, South, East and Central, and Northeast—according to the following set of common distinguishing characteristics: (i) rainfall and water availability—surface and groundwater, (ii) development and use of water resources, (iii) water quality problems emanating from development and use of water, and (iv) other quality problems (refer Boxes A1.2 (a) - (d)). This tremendous diversity implies that while a broad array

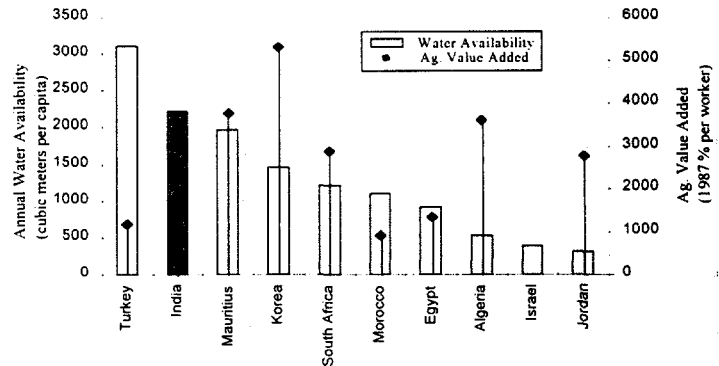


of general actions will be required for addressing current water problems throughout India, as addressed in this report,⁸ specific strategies for improving water management must be tailored to the unique needs of each region and state and, more specifically, to the basin or sub-basin concerned.

1.11. Though India is facing serious water constraints today, India is not on the whole a water scarce country. The present per capita availability of water in India of approximately 2200 m³ per annum,⁹ actually compares quite favorably with a number of other countries. As shown in Figure 1.4, per capita availability in many countries throughout the world is far less than in India. Yet, quite a number of these countries have by and large managed to harness their water resources more effectively to support intensive agriculture, to fulfill drinking water and sanitation needs of both rural and urban populations, and to satisfy the needs of industry. The handling of environmental issues, in addition, has often also been managed more successfully in other countries.

1.12. Current water resource constraints in India, in terms of both quality and quantity, can be expected to manifest themselves even more rapidly in the coming years. In the past, with lower population and development levels, there was still substantial room for each sector to satisfy its water needs and concerns independently. Now, as the gap between the availability of water resources and the demands on such resources narrows, the past approach to water management pursued in India is no longer tenable. Competition for water between urban and agricultural sectors will be a major challenge in the forthcoming century, as earlier discussed. Further, expansion in irrigation, industry, and domestic water demands will have serious implications for competing non-consumptive uses, such as hydropower and navigation.¹⁰ Provision for environmental and ecological concerns will have to be made. The weaknesses and inefficiencies in the existing institutional and operational mechanisms for allocating, reusing and reallocating water between sectors, as well as for distributing water to end users within sectors, will need to be rectified (see Figure 1.5.).

Figure 1.4. Water Availability and Ag. Value Added - Selected Countries
India uses water much less efficiently per unit of water than some other countries.



Note: Israel Ag. Value Added not available
Sources: World Resources Institute (1997) and World Bank (1998)

⁸ As well as the five specialist reports under the India WRM Sector Review exercise from which this report is prepared, namely: Intersectoral Water Allocation, Planning and Management (World Bank, 1998a); Groundwater Regulation and Management (World Bank, 1998b); Urban Water Supply and Sanitation (World Bank, 1998c); Rural Water Supply and Sanitation (World Bank, 1998d); and Irrigation (World Bank, 1998e).

⁹ World Resources Institute, 1997.

¹⁰ The actual and potential timing conflicts between hydropower and irrigation are a particularly serious problem.

C. THE COSTS OF INACTION

1.13. It is increasingly realized in India that the current approach to the country's water resources is unable to cope effectively with the existing and emerging problems. Substantial cost to the nation and to individuals, in economic, social and environmental terms, is already evident and will magnify over time. Water has tended to be developed rather than managed in India, with much less emphasis on efficient and sustainable use. While

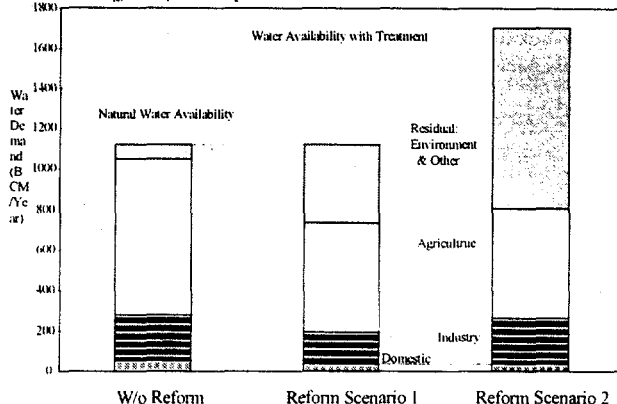
some positive examples of comprehensive approaches to water development and allocation exist in India, in most instances water decisions are still fragmentary. Comprehensive management—on a river basin basis, multi-sectorally, conjunctively for both surface and groundwater, incorporating both quality and quantity aspects of water, and fully incorporating long-term demand trends or environmental concerns—is largely lacking. Cooperation between states sharing river basins has been limited, and allocations of inter-state rivers between riparians have in some cases been highly contentious. Management of water has been through a top-down approach, and a supply-oriented approach—of exploiting additional water resources—has been used almost exclusively.

1.14. Some of the deleterious implications of the current approach include (see also Table 1.1:

- *Large foregone mutual benefits to various sectors* due to the fragmentary approach to planning and design of water projects. The absence for most basins of comprehensive river basin development plans has meant that interdependencies between projects have not been fully exploited. Benefits have, therefore, been lost from lack of basin-wide coordination, poor prioritization of expenditures on projects, and inadequate public participation.
- *High fiscal cost without achieving the objectives* - the proportion of the national and state budgets absorbed by the water sector—including debt servicing of water projects, operational deficits, and overt subsidies—represents a huge cost to the economy. Contribution of irrigation to the revenue (or current) deficits of the states ranges from 15% to 30.5% (Figure 1.6). The subsidy for irrigation alone (not including power subsidies to agriculture) was nearly 0.3 percent of GDP in 1994-95 (World Bank, 1996).
- *Exorbitant costs of future provision* (regarding both fixed and unit costs), since the easiest and least expensive water projects have already been exhausted. Already, urban areas and industry are facing high water costs in being forced to develop ever more distant sources as opposed to tapping nearby sources currently used by agriculture (see, for example, Figure 1.7 for the case of Hyderabad city). Timely completion of such water

Figure 1.5 Sectoral Water Projections to Year 2025

To safeguard even the current inadequate allocations to the environment, water use efficiency must improve, and water must be treated and reused.



Note: Own calculations based on CWC (1997) projections

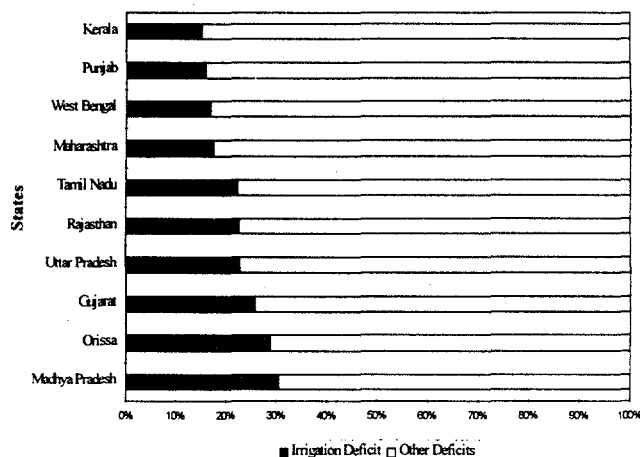
schemes cannot successfully be undertaken given growing budgetary constraints, without severe reductions in other public expenditures.

- *Closure of various income-generating water uses and activities* due to water pollution and reduction in water quantity. An example is the interference with the migration of the Hilsa fish due to construction of the Farakka Barrage, which has resulted in its virtual disappearance and had a large negative impact on the livelihood of fishermen at Patna, Allahabad and Buxor.
- *Continued high incidence of many severe water-borne diseases.* On the order of 30.5 million disability adjusted life years (DALYs)¹¹ are lost each year due to poor water quality, sanitation and hygiene (Brandon and Hommann, 1995). Water

pollution from domestic and human waste water is the most problematic source of contamination for health status; other sources are industry and agriculture pollutants.

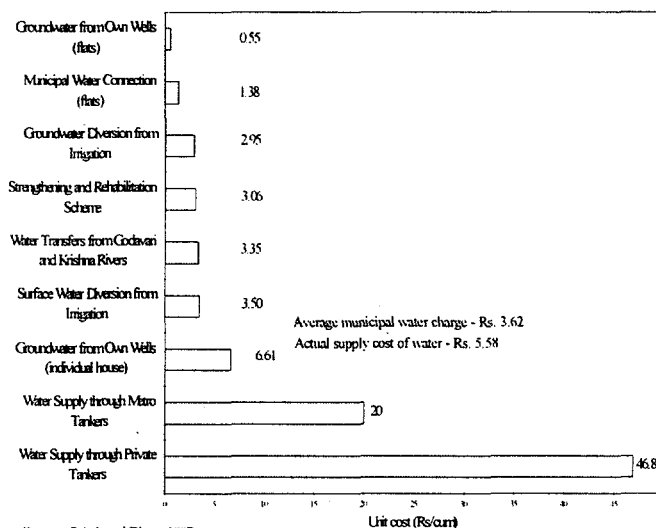
Estimates of these costs of inaction, even though partial and definitely a lower bound, are already staggering (refer Table 1.1), and will likely increase with each year of delay in implementing water sector reforms.

Figure 1.6. Share of Irrigation Deficits in Total - Selected States



Source: Mishra, 1998.

Figure 1.7. Estimated Unit Costs of Supply Augmentation Alternatives in Hyderabad, 1996



Source: Saloth and Dinar, 1997.

¹¹ The DALY indicator aggregates morbidity and mortality estimates into a single health impact measure. For further discussion, refer World Development Report 1993, pp. 26-27, as cited in Brandon and Hommann (1995).

D. THE CRITICAL CHALLENGES

1.15. The two critical challenges for India today are the need to:

(i) *improve resource allocation and management of water*, including attention to environmental considerations and integrated treatment of water on a river basin basis, to enable mutually-beneficial resolutions of competing demands, whether inter-sectoral or inter-state; and

(ii) *improve service delivery in the water sub-sectors* (i.e., irrigation, urban water & sanitation–UWSS, and rural water supply & sanitation–RWSS) to enable efficient, equitable and client-oriented provision of reliable and safe water at affordable prices to users and viable costs to providers.

1.16. An *enhanced management and demand-oriented focus is required*. To meet both these challenges, India will have to implement a shift from development (i.e., additional extraction activities) to management of water resources, or from supply-oriented to demand-oriented approaches. The combination of challenges

now emerging necessitates a broad-based approach to water management, which needs to focus on the inter-linked hydrologic and use systems as a whole rather than primarily on supply-side aspects (refer Figure 1.8). To date, most responses to water scarcity or intersectoral competition have generated supply-side solutions such as rationing or reallocation of water by expropriation. Management responses to groundwater overdraft, for instance, have focused on groundwater recharge and attempts to regulate extraction. Although recharge activities are important and should be enhanced, they represent an extremely limited aspect in a much broader array of potential interventions. On the supply side, conjunctive “management” or augmentation approaches involving the operation of surface systems can improve the availability of both ground and surface water.

1.17. *Enhanced management focus and additional development needs should be balanced*. Improvements in irrigation efficiency, encouragement of municipal and industrial water conservation, efficiency improvements and reuse, and introduction of value-based allocation and

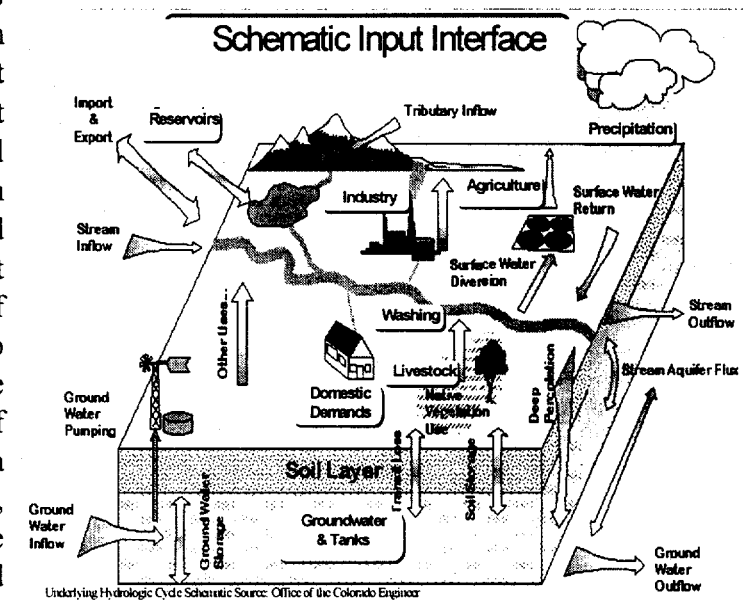
<i>Problem</i>	<i>Impact</i>	<i>Average Cost</i>	<i>As % of GDP</i>
Water pollution (health impacts)	Urban and rural health impacts (esp. diarrheal diseases)	US\$ 6.6 billion (1991-92)	3%
Soil degradation	Loss of agricultural output	US\$ 1.9 billion (1991-92)	1%
Fiscal costs (revenue deficit)	Poor quality service, poor water-use efficiency	US\$0.7 billion (1994-95)	0.3%
Fiscal costs (power subsidy to agriculture)	Unsustainable groundwater use	US\$4.1 billion (1994-95)	1.5%
Water pollution (production impacts); Other	Higher incremental costs for clean water supply; Unsustainable water use	Not estimated	Not estimated
Total Avg. Cost		US\$15.9 billion¹	4.8%²

Notes: ¹ 1991-92 figures in first two rows were converted to 1994-95 prices using the India GDP deflator (World Bank, 1997), and added to the 1994-95 figures in rows 3 & 4.
² All the figures in the column were added to give a ballpark lower bound, abstracting from likely changes in % shares between 1991-92 and 1994-95.
Sources: Brandon and Hommann, 1995; World Bank, 1996.

reallocation mechanisms between sectors and states, need to be central objectives of the new approach. The emphasis on management needs does not, however, imply that surface and groundwater resources in India are fully developed. Additional development and extraction in certain regions or locations, could still be supported. However even in these localities, the inclusion of significant development activities must now be balanced by enhanced management mechanisms to establish a sustainable utilization of surface and groundwater resources (refer Box 1.1).

1.18. *Water should be treated as both a social and economic good.* In addition to the enhanced management focus, there will also have to be a shift from viewing water as a fully social resource to accepting it as an economic good. There will thus need to be greater use of market mechanisms and participation of private sector actors, in order to achieve a more efficient and effective allocation, use and management of water. The nature of water as both a public as well as private good, however, precludes the exclusive application of market-based mechanisms to the development, use and management of water.

Figure 1.8. The Hydrologic and Use Cycle



1.19. *There is a need to clarify appropriate roles for the public and private sectors.* Activities in the sector will need to be divided between the public and private sectors. While the private sector should increasingly take over many of the responsibilities or activities currently handled by the government, the government will need to retain responsibility for certain activities to ensure that social and environmental considerations are properly incorporated in sector investments, operations, transactions and management. The presence of certain characteristics interrelate to determine whether a water sector activity should appropriately be transferred to the private sector or retained by government. The private sector will be discouraged from participating, if the investment or initial costs of doing so are high, or if transaction costs (such as the costs of collecting water bills from individual households) are high. In such cases the government would need to step in. In situations in which significant spillover advantages or disadvantages exist from engaging in an activity, or in which the activity is critical for livelihoods or other social objectives, the private sector will not be as effective as the public sector in addressing these concerns.

1.20. In general, provision of network facilities (especially primary level networks), investment planning, and monitoring and regulatory activities, are largely public goods and hence should be handled by the government. Other activities such as generation and maintenance of

services from the networks can be subject to a degree of competitive market forces by inclusion of the private sector through investment or management contracts (refer Annex 2 Table A2.1, which characterizes various water activities according to the factors mentioned above in para. 1.19, and Annex 2 Table A2.2, which indicates the degree to which various activities can be subjected to market forces). Box 1.1 provides a concrete example of private-public division of responsibilities in groundwater development and management.

1.21. *Decentralization of operations will be critical.* Achieving sustainable use and management of water in India will further require a shift from the traditional top-down, centralized approach towards a more decentralized and participatory approach. While government has an important role to play, it is only one among many stakeholders involved. These stakeholders include every household in India as a consumer of water, all of India's farms, commercial entities and industries, and larger community aggregates such as water users associations, villages, associations of industries, etc. Even within government, the state or central level institutions are only at the apex of an array of more local institutions: panchayats, block and district administrations, municipalities, etc. The more central government agencies, both at state and central levels, are not the directly concerned stakeholders. They are not directly accountable, are too far from the action to be effective at grass-roots levels, and do not have the staff or financial capacity to be deeply involved at micro levels.

1.22. *Sector stakeholders will need to be fully engaged in sector activities.* All stakeholders, including local level administrations, water user groups, and grass-roots organizations should be involved maximally in decision-making and implementation. Government has, to date, held almost exclusive responsibility for all decision-making, investment and management in the water sector. As a result, civil society institutions in the water sector are weakly developed or non-existent. Local government administrations, such as the relatively recently activated panchayat (village level) institutions, are also still fragile and require progressive strengthening. Fostering such formal or informal institutions is a matter of urgency and will require energetic actions by government, including capacity building, transparency of information and public awareness.

Box 1.1. Groundwater Resource Management: Considerations in Defining Public and Private Sector Roles

For groundwater, although facilitated by the provision of institutional credit and subsidized energy supplies, most development has been accomplished successfully through the private investment of millions of farmers (MOWR, 1996). While continued availability of credit may be important, particularly for poor farmers who need to replace or upgrade existing wells, groundwater development by private farmers will likely continue in most regions regardless of government intervention. In contrast, direct government involvement through the development of public tubewells, has been costly yet achieved little success, and currently contributes a very minor fraction of the total area irrigated with groundwater. Large-scale direct government support for groundwater development is largely unnecessary today.

Despite its continued prominence in groundwater development, private sector initiatives are unlikely to address the many management needs due to inability of private individuals who spend their own money on management activities, to exclude others from the benefits emanating thereof. Yet the consequences of inaction are severe. Seasonal fluctuations in the water table due to pumping are affecting the productivity of shallow wells, which are an important source of rural drinking water. In addition, pollution or deterioration in water quality is reducing potable water availability in ways that are far less reversible than overdraft. Non-point-source pollution from agriculture and other sources combined with point-source pollution represents a major challenge for groundwater management (MOWR, 1996). The impact of inaction on the poor, the environment and non-agricultural users can be major even where overdraft or waterlogging are absent. Protection of drinking water sources, pollution control, groundwater recharge, and environmental concerns are the main groundwater management needs. Given the substantial externalities emanating from addressing these concerns, private individuals will not act alone, and the high cost of cooperation hinders community solutions without external leadership and facilitation. This will appropriately have to come primarily from the government in partnership with NGOs.

1.23. Both issue areas—resource allocation and management, and service delivery in the sub-sectors—require addressing water quality and environmental considerations, in addition to water quantity. In addressing these issues, comprehensive approaches are required, recognizing river basins as hydrological units and the integral nature of surface and groundwater resources. Solutions also need to be found within the realities of India's administrative structures: state boundaries that do not match river basin boundaries, and even within states, the very location-specific nature of water allocation issues requiring grass-roots participation for their effectiveness. Much can be learned from already existing examples of successes and inadequacies both from within India and in other countries.

1.24. Given that the central need is to introduce comprehensive measures to handle water resources issues in India, the report will assess the needs and options in terms of the following intervention areas: (i) policy, legislative and regulatory framework, (ii) institutional culture and mechanisms; (iii) economic and financial incentives; and (iv) the supporting data, technological and information systems. **Chapter II** assesses the existing framework and mechanisms for resources allocation and management. **Chapter III** focuses on service delivery in the water sub-sectors—irrigation, UWSS and RWSS. In **Chapter IV**, based on the preceding analysis, a reform agenda and action plan is proposed to establish an enabling environment and a process for change to build upon existing positive initiatives and strengthen management capabilities and processes, and restore service delivery capabilities to quality levels.

Chapter II. Resource Allocation and Management¹²

2.1. Current approaches in India are still primarily geared to the development of water resources and construction of new infrastructure. In addition, development of water is highly fragmentary, with separate planning and implementation for surface water projects, groundwater development programs, and the various water-using sectors (irrigation, rural water supply/sanitation, urban water supply/sanitation, power, etc.). Coordination mechanisms are either weak or non-existent. Given the increasing scarcity and deteriorating quality of water in most basins and many localities today, there is a need to shift the emphasis from development to management of water resources, and from fragmentary to integrated planning, allocation and management of water, to ensure sustainable use of water and protect its quality into the future. This will entail an assessment of the appropriateness of (i) the policy, legislative and regulatory framework, (ii) institutional arrangements and mechanisms, including institutional culture; (iii) economic and financial incentives and mechanisms; and (iv) the supporting data, technological and information systems. Each of these will be assessed in turn below.

A. POLICY, LEGISLATIVE AND REGULATORY FRAMEWORK

2.2. *Overall Water Policies.* The central government plays an important role in establishing the overall framework and guidelines for state-level operations in the sector, and has made attempts at promoting better water allocation, planning and management. The most recent comprehensive Government of India (GOI) statement on water is the National Water Policy (NWP),¹³ adopted by the National Water Resources Council in 1987, which calls for: a holistic and integrated basin-oriented approach to water development, the promotion of conjunctive use of surface and groundwater, and water-conserving crop patterns as well as irrigation and production technologies. It also defines priorities for different uses, including drinking water as first priority, discusses various environmental issues, proposes participation of beneficiaries in water management, alludes to water as a social and economic good, and proposes water price increases to cover the costs of operation and maintenance in addition to a portion of capital

¹² The discussion in this chapter is based on two of the specialist reports under the India WRM sector review—the Intersectoral Allocation, Planning and Management Report, and the Groundwater Regulation and Management Report (World Bank, 1998 a & b, respectively). The Executive Summaries of these reports are reproduced at Annex 3.

¹³ Other policy statements have a bearing on specific issue areas. For instance, on environmental issues, relevant policies are: the Policy Statement for Abatement and Pollution (GOI, 1992a), the National Conservation Strategy and Policy Statement on Environment and Development (GOI, 1992b); and the National Forest Policy (GOI, 1988). The Policy Statement for Abatement of Pollution—which emphasizes pollution prevention in place of the conventional “end-of-pipe treatment” of effluents and also identifies the adoption of best available and practicable technologies as the key element for pollution prevention—is the most significant of the three. Policy directions are also contained in the Five Year Plans, Finance Commission Reports, policy statements on the agriculture sector, and other government statements.

investment costs.¹⁴ More recently, the New Economic Policy of 1991 and subsequent policy statements relating to liberalization of the economy, market-based approaches to economic management, privatization of urban water¹⁵ and decentralization of irrigation management have established a broader and more economically-oriented environment for water policy debate.

2.3. The primary concern over the NWP and the other policy statements, however, is that they have not been translated into action. They are not supported by institutional structures and mechanisms, enabling legislation, nor by supporting economic incentive structures. In some cases, the policies are actually contradicted by existing water laws. More important, the national policy is neither reflected in corresponding and state-specific water policies,¹⁶ nor in basin-level policies and action plans. In the majority of situations in India, the enabling framework for implementing sound water allocation, planning and management of surface and groundwater multisectorally and on a river basin basis is largely absent.

2.4. A secondary concern is that while the NWP and other policy statements are broadly in the right direction, they require review and updating to bring them in line with the current status of water resource development and the further evolution of water sector thinking in India and internationally.¹⁷ There are several conceptual issues where improvement is desirable. Generally, there is an over-emphasis on administrative mechanisms for water allocation, to the neglect of price-based or compensatory mechanisms. This approach relies on a fixed set of allocation priorities (particularly for allocation of water between sectors), which lack the flexibility to enable administrators to respond to changing social, economic, environmental or resource conditions. Subsidy-based approaches to water provision are advocated in the NWP, in part contradicting other statements on cost recovery and substantially deviating from more recent thinking under the New Economic Policy. Provisions for environmental issues also need updating in the NWP.

2.5. ***Legislative and Regulatory Framework.*** The existing Constitutional provisions and water legislation in India, furthermore, do not provide an appropriate framework with which to tackle water sharing issues between states, between sectors and between individuals. This is a critical deficiency because it hampers efficient and sustainable use of basin waters in a framework of equitable access to water. In the present set-up: (i) primary powers are vested at state levels which do not correspond to river basin boundaries; (ii) surface water rights are not clearly defined and are not secure and such rights cannot be commercially transferred; (iii) groundwater rights are purely private, thereby ignoring externalities, and such rights cannot be transferred independent of land; and (iv) environmental laws have not been comprehensively operationalized and regulatory standards are either not enforced or do not exist.

¹⁴ The water pricing issue was further assessed in detail and the policy validated by the Committee on Pricing of Irrigation Water (GOI, 1992c).

¹⁵ For instance, The India Infrastructure Report of the Expert Group on Commercialization of Infrastructure Projects, a.k.a. "The Rakesh Mohan Report," GOI (1997).

¹⁶ While most states still do not have state water policies, this situation is changing. For instance, Tamil Nadu (in 1994) and Orissa states (in 1995) have formally issued State Water Policies and Rajasthan is in the process of finalizing a State Water Policy. Andhra Pradesh has issued an Irrigation Sector Policy (1998), also discussing water resources management issues.

¹⁷ Refer, for instance, to "Water Resources Management", World Bank Policy Paper (World Bank, 1993).

2.6. Under Indian statutory law, as interpreted and applied by the courts, all surface water is public property, whether it is natural flow in a river or storage behind a dam or natural lake. In other words, the Indian government has the right to regulate, develop and administer surface water, and riparian claims to the use of such water are subordinate to this right. In the *de facto* interpretation of Constitutional responsibilities, the power of the states has emerged as pre-eminent. Thus, notwithstanding the powers conferred on the central government in Entry 56 of the Constitution, water has come to be perceived and treated largely as a “State Subject” per Entry 17.¹⁸ This has serious ramifications for inter-state water development and allocation. Surface water needs to be managed on a river basin basis. The fragmentation of basins by state boundaries, the unclear definition of actual water rights of the states, and the lack of cooperation between them is a critical issue. Indian politicians and legislators implicitly understand that inter-state waters need to be shared and that other riparians have rights. Nonetheless, each state interest argues for as large a share as possible, without legal clarity on what these shares mean.

2.7. Individual usufructary rights for surface water are also unclear, as the legislation has failed to devise a structured system and process for providing secure, defensible and enforceable surface water use rights. Riparian rights, where a person abutting upon a stream can use water without disturbing a similar benefit to other riparians, have been accepted by the Indian courts as natural rights.^{19,20} However, individualized rights of abstraction and use of such water can only be established through expensive and time-consuming litigation in the courts. Consequently, the right to abstract water from natural rivers and streams is left in a legal limbo at best, and to an adversarial-style process of claiming such rights at worst. Not only does the legal uncertainty surrounding water rights openly invite conflict, but it also creates imbalances in water development, stifles private sector investment in water projects, and seriously constrains the allocation and reallocation of water across sectors.

2.8. These problems are compounded by the legal question of whether original government-granted assurances of water allocation can be withdrawn in favor of new uses (e.g., diverting water originally committed for agriculture to domestic, industry or other uses) or whether reallocation would amount to a violation of an established riparian right that requires compensation. States’ sovereign and absolute rights over surface water have in the past been challenged in court by riparian landowners who claimed their rights had been infringed upon by

¹⁸ The responsibilities apportioned to the states and the Union by the Constitution fall into three categories as listed in Schedule VII: The Union List (List I), the State List (List II), and the Concurrent List (List III). Water is mentioned in both List I and List II as follows: List I (Union List), Entry 56—“Regulation and Development of interstate rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by Law to be expedient in the Public Interest;” and List II (State List), Entry 17—“Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to provisions of Entry 56 of List I.”

¹⁹ Notably, this form of water rights system is recognized only in the case of natural streams, but does not apply to waters flowing in irrigation canals or stored in man-made reservoirs (in which case water can be drawn only with a government-issued permit).

²⁰ There are also difficult questions concerning how rights are claimed. Riparian rights based on geographic principles alone neglect the legitimate claims of those located away from the water body. While these issues fall in a gray area and is yet to be tested by the courts of law, it is likely to increasingly appear in the future given changing water-use priorities.

the government in pursuit of its irrigation projects. Nothing prevents the courts from entertaining such litigation in the future and possibly making the legal question less clear.²¹ Unless surface water rights are better clarified, conflict or litigation will be increasingly common in the future.

2.9. *Groundwater legislation and regulation.* The legal and absolute right to groundwater rests with the owner of the overlying land, irrespective of the social and environmental consequences.²² All groundwater captured from beneath private property is, therefore, fully under the control of the landowner to extract and use as he or she sees fit. An associated issue is that even where private ownership of groundwater is clearly defined, transferability of ownership independent of land is not. Tying water rights to land rights has implications for access to groundwater and distribution of benefits from water use, and also constrains the potential for inter-sectoral allocation. This system has led to *de facto* rights at the field level where, due to the physical and hydrogeological characteristics of groundwater as a common-property resource, larger farmers with higher pumping capacity and deeper tubewells have a disproportionate claim over the resource than others.

2.10. In contrast with surface water, the regulation of groundwater extraction suffers from a major gap in enabling legislation and regulatory mechanisms.²³ An indirect attempt at groundwater regulation is made through the access rules applied by the National Bank for Agricultural and Rural Development when providing credit for investments in wells and pumpsets, or by the state electricity boards when granting power connections to pumpsets (though these are oftentimes bypassed).²⁴ Credit applications and requests for power connections to pumpsets are assessed against the degree of development of the aquifer (i.e., whether “over-exploited”, “dark”, “gray” or “white” as classified by the state groundwater authorities) and are also governed by rules for minimum spacing between wells. There are no controls on well-spacing and abstraction where investment and operation of wells are privately funded. Ineffective regulation of groundwater has resulted in excessive withdrawals in many areas, spelling disaster for the sustainability of groundwater stocks and water supply.²⁵ Apart from their inability to control resource depletion and ecological degradation except in the limited cases where bank funding is requested, the policies are also inequitable as they restrict the new entrants

²¹ For example, both the Madras High Court in 1936 and the Bombay High Court in 1979 have established that the Government’s sovereign rights do not amount to absolute rights.

²² Groundwater is considered an easement connected to land under land tenure laws and the ‘dominant heritage’ principle implicit in the Transfer Property Act IV of 1882 and the Land Acquisition Act of 1894. Under the riparian law applicable in India, ownership of groundwater accrues to the owner of the land above and its use and disposition are governed by the tenancy laws. By virtue of these laws, groundwater is “attached like chattel” to land property and cannot be transferred separately from the land to which it is attached (Singh, 1992).

²³ Apart from a limited Act for the Chennai metropolitan area and, a Bill in Gujarat and one passed recently by Maharashtra for protecting rural water supply, none of the states in India have groundwater Acts.

²⁴ Dhawan, 1989, pp. 44-45.

²⁵ Prompted by equity and ecological concerns a few Indian state legislatures have passed legislation seeking to regulate groundwater extraction and use. The sparse legislation which exists, however, tends to be limited in its scope of application. For instance, legislation in Maharashtra focuses only on protection of the sources of drinking water supplies. Legislation has also consistently failed to address the issue of groundwater extraction rights, favoring instead regulation of the depth of the wells, as with Gujarat’s legislation regulating tubewell construction. In West Bengal, regulation of power connections to pumping equipment has been introduced and effectively implemented since 1993 as a result of administrative initiative and practice.

who are mostly resource-poor farmers and more importantly, offer no protection to the poor farmers relying on traditional water-lifting technologies.²⁶

2.11. The Central Ground Water Board (CGWB) has prepared a model legislation for groundwater regulation. Several versions of the proposed legislation have been circulated to state governments, and the latest version is currently under revision. The current version focuses on regulation and addresses management as well as overdraft regulation. Earlier versions advocated establishing a centrally controlled, technically dominated Groundwater Authority in each state. These versions contained no provisions for ensuring the effective participation of local populations in management or regulation. Regulatory or management approaches based primarily on powers vested in state or central government entities face strong opposition at local levels, in academic circles, and in many field and research NGOs.²⁷ It is, furthermore, far from clear how implementation could occur. The recent order issued by the Supreme Court establishing the CGWB as a central Ground Water Authority provides an important opportunity for developing and passing effective legislation and corresponding regulatory and management mechanisms at the central and state levels. However, the development of effective management systems will require a practical, grass-roots approach. There are no simple solutions. Development will require an energetic and adaptive process that enables piloting and the evolution of management capacity at all levels from the central government to the local levels and the individual user.

2.12. *Environmental Legislation and Regulation.* Despite a number of standards broadly in line with international practice that have been provided for regulating water quality,²⁸ environmental protection laws and regulations that exist are either inadequate or are not effectively enforced. For instance, as is discussed in para. 2.33, the permitted levels of fines or polluter fees for industry in existing legislation are usually so small as to have no impact. The laws²⁹ are insufficiently used by the states for protection of water resources, due to inadequate

²⁶ Dhawan, 1990, p. 45; Moench, 1992, p. A172.

²⁷ Academic and NGO representatives attending the workshop sponsored by the Government of India and the World Bank on Ground Water Regulation and Management (February 17-18, 1997, New Delhi) strongly criticized the proposed legal frameworks emphasizing governmental regulation as opposed to more participatory strategies.

²⁸ Environmental laws and regulations are specified under guidelines of the Central Pollution Control Board (CPCB), the Bureau of Indian Standards (BIS), the 1986 Environmental Protection Act (EPA). The CPCB defines water quality requirements for five different categories of inland/fresh waters and these are largely being followed by the States. The BIS (formerly the Indian Standards Institution) established drinking water quality standards in 1983, and World Health Organization guidelines are utilized for parameters not covered by the ISI standards' list. Under the 1986 EPA, effluent standards with respect to more than 60 categories of industries were developed. EPA standards are to be achieved within a period of one year from the date of their notification: if a particular SPCB desires, it may reduce the time limit and also specify more stringent standards within their jurisdiction; the board cannot relax either the time limit or the standards. Hazardous Waste Rules were issued in 1989, providing important tools for the management of hazardous substances and, consequently, the prevention of surface and groundwater contamination. Another regulatory change mandated after 1992-93 requires firms to conduct annual environmental audits and submit their findings to their respective SPCB. Also, industries and other polluters not meeting environmental standards are required to develop a remedial program within a specific time or close down.

²⁹ These include: (i) the 1974 Water Prevention and Control of Pollution Act (and its 1978 and 1988 Amendments), which establish water quality and effluent standards and the requirement that polluting industries

monitoring and enforcement. These laws are becoming outdated and require adaptation to address the changing circumstances and rapidly deteriorating environmental conditions that have emerged in recent years. The need is to better apply these regulations, requiring more complete measurement and monitoring systems and capacity to enforce compliance.

2.13. An encouraging development has come under the 1994 Environmental Impact Assessment Notification. Under this regulation an Environmental Impact Assessment has been made mandatory for 29 categories of development activities involving investments of Rs. 500 million and above. The list includes various industrial and mining enterprises, river valley projects (hydropower, major irrigation, flood control), ports, harbors, airports, highway and tourism projects. The environmental clearance is given by the Ministry of Environment and Forests. Application of this recent initiative is progressively increasing awareness among State and Central government development planners and increasing awareness of environmental issues at implementation levels. It has had some effect on screening out projects with serious environmental problems and for many others has enabled design modifications better catering to environmental issues, or mitigation measures to reduce negative environmental impact.

B. INSTITUTIONAL ARRANGEMENTS AND MECHANISMS

2.14. The present institutional arrangements in India, including central, state, and local institutions, and both formal and informal structures, do not enable comprehensive water allocation, planning and management. The main problems that exist are: (i) inadequacies in necessary institutions for comprehensive water allocation, planning and management, particularly at state and basin levels where they are frequently absent; (ii) lack of coordination between institutions, duplication of responsibility and accountability gaps; (iii) inadequate fostering of grass-roots institutions; and (iv) lack of involvement of civil society—local communities, NGOs, the private sector and academia.

State Level Institutions

2.15. Although the constitutional division of power between the center and the states virtually places development and management of water under state-level jurisdiction,³⁰ effective state-level institutions governing multi-sectoral water use and allocation are, in most states,

must seek permission from the SPCB to discharge waste into water bodies; (ii) the 1977 Water Cess Act (amended in 1995) which allows a cess (fee) to be levied on water consumed by industries and local authorities; and (iii) the 1986 Environment Protection Act which authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources, authorizes government to prohibit or restrict the siting and/or operation of an industrial facility on environmental grounds (including the closure of any firm that violates the Act's restrictions regarding effluent discharge), and permits individuals to initiate legal action against anyone violating it. Three other environmental laws that include provisions to reduce environmental problems in the water sector are: (i) the 1991 Public Liability Insurance Act, (ii) the 1980 Forest (Conservation) Act; and (iii) the 1995 National Environment Tribunal Act. (This last has created a tribunal with power to award compensation for damages to persons, property, and the environment arising out of any activity involving hazardous substances.)

³⁰ Subject to limitations imposed under Entry 56 of List I of the Constitution (refer footnote 16).

conspicuous by their absence. With few exceptions,³¹ there are no formal institutional mechanisms that consider the different sectoral demands and that plan and manage water between them. Only a few attempts have been made to create river basin organizations to manage water comprehensively along river basin lines, including for rivers fully within the state boundaries where issues of inter-state sharing do not arise. Another problem is the frequently found fragmentation of responsibilities for water sector issues across different departments. Groundwater is frequently handled by another department (e.g., in Bihar, Kerala, Rajasthan, Uttar Pradesh, and formerly in Orissa). Major, medium and minor irrigation are also often split across departments (e.g., in Andhra Pradesh, Bihar, Maharashtra and Uttar Pradesh). Water quantity, water quality and other environmental issues are usually handled separately and by different departments, such as by environment, health and forestry departments, the state pollution control board or other agencies. In nearly all states, urban water supply and sanitation, rural water supply and sanitation, and irrigation are handled in separate agencies, without effective mechanisms to assure cross-coordination on water issues.

2.16. Because irrigation is the largest user of water, state irrigation departments have been responsible for construction, maintenance and management of water resource development schemes, and with responsibility for making water available from these schemes to other sectoral needs when requested. Responsibility to deliver water to other sectors, however, is not undertaken within an integrated water resources management framework. Integrated water resources management is seldom explicitly recognized or prioritized as a core function either in the irrigation departments or in any other state agency. The very limited attention to water planning and management has been further exacerbated by a strong orientation towards civil works construction, even within irrigation. In the case of Tamil Nadu, the laudable recent step to create a specialist Water Resources Organization was, for instance, only carried out in 1994.³² The other specialist government departments (for RWSS, UWSS, power, etc.) also have not been given a mandate for multi-sectoral water planning. The combined result is that, while irrigation departments (and other specialist government departments) have all tried to consider water in a broader context, they have seldom fully succeeded because of the "institutional gap" as regards specific institutions and mechanisms for handling inter-sectoral issues. An obvious outcome of this arrangement is that irrigation demands have received priority over water requirements in other sectors.

³¹ Recognizing the need for tackling such inadequacies, a number of states are taking measures to improve inter-sectoral coordination of water issues. Under their World Bank-assisted Water Resources Consolidation Projects (WRCPs), Tamil Nadu and Orissa states have created a State Water Resources Council (Tamil Nadu) and a State Water Resources Board (Orissa), chaired by a senior neutral party (respectively, the Chief Minister and the Chief Secretary). These are permanent committees with membership from all key government departments with interest in water. For each, a technical secretariat has also been created to act as convenor of meetings and to provide the professional staff inputs on a multi-sectoral basis for preparing river basin plans and examining inter-sectoral water issues, including environmental issues. Maharashtra has established a Water Resources Authority, Punjab is proposing to establish a Water Resources Council, and considerations are under way in Rajasthan.

³² This was a result of the Institutional Study carried out by government of Tamil Nadu as part of its preparation exercise for the World Bank assisted Tamil Nadu Water Resources Consolidation Project (WRCP).

Local Level Institutions, Civil Society and the Private Sector

2.17. At the local levels within the states, there is a similar lack of institutions for water management and conflict resolution purposes. These institutions would need to be at each administrative level and at grass-roots levels, with both linked to the relevant state basin level units. Many water management issues have their origin and their solution at very local levels if community members deliberate together and take pragmatic action. For example, a farmers' Water Users Association (WUA) in Tambaraparani Basin, Tamil Nadu has expressed concern about the additional extractions of water and the pollution resulting from new industrial development. The WUA has been encouraged to take steps to form a cross-sectoral stakeholders association, including industrial representatives and the local government apparatus. Initiatives should also be undertaken to encourage the participation of women and other minorities who have been overlooked in the past. In particular, women are larger stakeholders in water than men as they are the primary fetchers of water and users of water for household purposes, are most directly concerned with sanitation, pollution and health issues, and have a significant role in agricultural production.³³

2.18. In even more frequent cases, particularly in rural areas, problems and solutions are at micro-level: the village or the Panchayat. For example, a village has in its power the ability to make decisions about protection of local ponds or other water bodies from pollution resulting from human and animal waste. Similarly, excessive extraction of groundwater by a few farmers, resulting in drying up of rural drinking water wells can also be controlled, as can pollution from local small industries. Traditional village institutional structures for managing water (especially for tanks, ponds, wells, and minor irrigation schemes) have been a part of India's history. Many of these, however, have eroded over time, partly as a result of the increased involvement of government in managing water schemes during this century, and also due to their benign neglect by the government. Such informal or formal water user groupings now need to be fostered again, and incorporated into an emerging public-private institutional structure.

2.19. Two developments provide major opportunity. The first is the decentralization movement in India and, in particular, the options available under the 73rd and 74th Constitutional Amendment Acts of 1992 to establish or revive local government structures at district, block, and municipal levels. These Acts support reforms in local governments and promote the development of local-level participation, primarily through: (i) shifting administrative functions to the local-level by giving more decision-making authority to Panchayats (village government) in rural areas and Nagar Palikas in urban areas; (ii) promoting fiscal decentralization by increasing the percentage of state resources reaching local institutions; and (iii) creating a planning system for villages and municipalities and entrusting implementation to the Panchayat Raj and urban local level institutions. While creation of such bodies under these Acts is still in its infancy, potential is available for specifically adding responsibilities and powers (legal and financial) for managing water. This may need specific water committees within the Panchayat institutions to carry out these functions.

³³ In water scarce areas, such as in Rajasthan, women travel as far as 2 km. to collect water. Also, by some estimates, women spend as much as 60 percent of their time on agricultural production activities in the field.

2.20. The second is the potential of water users associations (WUAs) in irrigation to play an expanded role in water resource allocation and management. India is now ready for a breakthrough in this regard. In states such as Andhra Pradesh and the states implementing Bank-assisted water resources consolidation projects (WRCs), major programs are underway to help establish WUAs in association with improvement of the irrigation systems. The vision of WUAs fully managing the lower-level irrigation systems and subsequently to be federated into higher level committees for participatory management of whole commands, could be extended to enable WUAs to participate in river basin management along with other stakeholder groups. The new GOI-World Bank strategy for irrigation management³⁴ emphasizes establishing WUAs on an India-wide basis, presenting obvious opportunity for their further adaptation to include other stakeholders and handle water resource allocation and management issues more broadly.

2.21. Finally, the potential contribution of civil society and the private sector has been greatly neglected. A substantial reason for their limited involvement to date is the limited efforts of government agencies to inform the public on water sector issues. In particular, outreach to women has been neglected, yet women are the most interested and involved in rural water supply, domestic urban water consumption, health and sanitation issues, and are at least equally concerned as men in agricultural production. More generally, the public at large has not been comprehensively informed about water sector issues. In order to foster an environment for change, including on difficult policy decisions, such as water pricing, and to encourage public involvement in water management, there should be an "awakening" to water issues of common concern. Information and dialogue must also be a multi-directional flow; not only from government to civil society, but also from civil society to government and between different sectoral users within civil society and government.³⁵

2.22. By their nature, decisions on water allocation, planning and management directly impact on communities and individuals. No recommendations will be successful without the acceptance of the populace. Additionally, a reservoir of talent exists in the academic community, the private sector, NGOs, and local communities that can play a role in organizing stakeholder groups. For instance, many universities have capabilities in basin modeling, hydrology and other related technical and economic subjects that could assist river basin entities in better planning, allocation and management. If given the opportunity, NGOs and the academic community would likely step forward and could play an important role in motivating and organizing stakeholder groups. The size of the reservoir of academic, NGO and private sector communities that can readily step in to organize stakeholders varies from one state to the next, however, while the needs for organizing stakeholders is much greater than this relatively small reservoir of talent. It should thus be kept in mind that development of such talent through training programs and capacity building will also need to be a part of the reform program.

³⁴ "India: Water Resources Management Sector Review, Irrigation Report" (World Bank, 1998e).

³⁵ The term "awakening" was specifically suggested in the GOI-World Bank National Workshop on Intersectoral Water Allocation, Planning and Management (Musoorie, May 12-13, 1998) to reflect the major changes required in the area of public awareness and participation.

Inter-State Institutions

2.23. Inter-state institutions for allocation, planning and management of water resources in basins crossing state boundaries are even rarer in India than state level institutions. Yet the catchment areas of all of India's major river basins are inter-state, making the resolution of inter-state water allocation issues of critical importance. While there are some inter-state river basin organizations³⁶ in India,³⁷ the more general case is an absence of institutions for integrating river basin development and management across states. One existing mechanism in India for promoting institutional cooperation between states is the River Boards Act of 1956, which enables the central government to set up a River Board, on request received from a state government or otherwise notified in the official Gazette. This mechanism, however, has never been used, suggesting that changes are required to make it more effective. The present Act requires the prior consultation with the states concerned before setting up a River Board. Such Boards are conceived to have mainly an advisory role and are therefore inherently ineffective. As the River Boards Act comes under the "Union List" of the Constitution (List I, entry 56), the Constitutional powers are already present for amendment of the Act to provide greater capacity for the center to intervene where greater state cooperation would clearly be in the public interest.

2.24. A second existing mechanism is the Tribunal Award system (established by the Inter-State Water Disputes Act of 1956 under Article 262 of the Constitution³⁸). The Tribunal system has been the primary mechanism used for resolving inter-state water disputes, and five tribunals have been established thus far.³⁹ Decisions in the first three tribunals, which include the awarding of specified quantities of water based on the principal of equitable apportionment, were accepted by the states involved. Although better than nothing at all, and arguably as good as many other legal mechanisms for resolving disputes found in other countries, India's Tribunal Award system is acknowledged to have a number of deficiencies. First, it can take years before a water issue ripens into a fully blown dispute that prompts the concerned states to even consider seeking a Tribunal adjudication. Second, once a Tribunal is constituted, the decision-making process is extremely lengthy and time-consuming: it takes an average of 15 years to finalize the award, which is then subject to a probationary period prior to review and finalization of the

³⁶ It should be noted that the term "River Basin Organization" as used in this report, is a generic term, referring to any form of institution or institutional coordination mechanism which facilitates inter-sectoral water allocation, planning and/or management on a river basin—whether intra-state or inter-state—basis. This is in contrast to past usage of the term "RBO" in India, which has tended to refer to more formalized types of RBOs and to inter-state RBOs.

³⁷ Examples are: (i) the Bhakra-Beas Management Board, which successfully operates and maintains the headworks and parts of the main system providing water to Punjab, Haryana, parts of Rajasthan, and Delhi; (ii) the Ganga Flood Control Board and Ganga Flood Control Commission undertakes planning and coordination of works related to flood control across seven riparian States; (iii) the Brahmaputra Board, which is responsible for coordinated flood control across seven States; and (iv) the Upper Yamuna River Board, which is responsible for allocating available flows between Haryana, Uttar Pradesh, Rajasthan, Himachal Pradesh, and Delhi. These and other Indian examples are described in more detail in World Bank (1998a) Box A3.3 and have all had positive impacts.

³⁸ "Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any interstate river or river valleys."

³⁹ These are: (i) Krishna Water Dispute Tribunal, (ii) Godavari Water Dispute Tribunal, (iii) Narmada Water Dispute Tribunal, (iv) Ravi Beas Water Dispute Tribunal, and (v) Cauvery Water Dispute Tribunal.

award. Inability to determine the facts of the case is the primary cause for inordinate delays in the final decision.

2.25. The third deficiency with the Tribunal system is that the process is often adversarial in nature. This is often due to disagreement and haggling over supporting data by the states involved, and with the Tribunals' membership consisting only of judges, results in an over-emphasis on the effectiveness of presentation and legal minutia. As a result, facts at times tend to get blurred and judges are forced to sift through often biased evidence submitted by claimants. Such Tribunal discussions also tend to become highly politicized as, for instance, in the case of the interim award of the Cauvery River Tribunal.⁴⁰ Lastly, the incentives provided by such Tribunal awards can produce very curious consequences. In the case of the Krishna basin, for instance, both Maharashtra and Karnataka are investing massively in new construction to, *inter alia*, establish "claims" on the water of the basin in hopes that the forthcoming Award review and finalization will consider such investment, even where it has hardly begun, as representing an acquired right. A better incentive would be to consider future rights on the basis of the adequacy of current water management practices and to actively discriminate against such undisciplined and inappropriate investment. Unless Tribunal procedures can be improved, the difficulties of Tribunal awards are likely to become more apparent over time as inter-state water issues grow in intensity.

Central Level Institutions

2.26. At the central level, the Ministry of Water Resources (MOWR) is the nodal ministry responsible for water, and under MOWR a number of technical agencies have been created.⁴¹ Many other ministries and agencies are also involved with water.⁴² An issue well recognized by

⁴⁰ The interim Cauvery award of June 1991 has been contested by Karnataka, one of the four riparian parties. Attempts to address Karnataka's concerns have until this summer been unsuccessful. Karnataka for a long time boycotted the Tribunal, and its chairman resigned in 1995. Bilateral negotiations between Karnataka and Tamil Nadu were held for some time, by-passing the de-facto disbanded Tribunal. Recently, however, with the intervention of the central government, a Cauvery River Board has been established with consent of the concerned riparians.

⁴¹ These include the Central Water Commission, primarily concerned with surface water; the Central Ground Water Board, handling groundwater; and the National Water Development Agency, primarily assessing inter-basin transfer options. Other entities linked with MOWR include the Indian National Committee for Irrigation and Drainage, sponsoring some research activities, and the Indian Water Resources Society, a non-governmental organization which sponsors networking and publications. MOWR also has a number of national research institutes, including the Central Water and Power Research Station and the Central Training Unit, both at Pune, and the National Institute of Hydrology at Roorkee.

⁴² Water quality and environmental matters come under the Ministry of Environment and Forests (MOEF), although MOWR also considers these matters. The MOEF is entrusted with coordinating India's Environment Action Program. It has also launched a number of environmental initiatives including the Wetlands Conservation Program and the National River Conservation Plan. Urban water supply and sanitation projects come under the Ministry of Urban Affairs and Employment. Rural water supply and sanitation is handled by the Rajiv Gandhi National Drinking Water Mission in the Ministry of Rural Development. Water for hydro and thermal power involves the Ministry of Power and the Central Electricity Authority. There are other ministries and agencies with evident strong interest in water, such as the Ministry of Agriculture (for irrigation), the Ministry of Health and Family Welfare, Wasteland Development Board, Ministry of Surface Transport, Inland

water professionals in India is the need for much better coordination between these different entities. Water responsibilities are highly fragmented. Some of the divisions are detrimental to comprehensive analysis and treatment of water issues: for instance, the split of surface and groundwater which has discouraged unitary analysis as a combined resource and conjunctive use. The division between water quality and water quantity is also artificial. The separation of main water services—irrigation, urban, rural, etc.—in different ministries without effective coordination mechanisms, does not foster comprehensive planning and tackling of issues such as reallocation of water between sectors, locating water sources for rural drinking water, and reducing pollution of water bodies by industries. Furthermore, in some cases the division of responsibility is not clear, leading to over-lap or, much worse, inadequate handling of issues. In particular, environmental issues are often the victim of unclear responsibilities. For instance, the Central Pollution Control Board (CPCB) and the state PCBs focus on control and abatement of industrial pollution, while pollution from agricultural activities is often neglected.

2.27. Groundwater is another field experiencing substantial duplication between center and state agencies, evident particularly in the area of undertaking broad assessments of recharge and extraction as a basis for targeting development finances. While this is a valuable mechanism for cross-checking data from different sources, it is also a relatively inefficient use of scarce resources. The cost of this is recognized in India, and efforts are under way to minimize expenditures stemming from duplication of water-level measurement (GOI, 1996). A further and more critical source of inefficiency, is the focus of the CGWB on macro-level data and analysis, while state groundwater organizations (SGWOs) focus on micro levels. Effective analysis of hydrologic system dynamics cannot be differentiated into macro and micro components but rather depends on the scale of the system being studied. The consequence of the macro-micro distinction is the perpetuation of development-focused assessments of water balance to the neglect of management capacity development in central and state agencies in activities—such as in scientific research versus implementation—where they have different comparative advantages.

2.28. Aside from these issues, existing organizations lack capacity in key management areas. Management is not primarily a technical challenge but depends heavily on social, economic, legal and other considerations. At present, most groundwater organizations are dominated by engineers. Even in the technical arena, most of capacity in the CGWB and SGWOs is concentrated on exploration and basic resource monitoring, not on the types of system analysis essential for management. An additional constraint is the lack of integrated approaches or effective communication between the various water and environmental organizations. Without effective institutional mechanisms to implement an integrated approach, sustainable management will be unattainable.

2.29. The MOWR, with support from other ministries, has taken various initiatives to encourage coordination and a unitary approach to water resources issues. The National Water Resources Council was established in 1983 and, among other achievements, produced the National Water Policy of 1987. Strong encouragement is also provided by MOWR and its

agencies to river basin planning and holistic water management. It is still recognized, however, that there remains much to be done to more effectively achieve the cooperation required at central level. Better cooperation would also enable the center to have greater impact on water issues at state and inter-state levels.

C. ECONOMIC AND FINANCIAL INCENTIVES AND MECHANISMS

2.30. The existing incentive structure underlies the paradoxical phenomenon that unlike other economic goods where scarcity prompts efficiency and conservation, water resources continue to be depleted and misused, even under conditions of scarcity. Appropriate economic incentives for efficient water use and conservation are lacking on various levels. At the sub-sector level, the system of prices and other economic incentives affecting water demand and supply are inadequate. Direct water pricing for irrigation, rural water supply and urban water supply fails to fully reflect the costs of production and delivery of water and the underlying scarcity value of water, thereby negatively impacting water provision and usage in these sub-sectors (refer to Chapter 3). This is exacerbated by an inadequately developed and under-priced system of economic incentives and disincentives to control pollution and encourage water saving or reuse technology. Indirect pricing policies at the sub-sector level have also had a serious impact on water use. This is particularly the case for electricity pricing for groundwater, where non-volumetric and very low (in some cases zero) electricity charges provide little incentive to conserve either water or power. Additionally, the application of agricultural pricing and marketing policies has distorted cropping patterns, and thereby water use. The net effect of these direct and indirect pricing policies is enormous fiscal burden on the states and inability to cover full costs, resulting in inadequate funding of operations and maintenance, poor water service by providers, and service dissatisfaction and water-use inefficiencies on the users end (refer to Chapter 3 for full discussion of these issues).

2.31. The absence of appropriate direct water pricing and adequate application of other economic and financial incentives at the sub-sector level has also served as an obstacle to the smooth transfer of water between sectors and states. Further, economic incentives for efficient inter-sectoral allocation—introduced either through negotiation or “automatic” market mechanisms—largely do not exist in India, with the core problems being:

- absence of an economic-value-based administrative mechanism, or a market-based mechanism, to facilitate reallocation of water, with compensation, from lower valued to higher valued uses.
- absence of institutional, legal, administrative and technological mechanisms to enable development and operation of formal water markets for sale or lease of water between users and sectors.

Sub-Sectoral Economic Incentives

2.32. *Direct Sub-sector Water Pricing.*⁴³ Key features of India's current sub-sector—irrigation, rural water supply, urban water supply—water pricing regime are:

- *irrigation pricing.* In most states, water charges have not been adjusted for years (in some states for over a decade)⁴⁴ and are not volumetrically-based. This system of water rates has a negligible impact on farmer decisions on water conservation and usage. Further, the limited revenues that are received go into the general state budget rather than to the irrigation department, providing no linkage between irrigation expenditures and revenues and little incentive to improve the service. The net result is that water charges for surface irrigation are a fraction of escalating costs of water provision, and do not even cover the costs of O&M.⁴⁵ This is further exacerbated by lack of transparent information on the costs of water provision and on water charges. The agricultural sector is the largest user of water (83 percent of water use in India in 1990) and the deficiencies here thus have particular significance.
- *rural water pricing.* Within the rural water supply and sanitation sector itself, there are many problems regarding water pricing. Although rural drinking water has both social and economic good features, there has been an overwhelming tendency to heavily subsidize it. Subsidized water and highly centralized water management in the rural sector have resulted in poor water service at high cost.
- *urban water pricing.* The key problem in the urban water supply and sanitation sector is that pricing has negligible influence on both consumers and suppliers of water. In most cities, only industries are subject to water metering and volumetric charging. These are typically charged higher fees to cross-subsidize domestic consumers. Although some cities are attempting to meter domestic consumers, tariffs remain so low that there is virtually no incentive for users to conserve water. UWSS agencies confront many of the same institutional and financial problems as irrigation departments, including poor cost recovery and large government subsidies, with similar consequences for efficient and sustainable water service provision.

2.33. *Incentives for Pollution Control.* A positive feature is that both the legislation and the institutions exist for applying incentives and disincentives to control pollution. The legislative structure is already well developed (paras. 2.12 & 2.13). All states have pollution control boards, and various forms of pollution fees already exist. The problem is that such fees are usually so nominal that they are ineffective in sending the appropriate signals to potentially polluting industries. Thus, Tamil Nadu Pollution Control Board has introduced a sophisticated structure of

⁴³ Sub-sectoral water pricing issues are more fully discussed in Chapter 3.

⁴⁴ Most states have not revised water rates since the 1980's. Punjab and West Bengal have not increased rates since the mid 1970's, while Tamil Nadu last revised charges in 1962 ("India: Irrigation Sector Review", World Bank, 1991). Apart from Punjab where irrigation water and rural electricity was declared free in 1997, change toward appropriate pricing of services is now beginning. Andhra Pradesh, for instance, implemented a three-fold increase in its water charges in 1997, and several other states (e.g., Orissa and Haryana) have made smaller increases.

⁴⁵ "India: Water Resources Management Sector Review, Irrigation Report" (World Bank, 1998e).

fees with differentials applied according to the classified potential for pollution of the industry concerned. But the differential fees between “green” or lightly polluting industries, and “red” or heavily polluting industries, are quite marginal. Also, the bulk of pollution taxes are not actually related to the amount and toxicity of effluent produced, but are based on the size or nature of the industry. Such fees based on potential to pollute do not encourage measures by industries to control effluents. In other states, “pollution fees” bear even less resemblance to actual pollution. For instance, in Andhra Pradesh, a pollution fee is levied solely on the water consumption of the industry concerned, with no differentiation by type of industry and its pollution potential. The fee structure also favors more water-consuming industries. In many states, pollution taxes seem to be aimed more at providing the fiscal basis for the operation of the pollution control board than at actually regulating industrial pollution. Furthermore, under existing pollution tax rates it is likely that the cost of compliance with environmental standards for industry is higher than the cost of non-compliance. Even when incentives have been used to encourage industries to use pollution control equipment, there have been cases where the costs of installation and operation outweigh the penalty associated with non-compliance. Similarly, municipalities are not adequately taxed against effluent discharge, discouraging investment in sewerage treatment. These problems are exacerbated by poor monitoring and regulation of pollution generally.

2.34. *Indirect Groundwater Pricing.* The present groundwater pricing structure provides minimal incentives for efficient and sustainable groundwater resource use, and in the case of agriculture, by far the largest user of groundwater, almost zero price incentives. There are no charges on groundwater itself, its pricing being indirect through diesel fuel or electricity prices. For diesel powered pumpsets, a variable cost (the price of fuel) is incurred in near direct proportion to groundwater usage. For electric pumpsets, almost throughout India, charges are levied on a flat rate basis per quarter or per month in proportion to the size of the pumpset (i.e., horsepower). Such non-volumetric charging only very indirectly bears relation to actual water use. Further, in most states power is supplied to rural areas at subsidized prices at enormous fiscal cost: pumpset owners pay the equivalent of less than 20 percent of the average cost of electricity provision and in several states (including Tamil Nadu, Karnataka and now Punjab), power is provided free of charge. Subsidized rural power prices are the major financial losses incurred by state electricity boards (SEBs), ranging from 5 to 7 percent of total state receipts.⁴⁶

2.35. Although many factors influence groundwater exploitation, studies in India and elsewhere are available that point to water pricing as a significant determining factor. For instance, a study in Gujarat constructs the expected normal demand curve with an inverse relationship between consumption of groundwater and groundwater prices.⁴⁷ Thus, the pace of groundwater withdrawals is intimately tied to energy prices. The use of flat rates for electricity, combined with unreliable power supplies, encourages individuals who own wells to maximize

⁴⁶ A large portion of these losses have been attributed to the agricultural sector, where flat rates are prevalent and collection of electricity charges are low. However, there is evidence to indicate that agricultural power consumption is far lower than reported by SEBs in all states studied and possibly the country as a whole. Provision of unmetered power to the agricultural sector creates an accountability gap and generates incentives and opportunities for large unaccounted losses to be attributed to agricultural use. Unless the accountability gap is closed, there will be no basis for addressing concerns over SEB finances which will remain precarious.

⁴⁷ Saleth, 1997.

pumping of groundwater, often to sell to neighboring farmers in informal water markets.⁴⁸ Within this backdrop, it is not surprising that in many states and districts in India, groundwater depletion has become a major issue. This also has significant inter-sectoral and equity impacts in that indiscriminate agricultural groundwater use—very often by a relatively small number of larger farmers—has caused the drying up of many rural community drinking water wells,⁴⁹ and constrained water availability for rural domestic consumption.

2.36. *Agricultural Pricing and Marketing Policies.* Distortions in the prices and markets of agricultural outputs and inputs also contribute to inappropriate production incentives and contamination and misuse of water. For instance, the centrally-financed fertilizer subsidy leads to serious fertilizer imbalances, in particular the over-application of nitrogenous fertilizer which through seepage and run-off deteriorates the quality of surface and groundwater resources. A review by Government of Karnataka in 1995 found a variety of distortions favoring indiscriminate use of water.⁵⁰ Output price and market distortions, however, have more dramatically impacted agricultural production and, thereby, water use. Domestic food policies distort cropping patterns and prevent an efficient allocation of resources—through regional specialization based on comparative advantage—which results in inefficient water use. Domestic food policies do so by blocking the development of an integrated domestic market, and by taxing crops in those regions where they would have a natural comparative advantage, while subsidizing crops in those regions with less of a comparative advantage. Water-intensive crops thus tend to be promoted in water-scarce states (e.g., sugarcane in water-scarce districts of Maharashtra⁵¹, and paddy in Punjab, Haryana, Western Uttar Pradesh⁵²), while water-intensive crops tend to receive no special favor in water abundant states and/or regions (e.g., sugarcane in Eastern Uttar Pradesh and Bihar, paddy in Eastern India, and in the deltas of Andhra Pradesh and Tamil Nadu).⁵³

⁴⁸ Where diesel pumps dominate, pumping costs and thus water prices in informal groundwater markets are much higher. Higher pumping costs related to actual water use tend to induce more efficient and sustainable withdrawal and use of groundwater.

⁴⁹ The many cases of rural drinking wells running dry or becoming seriously contaminated have been well documented by various state governments and the GOI Rajiv Gandhi National Drinking Water Mission. Groundwater issues are reviewed in detail in “India WRM Sector Review: Groundwater Regulation and Management Report” (World Bank, 1998b).

⁵⁰ Distortions include: (i) subsidies for rice production, on fertilizer, pesticides, and herbicides; (ii) subsidies on sugar cane seed; and (iii) agricultural power provided free of charge.

⁵¹ According to some estimates, over 75% of irrigation water in Maharashtra is used for sugarcane cultivation which occupies only 3% of the state’s agricultural area.

⁵² The Food Corporation of India policy of concentrated procurement of paddy and rice in water short northwest states and regions discriminates against the development of an integrated rice market, and also discourages paddy production in Eastern India while encouraging paddy production in the northwest regions. Rice policies in some states, such as restrictions imposed by Government of Andhra Pradesh on exports of rice to other states, tax paddy farmers and discriminate against paddy production in the irrigated or high rainfall regions in that state.

⁵³ For further discussion, refer to the ongoing commodity study series prepared by the World Bank in cooperation with GOI: (i) “The Indian Oilseed Complex: Capturing Market Opportunities” (July, 1997b); (ii) “India’s Sugar Industry: Priorities for Reforms” (1998f); and (iii) “India Cotton and Textile Industries: Reforming to Compete” (1998g).

Inter-Sectoral Economic Allocation

2.37. *Current Allocation Mechanisms.* Decisions on allocation and investments tend to be made with only limited reference to economic analysis and assessment of alternatives. Decisions are largely administrative in nature and made on an ad hoc basis rather than through a comprehensive planning process involving the stakeholders concerned. Allocation mechanisms also lack flexibility to adequately meet pressing needs for water as they arise, without adversely affecting existing users and the environment. Allocations of water to the various sectors are largely bound by history and reallocations are increasingly made according to a prescribed priority ordering of uses. The criteria used to make such allocations have rarely included consideration of the relative value of water in the various uses or sectors. Reallocations of water, typically from agriculture to domestic or industrial consumers, are done through compulsory acquisition and usually without compensation. The critical constraint is the lack of a comprehensive analytical framework or decision support system encompassing all water-using sectors that enables the appropriate determination of pricing and allocation decisions in line with considered development objectives. Better integration of economic factors in water allocation and management will thus require the complementary development of institutions, planning and analytical capabilities.

2.38. *Water Trading and Water Markets.* With increasing demands on water resources in India and the emergence of water quality problems, the lack of mechanisms for leasing or selling water in critically water scarce areas may represent a significant opportunity foregone. Water resource transactions in India exist, but they are generally limited to very localized water trading between adjacent farmers, where the practice is quite common especially for groundwater. Such water trading is informal in that sales occur outside a formal water rights and institutional framework, and thus, the ability to regulate not only the sales but also the extent of groundwater extractions and possible third party effects is limited if not impossible. Although there are examples of more organized grass-roots water markets, such as that evolving in the Vaigai basin,⁵⁴ India has not yet developed formally organized inter-sectoral water trading or markets as found, for instance, in Chile, Western USA and Australia. Unlike in these countries, in India the framework does not exist for more formal transactions either within a sector or between, for instance, an agricultural water user association and a municipality or industry. In particular, the absence of formal rights to surface water and of formal rights to sell groundwater, supported by regulations and effective management institutions, have hindered water transactions from low value uses to uses with higher productivity.

2.39. Water trading, recognizing that water is an economic as well as a social good, would allow for voluntary transactions rather than the present involuntary and typically uncompensated expropriations. Water resource transactions would enable water to be sold or leased from one willing user to another, making possible a reallocation of water to higher productivity uses. The introduction of more formal water markets, where feasible, could further provide opportunity for efficient reallocation using market mechanisms. However, expanding the role of markets into a formal mechanism requires the implementation of a supportive framework in order to avoid

⁵⁴ This is documented in World Bank (1998a), Annex Box A5.6.

significant undesirable outcomes. The development of water market systems would thus need to be accompanied by: appropriate and effective management institutions, including at the local level; and regulation to ensure fairness in their operation and to safeguard resource sustainability, the environment and social welfare.

Inter-State Economic Allocation Mechanisms

2.40. As with inter-sectoral allocation, inter-state decisions are largely based on history, and are also administratively (and politically) determined with only limited reference to economic and regional development considerations. Little thought has as yet been given to the possibilities of selling or leasing arrangements between states, or of multiple-objective development programs for shared river basins (transportation, power, water and other infrastructure). As a consequence, substantial opportunities for mutually beneficial development for all riparians are being foregone.

D. TECHNOLOGICAL AND INFORMATION SYSTEMS

Technology and Water Productivity

2.41. Major scope for enhancing effective water supply and improving the productivity per unit of water, with evident positive impact on the environment, is available from technological improvement. India's water-use efficiency in all sectors is low compared to international standards. Irrigation efficiency is only 30-40 percent in an unlined system, and this may be appropriate where groundwater recharge would be beneficial. However, even water that does reach the user is generally unproductively used, due partly to low effectiveness of irrigation in terms of its reliability and timeliness relative to crop water needs, as well as to farmers' lack of information on appropriate water application methods. Similar inefficiencies are found for rural and urban water supply. Infrastructure is often in such poor shape that unaccounted for water losses in pipeline systems typically account for 30-50 percent of the water delivered from treatment plants. Construction of simple rural water supply systems are also not always up to standards and in many instances are not operational, forcing villagers to resort to unclean water supplies. Water-use efficiency in the industrial sector is also poor when compared to usage of similar industries in other countries. Substantial water (and often cost) savings can be obtained by introducing water-saving technologies, treatment and reuse of wastewater, and changing industrial processes.

Data, Performance Information Systems and Analytical Capabilities

2.42. Addressing India's water resource management issues also requires substantial improvement in the data base, analytical framework and public information. First, by international standards, the network of measuring stations for river flows, groundwater levels, water quality, and meteorology is insufficient. This inadequacy is compounded by the need to improve the quality of measuring equipment, and the methods of data collection and collation. This should be accompanied by the development of a coordination mechanism between the

different agencies collecting similar data,⁵⁵ to standardize measurement quality and measured data, and to synthesize data in centralized data banks. Performance measurement and monitoring, including of environmental aspects, is also inadequate. On few irrigation commands, for instance, is there accurate information to assess the impact of irrigation and drainage (e.g., on irrigation efficiency, crop productivity and the environment) as a basis for making technological improvements for enhanced water productivity, efficiency and environmental sustainability. Similar significant upgrades in performance and environmental monitoring is needed in the urban and rural water supply sectors. Box 2.1 discusses the deficiencies as it relates to groundwater data and analysis.

Box 2.1. Current Information Systems are Not Conducive to Resource Management

Extraction and recharge estimates, for instance, developed using MOWR's Groundwater Estimation Committee (GEC) methodology, provides little information on groundwater dynamics and interaction with surface water systems. It encourages data processing rather than scientific evaluation. Because it also omits dimensions of water quality and pollution, or the array of environmental and socioeconomic impacts that groundwater development can have long before overdraft conditions occur, it provides limited advance warning of emerging problems.

This deficiency is recognized by the CGWB and is likely to be incorporated in ongoing revisions to the GEC methodology. The better approach, however, would be to adopt direct indicators of groundwater conditions, such as long-term trends in the level and quality of water and pollutant concentrations in groundwater which could signal emerging problems—of quality as well as quantity—more reliably and transparently than estimates based on the water balance approach. Data should also be collected and analyzed on hydrological units rather than on administrative unit basis.

2.43. Second, professional capabilities in basin modeling are very limited in most Indian states. Actual basin modeling tends to be restricted to reservoir simulations specifically related to an investment proposal or dam safety, and comprehensive basin plans are either not present or are rudimentary. Furthermore, the limited basin modeling that is done is seldom made available to the general public. A few of India's centers of excellence and states are forging change. These are: the Central Training Unit of the CWC, the Central Water and Power Research Station (CWPRS), and the National Institute of Hydrology; and the states of Orissa, Tamil Nadu, Rajasthan and Gujarat. But such initiatives need to be generalized throughout India.⁵⁶ Overall, there is a need for further professionalization of data, information systems and analytical capabilities, including training and improved equipment for the cadres involved. A systematic and integrated approach to the spectrum of activities involved is required: for data, this would include measurement, collection, collation, quality control, storage, retrieval, dissemination, and analysis;⁵⁷ and in basin modeling and planning, a sustained effort to prepare basin plans for all river basins.

⁵⁵ These include: CWC, CGWB, CPCB, Health, Environment, Rural Water Supply, the Indian Meteorological Department (IMD), etc. from the center; similar fragmentation at state levels; and a number of other actors such as industries and research centers.

⁵⁶ Assistance to these efforts is being provided by the World Bank. All WRCP projects contain a Water Planning and Environmental Management component, including basin modeling for all of the state's basins. This has included establishment of consultancy and training linkages with HR Wallingford, Delft Hydraulics, various UK and USA universities, and several international consultancy firms. An inter-active decision support system (using the GAMS—General Algebraic Modeling System—optimization software) has also been introduced to India. Support has also been provided through software and consultancy to the CTU.

⁵⁷ This integrated approach is getting underway in the eight states (Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu) and five central agencies (CWC, CGWB, IMD, NIH, CWPRS) participating in the Hydrology Project (Credit no. 2774-IN). The project was approved in 1995 and is assisted by the World Bank and the Netherlands Government

2.44. Third, such data and (where available) basin plans, are often not easily accessible by concerned users. And, moreover, as users are not involved in decision-making about the required type of data, data quality and data networks, the data collected and basin plans may have limited relevance to user needs. More important is the need for full transparency of all such data to the general public, as well as public information and education campaigns on matters where the public should be particularly well-informed. The information and public participation process should become a two-way interaction process between stakeholders and civil society on the one hand, and the various water agencies, public planners and decision makers on the other. This will be fundamental to improved water resources allocation and management in all areas, including policy, legislation, institutional restructuring and technology.

Chapter III. Service Delivery in the Water Sub-Sectors⁵⁸

A. SECTOR ACHIEVEMENTS AND CURRENT PERFORMANCE

3.1. Being a vital resource for the lives and livelihoods of all India's citizens, and having contributed significantly to India's economic growth since independence, water sector investments have rightly been accorded high priority in India's development plans. Expenditures on irrigation in India have been as high as 23 percent of government spending since Independence, and averaged 11-15 percent of government spending in the 70s and 80s. While having declined during the 1990s as a percent of total spending, irrigation expenditures still represent about seven percent of total government expenditure. India likewise has devoted substantial resources to the water supply and sanitation sector, significantly increasing its commitment since 1980 with the launch of the International Drinking Water Supply and Sanitation Decade. Drinking water investments have increased and presently constitute about three percent of the national budget, with a 40-60 split between urban and rural areas.

3.2. With a massive resource commitment for irrigation since independence of Rs. 576 billion,⁵⁹ the gross irrigated area⁶⁰ increased four-fold from 23 million hectares in 1951 to about 90 million ha in 1997, substantially increasing and stabilizing the incomes of millions of farmers throughout the country. Significant achievements in drinking water coverage have also been realized. About 85 percent of India's urban population (about 210 million people) have access to public water supplies and over 75 percent of the rural population (or 520 million people) are now provided with public water supply facilities. Achievements in sanitation coverage have been less extensive, due to the lower attention it received compared with water supply—about 48 percent of the urban population has access to sanitation services, and only 3.6 percent of the rural population is currently covered. Actions to improve the rural coverage of sanitation have been stepped up recently, through provision of subsidies and technical assistance for household construction of sanitation facilities.

3.3. These achievements have mostly been accomplished following a target-driven, supply-oriented and government-dominated approach with minimal user involvement. In an environment of increasing scarcity of water, land and financial resources that characterizes India today, however, the disadvantages of this approach have become increasingly evident. All three

⁵⁸ The discussion in this chapter is based on three of the specialist reports under the India WRM sector review—the Urban Water Supply and Sanitation Report, the Rural Water Supply and Sanitation Report, and the Irrigation Report (World Bank, 1998 c, d & e, respectively). Core themes are highlighted here, leaving the bulk of the sub-sector specific discussions to the respective specialist reports. The Executive Summaries of these reports are reproduced at Annex 3.

⁵⁹ In 1980-81 prices (NIPFP, 1997)

⁶⁰ The use of the term "gross irrigated area" follows the convention in India, where "gross" includes irrigated cropped area each time it is farmed from season to season. "Net irrigated area" would only count the irrigated land area once, whether or not it is cropped in multiple seasons.

service sectors—irrigation, urban water supply and sanitation, and rural water supply and sanitation—are facing problems in ensuring quality water supplies or reliable access of all citizens to water at sustainable costs of provision, affordable prices to consumers, and to the full satisfaction of users.

3.4 *Irrigation sector.* In irrigation, farmers are dissatisfied by a service that is unreliable and unresponsive to their needs. Distribution of water throughout the command is typically inequitable: farmers at the head of the irrigation canals receive more than their fair share of water (often causing waterlogging and salinization, to the detriment of crop yields and prospects for crop diversification), whereas farmers at the tail ends receive little or no water and their lands are relegated to rainfed status. The timing of deliveries is typically not appropriate to the needs of the crops, contributing to the low yields observed in public irrigation commands compared to groundwater irrigation over which farmers have full control.

3.5. *Urban water supply and sanitation (UWSS) sector.* In most cities and towns, service delivery is inadequate and unreliable, and is particularly weak at reaching the poor and disadvantaged (Box 3.1). While many schemes are designed for a 24 hour supply using 150/200 liters per capita per day, consumers experience regular shortages, with only a few hours supply on average per day. Water quality is also often below standard.⁶¹ This has had deleterious impact on public health, especially that of the poor, as well as on the environment. It has also hampered industrial profitability and growth, due to the higher costs industry is forced to incur to secure its water requirements. The low service levels and low operating efficiency of the public urban water agencies, thus pose serious impediments to the achievement of the declared national goals of rapid economic growth and poverty alleviation. Many higher income groups have responded to the situation by partially self-supplying—many have installed ground level sumps, roof level tanks and boreholes, to ensure their water supply during the intermittent flows. Disinfection is achieved by boiling, and bottled water or private water deliveries by tanker are also used, at very high unit costs. Industries are increasingly reverting to private suppliers for their water needs, and the loss of industrial customers further constrains the financial position of the public providers and results in ever worsening public service conditions.

3.6. *Rural water supply and sanitation RWSS sector.* National guidelines and investments in the RWSS sector, which traditionally focused on extending coverage⁶² to rural areas, neglected

Box 3.1. WSS Coverage Statistics and the Urban Poor

Most national reports typically count an entire population as 'covered' by WSS services so long as there is some kind of water supply system operating in the town. Per capita data of supply are calculated even more simplistically by dividing the total installed capacity by the population, without further disaggregation. The official reported per capita water supply in Delhi, for instance, is about 200 liters per day. This comfortable average, however, is far from the reality for about 30 percent of the city's nine million people (typically the poorest) who's access is less than 25 liters/dy.

As regards basic sanitation, about 40-50 percent of the total urban population is reported to be covered. In the low income slum and squatter settlements, however, the percentage is even less, with only 15 percent of the households equipped with toilets and another 21 percent having access to community toilets. What is alarming is that 61 percent of the poor households continue to use 'open spaces' for personal sanitary relief. Apart from being a major source of environmental deterioration and high negative externalities, these conditions underlie many of India's human and social problems.

Sources: K. C. Sivaramakrishna, et. al. (1993), and Mathur (1993).

⁶¹ Selvam (1989) found bacteriological quality standards were not met in 16 of 47 cities studied.

⁶² Coverage is defined as the number of villages reported as served with a public WSS facility.

to ensure that the quality of services remained adequate. Public RWSS services today clearly do not adequately serve the needs of user communities. Infrastructure is typically poorly designed and constructed, oftentimes designed and positioned at sites without consideration to community needs or preferences. Planning of RWSS services also takes place without due attention to resource availability or quality, and is rarely financially viable. Far too frequently, users do not participate in sector activities: there is minimal user involvement in investment, and only peripheral user involvement in maintenance and management. The end result is a government-dominated and target-driven service that has become unsustainable institutionally, financially and environmentally.

Reform is now entering the agenda

3.7. The government is coming to the realization of the practical limits of irrigation expansion as a long-run strategy for agricultural growth, and policy-makers have been increasingly emphasizing the need for a strategic shift. Government of India policy papers (1996a, 1996b, and 1997b) provide recent evidence of this emerging strategy in irrigation. A gradual shift in irrigation sector activities has also been evident over the last decade: there is progressively more emphasis placed on completing ongoing projects rather than constructing new ones, and in a few states greater emphasis is now on undertaking rehabilitation and modernization projects, with an increasing focus on performance improvement. Such initiatives, while increasingly encountered are, however, still under-emphasized in nearly all Indian states.⁶³ The construction and expansion approach is still dominant, in part because of the still limited awareness of the potential gains from improving performance, and of the actions required to advance this.

3.8. For domestic and industrial water supply, there is also increasing recognition of the need to improve the functioning and sustainability of the service. The following principles were stated in the Eighth Five Year Plan (1992–97): (i) water should be managed as a commodity; (ii) the provision of WSS services should be demand-oriented; (iii) emphasis should be placed on decentralization, user participation and private sector involvement; (iv) operation and maintenance should be managed at the local level with emphasis on financial sustainability; and (v) sanitation programs should be integrated with those of water supply. The recent efforts in India toward achieving UWSS financial reform, for which commitment is further advanced than for associated institutional reform, are also notable. This decade is seeing capital markets develop and expand across most sectors of the Indian economy, and financial reform in the UWSS sector is a logical extension of this trend.

3.9. Likewise in the RWSS sector, there is growing awareness that in order to be effective, significant reforms will need to be implemented. Desired reforms include changes in the project preparation to enable investments to be designed in accordance with the needs and demands of

⁶³ The notable exceptions are Orissa, Tamil Nadu, Haryana and Andhra Pradesh, which have all recently reprioritized expenditures and activities in the irrigation sector, including irrigation, drainage and flood control. Emphasis is now placed on maintenance, system upgrading and institutional capacity building, under their respective World Bank-assisted Water Resources Consolidation Projects (Orissa, Tamil Nadu, Haryana) and Economic Restructuring Project (Andhra Pradesh).

users, and for a price users are willing and able to pay. The transfer of ownership and responsibility of sector infrastructure to users and their communities is seen as critical, in order for sector operations and services to be sustainable.

3.10. In practice, however, these principles whether in irrigation, UWSS or RWSS, have seldom been reflected in sector operations due to a lack of effective mechanisms to translate the policy statements into action. A significant factor that has impeded, rather than facilitated, achieving the stated policy objectives, has been the inappropriate incentive framework which permeates all aspects of sector operations. In the RWSS sector, for instance, the continued availability of unconditional funding from the central to the state governments has not encouraged the states to commit to implementing needed reforms. The supply-driven approach continues to guide activities and investments in the sector. Until the policy pronouncements are linked to decisions on the investment program, and effective mechanisms are established to guide sectoral operations, the coverage and quality of services will remain inadequate. Sector viability, both institutionally and financially, will also continue to deteriorate, to the continued detriment of all stakeholders, especially the poor and women.

3.11. In recent years, fundamental policy changes have started to emerge in India that will facilitate reforms in the sector. First, is the New Economic Policy which, since the early 1990s, has promoted growth in economic production and exports through liberalization of economic activity. It has also fostered divestment of activities from the public sector, to achieve higher efficiencies and thereby raise international competitiveness of Indian firms. Second, is the decentralization and user involvement drive which is slowly beginning to take hold. The recently passed 73rd (in 1993) and 74th (in 1994) constitutional amendments in India, empower the states to devolve activities and responsibilities for rural and urban water development and management, respectively, to the *panchayati raj* (i.e. local government) institutions. Responsibility and accountability for water service delivery are to be delegated to local levels, whether it be to farmers at the irrigation command level, cities, towns or villages.⁶⁴ The decentralization initiative is a positive change for India with its huge diversity of local priorities and situations.

3.12. Under the decentralized arrangement, it is envisioned that engineers joined by other specialists at the district and block levels, rather than at the state level as is currently the case, would plan and implement WSS investment programs at the request of, and in close consultation with, the concerned local administration (of a village or small town). The latter would then subsequently take responsibility for implementing or overseeing O&M of the WSS facility upon its completion. Larger municipal governments would take responsibility for all these functions in their jurisdictions, discharging their responsibility under a variety of arrangements, including through a municipal department, a municipal enterprise, a contract with the reformed state water supply and sanitation boards (or utility), or a contract with a private provider. In some cases, authorities of several jurisdictions (including municipalities, smaller towns and villages) may wish to pool their operations by entering into joint contracts for WSS services. This would pertain to situations in which a multi-jurisdictional WSS system was deemed feasible and the

⁶⁴ Further articulation of decentralization drive has been specified by sub-sector in the source the WRM review. Details are included in the specialist sub-sector reports (World Bank, 1998c, d & e).

jurisdictions opted to jointly invest in and operate it, rather than each have their own uni-jurisdictional system. Devolution of responsibilities to municipal authorities, in particular, but also to authorities in smaller towns and villages, will further need to be accompanied by mandating good municipal and water utility practices. Examples include integrated long term development plans, inter-municipal cooperation and customer consultation and responsiveness.

3.13. Decentralization to lower levels was also expected to facilitate integration of sanitation and water supply services, to ease the transfer of schemes to panchayats for operation and maintenance, and to engage user communities in sectoral decision making. Due partly to problems associated with financing from multiple sources, and the lack of managerial capacity to undertake demand-driven activities, the anticipated benefits of decentralization have not yet materialized. An assessment of decentralization of WSS operations in India is in Box 3.2.

Box 3.2. Decentralization of WSS Operations

Though decentralization in WSS is only beginning in most states, there is evidence already that the process is fraught with difficulties. Decentralization has simply passed the problems inherent in the state level engineering agency on to the decentralized sector agencies. Even in states with relatively strong panchayat institutions, progress with decentralization has been inadequate. The impact of decentralization so far has been a wide distribution of responsibilities across agencies (without corresponding strengthening of inter-agency coordination mechanisms), and a weakening of accountabilities. State-level agencies by and large retain a limited role in technology selection, scheme sanctioning, monitoring and training. State public health engineering departments also conduct investigations and drilling, while the district zilla parishad engineering departments now plan and execute works. Poor liaison between departments and an inefficient financial and technical approvals process, however, inordinately delay the implementation of sectoral programs.

Though local level panchayats are now responsible for operations and maintenance of commissioned schemes, they are reluctant to assume this role. Reasons for this vary but include lack of managerial autonomy, inadequate staff and financial support from the state government, the typically low quality of the schemes planned (by the state-level agency) and constructed without their (i.e., zilla parishad's) participation, and a lack of ownership of the assets. In consequence, the state government continues to own the assets, supply the technology, and deliver the services. Despite these external factors, the panchayats themselves face many inherent problems, which inhibit them from taking advantage of the limited autonomy offered them under the constitutional amendments. These include a historical reliance on central and state guidance and funding, weak capacity, high politicization, and limited resources.

Responsibility for management and operation of rural sanitation, including waste disposal in small towns and provision of latrine and environmental sanitation services, have also been devolved to the gram panchayats. Environmental sanitation consisting mainly of sullage and storm drainage is funded largely under an employment-generation program and is not integrated with water supply programs. Due to limited capacity or interest in implementing what are typically scattered rather than comprehensive sanitation programs, progress under the government's rural sanitation program has been very slow. A lack of integration of sanitation with water supply operations has compounded the managerial difficulties panchayats face in the sector. The inattention to hygiene practices, stemming from the failure to integrate sanitation programs with programs delivering health and hygiene education, prevents the realization of significant health and economic benefits. There is also little or no follow-up monitoring or evaluation of programs, and communities are unaware of, or lack access to, low-cost investment options. Absence of health and hygiene programs linked to sanitation operations, curtail the emergence of demand for sanitation facilities in rural areas, thereby precluding improvements in current sanitation and hygienic practices. High subsidies provided by central and local governments for relatively expensive latrines, furthermore, inhibit the ability of local agencies to work toward financial sustainability of sanitation services.

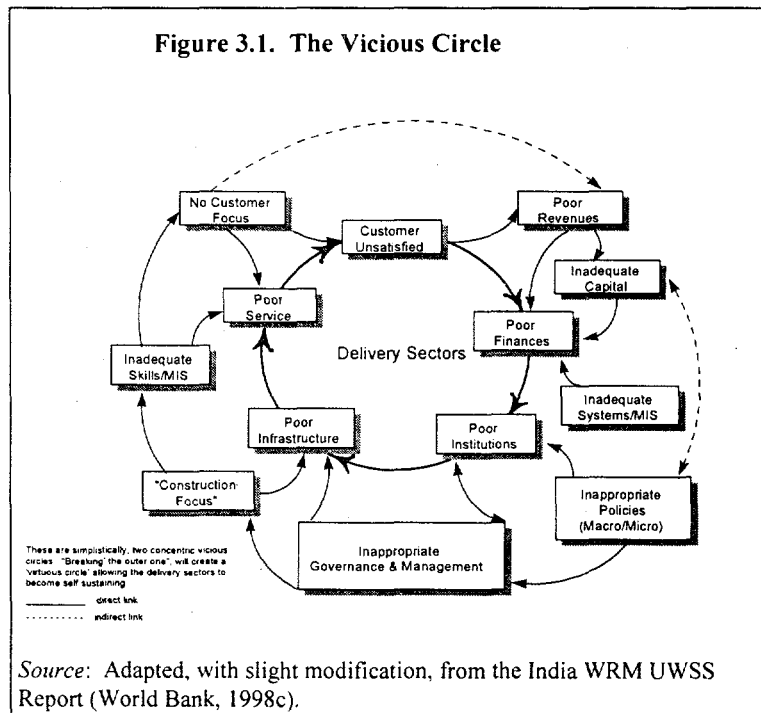
3.14. In irrigation, decentralization has been promoted since 1974 through the centrally-sponsored Command Area Development (CAD) Programme, which aimed to promote on-farm infrastructure development through a government-farmer partnership effort. Though many states

created multi-disciplinary CAD departments or units in the irrigation departments, to benefit from centrally-provided matching funds, the achievements in terms of on-farm developments or the number of functioning farmer organizations are sorely low. Recent Bank-assisted efforts in Orissa, Andhra Pradesh and Tamil Nadu to create and strengthen water user associations (WUAs) at tertiary canal levels (including federation of these WUAs to distributory and whole command levels), are showing good promise, but these are at present only on a pilot basis (Orissa & Tamil Nadu) or at the early stages of state-wide implementation (Andhra Pradesh).

3.15. These policy developments and initiatives notwithstanding, the reform climate for the water sector and, in particular, the actual implementation of reforms, has not gone far enough. A comprehensive understanding of sector diagnostics and the interaction between various sector problem areas is critical for articulating the reform needs. This is addressed in the following section.

B. THE VICIOUS CIRCLE

3.16. The current situation in water service delivery in India can be characterized by a vicious circle of *inadequate financial allocations* to the sector (particularly for operations and maintenance) and *inefficient and bloated service institutions*, which have led to *poor quality and unreliable services*, *user dissatisfaction* with the services they receive, and an *unwillingness of users to pay for the services*. The *inadequate resources generated by the sector* due to user unwillingness to pay for services, further *undermines sector financial resources* contributing to a perpetuation of the circle. The end result is a sector that has become unsustainable. This general vicious circle syndrome (characterized by the inner loop of Figure 3.1) is evident in all three service delivery sectors, though slight variations in sub-sector specifics can be inserted in the story. The following paragraphs discuss some of the sub-sector specifics, leaving the bulk of the sub-sector details to be accessed through the relevant India WRM specialist report.



3.17. In the case of irrigation, a starting point in the circle can be the frequently found *poor quality of the service*. Farmers typically have no participation in irrigation decision-making and,

thus, no control over the amount of water they receive, when they receive it, nor whether they will receive it at all. Combined with *poor quality agricultural extension services*, this leads to low crop yields and low incomes, which in turn generates *farmer dissatisfaction* with the irrigation system, bureaucracy and state government. Under these conditions, water rate revisions are politically resisted and payments on water bills are postponed, resulting in low cost recovery and the ensuing *political pressure by farmers not to pay* for a service that is not responsive to their needs. *Low cost recovery*, in turn, is linked to *underfunding of the operations and maintenance* of the conveyance systems which, coupled with the *poor quality and state* of most systems, and compounded by the inappropriate structure, policies and staff skills of many *state irrigation departments*, closes the circle by providing *poor quality service*.

3.18. The drinking water sectors (both rural and urban) face the same problems, though the characterization varies slightly due to the varied and disaggregated institutional structures that make up the RWSS and UWSS sub-sectors within India's states. The sectors are similarly bound-up by a vicious circle of circumstances, where service providers are typically financially unviable and unable to maintain services without extensive subsidies. Existing services fall short of full coverage of the population, and are often of low quality due to insufficient funding of O&M. Sanitation services, in particular, are generally inadequate and access to acceptable UWSS services is extremely limited for those in poor neighborhoods. The resource as it is currently used is increasingly insufficient and over-exploited, leading to increasing environmental degradation. The lack of adequate pricing levels charged to consumers contributes to the financial weakness of the agencies, and failure to levy rates based on actual water-use levels prevents efficient use of water resources.

3.19. The key to breaking the vicious circle rests in correctly diagnosing the underlying causes of each point on the circle, represented by the outer loop in Figure 3.1. These problem areas—inappropriate governance and management, inappropriate strategic focus resulting in excess construction, inadequate skills and information systems resulting in significant inefficiencies, lack of consumer focus, weak revenues and inadequate sector funding, and weak accounting and financial management—are discussed in turn below.

3.20. *Inappropriate governance and management.* Most water service providers are not autonomous but are part of a state, municipal or local government department.⁶⁵ In practice, the most detailed operational decisions are governed by an extensive network of government-determined rules and regulations, and managers' decisions often appear to be unduly politically dominated.⁶⁶ Promotion to senior management posts tends to be on the basis of seniority, rather than on merit. In consequence, there are frequent changes in top management positions (in some states, average incumbency is around six months). This in turn prevents the development of

⁶⁵ This is the case also for those state-level and metropolitan organizations which are intended to be semi-autonomous in day-to-day management, such as the state water supply and sewerage boards, or municipal water supply and sewerage boards.

⁶⁶ Political influence is evident also in the tariff levels and structures in many parts of India. Seldom do tariffs fully cover operating and maintenance costs, let alone provide for capital costs or forecast expansion. Consequently, all state irrigation departments, likely all state RWSS agencies and most UWSS providers are not financially sound.

specific skills and a longer-term outlook in senior managers. The strict seniority system as opposed to one that includes a merit component, also means that many senior managers do not necessarily have the required knowledge or aptitude to effectively manage their large, complex and often financially-troubled organizations. In the case of the state public health engineering departments (PHEDs) and state water supply and sanitation boards (WSSBs), and to a lesser extent in state irrigation departments, the challenge senior managers face is often intensified because the top appointed officers who manage these entities come from sectors other than the respective water sub-sector. These factors combine to yield managers without the requisite drive and commitment to operational efficiency and sustainability of the service delivery system, and managers without the accountability to their customers for the performance of the organization.

3.21. *Inappropriate strategic focus.* The current emphasis on targets and norms in WSS, and on investing to close the gap between actual irrigation and the estimate of ultimate irrigation potential, is a supply-driven approach that encourages excessive investment, diverts attention from ensuring high quality service delivery, and undermines efficiency and sustainability of operations. This current imbalanced and inappropriate strategic focus manifests itself also in the allocation of funds as well as in personnel and other sectoral policies. Funding allocations tend to flow to proposed new schemes to the neglect of funding for operations and maintenance or institutional strengthening, and the staffing of water agencies is almost fully weighted towards construction engineering skills instead of being balanced with other specialties such as water management engineers, public relations specialists, specialists in organizing and interacting with users, financial and accounting specialists, economists, or environmentalists. Since service delivery is not viewed as a priority, decentralization of decision-making and the transfer of ownership to the institutions responsible for operations and maintenance (whether these be farmer or community water user groups, river basins or local administrative levels) are neither implemented nor under urgent consideration.

3.22. *Inadequate information systems and skills.* Basic data and information systems for engineering and accounting functions are often under-developed or even largely absent. As a result, decision making in the sub-sectors is undertaken without sufficient information and often without use of appropriate methodologies. Limited long-term focus discussed above, which is prevalent among managers, fosters a lack of long-term organizational or corporate planning, and a lack of capacity to undertake such planning. Planning for irrigation, for instance, typically does not fully consider existing or increasing other uses for water in a given basin. A result is that schemes are constructed that are unable to operate at the designed capacities due to insufficient unutilized water in the basin. For UWSS, accurate and up to date topographical maps and plans of the urban area are often absent even in the larger conurbations, though these are essential and cost effective inputs for serious planning and management of WSS systems. In RWSS, an example of lack of comprehensive planning is that no attempt is made to assess the extent and status of privately-financed sources, even when such sources may constitute the primary drinking water source of a community. Neither are user preferences and willingness to pay for different levels of service ascertained.

3.23. The impact of weak information systems for planning and monitoring sector operations has often been inappropriate designs and, in particular, weak system operations and maintenance.

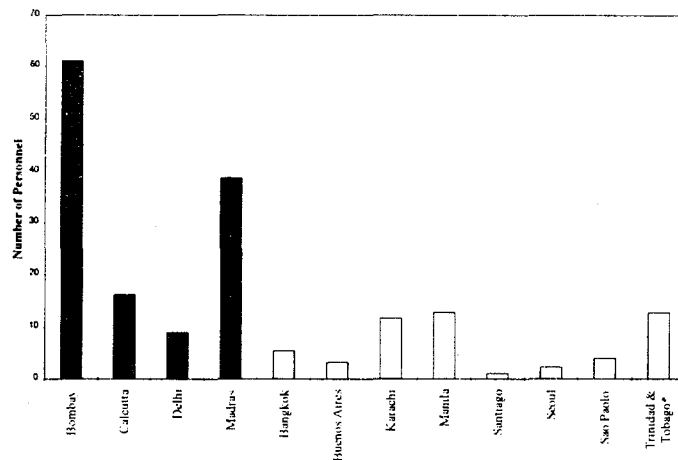
Combined with poor quality of materials used and equally poor methods of construction, this has led over the years to a deterioration of sector assets, which are now generally in very poor condition,⁶⁷ and has had a direct negative impact upon system efficiency and the quality of service delivery. Efficiency of irrigation, for instance, is about 30-40 compared with 50-60 in some other countries. UWSS agencies deliver an average of less than 50 to 60 percent of their capacity to the end-users, compared with best practice delivery rates of around 80 to 85 percent in other countries.⁶⁸ The flow monitoring of irrigation systems at major diversion points, or the zoning of distribution systems for UWSS, is not generally practiced, with the result that there is no reliable information on physical water losses in the systems. Where flow meters exist they are generally not properly functioning.

3.24. *Inefficient operations.*

Chronically inadequate maintenance and low degree of accountability to consumers, often compounded by inefficient procurement of materials and poor construction practices, have reduced the operating efficiencies of water delivery systems. Weak corporate management has led to wasteful and inefficient practices, giving rise to lost opportunities to re-deploy financial and manpower resources toward improving service delivery. The lack of human resource development and personnel policies tailored to meet organizational needs

has led to both widespread overstaffing and labor misallocation. Worldwide data on this is readily available for the UWSS sector only, and Figures 3.2 (on staff ratios) and 3.3 (on working ratios) show how unfavorably India compares with other countries. The ratio of staff per 1,000 service connections, for instance, which is an accepted measure of efficiency of UWSS utilities, ranges from 40 to 60 staff per 1,000 connections in India, as against the South Asia regional average of around 10 staff per 1,000 connections, and international best practice of around 2 - 3 staff per 1,000 connections.

Figure 3.2. Number of Personnel per 1000 Connections - Selected Cities



Note: Prior to reforms to encourage private sector participation.
Sources: Yepes and Diandens (1996), ADB (1993), and World Bank (1998c).

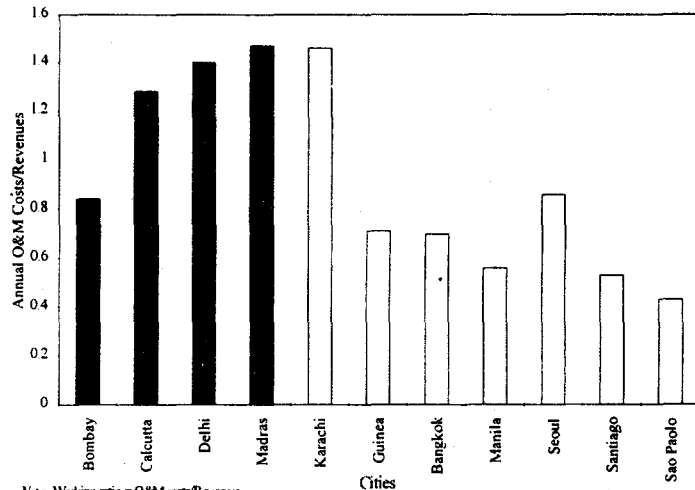
⁶⁷ The cumulative impact of inadequate maintenance of irrigation systems, leading to effectively reduced irrigated area on many schemes, is a widespread problem in most states. A particular problem in urban water supply systems are the low pressures and intermittent supplies. These allow back-syphonage resulting in contamination of the water in the distribution network. This problem is most evident at cross-over points between water distribution mains and street drains, which are in practice open sewers, and/or where the sewers are at a higher level in the ground. The outbreak of Cholera in 1993, in the slum settlement of Korukkupt, Chennai was caused by this type of problem.

⁶⁸ In UWSS, estimates of average physical water losses in systems range from 25 percent to over 50 percent. Non-physical UFW (or 'administration losses') are also likely to be high. International experience shows that "administrative losses" can be two to three times the "physical losses".

3.25. *Weak consumer or user orientation.*

The general lack of consumer orientation is reflected in the absence of user consultations undertaken by service providers about significant operational issues such as quality/cost trade-offs, or the resultant implications on the water price charged to users. A contributing factor is that most providers have come to rely on subsidies from the national and state governments to meet their financial obligations, in some cases to a greater extent than they depend on revenue from water users. Managers often perceive revenue from users to be “fixed” or constrained, since increases in water charges are typically politically difficult, whereas subsidies are seen as having an in-built flexibility—whatever is needed in terms of shortfalls between costs and revenues are typically provided by the government. Consequently, managers tend to pay more attention to maximizing subsidy inflows than to addressing their customers’ concerns. While this is a widespread problem, it must be said that there are a number of examples of good practice in India. Consumers in Mumbai and Hyderabad, for example, have at times been able to participate in the planning and implementation process through user groups. Another example is the “Swabhiman Movement” in Bangalore, a consumer initiative which promotes the organization of resident groups to address neighborhood problems and provides a platform for information exchange and discussions with civic authorities and NGOs.⁶⁹ RWSS staff in Uttar Pradesh and Karnataka are utilizing NGOs on a pilot basis, to facilitate their interaction with village water user committees in discussing design and cost options of the service.

Figure 3.3. Working Ratios for Urban Water Supply - Selected Cities



Note: Working ratio = O&M Costs/Revenues.
Sources: Yeps and Dandras (1986), ADB (1993), and World Bank (1986c).

3.26. Command area development staff of Chambal command in Rajasthan, have effectively worked with farmer groups to undertake on-farm developments or upgrade system quality at tertiary command level. The resultant impact of these initiatives on farmer yields and hence farmer satisfaction has been tremendous. Irrigation staff in Orissa, Andhra Pradesh and Tamil Nadu are, with the assistance of NGOs, organizing farmers into water user associations and increasingly undertaking participatory walkthroughs along the canals with the farmer user groups, to jointly assess problems of the systems and options to resolve them. The most recent promising example is Andhra Pradesh’s program for farmers’ management of irrigation, where the tertiary levels of all the systems statewide, have been transferred to WUAs and the irrigation department is now a service agency responsible to the farmers.⁷⁰

⁶⁹ For further information of the Swabiman Movement, refer to Annex 2 of the India WRM UWSS Report (World Bank, 1998c).

⁷⁰ For further discussion, refer to the WRM’s irrigation report (World Bank 1998e) and the Andhra Pradesh Economic Recovery Project appraisal document (World Bank 1998h).

3.27. *Weak revenues and inadequate sector funding.* The low priority accorded to collections has a significant negative impact on the revenue base of water entities. While there is abundant evidence that most water users at virtually all levels of society, are willing and able to pay much higher than official prices for water, only the presence of large commercial and industrial users (who are metered and pay a high tariff rate) keep many of the water agencies funded. The metering of domestic customers in any city is rarely taken seriously. Meters that are installed generally do not work for very long (due to high particulate matter in the mains, which block the clock mechanisms, or due to damage caused by surges, when pressure returns to the intermittent water supply, or due to vandalism). Even where they do work, the very low tariff charges are either not collected or are not worth collecting. Disconnecting domestic consumers for failure to pay is extremely unusual, although this is occasionally done with commercial customers. Low water prices and the resultant poor quality and coverage of the service, in fact results in a higher cost of water paid (in time, money and lost opportunities) by the very groups the subsidies are intended to protect—the poor and or disadvantaged groups (such as residents in peripheral neighborhoods, women, or marginal farmers). People who are not served by the public irrigation or WSS facilities invest their own funds in groundwater pumps for irrigation, purchase water from private water sellers at high cost, and/or travel long distances to fetch small quantities of water.

3.28. *Weak accounting and financial management.* The above problems, particularly the lack of institutional and managerial autonomy and accountability, are also evident in the lack of accounting and financial management tools used in the sector. Few water service agencies (whether for irrigation or drinking water) report against a set of monitoring indicators, let alone publicly share performance targets and achievements. Cost accounting, programming & budgeting, and management information systems are usually rudimentary, especially for irrigation and RWSS agencies. Consequently, comparatively little financial management information is available to run, or to scrutinize the performance of water service agencies. In the absence of a separate accounting and financial reporting system for the sector, and the general lack of transparency, the amounts collected disappear into a general government fund rather than being applied directly for sector expenses. The inadequate financial accounting system further aggravates the ability to attend effectively to cost recovery concerns.

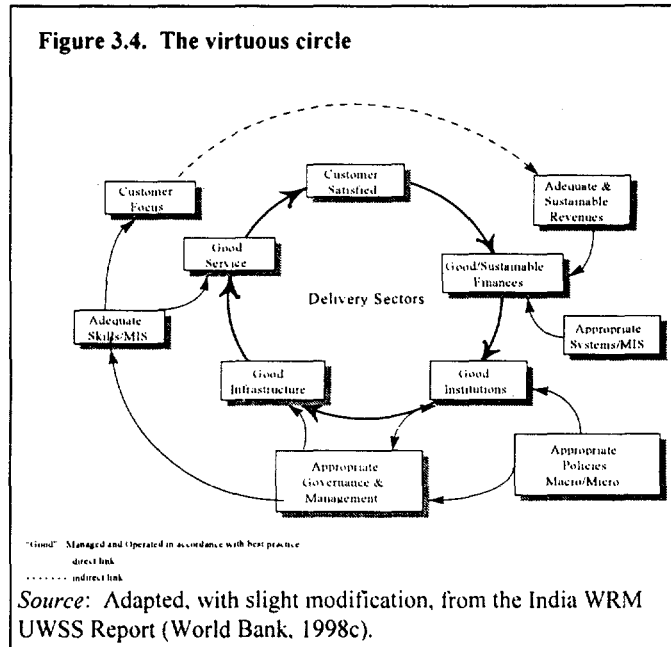
3.29. Quality assurance and supervision activities are limited despite a comprehensive set of official controls. Monitoring and evaluation of central and state-financed programs by and large have been limited to ensuring that central government funding is allocated as required. As these problems are increasingly understood in India, it is not surprising that there have been some positive developments in recent years. Notable examples include: accounting separately for irrigation water revenues in the state treasury in Orissa, and earmarking the revenues for irrigation O&M activities; the separation of UWSS budgets from the general budgets in one municipal corporation in Maharashtra and, in some Tamil Nadu cities; the legislative requirement for an annual report on subsidies in Maharashtra; and the introduction of a commercial accounting system in the Chennai Municipal Corporation. These, and many more examples throughout India, are nevertheless overshadowed by situations where change is minimal.

C. THE REFORM NEEDS

3.30. Proposed reforms at sub-sector level (i.e. in irrigation, RWSS and UWSS), which are distinguished by jurisdiction and agency responsible for implementation, necessarily center around transforming the vicious circle into a virtuous circle (Figure 3.4) which will enable sustainability and higher quality of service delivery at viable costs to the service agencies and affordable prices to users. The general integrated framework for reform is applicable in each of the sub-sectors; however, each also faces specific challenges which must be addressed sub-sectorally. A flavor of these challenges is provided in Boxes 3.3, 3.4 and 3.5.

3.31. The key need is to change the incentive structure currently perpetuating the vicious circle. Central to this is to tackle the present dominant role of government and complete lack of client involvement. Changes are required both at the levels of the service provider (the government agency) and the users (farmers, villagers and urban dwellers). Both groups presently have few incentives to change the status quo. For government, a lack of accountability to users means that all incentives are internal to the department and based on bureaucratic survival and pleasing vested interests, who are seldom at the grassroots level. There is little incentive to be cost efficient in providing services, to find and collect sources of revenue, to be financially self-sufficient, to improve the technical quality of services, to satisfy the client or to link up with other government services, the private sector and civil society. For users, there are also few incentives to push for reform. Because users are heavily subsidized, are not involved in sector operations and are not even consulted by

Figure 3.4. The virtuous circle



Box 3.3. The Challenge for India's RWSS Sector

In order to effectively address the needs of disparate communities with varied socio-economic situations, India's RWSS sector needs to institute a more decentralized, grass roots, demand-driven and self-financing approach to investment and service delivery. The sector should be able to equally accommodate the interests of a village community that can afford only standpipe service, as well as that of a community able and willing to invest in a more expensive piped system that would better meet its increasing population and per capita demand requirements of the future. This specialized and flexible approach will only be possible with strong community participation and financing in RWSS activities through village WSS committees.

In addition to improving the quality and viability of services, the RWSS sector also faces an urgent need to protect its sources of water which face continual threats of depletion or contamination due to increased economic activity in and around the villages. Approximately 90 percent of India's rural population rely on shallow or deep groundwater aquifers for drinking water, though only five percent of total groundwater extraction goes to domestic use (both rural and urban), with an equal amount consumed by industry and the rest by irrigation. The rapid development of irrigation is depleting groundwater resources, resulting in the need to replace dried up sources of drinking water. Increasingly more areas at regional and local levels (currently about 144 districts in 10 states)¹ are facing a scarcity of groundwater for domestic uses, with withdrawal rates exceeding the annual recharge. Water protection measures will need to be built into the RWSS community O&M activities.

¹Aims Research, 1996.

government, they are detached from decision making and feel they can have little influence on improving the service. Their only leverage is through political pressures resisting increases in the charges for water service delivery.

Box 3.4. The Challenge for India's Irrigation and Agriculture Sector

With population growing at an annual rate of 2%, India will have to feed an estimated 1.4 billion people by year 2025. To remain self-sufficient in foodgrains, the current production of 191 million tons (MT) would need to increase to about 350 MT by 2025 (Bhalla, 1995; Navalawala, 1996). There will also be a need to satisfy the population's increasing requirements over the above estimate for a more varied, higher-value diet, and to take advantage of major export opportunities.

The usual route of continued expansion of irrigated area, however, cannot remain the main strategy for agricultural growth. The basic assumptions for expansion—i.e., availability of land, water, and fiscal resources for irrigation expansion—are under severe strain today. To meet the government's targeted 4.5% growth rate for agriculture, representing a 50% increase over the 3% historic growth rate, agricultural productivity would need to increase significantly and diversified and higher-value crops will have to be grown. With rainfed growth rates remaining unchanged from the current 0.3% a year, irrigated agriculture—expected to contribute most of the anticipated incremental production—would have to grow by at least 5% per annum.

Box 3.5. The Challenge for India's UWSS Sector

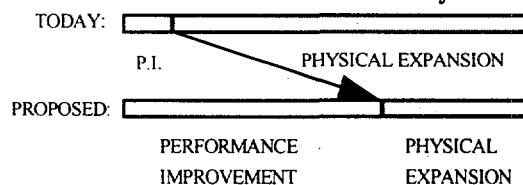
The urban population growth rate of 3.1% is significantly higher than the national average and is expected to grow by a factor of three by 2025. This increase in itself, or about 400 million people, represents 1.5 times the US population and half that of Europe. UWSS agencies will further be strained by demand from an expanding industries. Growth will also be high in the smaller cities and towns where capacities (technical, administrative, financial) are much lower than in the mega-cities.

With the increase in water use urban growth will entail, an equal or greater increase in wastewater (sewerage and industrial wastes) and solid wastes will need to be reckoned with. Much of the uncollected solid waste in Indian cities (ranging from 8 percent in Calcutta to 75 percent in Patna) end up in the drains and sewerage systems, resulting in blockages that induce floods during the monsoons, and spur proliferation of disease-carrying mosquitoes. UWSS approaches will need to include in an integrated way, wastewater treatment, pollution control, improved storm water drainage and solid waste handling.

3.32. The weak incentive structure for both service provider and user must be tackled. Marginal changes will not be able to surmount these problems. A highly capable and dedicated head administrator, such as an Irrigation Secretary, Engineer-in-Chief, or Municipal Commissioner may be able to make a small impact on a temporary basis in the absence of major institutional and financial reforms. For instance, greater consultation with the farmers may be achieved by continuous encouragement and pressure on irrigation department staff, or RWSS staff may organize community groups and undertake consultations with them to determine the level of service they are willing and able to pay for. Temporarily, when there is a period of high political will, a skilled sector Secretary or Minister may secure the full funds required for maintenance. However, for these and other initiatives, as there is no in-built incentive structure to persist with and build on such interventions, they will founder with staff changes or changes in the economic and political environment.

3.33. Significant restructuring is thus required of the institutional and financial environment in order to create the incentives to initiate a continuous and vigorous process of change. *Since the problems facing the sub-sectors are inter-related and reinforce each other, resolving one or the other alone will not aid in remedying the system deficiencies. It is*

Figure 3.5. A Major Paradigm Shift Needed in Water Service Delivery



thus necessary to attack them simultaneously or in a well thought out (and politically feasible) sequence. The integrated reform strategy calls for *a major shift in the current paradigm governing sub-sector water development in India:* from the current heavy emphasis on physical expansion to a much greater emphasis on performance improvement (Figure 3.5).⁷¹ The performance improvement approach entails achieving: (i) the devolution of operations and maintenance to lower administrative levels and user groups, as well as adopting a customer-oriented approach; (ii) financial viability and sustainability of the service agencies; (iii) more appropriate technology and information systems; and (iv) a demand and client-orientation in the service agencies.

3.34. A fundamental need is to bring the users into the decision making process and to create user-driven pressures on the service provider to improve performance. Users can better manage irrigation and RWSS systems at grassroots level than can a remote government bureaucracy which does not have the staffing, local knowledge or direct motivation. For UWSS systems, participation of users in decision making will provide needed information to the service provider about service status throughout the system.

3.35. Figure 3.4 above makes clear *the strategic points of intervention* for improving performance in the sub-sectors and raising the quality of services delivered to farmers, domestic consumers and industry. These intervention points are grouped as: (i) institutional reorientation and strengthening; (ii) economic and financial incentives; (iii) technology and information systems; and (iv) policy, legal framework to support actions under the previous three groupings.

Institutional Reorientation and Strengthening

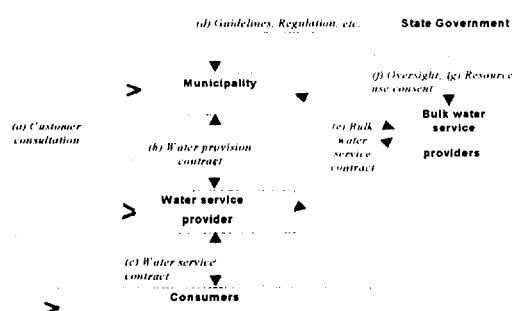
- *A cornerstone of the reforms is the forming of user organizations to assume responsibility for operations and maintenance of the systems.* User organizations are essential to enable: decentralization of O&M; reduction of costs and improvements in efficiency of O&M; collection of the water charges necessary to finance both; and the making of operational decisions at the lowest possible level by the directly concerned stakeholders. As user organizations grow in coverage and experience, they can form larger organizations to promote their interests in higher policy fora. In the case of irrigation, for instance, user organizations at the minor canal level in a given command can be federated to manage (or jointly manage with the irrigation service department) higher-level hydraulic structures (i.e. distributory, branch and main canals; and, in time, headworks and dams), and to present their views on state policy and expenditure programs in advisory or executive government bodies. Irrigation user organizations could also become the focal point for agricultural extension work, and also for input supply, credit, crop processing and marketing initiatives (refer Box 3.6). For RWSS, users would be

⁷¹ The performance improvement strategy is not against physical expansion *per se*, nor does it foreclose the option of undertaking new projects for special regional and poverty alleviation considerations. In fact, there are several states (particularly those in the East and Northeast) in which further physical expansion could still play a role in furthering the sector's growth, or in addressing localized production, social or ethnic problems. Rather, the strategy stresses the complementarity of both physical expansion and performance improvement in the sub-sectors, while calling for a major *paradigm shift* giving urgent and much greater emphasis to performance improvement.

formed into local water supply and sanitation committees comprised to assume responsibility for O&M, and in the case of UWSS (see Figure 3.6) this would entail the formation of consumer interest groups, which would be formally represented on the decision making boards of the UWSS agencies and various grass roots organizations as appropriate for neighborhood public WSS facilities .

- *Water service agencies will need to be reoriented, and their capabilities strengthened and modernized, in order to*

Figure 3.6. Possible UWSS sector structure**



Notes:

a. *Customer consultation:* The municipality consults with consumers. Customers' priorities guide planning, and the water service provision contract.

b. *Water provision contract:* Where the municipality uses an independent provider, it will enter into a water provision contract governing coverage, tariff setting and service standards.

c. *Water service contract:* Specifies consumers' rights and obligations.

d. *Guidelines, Regulation, etc.:* State Government will support municipalities. For example, the State may issue high-level guidelines for contents of development plans, contracts and/or public consultation.

e. *Bulk water contract:* Bulk water service providers will provide bulk service under contract to the municipality (or the distribution service provider). The contract will specify price, quantity, reliability, etc.

f. *Oversight powers:* State Government may supervise bulk water service suppliers to prevent exploitation of monopolies.

g. *Resource use consent:* There will be a resource use consent which will govern the bulk provider's access to the resource (details in the India WRM Intersectoral Allocation Report (World Bank, 1998a.)

Notes: **The diagram omits the central-level institutions (MOWR, MOUAE, MORD, the Planning Commission, MOF) that are responsible for policy formulation, planning, technical guidance and funding of water supply and sanitation schemes.

Box 3.6. User Organizations in Irrigation

Forming the irrigation user organizations—or water user associations (WUAs) as they are commonly known—and turning over the conveyance systems to them allows decision-making in canal management by the main stakeholders - the water users themselves. WUAs take better care of the systems than a distant bureaucracy. There is ample evidence for this, both in India (in old tanks managed by traditional WUAs as well as in reforming states, such as Andhra Pradesh and Orissa) and in a number of countries (e.g., Mexico, Chile, China, Argentina). But in many places in India, WUAs will have to be formed from scratch, basically through pro-active action of the irrigation departments (IDs), so in those places it is necessary to reform the IDs first in order to have the WUAs formed - as well as to have the systems better operated and maintained. Both IDs and WUAs acting together should lead to an improved quality of irrigation service. This, plus a reinforced agricultural extension service, linked in a partnership with the IDs and WUAs, and with ID staff better trained in hydraulics and water management techniques, should lead to higher yields and higher incomes, higher farmer satisfaction, and increased willingness to pay. Coupled with higher user fees and improved financial systems, this would contribute to a more effective O&M and better irrigation service - and to reinforcing the WUAs.

make them more effective, service-oriented, client-focused, and financially autonomous, directly funded by, and answerable to, water users. Where feasible, sub-entities or specific functions of the service agencies should be unbundled from the agencies and given to the private sector.

- *Operations of water service agencies will need to be decentralized and commercialized.* The extent of decentralization will depend on the sub-sector. For irrigation, decentralization of the irrigation departments would be along river basin lines and responsibility for O&M will be assumed by farmer water user associations organized at the tertiary and secondary canal levels, and progressively to higher levels. For RWSS, devolution would be to the lowest administrative levels, with O&M responsibility taken up by the concerned community WSS committees. For UWSS, decentralization would be to cities and towns, and within the mega-cities to operational zones within the city. Each decentralized unit should

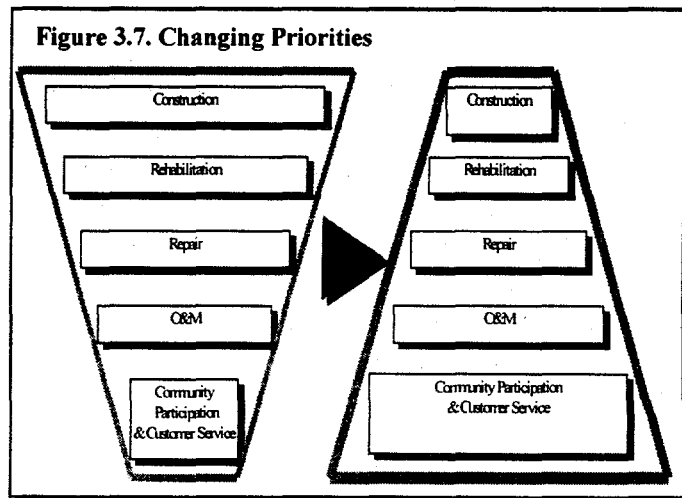
be operated on a commercial basis. This will necessitate improvements in accounting and financial management processes and information management systems, to enable proper monitoring of operational and financial performance as well as long-term viability of the units.

Economic and Financial Incentives

- *Water charges will need to be increased to at least fully cover O&M needs plus interest, with actual costs and subsidies accounted for and made public in a transparent manner. Rate increases should be directly linked with reform of the water agency and the introduction of user organizations, and should be announced and implemented in parallel. Farmers and other consumers are, in general, reluctant to pay for something they can get for free if the appropriate political clout is exerted. They are even more reluctant to pay for services they see as unreliable, unpredictable and often non-existent, and at costs they perceive as gold-plated, with too many departmental staff. Experience worldwide, has shown that users are willing to pay adequate fees for services they appreciate as useful, timely and reliable, or where they are convinced the service agency will work to help achieve this.⁷²*
- *Enhancing allocations for operations and maintenance will be an important measure during the transition of water agencies from government departments to autonomous utilities, to enable the needed rehabilitation, modernization and upgrading of existing systems and to improve the quality of services delivered. Increasing cost recovery is often incorrectly viewed as synonymous with improved O&M, but water agencies today in India may not receive any additional budget allocations to improve the quality of services. The transition agencies will also need to retain the revenues from user fees, with which to apply toward O&M expenses. This will be the first step on the road to financial independence of the water agencies, when the latter start making the link explicitly between quality of service provided and amounts collected from users. The agencies would also have a stake in actually collecting the fees, enabling collection percentages to increase. Similarly, the users must have a direct stake in paying water charges, by noticing that they receive a better irrigation service directly financed through their contributions.*
- *Re-prioritizing government expenditures to first emphasize customer service, O&M, institutional capacity building and systems improvement. These activities have typically received last priority, and complete reversal of emphasis, as per Figure 3.7, is thus required.*

⁷² In the drinking water sectors, for situations in which the cost burden for communities of the least expensive feasible WSS technology generally exceeds a community's ability to pay out of incomes, then payment in-kind, user access to credit facilities, or a direct and transparent subsidy arrangement should be implemented. Where wide disparities exist between socio-economic groups of consumers, some cross-subsidization could be an appropriate and practical option. A progressive tariff with different pricing tiers for different uses and different classes of customers would be preferred and could be considered at various administrative service levels (i.e. the gram panchayat, town, municipality, district, or state) as appropriate.

- *Enable access to private sector finance through establishing sector financial viability.* The availability of funds for sector investments from the government is becoming increasingly strained under the weight of increasing subsidies on provision of public services and the need to fund competing government priorities. The needs of the water sector to meet its objectives of extending WSS coverage to all citizens and capturing the full potential available to extend irrigation facilities are tremendous. Given the concurrent fiscal



Source: World Bank, 1998d, Figure 4.1.

reduction goals and needs of other sectors, substantial increases in government funding are unlikely. Funding from external support agencies are currently a small fraction of overall sector investment and will not increase significantly to bridge the financing gap. There will thus be a need to access private funding sources. Private funding could be as simple as requiring capital cost contributions from users—a viable approach and already underway to a limited extent in some states in the RWSS sector and tertiary level irrigation systems—to structuring of the complex financial instruments such as bonds to be issued through the capital markets. The opportunity provided by capital market finance is already potentially available to municipalities through the issuance of municipal bonds on the capital markets. Direct issuance of water bonds, would be available, in the absence of state or municipal guarantees, if and only if the sector becomes financially viable. India's irrigation sector already has experience in bond issuances in Maharashtra and Karnataka, though these were made possible due to state provided guarantees. In an era of general fiscal crisis facing most if not all Indian states today, it is unlikely that continued provision of state guarantees will be sufficient to attract capital market financing. Thus sector financial viability will be critical.

Technology and Information System

- *Water saving technologies will need to be introduced.* This would be an important complementary action where possible to enable improved water conservation by users. In irrigation this would include improved water application methods, availability and promotion of sprinkler and drip irrigation equipment, on-farm works and other land improvement investments (refer Box 3.7 for example from China). In the drinking water sectors, both urban and rural, the introduction of meters would be an important first step to inducing greater conservation of water by users. Cities and towns with private household connections would be able to promote dual-flush toilets and other technologies that would save on water used at household level.

- *Pollution control and reuse technologies will need to be introduced.* In addition to sewage treatment plants, innovative technologies such as aquaculture, pisciculture and afforestation will need to be used increasingly throughout the country where appropriate and viable. Networks to deliver treated water to end uses will need to put in place. In RWSS and poor urban

neighborhoods, effective low cost sanitary latrines should be promoted and made more widely available to communities. In irrigation, improvement in application of water, fertilizers and pesticides through better extension of irrigated agronomy know-how to farmers will greatly reduce the level of contamination of water sources by agricultural chemicals. Other investments in drainage and reuse structures will not only greatly improve crop yields but also reduce environmental problems of waterlogging and salinity.

- *For irrigation, there needs to be a better link between the irrigation service, agricultural extension service and farmers,*⁷³ to enable higher yields, farmer incomes, and farmer satisfaction. With such a partnership in place, synergistic improvements in the irrigation service and agricultural techniques will be possible through joint identification and design of irrigation commands, and enhancements in water application and management within the canal systems. While the detailed changes required in the agricultural sector and in agricultural policy is beyond the scope of this report,⁷⁴ irrigated agriculture extension, which requires substantial strengthening, definitely is within the report's scope. The extension service to irrigated farmers, whether undertaken by the irrigation, agriculture or command area development agencies, must include extension in water use and other agricultural practices at the individual field crop level.

Policy, Legislative and Regulatory

- *Supporting legislative changes will also be needed.* Institutional and financial reforms will usually require adjustment of water-related laws to better align them with current realities and thereby enable implementation of the proposed strategy for change and growth such as laws enabling user involvement in sector operations and management (a good example of this is the Andhra Pradesh Farmers' Management Irrigation Systems (FMIS) Act and FMIS Rules, both of 1997). In some states, the reform process can commence using existing legislation and *ad hoc* Government Orders. In other states, or as more complete reform occurs, legislation may be needed.
- *Legally-enforceable water rights to users will need to be introduced,* to provide water users with protection, encourage water saving, and facilitate intra- and inter-sector water transfers.

Box 3.7. Benefits of Water Saving Technology in China

In recent years, the Chinese Government has promoted water-saving technology in rice production to replace the prevailing deep submergence irrigation. The key method is the "shallow water depth, wet situation, and sun-drying field." It can save up to 1,500 m³/ha while increasing rice yields by 375 kg/ha. More than 3 million ha are already using it. If this were to be adopted in two-thirds of China's total rice growing area (of 21.4 million ha), 30 billion cubic meters of water would be saved and 7.5 million tons of more rice would be produced.

Source: ICID News Update, May 1997

⁷³ Unlike the WSS sectors where access to water is an end in itself, irrigation is but an input into the agricultural sector. For irrigation to generate (or contribute to the generation of) benefits, the agricultural sector must be able to make good use of the water being provided to it. This in turn requires diverse changes in the agricultural sector itself, from research, innovation and extension, to pricing and marketing, to other support services.

⁷⁴ Even though some of the quantitative restrictions faced by irrigated farmers (like restrictions on area planted to sugar cane in many states) derive directly from distortions in the pricing, taxing, and subsidy policies for the sector.

This will be particularly important for farmers groups⁷⁵ as well as to bulk supplied villages, towns and cities or areas served by multi-town schemes. Such water rights systems (WRS) exist in a few countries, covering all water uses, and have been found to generate definite benefits to most stakeholders in the water sector, in addition to badly-needed legal protection for Indian farmers. The WRS should be legally established in state policies and legislation, but its actual introduction would have to proceed in a progressive way, starting from irrigation commands as a whole, cities, towns, industries, power plants, and other bulk users (such as farmer water user associations or community WSS groups) with the most clearly defined water allocation, entitlement or licenses. Extension of the WRS within the above mentioned groupings (to cover all sources, uses and users) would be difficult and likely infeasible in India due to the large numbers involved; however, pilot programs should not be ruled out and could be part of a subsequent implementation program.

⁷⁵ In the case of irrigation, both the management of water resources by the irrigation service departments and the tasks undertaken by WUAs would be facilitated if each irrigation command, and within them, each WUA, could have a legally enforceable entitlement or right to the water originally allocated to, or used by, them.

Chapter IV. The Reform Agenda and Action Plan

A. THE REFORM AGENDA

4.1 Addressing India's water sector concerns needs to take account of the current resource situation and the issues that have emerged in recent decades. As discussed earlier, the issues are cumulative in impact and progressively exacerbated by the narrowing scope for maneuver. A finite resource base has been subjected to rapid development, primarily for irrigation, over the past few decades. Water service delivery has focussed heavily on putting in place the infrastructure toward achieving maximum coverage of the population, and has had been unable to attend adequately to the needs for quality service, efficient delivery, efficient water use, or responsiveness to their water using clients. Resources are no longer plentiful and constraints exist in most basins. Meanwhile, water demand has grown rapidly, and particularly rapidly in the case of the non-irrigation sectors. Management of water resources must be radically improved if the constraints are to be met. Furthermore, in all three main service sub-sectors—irrigation, urban water supply and sanitation, and rural water supply and sanitation—major restructuring is required.

4.2. Tackling and resolving India's water resources management problems will not be an easy task. In common with most other countries, water resources management is fraught with difficulties. By its nature, water is multi-dimensional. It involves: users from different sectors with widely different needs; millions of individual households and firms, each acting in its own interest in response to the physical and incentive environment within which it is situated; multi-layered levels of social organization and public administration, ranging from village and societal groupings to local administrations, such as panchayats, and to larger units such as blocks, municipalities, districts, states and the nation as a whole; government administrations where executive responsibilities for water are typically and perhaps necessarily split between many different government departments; and a question of the respective roles of government, civil society, and the private sector. India's task is made all the more difficult by its enormous population and its federal administrative structure. The undoubted virtue of democracy, which is one of India's blessings, can sometimes make decision-making more difficult. Pragmatic and often unique solutions will need to be found by India.

4.3. *There are two broad issues that need addressing.* **First**, solutions must be found to improve resource allocation and management, both between competing intersectoral uses and between states sharing the same river basin. Mechanisms must be developed for integrated treatment of surface and groundwater, including quality and environmental considerations, and for efficiently and equitably allocating scarce water resources between competing uses—i.e., irrigation, rapidly expanding domestic and industrial needs, hydropower, environmental and navigational requirements. **Second**, reforms to improve service delivery in the water sub-sectors (i.e. irrigation, urban water supply and sanitation, and rural water supply and sanitation) must be implemented.

4.4. *Comprehensive approaches will be required.* A combination of mechanisms in several subject fields (e.g. policy, institutions, pricing, technology) will be needed simultaneously. Permeating all of the mechanisms are four overarching factors. First, there should be a ***shift from supply-driven to demand-oriented approaches***, with further exploitation of additional resources where appropriate, balanced by demand management. Second, recognizing that water is an economic good with both public and private good characteristics, ***sector responsibilities should be divided between government and the non-government stakeholders***, as appropriate. The present almost exclusive domain of the public sector must broaden out to include the private sector—civil society groupings, academics, NGOs, industry, etc.—in decision-making and implementation. Third, effective participation of non-government and grassroots stakeholders will be achieved only by ***decentralizing decision making, and explicitly including non-government stakeholders in sector activities***. Fourth, ***achieving financial viability of service delivery is essential***. Until all water service delivery entities are financially viable and self-financing, the sector will be unsustainable, further development will be hindered, and private sector funding for investment activities will not be forthcoming.

4.5. *The role of government will be reoriented from being one of provider and financier of services, to one of facilitator and enabler.* The overall orientation should be towards decentralization, unbundling of agency activities, commercialization and corporatization, devolution of responsibilities to users, and involvement of civil society in sector operations. Specifically, the new roles envisaged for the state, sub-state, and central governments, as well as civil society, are as follows. The ***state governments*** will necessarily play a major role as initiators of reform, and in addition they will facilitate and enable change at sub-state levels. ***Sub-state administrations*** (i.e., cities, towns, villages, districts, blocks, river basin organizations) will take on new responsibilities for water service provision in their jurisdictions, delivering services through commercially run public utilities or overseeing the operations of contractors. They will facilitate community organization and involvement in decision making, in addition to capacity building in smaller and weaker jurisdictions.

4.6. The ***central government*** role would be to focus on facilitation and encouragement of state governments to undertake the reforms and evolve appropriate state strategies. Specific aspects of central government's role are: to disseminate examples and expose sector specialists to best practices in India and other countries; to develop an appropriate policy and program framework; to develop and provide standard formats and model legislation; to leverage limited government resources through appropriate mechanisms; and to promote comparative competition⁷⁶. ***Other non-governmental actors and stakeholders*** such as universities, NGOs, and the private sector, will work with government to contribute their talents to the reform agenda

⁷⁶ "Comparative competition" refers to the process whereby a public service entity strives to achieve a better reform and performance record than its peers. The "peers" in this context would vary depending on which entity was being referred to. The universe of peers in the water sector would include state governments, relevant state department, municipalities, towns, WSS agencies of relevant size, and so on. The central government, and even state governments (for promoting comparative competition among entities within its jurisdiction), can promote such competition through maintaining and disseminating among the relevant peers, a data base of performance indicators and reform actions accomplished. Such a data base can and should include information from other countries.

and facilitate participation of community user groups in sectoral decision making. Over time, the stakeholder should become the most important actor. Irrigation and rural water supply facilities should be owned and managed by farmer water user associations (as in Mexico, Chile, Turkey and commencing in Andhra Pradesh) and village water supply and sanitation committees (as is commencing in Uttar Pradesh and Karnataka). Urban consumer interest groups should play an active part in the decision making process of the urban water agencies.

4.7. *Development of effective management and delivery systems requires sustained effort.* There are no simple solutions, and development will require a process that enables the evolution of management capacity at all levels, from the central government to the individual user, as well as piloting of innovatory approaches. The key to successful implementation of the proposed strategy through these identified interventions is action to produce visible results for the customers and stakeholders. The results and improvements in resource availability and quality, and in the quality of service delivery, will help to cut through the vicious circle of problems that have deteriorated sector assets. They will be a stepping stone to the creation of the virtuous circle, thus helping to establish a sustainable use of water into the future. Commitment to reforms and strong political will to implement reforms will be critical. Also critical for effective implementation of reforms, and helping feed the political commitment, will be a broad-based public consultation process to ascertain stakeholder concerns and their specific needs, discuss the reform agenda, and strengthen the forces for change.

4.8. *A key need is to develop a new **enabling environment** that can influence the myriad of actors involved,* including each and every household, private businesses, and the various social, administrative and political aggregations (villages, socio-economic strata, municipalities, districts and states). *This will require establishing an **incentive framework** that influences these actors.* Direct impact will be felt through financial incentives or regulatory measures actually enforced. These translate the policy, legislation, institutional and technical capabilities into impact at the level of the individual. The incentive framework must also provide the right directions for the higher organizational units, i.e. the state governments and their various water related departments, river basin organizations, municipal water agencies, the different central government agencies, and grass-roots organizations (e.g. village WSS committees and irrigation water user associations). For these, policies, legislation, institutional structures and interlinkages, approval processes, capacity building, information, the structure of prices, and financial incentives and leverages, also come into play.

4.9. *As the reform program is implemented, a **long-term vision** needs to be in constant focus.* As soon as possible, management of water resources in India will have to be on a river basin basis, including a sophisticated management apparatus, incorporating all sectoral uses and stakeholders and crossing state boundaries. The report's recommendations start this process, but success stories such as the Murray-Darling Basin in Australia, including major emphasis on public awareness and public participation, illuminate the further actions required. The development of water policies, legislation and regulatory structures in India should look to the world's best-practices, even if a phased approach is required to get there. Pricing and other market allocation mechanisms need to evolve as quickly as possible to meaningful instruments guiding resource allocation and usage practices. For instance, the tariff structures used by the

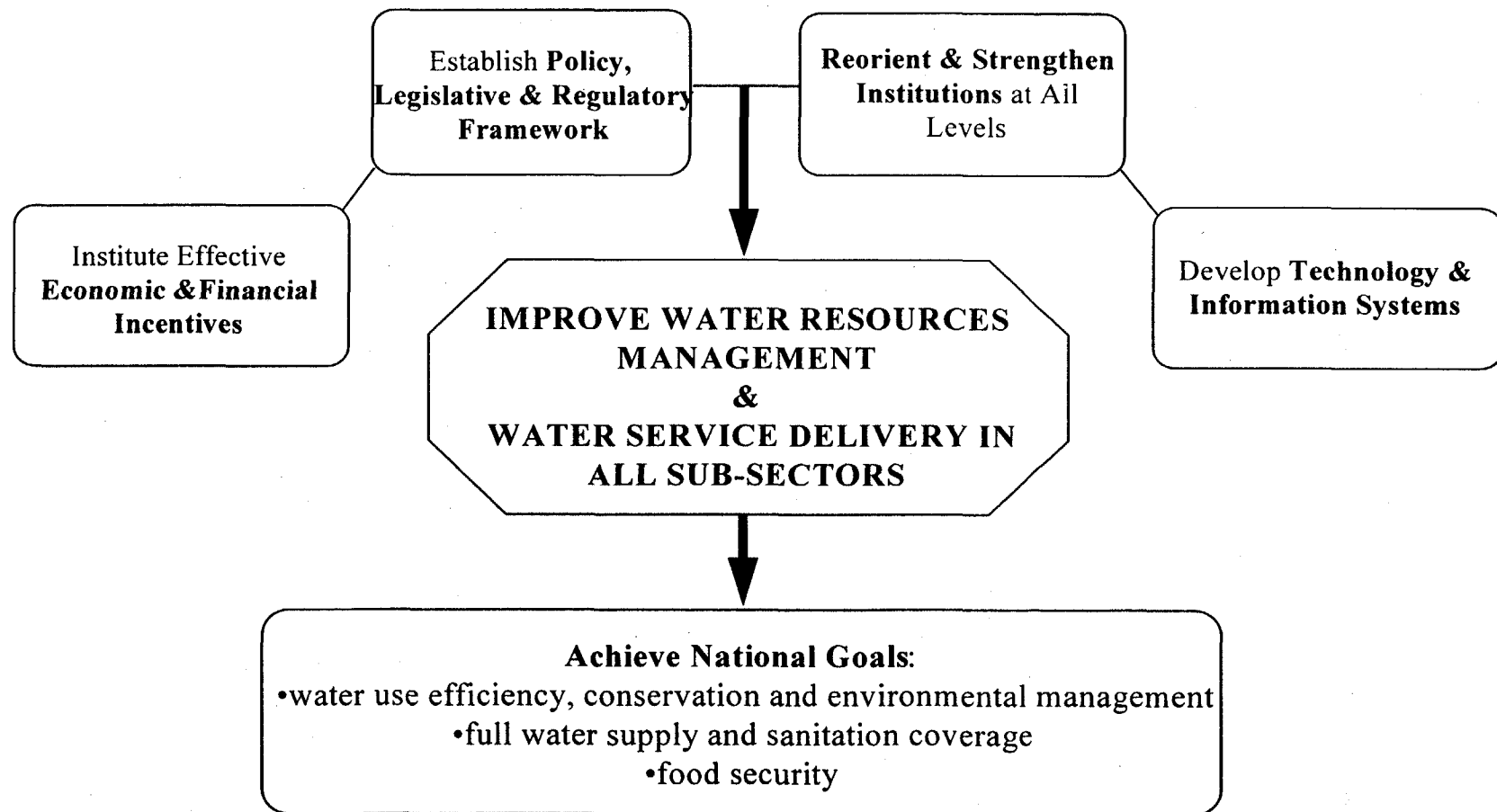
world's best-practice water utilities (e.g., Singapore, EMOS in Santiago, Chile, and initiatives underway in Buenos Aires, Argentina), water marketing arrangements found in the Western US and Chile, and pricing as an environmental management mechanism in the Netherlands.

4.10. *A major drive is required to improve technology for increased productivity of water in all sectors, with lessons for agriculture from countries such as Israel, Jordan and California, and for the drinking water sectors from best-practices water utilities in the US, Europe, Santiago and Singapore. Hydrological data and modeling capabilities must advance to the same levels found in the US and Europe. The eventual institutional structures in India, as well as even the initial restructurings in the reform process, will be a major transformation from the present: for instance, evolution to fully commercialized water services as found in the US, UK and Chile; and government agencies eventually restricted to policy, planning and regulatory activities, as found in the UK and evolving in a number of other countries. India's long-term sights must, necessarily, be far-reaching. The eventual goal must be the best, rather than marginal, change. This will be essential, and need to be achieved as rapidly as possible, if the nation is to achieve its social and economic objectives. The Action Plan summarized below will enable an energetic start in these directions.*

B. THE ACTION PLAN

4.11. The Action Plan discussed below has taken into account that, while initiatives are underway at the center and in some states, for most states and river basins, the country is starting largely from scratch as regards integrated water resources management and improvement in service delivery. The change process must recognize the realities from which change must commence. Many of the recommendations are, thus, start-up in nature, comprising primarily the short and medium term agenda. These actions should not, however, be considered the end of the process. Policy makers and implementers should keep in their sights the best examples of success worldwide. All reform areas—(i) policy, legislation and regulations, (ii) institutional reorientation and strengthening, (iii) economic incentive framework, and (iv) technological and information systems—require attention, and mutually support each other (Diagram 4.1). These will be discussed in turn below. The Action Plan is presented in full in Tables 4.1 to 4.5. Each focuses on a separate specialist topic or sub-sector and is reproduced from the five specialist India WRM reports (on: Intersectoral water allocation, planning and management; Groundwater regulation and management; Irrigation; UWSS; and RWSS). They included state, sub-state (city, town, village) and central level responsibilities and a suggested time-frame for action. Particularly at state and sub-state levels, the specific circumstances of the concerned state or sub-state entity will need to be factored in. No uniform prescription or blueprint will be appropriate for all circumstances. A strategic, but also opportunistic, approach will often be needed, tackling first those issues considered most important and susceptible to change.

DIAGRAM 4.1. INTERACTING AND MUTUALLY SUPPORTIVE REFORM AREAS



4.12. These recommendations are already the subject of encouraging follow-through by the Government of India, a number of states, bilateral and multilateral agencies, and NGOs. The India WRM national workshop to discuss the intersectoral allocation, planning and management report (World Bank, 1998) held May 12-13, 1998⁷⁷ in Mussoorie, was preceded by three regional consultation meetings organized by GOI to discuss the report findings, put water sector reform on the state government agenda, and ensure adequate preparation of the states at the May national workshop. Subsequent to initial discussion cum dissemination at another India WRM national workshop⁷⁸ in February 1997, of an earlier version of the India WRM RWSS report, and report revisions to incorporate the outcome of the national workshop, further workshops at regional and state levels are being organized by the Rajiv Gandhi National Drinking Water Mission to disseminate the final strategy recommendations as reflected in that report.

4.13. The outcome of the other India WRM national workshops that were held in New Delhi—on urban water supply and sanitation (June, 1997), irrigation (June, 1997) and groundwater regulation and management (February, 1997)—are similarly undergoing further discussion and follow-through by central, state and municipal governments. The recommendations are being incorporated at project level in some states, in the design of projects supported by the World Bank, and in various bilateral agency and NGO-supported activities. There is now a need to broaden implementation to a formal national strategy that encompasses all elements of the report in a comprehensive approach. Such a strategy for the water sector reform process is under energetic initiation by the Government of India and merits full support to achieve the intended turnaround in sector performance.

Improving the Policy, Legislative and Regulatory Framework

4.14. While India has prepared a National Water Policy (NWP) (1987) as discussed in Chapter II, this policy suffers from not having been translated into action through supporting legislation, institutional or financial actions for reform. It is also in need of updating to reflect the 1990s and the projected scenarios of increasing scarcity for water. One complication is that reforms in water, being primarily a “State subject,” need necessarily be implemented through state-level actions; yet minimal action has been taken at state levels. Very few states have formulated state water policies of their own, in line with the NWP, and coherent agendas or implementation mechanisms for improving water resources management are similarly absent or at best rudimentary. Each state will need to prepare two guiding documents: (i) a State Water Policy responsive to its needs and in line with the principles of the NWP, and (ii) an Action Agenda outlining the specific actions intended. The central government should facilitate and guide the state policy and reform agendas through updating the NWP and sensitizing the states.

4.15. A solid legislative and regulatory framework to support systematic approaches to improved allocation, utilization and management of water is largely absent. The legislative framework requires review, revision and, in some cases, augmentation to enable: (i) the creation

⁷⁷ This national workshop was hosted by the GOI Ministry of Water Resources.

⁷⁸ The national workshop on RWSS, held on February 20-21, 1997, was chaired by the Rajiv Gandhi National Drinking Water Mission, and was attended by central and state government representatives, academics, and members of NGOs and civil society.

of new water allocation and sharing institutions and arrangements, such as multi-sectoral water stakeholder associations or participation of private sector and civil society; (ii) strengthened regulations and enforcement mechanisms, particularly for pollution control measures but also to facilitate emergence of well functioning price-based reallocation mechanisms, including water markets; (iii) new forms of water tariffs, including volumetric charging in all water sub-sectors and power sector delivery for groundwater pumping; (iv) passage of a groundwater legislation and establishment of regulatory framework for groundwater management; and (v) assessing options for defining transferable surface and groundwater rights.

4.16. Given the current debates and wide disparities in opinion in India regarding the appropriate legal frameworks,⁷⁹ there will need to be a careful review of legislative issues as a first step, and such review should involve a wide range of participants from both within and outside government, including representatives of the center and different state governments, NGOs, academics and representatives from different states. There is also some debate on the appropriate regulatory framework and measures.⁸⁰ Frameworks need to enable local management initiatives and provide adequate technical support while also enabling government management where locally based approaches are not viable. Frameworks also need to establish a *process* by which management can be initiated and gradually evolve with regard to the issues addressed and tools used. This is essential because as yet, limited institutional capacity exists for addressing the broader array of groundwater management needs emerging in different parts of the country. Substantial international experience on establishing effective legal frameworks for the water sector should be reviewed, and utilized to the extent applicable with appropriate modification to reflect the Indian context. Experimentation with alternative management approaches using existing legal avenues and administrative powers may also be important in order to frame appropriate legislation.⁸¹

4.17. At central and inter-state levels, amendments of two existing Acts, the River Board's Act and the Inter-State River Disputes Act should be undertaken to enable the center to play a stronger facilitating role in the creation of river basin organizations (RBOs)⁸² and the resolution of inter-state water disputes. First, the River Board's Act, should be amended to give powers to the central government to initiate establishment of an RBO. Second, adjustments to the Inter-State River Disputes Act and its Tribunal Awards system, would benefit from substantial streamlining to constrain the awards procedures within a mandated time frame. Amendments should include provisions to enable: (i) the center to establish a Tribunal within one year of receipt of a

⁷⁹ For instance, legal approaches proposed by Chhatrapati Singh (Centre for Environmental Law), Vishal Narayan (Tata Energy Research Institute), and R. Maria Saleth (Centre for Economic Growth) are quite different from those proposed by the government and outlined in the model bill prepared by the CGWB.

⁸⁰ Attempts to regulate groundwater through restrictions on credit and electricity connections—the primary governmental management effort implemented to date—for instance, have had only limited success. While there is some evidence from NABARD that withdrawal of credit support for new wells reduces the number of new wells constructed, this will not be sufficient to address existing overdraft concerns.

⁸¹ There will need to be initiatives by NGOs and local populations to address groundwater problems and these have begun to emerge in some areas. These indicate local concern and willingness to act in areas where groundwater problems are perceived as urgent.

⁸² RBOs could take many different forms, ranging from fairly informal structures, facilitating dialogue and planning between states, to more formal institutions with executive powers.

grievance from a riparian state, if agreement is not reached between concerned riparian states; and (ii) following a Tribunal decision, to establish a mechanism for monitoring and implementing the award.

Strengthen Institutional Arrangements

Resource Allocation and Management

4.18. Institutional mechanisms need to be created or strengthened, in particular at state, grass-roots and basin levels:

- *Enhance Non-Governmental Stakeholder Participation.* This orientation should underlie all institutional initiatives. Initially, the lead on this will have to come substantially from government, given government's present dominant role. Civil society, NGOs, academia, industrialists and water user groupings should be engaged in brainstorming discussions and decision-making processes as quickly as possible. Particular attention should be given to fostering involvement of traditionally marginalized groups which have a large stake in water resources issues, such as women and the poor. As non-governmental stakeholder participation is developed through public awakening and capacity building, and additional responsibilities are shouldered, the center and state institutions should modify their role accordingly.
- *Reorganize and Strengthen State Level Institutions.* Except in a handful of states, mechanisms for integrated multi-sectoral planning, allocation and management of water along river basin lines are very weak or absent. The sometimes existing coordination arrangements among sectoral departments has not been effective. These arrangements will need to be formalized in a separate agency to adequately address present needs. Three complementary actions are required. First, state governments should establish a multi-sectoral state-level institutional group comprising (a) a policy-making State Water Resources Board (SWRB) staffed by heads of all using and concerned departments (including environment), and (b) its technical support unit, a State Water Planning Organization (SWPO) which would be staffed from the existing planning, forecasting and resource data personnel from irrigation, drinking water, industry, environment, groundwater and other water using departments as appropriate. Second, state governments should reorganize the state bulk water supply agency (typically the Irrigation Department) along river basin lines, and as per the item (b) of the first action immediately above, identify and send relevant staff to the new SWPO to assume the broader role in water resources management. Third, they should create River Basin Organizations for basins or portions of basins within the state.
- *Establish Grass-Roots Mechanisms for Water Management.* Grass-roots institutional arrangements are needed to enable stakeholders to discuss water resource issues, problems and solution options, and to implement local-level resource allocation and management initiatives. Many water resource management issues—such as conflicts between rural water supply needs and agricultural water pumping: a local industry polluting village drinking

water sources; or pollution from a municipality worsening the quality of water used by washermen downstream—have their origins and prospects for resolution at such micro-levels.

- *Create Inter-State River Basin Organizations (RBOs).* Riparian states on all inter-state basins, should endeavor to establish RBOs as a matter of priority, selecting among the wide range of successful national and international RBO models. The center should strongly encourage RBOs, through provision of financial incentives if necessary.
- *Strengthen and Reorient Central Institutions.* The center should provide leadership and guidance on implementing reforms to the states, including provision of information on best practices. It should further foster reform and public participation through appropriate policy and program initiatives, including public dissemination of information, stakeholder awakening or empowerment campaigns, and capacity building for local and state level institutions. It would provide financial incentives to state governments, and leverage and facilitate state initiatives and capacity building through: (i) monitoring of state water resource reform agendas as part of the Plan investment approval process; (ii) access of states to a new River Basin Development Fund to encourage inter-state cooperation, or multi-state basin developments where an RBO and basin plan exist; and (iii) providing technical assistance and related financing of consultancies, training and equipment to states for their reform and capacity building programs.

To effectively play this more pro-active role the center will need to better integrate the activities of the different central agencies connected with water. The National Water Resources Council (NWRC) and National Water Board (NWB) need to be strengthened with an operational level Technical Committee and a permanent multi-sectoral professional Secretariat or National Water Planning Organization. Also, MOWR and its member agencies (Central Water Commission, Central Ground Water Board and the National Water Development Agency) should establish mechanisms for closer interaction and coordination of activities.

Water Service Delivery

4.19. The proposed strategy focuses on establishing an enabling environment to support strengthening of institutions and financial viability, which will serve the broader objectives of public administration reform. The general approach focuses on several themes. During a transition phase from government provision to self-sustaining utilities, financial conditionality with the allocation of central and state funds will need to be the major force driving the reform process at both state and local levels. Conditionality for disbursement of funds must be explicitly defined, and strictly adhered to. This will be used to phase out the target-driven approach and government subsidies, and to phase in a demand-driven approach and full cost recovery. Public education and widespread communication will set the stage by convincing voters and politicians of the need and benefits of making and implementing difficult cost-sharing and recurrent cost recovery decisions. Implementation of a participatory demand-driven approach will ensure that users can directly influence the level of service they desire and can afford; and full cost recovery will ensure financial viability and sustainability. Finally,

supporting public sector reform and institutional strengthening will ensure sustainability. External agencies can facilitate by supporting these reform efforts.

4.20. Given the huge range of local requirements and opportunities in India, a “one size fits all” approach to implementing the recommended framework is not appropriate. A three-pronged approach is proposed for the implementation strategy: (i) systemic changes - the changes which are essential to operationalize the incentive-based approach; (ii) innovations through windows of opportunity - these are locally-led, incremental, opportunistic innovations which will occur where conditions are suitable; and (iii) demand-led capacity building - technical assistance and training to be oriented to local demand. This is intended to promote nation-wide reform while allowing local flexibility (see Box 4.1 for the approach under implementation in Andhra Pradesh for irrigation). The ultimate shape of these reforms will evolve out of a long-term process. This shape will reflect experiences gained, needs identified and results achieved in initial phases. Over the short term, therefore, highest priority should go to initiating those activities essential for starting and guiding the overall process of reform. The specific elements of reform will vary from state to state, town to town, and canal command to command, but will include:

- *Decentralizing Service Operations.*

Management and financial responsibility should be transferred to the lowest appropriate level, e.g. municipalities and the panchayat raj institutions and, in particular, community water user groups for RWSS, and as relates to irrigation, to basin-oriented farmer water user associations. Transfer of responsibility would require corresponding provision of management and financial autonomy to local administrations and user communities, as adequate and appropriate for their roles. Given the responsibility and autonomy, these local groups will be made responsible for overseeing planning and implementation activities. If required, these local groups would then be able to obtain a higher quality of services and minimize unit costs, through competitive selection of service providers among existing public agencies, non-governmental organizations, and the private sector.

Box 4.1. Irrigation Management Transfer Reforms in Andhra Pradesh

The strongest reform agenda in India, and an exemplary one for other states to look to for lessons, is presently being carried out in Andhra Pradesh, with financial and technical support from the World Bank. Andhra Pradesh—all within the last 12 months—has: (i) tripled water charges; (ii) issued a Farmers Management of Irrigation Act; (iii) held successful elections for 10,224 WUAs statewide for all irrigation systems; (iv) held subsequent elections for federation of WUAs to distributory Committees; (v) embarked on a massive training program for the new WUAs and supporting irrigation, agriculture and NGO cadres; (vi) held joint “walk-throughs” of all irrigation systems between WUAs and engineering staff; (vii) commenced the works program to improve the systems; and (viii) commenced planning for an agricultural intensification program. A program of further reforms and investments to achieve the virtuous circle described above are also planned by the Andhra Pradesh Government.

- *Strengthening Capabilities of Decentralized Entities and User Groups.* All decentralized units and groups will require basic capacity strengthening for their new roles. The decentralized entities, with their user community groups or irrigation water user associations, can improve the administration and provision of basic WSS and irrigation services if they are given the opportunity, support and resources to do so. Entities requiring strengthening will include: for UWSS, civil society-based associations that would be developed to improve customer responses and feedback mechanisms; for RWSS, gram panchayats and user

community groups created under the panchayats; and for irrigation, water user associations (WUAs) that will be organized to operate and maintain tertiary level systems, as well as federated WUAs that will be fostered to handle distributory and possibly higher level structures. The decentralized entities will also need sufficient incentives to increase their level of self-generated income and become more independent. They will in addition require: an understanding of the demand-driven approach and how to assess and meet community needs; the autonomy to prioritize and choose investments that best satisfy community needs; an ability to assess and appreciate the financial and social implications of their investment decisions; and an understanding of available technologies and how and from whom to best procure them.

- *Strengthening Capabilities of the Restructured Central Entities.* Achieving institutional sustainability will also entail strengthening the general management capacity of state and basin-level irrigation agencies, and state and local WSS agencies, while at the same time restructuring those organizations so that they may implement a delivery system oriented toward customer service. State and district WSS agencies as well as the central agency will further need to build up a capacity to facilitate the formation and capability building of local level entities. State level irrigation agencies will similarly need to provide technical assistance to basin-level agencies.
- *Commercializing Operations at all Levels.* This will be necessary to improve efficiency and effectiveness of the service agencies, and contribute to enhancing their viability. There will need to be: an unbundling of the agencies by functions such as bulk supply, operations and technical services; a removal of monopolies or barriers to entry to encourage competition; and commercialization and corporatization of the disaggregated entities leading, in some cases, to privatization. These reforms will be supported by developing appropriate comparative competition facilities⁸³ at state and central levels to collect and disseminate performance indicators among agencies.
- *Fostering Participation of NGOs and the Private Sector.* Participation of non-governmental organizations and the private sector, which will especially help to enhance efficiency and improve service delivery, need to be encouraged. This may be achieved by making the regulations and procedures governing procurement and contracts more flexible, and offering financial incentives in the form of preferential rates or tax incentives. NGOs, for example, are playing a critical role as facilitators for user community group formation and strengthening in the ongoing Bank-assisted Uttar Pradesh Rural Water Supply and Sanitation Project, as well as in various WSS and irrigation initiatives in other states.

Rationalize the Economic Incentive Framework

4.21. Although price instruments exist, the levels of existing incentives and the form in which they are applied result in minimal, and in some cases negative, impact. Major change is required in the system of prices and other economic incentives affecting water use and allocation. The

⁸³ Refer footnote 76. The organizational units that maintain and disseminate information on performance indicators and status with reforms constitute a “comparative competition facility”.

proposed institutional and financial reforms are mutually supporting. An initial implication of financial reform, for example, will be that access to more commercial financial facilities will provide incentives for service agencies to improve their performances so as to receive better credit ratings (which, in turn, will reinforce the institutional reform by creating a demand for performance information - both ex post and ex ante). Furthermore, financial reform will create greater incentives to focus on financially viable investments. Reforms to close the incentives gap will include actions at the intra-sectoral, inter-sectoral and inter-state levels, as follows:

Intra-Sectoral

- *Establish Meaningful Water Prices* (usually requiring significant increases) for irrigation, urban and rural water supply, at least reflecting the costs of service provision and charged volumetrically. Tariff rationalization is a pre-requisite to increasing financial flows to the sector. Tariffs should reflect costs, and any subsidies should be explicit and well-targeted (see Box 4.2 for example in RWSS sub-sector). Tariff levels should further reflect efficient levels of service, and in particular, costs of excess agency staff should not be included in the tariff rates. Service providers should not simply be allowed to pass on their inefficiencies to consumers in the form of higher tariffs. Tariff increases should be undertaken periodically, and be indexed to inflation. Improvements in operating efficiency will be essential and should result from the institutional reforms outlined above.
- *Establish Specific Targeted Measures to Protect the Poor*. This could include life-line blocks and community-based credit systems to enable the poor to spread payments over time.
- *Enhance Economic and Financial Capabilities*. Project preparation and appraisal skills need to improve, particularly so if the sector is to access new finance from the private sector. While raising private sector finance will be more pertinent to UWSS, possibilities exist especially for irrigation and RWSS. The institutional reforms to boost organizational capacity in the sector, commercialize water service providers, and involve the private sector, will assist in improving financial management, financial viability and sustainability. Further efforts to provide service providers with access to new finance sources are likely to be needed from state governments and financial intermediaries already involved in the sector.
- *Increase Agricultural Power Tariffs* and charge volumetrically to establish incentives for groundwater and power conservation;
- *Remove Agricultural Price and Marketing Distortions* in commodity and input markets that currently encourage excessive water use and regional imbalances;
- *Establish Pollution Taxes* and other incentives to encourage adoption of water conservation, treatment, reuse and pollution control practices, including utilization of “polluter pays” approaches and price structures.
- *Enable Access to Private Fund Sources*. Financial reform will also entail development of community credit systems, and direct borrowing from the capital market for the more advanced entities. Debt market scrutiny will be a lever to: greater efficiency and

transparency; new forms of financial intermediation to assist the move towards greater commercialization of water service sector borrowing, through existing as well as new specialized financial intermediaries (this is largely applicable to UWSS, but possibilities may exist for the other sub-sectors); developing new commercial credit enhancement and insurance facilities to enable the UWSS entities to create credit histories; and reorienting the use of limited public resources to achieve better leverage of these resources.

Box 4.2. Achieving Financial Viability and Sustainability in RWSS

During the transition period of reforms, the proposed strategy for RWSS sector is the fully recover of recurrent costs (i.e. O&M) immediately through user charges. The strategy further envisions an equal sharing of capital costs between state and center governments on the one hand, and panchayats and users on the other. For new schemes, a nominal 10 percent share of capital costs as a minimum will be required from users, as an equitable compromise between the old and new pricing regimes. The remainder of costs would be shared by the various governmental levels: 40 percent borne by panchayats out of their general tax receipts, and 25 percent each will be paid by center and state levels. For scheme rehabilitation and replacement, users and the three administrative levels will each bear 25 percent of the capital costs, making them equal partners in the sector.

The pre-defined capital cost sharing formula is expected to drive investments and serve as a financial conditionality for matching funding from central and state governments, as well as enable a more demand-driven approach to emerge. Capital cost contributions from users will encourage affordable investment profiles and more realistic user expectations, while matching government funding will be conditional on the implementation of tariffs to recover the full cost of operations and maintenance and establish an adequate replacement fund. Coming full circle, full cost recovery of both recurring and replacement costs will enable responsible local administrations to maintain assets properly and sustain adequate levels of services at affordable prices. In the long term, it will also ensure the financial viability and sustainability of investments in the sector.

The RWSS sub-sector does not currently offer sufficiently attractive returns in either the short or the long term. Such disincentives discourage even government-supported credit facilities such as HUDCO and the Life Insurance Corporation of India which, despite mandates to support both infrastructure and rural development, invest only a minor proportion of their total portfolio in RWSS.

Inter-Sectoral

- Develop economically-based water reallocation systems by: (i) introducing economic analysis and compensation packages in administrative reallocations; (ii) developing the brokering of compensated water trades (between, for instance, agricultural water user associations and industries or municipalities); and (iii) piloting water transactions through formal water markets, supported by an appropriate institutional and regulatory framework to safeguard social and environmental needs.

Inter-State

- Encourage multi-component (including non-water investments) basin development plans for inter-state river basins. The use of multi-component plans increases the scope for the states to select a set of investment options that provide net positive gains to each state. With the possibilities for mutually beneficial gains thus enhanced, cooperative investment planning would be enabled, and the process of achieving sustainable water resource development and management would be initiated.

Strengthen Data, Technological and Information Systems

- *Public Awareness Campaign.* A major public information program should be launched to educate and enlist the support of the general public for the reform agenda.
- *Strengthen Data Collection and Monitoring.* This will be critical for effective management. Given the role data and information play in formulating major investment programs and management decisions, there is a need to fill the critical gaps in data availability and assessment, on performance of the water services as well as on hydrological monitoring for both ground and surface water, and on water quality as well as quantity considerations. To facilitate the ability of the organizations involved to build the common social consensus essential for effective management, data collection and analytical systems should be transparent and accepted as reliable by all actors. Significant improvement is also required in data and analysis, necessary to support all of the above actions. The main needs are to: (i) strengthen hydrological measurement networks and institutions; (ii) establish performance and environmental monitoring systems for water provision services in all sectors; and (iii) involve stakeholders in all water planning and allocation decision-making.
- *Taylor Data Collection and Analysis to Basin and Environmental Planning Needs.* The current data collection and assessment system has served a useful purpose by encouraging the collection of a standard data set, and this has been important for past strategy of development of water infrastructure. For today's need to focus on water management, the existing approach to data collection and analysis will have limited practical use. Data collection and analysis should now be on hydrologic basis such as watersheds and aquifers, rather than on administrative units. River basin plans, state water plans and environmental management plans should be prepared.
- *Enable Access to Technologies for Efficient Water Use and Allocation.* All water sectors have substantial room for improving the productivity of water use. A major drive should be launched in all sectors to: (i) increase water-use efficiency; (ii) improve productivity of end use; (iii) employ water conservation, water treatment and water recycling and reuse technologies; and (iv) enable transfer and reuse of water between sectors.

C. GETTING STARTED

4.22. There is no absolute blueprint for the sequencing of the reform agenda. The key point is the complementarity and vigor of the various actions. No reform agenda will be complete or ultimately successful without tackling the identified problems synergistically, vigorously, and comprehensively. A strong start is needed on at least several of the fronts simultaneously. The key need is to make a start. Some actions, however, are particularly critical at the beginning, as they provide a foundation for other subsequent steps.

Resource Allocation and Management

4.23. ***State Level Start-up Actions.*** The first need in each state will be to set out a policy framework and Action Agenda. To this effect, an Interim Water Resources Task Team should be established quickly to assess the situation in the state and to draft two guiding documents establishing the agenda for change: the State Water Policy, and the Action Agenda. These documents should be reviewed extensively within the state, including consultation with civil society and major constituencies. The following actions will be likely short-term needs:

- *Establish Institutional Capability.* Forming a SWRB and its SWPO will be required to steer and implement further actions.
- *Create Public Awareness.* A multi-media campaign should be launched to create awareness and understanding of the changes required.
- *Review and Establish Economic Incentives and Mechanisms.* A review should be made of existing incentives for water use and conservation, focusing on areas particularly in need of change and where change can be introduced quickly.
- *Initial Review of State Water Legislation.* A review should be undertaken to identify key areas requiring change.
- *Launch Initiatives for Inter-State Basins.* Possibilities will vary depending on the present degree of cooperation between the concerned riparian states. In all cases, some steps towards further cooperation are possible and should be identified and undertaken.
- *Introduce Technological Improvements.* A quick review should be undertaken in all sectors of opportunities for enhancing productivity and water-use efficiency.
- *Improve Modeling, Data, Performance and Environmental Monitoring, and Public Information.* Identify the state-specific actions needed and implement.

4.24. ***Central Level Start-up Actions.*** Actions in the short term should be to help create awareness of the issues among civil society and government. At the level of the states, it would provide technical assistance, create financial incentives and levers encouraging change, and make targeted adjustments in the center's institutional structure and legislation. To get these actions underway, a cross-ministerial "Interim Water Resources Task Team" should be established to prepare a short-term "Action Agenda" for central government's role. The following actions will need to be at the forefront:

- *Public Awareness.* A vigorous program to this effect should be launched, including use of media, literature, workshops and study tours.
- *Guidance and Capacity Building.* This will require multi-disciplinary capabilities, and an advisory role ranging from the general and conceptual to highly specific advisory capability

to help states devise and implement specific actions. The center should also help train and build capacity of local level institutions.

- *Funding for State Initiatives.* A funding provision should be provided for ready access by states to finance initiatives at the state or basin level.
- *Applying Approvals Leverage.* Develop and apply in the Plan approvals process, a system for monitoring state progress in water resources management reform.
- *River Basin Development Funding.* Establish centrally-sponsored scheme Plan funding for multi-state river basin development where RBOs and basin plans exist.
- *Reviewing Existing Legislation and Procedures.* Amendments of the River Boards Act and the Interstate Water Disputes Act should be a priority for the NWRC and the national Parliament.
- *Strengthening Central Institutions.* The short-term need is to establish or strengthen capacity to handle the areas above, including making the NWRC more operational.

Service Delivery in the Water Sub-Sectors

4.25. Given the wide diversity of conditions and readiness across different states in India and even within different cities and regions within a state, it is difficult and inappropriate to generalize the detailed implementation sequencing plan. It is expected that each state will consider its options, develop a state-wide consensus and then prepare its own action plan. This must be done through a consultative process involving all the important stake-holders.

4.26. ***State level start-up actions.*** Each state will need to develop a consensus on integrated sub-sector reform strategies, similar to the power sector reforms developed and now being implemented in several Indian states. A multi-disciplinary Interim Service Delivery Task Team for each sub-sector should be established comprising government, academics, NGOs, farmer and private interests, with perhaps a core team to carry on activities on a day to day basis. It would be helpful for the task team to visit reform experiences elsewhere both in India and internationally, while observing and drawing from relevant experience in other sectors.

4.27. For irrigation, agriculture sector representatives should be an important component of the task team. Experiences underway in India should be reviewed, and lessons extracted on good implementation practices. India water sector experiences include: state-wide initiatives in Andhra Pradesh (i.e., comprehensive reform to transfer irrigation management to farmers); comprehensive sector-wide planning and management reforms in Orissa and Tamil Nadu; the farmer managed tubewell program in West Bengal; and private sector initiatives in West Bengal to assist micro farmers to increase productivity and incomes and achieve crop diversification. Internationally, Mexico and Turkey provide good examples of recent successful major reform programs, while countries like Australia, Israel, US, Chile provide examples of largely completed reform programs. Nearer to India, Nepal's experience with WUAs and the just commencing program in Pakistan to create public irrigation and drainage utilities could also be

of interest. Experiences from the power sector (Orissa and Haryana) and UWSS sector on corporate management (Hyderabad, Chennai and Ahmedabad) would also be useful for the institutional and financial aspects of the reforms.

4.28. For UWSS and RWSS, which face a complicated institutional set-up, state strategies will need to address how municipalities, towns and villages of varying sizes and capacities should be treated. Generally for larger cities and those with higher capacity, states should encourage them to develop their own reforms. However, small and low capacity municipalities will need continued state involvement for some time to come. Villages will need state involvement in planning and possibly implementing investments (depending on the complexity of the WSS system), but would be able to handle O&M responsibilities either directly or by contracting out functions to private persons or firms. Options include assisting these smaller authorities to develop contracts with private contractors or with the state UWSS provider. The reform of state water boards should be accompanied by careful identification of multi-municipal (or integrated) schemes. State governments will also need to assist in coordinating such schemes. Lessons may be gleaned from Indian cities of Hyderabad, Chennai, Ahmedabad and from many international cities including Santiago (Chile), Buenos Aires (Argentina), Conakry (Guinea) and Ostrava (Czech Republic).

4.29. Priority actions for each sub-sector will include:

- *Public awareness.* Implement a widespread campaign to sensitize users on the scarcity value of water, and to convince voters and politicians of the need to: (i) levy water charges on those users in line with the level of service received (industry, farmers, large consumers); (ii) ensure sufficient resources to maintain investment and assure an adequate level of service for all; (iii) reduce and eliminate the reliance on limited government funding; (iv) eliminate subsidies for water supply (with possible transparent targeted subsidies for impoverished groups); and (v) ensure financial viability of the water service agencies.
- *Reprioritize Public Expenditures.* During the transition from government agencies to commercial operations, there will need to be a better allocation of public expenditures to reflect needs of the agencies. Priority should be given first to funding O&M expenditures to enable agencies to maintain and start restoring the service quality, and next to institutional strengthening. Remaining funds if any should be allocated to modernizing the systems, and only as a last resort to investment in new infrastructure.
- *Devolve Responsibilities and Strengthen Capabilities.* Responsibilities and resources should be devolved to municipalities, villages and basin level irrigation units as per the 73rd and 74th Constitutional Amendments. Necessary support should be provided to the local levels to enable strengthening of capabilities to discharge the devolved responsibilities.
- *Redefine and Reduce the Government's Role.* Reform existing state providers such as the state WSS boards, and PHEDs, by disaggregating them by function, separating service provision from regulatory and policy responsibilities, commercializing the service provision entities, and involving the private sector in management of the new commercialized entities.

The irrigation departments should similarly be disaggregated by function, separating water planning and environmental management functions from service delivery, and further disaggregating the service delivery entity into river basin units.

4.30. *Municipal and village level start-up actions.* For cities, towns and villages.

- *Undertake Consultations With Users.* Service agencies should begin consultations over customer priorities, and service level/tariff trade-offs, with their respective client bases, such as user committees at village level, water user associations at tertiary canal levels, and ward committees in towns and cities. Consultations should also be undertaken with the poor and disadvantaged groups.
- *Professionalize Management.* This will be achieved through employing specialists managers and financial executives on fixed or long-term contracts.
- *Develop a Universal Service Obligation.* This would require service agencies to find means of delivering services to all citizens, including the poor and disadvantaged groups, and at affordable prices to consumers and viable costs to the agencies.
- *Launch a Program to Increase Service Quality and Water Fees.* Introduce a program to increase water fees to fully cover O&M costs, combined with investments to restore the existing systems to designed capacity and participation of users in decision making and operations.
- *Improve Cost Accounting and Financial Management.* This will be particularly important for increased transparency of the cost structure, for introducing measures to reduce costs, and for determining an appropriate tariff or fee structure for service deliveries.

4.30. *Civil society start-up actions.* Many other organizations, NGOs, academics, etc. will also contribute to the strategy. The following contributions will be particularly important.

- *Facilitate the Organization and Consultation of Users.* Assist in developing consumer consultation mechanisms, and in the development of reforms at municipal, local and canal command levels.
- *Contribute to Developing Pilots.* NGOs need to be involved in the development of new mechanisms and pilot projects to involve and serve disadvantaged groups.

4.32. *Central level start-up actions.*

- *Public Awareness.* The center at its level should sensitize the states and the nation on the need to conserve water and greatly enhance its productivity.
- *Strengthen Operational Guidelines and Procedures.* This will include developing best practice procedures and service standards in areas such as accounting, auditing, procurement,

tariff rationalization, customer consultation, and integrating service to disadvantaged groups with the mainstream of service delivery.

- *Encourage and Finance State Reform Programs.* This will include use of the Plan approvals process as well as approval and disbursement of funds through centrally sponsored schemes or program.

**Table 4.1.⁸⁴ Intersectoral Allocation, Planning and Management - Detailed Matrix of Recommendations
Action Plan for States and Central Government**

Part I. State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
A.1. Improving Policy Framework			
Formulate State Water Policies and Action Agenda	Establish <u>Interim Water Resources Task Team</u>	Chief Minister Chief Secretary	Immediate
State Water Policy should include the following:			
<ul style="list-style-type: none"> • comprehensive basin-wide approach • treatment of surface and groundwater as unitary resource • multi-sectoral perspective • integration of quantity and quality-related aspects • full integration of environmental aspects • integration of pricing and economic incentives • introduction of administrative allocation mechanisms incorporating economic or value-based criteria, as well as promotion of market-oriented approaches to water management • demand management approaches • assured O&M funding and related policies and revenues (water charges) generation • technological improvement aspects, including productivity enhancement, water conservation and water reuse • intended implementation actions, including core reform areas for legislation, institutions, the incentives environment, and technology 	<p>Prepare a draft <u>State Water Policy</u></p> <ul style="list-style-type: none"> • overview of state's water resources situation, key issues, future vision and objectives • broad intentions for current and future development of state's water resources. <p>Prepare an <u>Action Agenda</u></p> <ul style="list-style-type: none"> • specific short-term actions for improving water resource management • appended to State Water Policy or a separate note 	<p>Interim Water Resources Task Team</p> <p>Interim Water Resources Task Team</p>	<p>Immediate</p> <p>Immediate</p>

⁸⁴ This is Matrix 2 of the India WRM Sector Review: Intersectoral Allocation Planning and Management Report (World Bank, 1998a), with format modified.

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
A.2. Strengthening Legislative and Regulatory Framework			
Amend and Create Legislation: Enabling legislation will typically be needed for the following:	Undertake overall review of existing legislation	SWRB	Short term
<ul style="list-style-type: none"> • state water policies • implementation of new or revised institutions and institutional responsibilities • regulation of water resources • pollution control • establishment of water users associations, participation of private sector and civil society • new forms of water charges and collection procedures • surface and groundwater rights and management 	Amend or create necessary legislation	SWRB/state government	Medium term
Establish Groundwater Legislation	Enact appropriate and politically acceptable legislation for groundwater management (re: WRM Report on Groundwater Management)	SWRB/state government	Medium term
Define Transferable Surface and Groundwater Rights	<p>Assess options for defining and making transferable surface and groundwater rights</p> <ul style="list-style-type: none"> • surface water: maintenance of riparian rights coupled with introduction of government administered licensing of transferable water rights • groundwater: institution of government-administered permit system for selective groundwater extraction and use, including provision for transferability (as recommended in 1996 Model Bill for groundwater) 	SWRB/state government	Medium term
	<p>Introduce government administered licensing of transferable water rights</p> <ul style="list-style-type: none"> • provide transferable bulk water rights to water user groupings on pilot basis in selected areas • include protective provisions for existing uses; terms and conditions on use; provisions for necessary suspension or cancellation of rights with compensation; recording of licenses 	SWRB, Bulk water supply agency & Basin Managers	Medium to long term

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
B. Establishing Government and Non-Government Institutions			
Establish a Multi-Sectoral State Level Institution	Create a <u>State Water Resources Board (SWRB)</u>	Chief Minister or Chief Secretary	Immediate
<ul style="list-style-type: none"> apex body at the level of the state, responsible for comprehensive water planning, allocation and analysis 	<ul style="list-style-type: none"> core & most senior level state institution for multi-sectoral planning & allocation decisions, including policy, intersectoral allocation, planning of water development programs, & resolution of water resources issues formal committee, comprised of heads of relevant government departments and agencies connected with water, supplemented by representatives from water user groupings, industry, academia and other stakeholders chaired by a neutral senior party (e.g., Chief Minister, Chief Secretary, Finance Secretary or Dev. Commissioner) 		
	Create SWRB's <u>State Water Planning Organization (SWPO)</u>	SWRB	Immediate
	<ul style="list-style-type: none"> technical secretariat for SWRB full time professional staffing in areas related to multi-sectoral water resources planning and management senior officer head (Additional Secretary rank/equivalent or above) to also serve as Member Secretary of SWRB responsible for preparing basin plans for all river basins in the state and a State Water Plan, undertaking studies of water-related issues, preparing environmental management plans by river basin 		
	Establish Environmental Capability	SWRB, SWPO & Basin Managers	Short term
	<ul style="list-style-type: none"> create and Environmental Working Group in SWRB create Environmental Unit in the SWPO and at basin levels 		
Reorganize and Broaden Mandate of State Bulk Water Supply Agency (e.g., Irrigation Department)	Reorganize along river basin lines and adjust mandate to include a broader role in water resources and overall basin management	Chief Secretary & Secretary of Irrigation Department or State bulk water supply agency	Short term
<ul style="list-style-type: none"> responsible for overall basin management, including surface and groundwater, bulk water supplies to urban, rural and industrial consumers, irrigation services, and flood and drainage management 	<ul style="list-style-type: none"> re-organize field staff along river basin lines take on additional specialist functions such as hydrology and water resources data absorb staff and responsibilities from other governmental departments such as groundwater 		

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
B (cont.). Establishing Government and Non-Government Institutions			
Create River Basin Organizations (RBOs) at state level <ul style="list-style-type: none"> responsible for implementing integrated basin management at the operational (basin) level incorporating all governmental and multi-sectoral stakeholders and including private sector interests 	Initiate establishment process <ul style="list-style-type: none"> in acutely water scarce river basins with high stake-holder interest bringing together various stakeholders, including government and private sector interests (water user groupings, industrialists, NGOs, etc.) Encourage RBO's further gradual development to assume a role of increasing importance	Basin Managers SWRB & Basin Managers	Short to medium term Medium term & continuous
Create Inter-State River Basin Organizations (RBOs) <ul style="list-style-type: none"> various possible forms -- both informal and formal -- ranging from basin planning and coordination, to water allocation and management of common bulk supplies, to monitoring and maintenance of water quality, and to general operations and hands-on management flexibility on the degree of central gov't involvement and use of legislative provisions in establishment 	Initiate establishment process <ul style="list-style-type: none"> begin dialogue, even if only on an ad hoc and informal basis, on key river basins with an aim to agree on an institutional structure and mandate for RBO Adopt a situation specific approach, evolutionary with respect to structural forms and scope of responsibilities 	Riparian States (Chief Ministers, Chief Secretaries, SWRB & Basin Managers	Short to medium term
Promote Training and Technical Assistance in State Level Institutions	Transfer specialist expertise through careful selection of staff, contractual arrangements with private sector and consultancy assistance	SWRB & SWPO	Short term
Develop and Foster Grass-Roots Institutions	Transfer technology (computers, software, etc.), particularly to SWPO and Environmental Units	SWPO	Short term
	Commence mobilization effort through consultation with NGOs and stakeholders on a pilot basis in select areas	Basin Managers supported by SWRB/SWPO	Short term
Promote Public Awareness and Integrate the Private Sector	Provide training and financial and technical support for capacity building to existing local-level institutions	SWRB, SWPO & Basin Managers	Medium term & continuous
	Involve academics, NGOs, industry, water user groups and other civil society maximally in decision-making, with particular emphasis on out-reach to traditionally marginalized groups such as women and the poor		Immediate & continuous
	Inform and involve the public through media campaigns, seminars, workshops, publicity, education programs, etc.	SWRB, SWPO, Basin Managers	Immediate & continuous

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
C. Introducing Economic Incentives			
C.1. Intra-Sectoral Allocation and Pricing			
Establish Water Prices	<p>Create a <u>Water Pricing Committee (WPC)</u></p> <ul style="list-style-type: none"> to undertake analysis and present recommendations to government responsible for determining water rates in all sectors 	Chief Secretary & SWRB	Immediate
<p>These should be accompanied by:</p> <ul style="list-style-type: none"> public awareness campaigns, including outreach programs to water consumers transparent information to water users on water charges, the necessary costs of effective O&M, actual expenditures, the size of existing subsidies, environmental costs, etc. system improvements, including increasing financial allocation to maintenance works, rehabilitation and modernization of distribution systems; additionally in the agricultural sector, agricultural intensification programs 	<p>Increase irrigation prices and charge volumetrically</p> <ul style="list-style-type: none"> implement major jump in water charges, with the goal of covering at least efficient operations and maintenance (O&M) costs in the short-term switch from area-crop based charging to volumetric charging and bulk sales to Water User Associations (WUAs) 	WPC & Irrigation agency	Short term
	Increase urban water prices (both domestic and industry) and introduce volumetric charges	WPC & municipalities	Short term
	Increase rural water supply prices	WPC & RWSS agency	Short term
Establish Groundwater Pricing	Increase or introduce power tariffs	WPC &/or state electricity agency(ies)	Immediate
<p>These should be accompanied by:</p> <ul style="list-style-type: none"> transparent information to pumpset owners and the general public on actual costs of power provision, the size of existing subsidies, environmental costs, etc. 	Introduce volumetric charges (i.e., based on power consumption)	state electricity agency(ies)	Short to medium term
Tackle Distortions in Agricultural Commodity and Input Prices and Domestic Marketing Policies Created at State Levels	Undertake review of subsidies and marketing policies for water-related agricultural inputs and outputs	WPC	Medium term

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
C. (cont.) Introducing Economic Incentives			
C.1 (cont.). Intra-Sectoral Allocation and Pricing			
Establish Incentives for Pollution Control and Water Conservation	Review and revise existing state taxes and fines relating to pollution	WPC, SWRB & Pollution Control Board	Immediate
<ul style="list-style-type: none"> • Financial disincentives/penalties for water pollution • Financial incentives for pollution control, water conservation and recycling 	Introduce pollution taxes and effluent charges for actual amount of pollution emitted based on “Polluter Pays Principle”	Pollution Control Board	Short term
	Introduce or review and revise existing state incentives for investment in environmental protection and water recycling and conservation	SWRB, WPC & Pollution Control Board	Short to medium term
Install Measures to Guard Social Well-being	Create a pricing structure such that minimum quantities of safe and reliable drinking water are provided to the poor <ul style="list-style-type: none"> • through multi-tiered (increasing block) rate structures • through direct subsidies (i.e., not relating to water use) for <i>targeted</i> consumers and /or service providers 	WPC & state water supply agencies	Short term
	Rehabilitate and modernize agricultural systems and undertake agricultural extension	state irrigation agency and agriculture department	Short to medium term

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
C. (cont.) Introducing Economic Incentives			
C.2. Inter-Sectoral Allocation			
Improve Administrative Allocation of Water	Introduce economic analysis and compensation packages in administrative allocations	SWRB & SWPO	Short to medium term
	Develop knowledge base (hydrological data and basin modeling) and disseminate information to all affected parties	SWRDC, SWPO & Basin Managers	Short to medium term
Develop Brokering of Compensated Trades	Assess where mutually profitable/beneficial outcomes exist and play a catalyzing role in negotiating such arrangements	SWPO & Basin Managers	Medium term
	Develop knowledge base and disseminate information to all affected parties	SWRDC, SWPO & Basin Managers	Short to medium term
Study and Pilot Water Markets	Undertake study tours, including users and all water using sectors, to assess international experience	SWPO, irrigation agency and other agencies	Short term
	Introduce water markets on a pilot basis, restricted to select areas with evident need and high stakeholder interest, and restricted in scope to formal groups of water users <ul style="list-style-type: none"> • Establish local management unit to facilitate trades, monitor, and regulate, and to provide dispute resolution mechanism • Monitor and make adjustments as needed for replication 	Basin Managers, concerned agencies & NGOs	Medium to long term
	Introduce regulations to guard environmental and social welfare	Basin Managers and concerned agencies	Concurrently with above
	Establish institutional, legal (clearly defined and transferable bulk/sectoral water rights), administrative and technological mechanisms to enable development of formal water markets	state government, SWRB & Basin Managers	Concurrently with above

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
C.3. Inter-State Allocation Mechanisms			
Improve Inter-State Allocation of Water	Introduce economic analysis in administrative allocations	state gov'ts with GOI	Short term
	Develop knowledge base (hydrological data and basin modeling) and disseminate information to all affected parties	SWRBs, SWRDCs & SWPOs (& inter-state RBOs where existing)	Medium term
Develop Multi-Component (including non-water investments) Basin Development Plans	Give due weight to economic criteria in decision-making in order identify potential mutual benefits from integrated development of inter-state river basins	state gov'ts & GOI (& RBOs where existing)	Short to medium term
	Develop analytical base to support decision-making, including basin modeling incorporating economic variables	SWPOs (& RBOs where existing)	Medium term
D.1. Technological Improvements			
Increase Water Use Efficiency and Improve Productivity of End Use in all Sectors	Rehabilitate and modernize surface irrigation schemes	irrigation department	Short to medium term
	Undertake leak detection and repairs for domestic water supply schemes and improve monitoring and metering	UWSS agencies	short to medium term
Improve Agricultural Technology	Encourage the adoption of technology innovations to maximize productivity (on-farm water management, agronomic practices, diversification, eco-agriculture technologies, watershed management)	agriculture departments, WALMIs & universities	Short to medium term
Encourage Water Conservation, Recycling, Reuse and Treatment	Encourage effluent treatment, water conservation programs, water harvesting	all agencies	Medium term

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations**Part I (cont.). State Level Actions**

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
D.2. Improving Modeling, Data, Performance and Environmental Monitoring, and Public Information			
Prepare River Basin Plans and Environmental Assessments, supported by Modeling	Prepare comprehensive <u>River Basin Plans</u> for all basins or parts of basins in the state	SWPO (& RBOs where existing)	Short to medium term
	Prepare a <u>State Water Plan</u>	SWPO	Medium term
	Prepare <u>Basin Environmental Assessments</u> and <u>Environmental Assessments</u> of specific environmental issues	SWPO (& RBOs where existing)	Short to medium term
	Improve basin modeling capability implement training program including transfer of modeling software, provision of computers, selective provision of other facilities (e.g. satellite imagery) identify training institutes including universities and seek supplementary assistance through twinning arrangements select a few basins for particularly intensive study encourage an inter-active process with high degree of stakeholder involvement	SWRB, SWPO & universities	Immediate to short term
Improve Hydrological Data	Establish a <u>State Water Resources Data Center (SWRDC)</u> to assemble and monitor all quantity and quality related data from collecting sources in the state to develop Geographic Information System (GIS) to disseminate data to all <i>bona fide</i> users on a periodic and regular basis, including making it accessible on internet and CD-ROM	SWRB	Short to medium term
	Expand and improve data measurement assess in each state and river basin existing network of measuring stations expand existing network of measuring stations for surface and groundwater, including water quality	SWPO & SWRDC	Medium to long term

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part I (cont.). State Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
D.2. (cont.) Improving Modeling, Data, Performance and Environmental Monitoring, and Public Information			
Establish Performance Monitoring	Establish relevant measurement and monitoring indicators of performance for irrigation, urban water supply and sanitation, and rural water supply and sanitation	SWRB, SWPO, state agencies (irrigation, UWSS, RWSS, etc.)	Short term
	Issue on a regular and periodic basis reports on performance indicators and make information accessible on internet and on CD-ROM	SWPO	Short to medium term
Improve Environmental Monitoring and Management	Establish measurement and monitoring indicators of environmental aspects of water development and management	SWPO, SPCB & others	Short term
	Collect, analyze and issue on a regular and periodic basis environmental and ecological data and performance indicators and make information accessible on internet and CD-ROM	SWPO & SPCB	Short to medium term
Data Transparency, Public Information and Public Involvement	Make data transparent and provide mechanisms for ready access by stakeholders and the public to all information and analysis	SWPO & Basin Managers	Immediate start
	Provide “outreach” to public through media, seminars, workshops, political gatherings, and information bulletins to inform and involve the general public in basin planning, environmental issues, and productivity improvements	SWRB, SWPO, Basin Managers & state agencies	Immediate start
	Actively enlist participation of traditionally more marginal or less vocal groups, such as women, the poor and other minority groupings	Basin Managers, state agencies & SWRB	Immediate start

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part II. Central Level Actions

<i>Reform Recommendation</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
A.1. Improving Policy Framework			
Formulate Action Agenda	Establish cross-ministerial <u>Interim Water Resources Task Team</u>	MOWR/NWB	Immediate
The National Water Policy should include the following:			
<ul style="list-style-type: none"> • comprehensive basin-wide approach • treatment of surface and groundwater as unitary resource • multi-sectoral perspective • integration of quantity and quality-related aspects • integration of environmental aspects • integration of pricing and economic incentives • introduction of administrative allocation mechanisms incorporating value-based criteria, as well as promotion of market-oriented approaches to water management • demand management approaches assured • O&M funding, related policies and revenues generation • technology improvement aspects, including productivity enhancements, water conservation and water reuse • intended implementation actions, including core reform areas for legislation, institutions, the incentives environment, and technology 	Prepare an <u>Action Agenda</u> <ul style="list-style-type: none"> • note articulating specific short-term actions at central level for improving water resource management 	Interim Water Resources Task Team	Immediate to short term
	Update <u>National Water Policy</u>	MOWR (consult NWB & NWRC)	Short to medium term
A.2. Strengthening Legislative and Regulatory Framework			
Strengthen Legislative Framework	Establish <u>Task Force</u> to assess possible reforms in: <ul style="list-style-type: none"> • River Boards Act and Interstate Water Disputes Act • surface and groundwater rights • other enabling legislation 	MOWR	Immediate to short term
Facilitate Establishment of River Basin Organizations	Amend River Boards Act to give powers to the central government to initiate the establishment of an RBO	MOWR	Short term
Improve Performance of Tribunal Awards System	Enhance effectiveness of Tribunal by: <ul style="list-style-type: none"> • amending Inter-state Water Disputes Act to enable central gov't to institute a Tribunal within a year of a state's request, if the concerned riparian states have not reached agreement • establishing mandatory time limits for creation of Tribunal, award decision, and state response rebuttal • fixing by law the review of Tribunal awards at set intervals • providing for the establishment of a mechanism for monitoring and implementing the award decision 	MOWR	Short term

**Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part II (cont.). Central Level Actions**

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
B. Establishing Government and Non-Government Institutions			
<p>Strengthen the National Water Resources Council in order to more effectively:</p> <ul style="list-style-type: none"> • coordinate activities between various central government agencies involved in water • promote best practices in water resources management • discuss inter-state and international water issues 	<p>Create a <u>Technical Committee</u> under NWRC/NWB</p> <ul style="list-style-type: none"> • with representation from all states and key GOI departments • chaired by Ministry of Water Resources • meeting on a quarterly basis 	MOWR	Short term
	<p>Create a <u>National Water Planning Organization (NWPO)</u></p> <ul style="list-style-type: none"> • Secretariat of Technical Committee • adapt CWC's WP&P wing for this purpose • staffing on secondment from MOWR, CWC, CGWB, NWDA, MOEF, CPCB and other relevant agencies and some additional disciplines 	MOWR/CWC	Short term
	<p>Create an <u>Environmental Sub-Committee</u> and an <u>Environmental Cell</u> within NWPO</p>	MOWR/MOEF & NWPO	Short term
<p>Restructure Ministry of Water Resources (MOWR)</p>	<p>Create a mechanism for closer interaction between MOWR and its member agencies (CWC, CGWB, NWDA)</p>	MOWR	Short term
<p>Use Approvals Process to Encourage Reforms at State Levels</p>	<p>Review process for Plan funding and approval of state project proposals to include monitoring of water allocation, planning and management reforms at state levels. Monitoring to include state progress with:</p> <ul style="list-style-type: none"> • establishment of State Water Policy and Action Agenda • establishment of SWRB and SWPO • establishment of financial incentives for water use productivity and environmental management • preparation of intra-state River Basin Action Plan and Basin Environmental Action Plan • actions towards creation of an intra-state RBO • status of dialogue with other riparian states for inter-state basins • degree of initiatives taken by the state to cooperate with other riparian states and to move towards/establish an inter-state RBO 	MOWR/CWC, Planning Commission	Short term
<p>Provide Financial Assistance for RBOs</p>	<p>Provide river basin development funding for investment in river basins where riparian states have :</p> <ul style="list-style-type: none"> • a non-contested agreement between riparian states • a jointly issued River Basin Plan for the full basin • some form of inter-state RBO 	Planning Commission, MOWR/CWC & Ministry of Finance	Medium term

Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part II (cont.). Central Level Actions

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
B. (cont.) Establishing Government and Non-Government Institutions			
Provide Training and Technical Assistance to State and Local Level Institutions	Build capacity through: <ul style="list-style-type: none"> • awareness creation (e.g. seminars, workshops) • providing advisory support • disseminating best practices (e.g., study tours) • providing specialist training, provision of computers, software, etc. 	MOWR & its specialist agencies	Immediate start
C. Introducing Economic Incentives			
Improve Environmental Incentives	Assess and introduce augmented incentives/disincentives for pollution control, water conservation, water recycling and reuse	NWPO, MOEF & CPCB	Short to medium term
Tackle Agricultural Pricing and Marketing Policies	Dismantle artificial trade barriers between states and regions and unify commodity pricing policies throughout India	GOI	Medium term
	Correct market and infrastructure imbalances	GOI	Medium term
Provide Funding for State Initiatives	Develop a centrally-sponsored scheme or grant-providing mechanism to support state-level initiatives, including: <ul style="list-style-type: none"> • introducing volumetric charging • establishing enforceable pollution fees • brokering compensated trades • piloting or developing water markets 	MOWR, Planning Commission & Ministry of Finance	Short to medium term
D.1. Technological Improvements			
Undertake a Sustained Drive to Encourage Technological Improvement	Provide technical support, including financing of state initiatives to introduce improved technology to enhance productivity of irrigation systems, related agricultural technology	MOWR & Ministry of Agriculture	Short term
	Improve efficiency of domestic water supply schemes, including water treatment and water conservation practices	MOUAE & RGNWDM	Short to medium term

**Table 4.1 (cont.). Intersectoral Allocation, Planning and Management – Detailed Matrix of Recommendations
Part II (cont.). Central Level Actions**

<i>Reform Recommendations</i>	<i>Components of Reform</i>	<i>Responsibility</i>	<i>Time Frame</i>
D.2. Improving Modeling, Data, Performance and Environmental Monitoring, and Public Information			
Improve Hydrological Measurement, Data Systems, and Data Analysis	Strengthen the <u>National Water Resources Data Center (NWRDC)</u> <ul style="list-style-type: none"> to assemble and monitor all quantity and quality related data from collecting sources to disseminate data to <i>bona fide</i> users to develop National Geographic Information System (GIS) to disseminate data to all <i>bona fide</i> users on a periodic and regular basis, including making it accessible on internet and CD-ROM fully networked with SWRDCs 	CWC & CGWB (supported by CPCB, IMD & SWRDCs)	Short to medium term
Improve Basin Modeling Capability	Expand and improve data measurement <ul style="list-style-type: none"> assess and expand existing network of measuring stations for surface and groundwater, including water quality 	CWC, CGWB & CPCB	Medium term
	Implement training program including transfer of modeling software, provision of computers, selective provision of other facilities (e.g. satellite imagery)	NWPO, CTU, CWRPS & IHH	Short to medium term
	Expand training program provided by MOWR's Central Training Unit (CTU) at Pune and identify a network of other training institutes	NWPO & CTU	Short to medium term
	Develop twinning arrangements with international centers of excellence	NWPO	Short to medium term
Establish Performance and Environmental Monitoring Criteria	Develop and Apply Performance and Environmental Monitoring Criteria for Evaluation of State Performance and Evaluation of Individual Investments	NWPO, MOEF & CPCB	Short to medium term
Foster Public Participation	Provide "outreach" to public through media, seminars, workshops, political gatherings, and information bulletins to inform and involve the general public	MOWR & agencies	Short term
	Actively enlist participation of traditionally more marginal or less vocal groups, such as women, the poor and other minority groupings	MOWR & agencies	Short term

Table 4.2.⁸⁵ Groundwater Regulation and Management – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
A. Reorient the Approach to Groundwater Management		
<i>Objective:</i> To achieve a shift in policy and operations from development to management of groundwater resources, including integration of environmental issues.		
A1. Shift the emphasis from development to management		
<ul style="list-style-type: none"> • Develop effective mechanisms and processes for involving local populations in management 	SGWOs, CGWB	Begin immediately and sustain Within 1 year
<ul style="list-style-type: none"> • Reduce programs that directly or indirectly subsidize groundwater development 	Central and State Governments	Within 1-2 years
<ul style="list-style-type: none"> • Develop mechanisms for integrating groundwater, surface water, pollution, irrigation and municipal water supply data collection, planning and management. Mechanisms for closely coordinating the activities of all government organizations dealing with water should be established. 	SGWOs, Drinking Water agencies., IDs, CGWB	Within 1-2 years
<ul style="list-style-type: none"> • Develop groundwater management support capacities in government groundwater organizations. Capacities needed include: economic analysis, legal and institutional development, community relations & participation, education and outreach. In addition, technical skills in hydrologic data monitoring, analysis, modeling and presentation should be strengthened. 	CGWB, SGWOs, NABARD	Initiate within 1 year and sustain
<ul style="list-style-type: none"> • Identify and further develop legal and regulatory frameworks for management 	MOWR & CGWB in collaboration w/ Legal Specialists, Academics/NGOs.	Immediate. Evaluate and develop as pilots occur
A2. Integrate Environmental Considerations		
<ul style="list-style-type: none"> • Create environmental cells in state and central groundwater organizations 	CGWB, SGWOs	Within one year
<ul style="list-style-type: none"> • Establish effective mechanisms for environmental policy and implementation coordination both among government organizations and between government organizations and NGOs. 	CGWB, SGWOs, CPCB, SPCBs, MOEF	Within one year
<ul style="list-style-type: none"> • Undertake environmental impact analyses for all groundwater development and management programs 	CGWB, SGWOs, CPCB & MOEF	Begin within 1 year and sustain
<ul style="list-style-type: none"> • Establish comprehensive approach to environmental impact assessment and monitoring based on: (a) monitoring of direct indicators (water level, quality and pollution trends and instream flows); (b) designation of sensitive zones; (c) continued refinement of water balance methods; and (d) application of state of the art analytical techniques where indicators suggest problems are likely. 	CGWB & SGWOs	Begin process immediately

⁸⁵ This is Table 6.1 of the Groundwater Regulation and Management Report of the India Water Resource management Sector Review (World bank, 1998b), with format modified.

Table 4.2 (cont.). Groundwater Regulation and Management – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
B. Create Legal and Regulatory Mechanisms.		
<i>Objective:</i> Develop legal and regulatory framework that has broadbased community support and is implementable. Utilize pilot management projects to build community support for regulation.		
B1. Create Legal Frameworks, Institutions and Processes to Enable Management		
<ul style="list-style-type: none"> • Form a broad based working group containing NGO, Academic and Government representatives to review legislative and regulatory issues and to guide pilot projects. • Undertake international review of groundwater legislation to identify models with potential relevance for India. • Develop management institution process and framework enabling community participation • Initiate pilot projects using existing administrative powers to test management options, including: formation of aquifer management organizations (or districts) that combine local governance and participation with professional guidance, centralized regulation and water market approaches. • Investigate avenues for groundwater rights reform that could improve water market functioning while allowing social and environmental concerns to be addressed. • Implement legal, institutional and process reforms on the basis of pilot project and evaluation results 	<p>Academic Orgs, NGOs, CGWB, SGWOs, NABARD Working group</p> <p>Collaboration among the above SGWOs w/ support from research orgs., NGOs & CGWB Research orgs., & CGWB State & Central Governments</p>	<p>Immediately.</p> <p>Complete within 2 years</p> <p>Complete within 2 years</p> <p>Initiate immediately for duration of 1-5 Complete within 2 years</p> <p>Intermediate term.</p>
B2. Evaluate existing and potential roles for water markets		
<ul style="list-style-type: none"> • Investigate the potential for developing formal water markets and the institutional and water rights structures they require through pilot projects, evaluation of international experiences, through study tours, consultancies and workshops. • Undertake detailed evaluation of the impact of energy pricing and other government policies on existing informal water markets and the role energy pricing plays in water market functioning. Incorporate results of evaluations in policy decisions. • Additional research on the nature and functioning of informal water markets including: (a) intersectoral transfers; (b) equity, efficiency and sustainability implications under an array of resource, social and policy conditions; (c) avenues for management of informal water markets where major social or resource concerns exist. 	<p>SGWOs & other state agencies, supported by academic/research organizations with management skills. Academic/research orgs., with implementation by State/Central gov'ts Academic and research organizations</p>	<p>Implement pilots, & begin studies & research within one year.</p> <p>Begin studies and research within 1 year</p> <p>Begin studies and research within 1 year</p>

Table 4.2 (cont.). Groundwater Regulation and Management – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
C1. Reform Institutional Structures and Operations		
<i>Objective:</i> Institutional structure and procedures that support the new emphasis on management (as opposed to development), and the development and strengthening of supporting data and other systems.		
C1. Reorient government organizations		
<ul style="list-style-type: none"> • Shift focus of government groundwater organizations away from development and exploration to management support. 	CGWB & SGWOs	Begin immediately
<ul style="list-style-type: none"> • Strengthen social science, education and outreach capacities of government groundwater organizations <i>in ways that strongly support community participation.</i> 	CGWB & SGWOs	Begin immediately
<ul style="list-style-type: none"> • Establish strong functional linkages between government agencies by involving groundwater officials in the design and implementation of all water resource projects and giving officials from groundwater organizations equivalent official positions as counterparts in surface water organizations. 	CGWB, SGWOs, IDs, CPCB, SPCB, Municipal Supply Organizations, etc.	Begin within 1 year
<ul style="list-style-type: none"> • De-emphasize “micro-macro” distinction between CGWB and SGWOs 	CGWB & SGWOs	Begin immediately
<ul style="list-style-type: none"> • Enhance CGWB capacity to undertake basic hydrologic and management research 	CGWB	Begin & sustain
<ul style="list-style-type: none"> • Enhance capacity of SGWOs to act as management support and implementation organizations at the state level with particular focus on education, consensus building and institutional support as well as technical. 	SGWOs	Begin & sustain
<ul style="list-style-type: none"> • Increase NABARD capacity to support groundwater management investments such as water conservation technologies and water harvesting. Reduce NABARD support for new wells, except in areas of low groundwater development. 	NABARD	Begin immediately
<ul style="list-style-type: none"> • Eliminate direct government involvement in groundwater exploitation through public tubewells and turn public tubewells over to users. 	State & Central Governments	Over one year
C2. Create Data and Analytical Tools Essential for Management		
<ul style="list-style-type: none"> • Continue and expand the hydrology project 	CGWB and SGWOs	Sustain
<ul style="list-style-type: none"> • Revise CGWB & SGWO well networks & monitoring activities to reduce duplication & ensure optimal sampling. 	CGWB and SGWOs	Within 2-3 yrs
<ul style="list-style-type: none"> • Develop monitoring systems for and collect point and non-point data on pollution. 	CGWB, SGWO PCB	Within 2-3 yrs
<ul style="list-style-type: none"> • Develop two stage approach to groundwater condition monitoring in which water level, quality and pollution trends along with crude GEC estimation procedures are used as warning indicators to target the detailed scientific studies essential for policy decisions 	CGWB and SGWOs	Over next 2-3 years
<ul style="list-style-type: none"> • For the first level of monitoring, increase reliance on direct measures of groundwater conditions (water level, quality and pollution trends) & decrease emphasis on GEC water balance data. Eliminate use of GEC water balance calculations as a basis for policy decisions. 	CGWB and SGWOs	Over next year
<ul style="list-style-type: none"> • Undertake further basic research on the hydrology of hard rock aquifers 	CGWB and SGWOs	Begin & sustain

Table 4.2 (cont.). Groundwater Regulation and Management – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
D. Introduce Techniques and Incentives for Sustainable Groundwater Management		
<i>Objective:</i> Providing and strengthening incentives that will induce sustainable extraction and use of groundwater resources.		
D1. Identify Techniques and Programs for Sustainable Groundwater Management		
<ul style="list-style-type: none"> • Planning, implementing and developing policies for conjunctive management, end-use conservation, land-use planning, pollution avoidance and groundwater recharge should be core functions of groundwater management organizations. Capacities should be developed for this. • Conjunctive management and recharge should be emphasized as central to effective groundwater management. Pilot projects on this should be initiated. • Ensure credit availability for water conservation technologies • Support investigation of low water intensity cropping systems • Investigate opportunities for pollution avoidance through land use planning and development of low chemical input agriculture 	<p>CGWB and SGWOs with IDs</p> <p>CGWB and SGWOs</p> <p>NABARD Agriculture Depts. CGWB, SGWOs, PCBs, MOEF</p>	<p>Begin & sustain</p> <p>Begin & sustain Pilots within 2 years</p> <p>Begin & sustain</p> <p>Within next 2-3 years</p>
D2. Improving Agricultural Power Supplies and Pricing Structure		
<ul style="list-style-type: none"> • Initiate institutional reforms to close the state electricity board (SEB) “accountability gaps” through pilot projects for rural power delivery such as through high quality, single point metered supply to local organizations such as panchayats, user groups or small scale distribution companies. • Link power tariff changes to increases in the quality of service as part of rural electricity sector reform. • Reform energy prices so that users pay rates that reflect the cost of power consumed. • Conduct detailed studies to further quantify power consumption, the financial and economic costs of power delivered and the prices users actually pay for power in the agricultural sector. • Investigate the use of non-conventional energy sources for groundwater pumping. 	<p>Central and State Governments</p> <p>Central and State Governments, SEBs Central and State Governments Academic and research organizations DNES, SEBs, Academic orgs.</p>	<p>Begin immediately and sustain</p> <p>Begin and sustain Within two years</p> <p>Begin immediately</p> <p>Begin sustained research and development program</p>

Table 4.2 (cont.). Groundwater Regulation and Management – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
D. Introduce Techniques and Incentives for Sustainable Groundwater Management (cont.)		
D3. Channel Investment to Emerging Needs		
<ul style="list-style-type: none"> Investments should focus on development of the information base essential for management, conjunctive management, end-use conservation, pollution control, groundwater recharge and other management needs. Investments in energy supply improvements may also be important. 	Central and State Governments, NABARD, SEBs, CGWB, SGWOs.	Begin immediately
<ul style="list-style-type: none"> Large scale governmental support for groundwater development, such as the subsidy programs run through NABARD, no longer appear necessary except where: (1) groundwater development levels are low; (2) substantial scientifically documented groundwater potential exists; (3) additional irrigation is important for improving agricultural productivity; and (4) farmers are unfamiliar with groundwater irrigation or unable to afford the cost of new wells. 	Central & State Governments, NABARD	Sustained reductions in over next 5 years. Very small program remaining.
<ul style="list-style-type: none"> Improvements in rural electricity supplies is the primary point where investments are required to encourage groundwater development in areas where substantial untapped resources remain. 	SEBs, State Governments	Over next 5 years.
<ul style="list-style-type: none"> The potential for investments in non-conventional energy sources for pumping should be investigated in detail. 	DNES	Invest gradually as programs are developed.
<ul style="list-style-type: none"> Significant investments to improve data availability, scientific understanding, policy analysis and management capacity are required at central, state and local levels. 	Central and State Governments, CGWB, SGWOs	Sustained, planned investment
<ul style="list-style-type: none"> Investments to encourage end-use efficiency of water and power are essential. 	NABARD	Sustained major drive as programs develop.

Table 4.3.⁸⁶ Irrigation Service Delivery – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
A. Institutional Reforms And Reorientation		
Main action areas are: (i) promoting irrigation management transfer to WUAs; (ii) restructuring state irrigation institutions; and (iii) involving the private sector in irrigation service delivery and technology dissemination.		
A.1. Promote Irrigation Management Transfer (IMT)		
<i>Objective:</i> An irrigation system responsive to users' needs, operated at lower costs, allowing users to make most O&M decisions, and creating self-reliant, financially autonomous irrigation schemes primarily managed by WUAs.		
<ul style="list-style-type: none"> • Launch Major Drive to Promote WUAs and IMT: <ul style="list-style-type: none"> • Review State, India and International Experience • Discuss with Civil Society, Farmers and in Political Fora • Devise Comprehensive Program and Prepare all components in Detail (Pilot as needed) • Major Outreach Program, staff training and farmer workshops • Organize and hold WUA elections • Implement Major WUA support program including WUA organizational support, Systems Rehabilitation and Improvement, and Agricultural Support • Implementation Features for Successful WUA Formation & IMT: <ul style="list-style-type: none"> (i) democratic grassroots base; (ii) demand and client-led approach; (iii) financial viability; (iv) supporting legislation; (v) whole-scheme approach; (vi) accompanying investment and technical support; (vii) major government mobilization and political commitment; (viii) participation of women and minorities; (ix) water rights for farmers and WUAs . 	<p>State task team, state gov't, ID and NGOs ID, AD and NGOs</p> <p>Irrig. agency & WUAs, and State Gov't.</p>	<p>Short term</p> <p>Short term</p> <p>As soon as ready</p> <p>“</p> <p>Short term</p>

⁸⁶ This is the matrix on Action Plan for the Reform Agenda in the India WRM Irrigation Report (World bank, 1998e), with format modified.

Table 4.3 (cont.). Irrigation Service Delivery – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
A.2. Restructure State Irrigation Institutions		
<i>Objective:</i> Demand-driven and decentralized; up-to-date on managerial technologies; accountable and self-financing; managerial transparency with farmers and other stakeholders.		
<ul style="list-style-type: none"> • Restructure governments role and unbundle the ID: Unbundle the irrigation department to: (i) an irrigation agency for O&M funded by WUAs; (ii) a State Water Resources Board for intersectoral water allocation, planning and management; (iii) regulatory body for water resource management; (iv) regulatory body for water pricing; and (v) smaller ID for remaining government functions (e.g., design, construction supervision, investment funding) 	State Gov't./ID	medium term
<ul style="list-style-type: none"> • Establish an irrigation service agency: Commercially operated O&M agency, funded directly by users (WUAs), and answerable to WUAs. There should be one (or several in needed) by major basin or command in each state. 	State Gov't./ID	medium term
<ul style="list-style-type: none"> • Improve the ID or irrigation service agency: (i) decentralize management on basin lines; (ii) reorganize to create specialist units including corporate management capabilities; (iii) upgrade staff skills (training), expand skills mix including non-engineering disciplines; and (iv) improve staff incentives for specialization, continuity and good performance. 	Irrig. agency	short term
<ul style="list-style-type: none"> • Create a Farmer-Government Partnership. This will include: a cultural change in the irrigation service agency and agricultural departments (ADs); a client-oriented and demand-driven approach; partnership between the WUA, irrigation agency and the AD; and partnership between government, WUA and civil society actively involving NGOs, universities and outreach to the public 	ID & AD	short term
A.3. Involve the Private Sector		
<i>Objective:</i> Bring additional actors into the irrigation sector with stronger commercial orientation, innovative ideas, corporate management and other skills and financial resources.		
<ul style="list-style-type: none"> • Unbundling and contracting out of activities where private sector has comparative advantage. 	State gov't. and Irrig. agency.	Medium term. Short term.
<ul style="list-style-type: none"> • Involve & encourage private sector in promoting innovations. 	Irrig. agency and private sector.	Medium term.
<ul style="list-style-type: none"> • Management contracts for scheme operations (e.g., agribusinesses) 	Irrig. agency & WUA.	Medium term.
<ul style="list-style-type: none"> • Management Contracts with the irrigation service agency for specific activities. 	Irrig. agency	

Table 4.3 (cont.). Irrigation Service Delivery – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
B. Achieving Financial Viability And Sustainability		
<i>Objective:</i> Achieve cost recovery, financial viability, adequate O&M funding, appropriate government expenditure priorities, and access to credit, private sector investment and capital markets		
B.1. Achieving Full Cost Recovery and Financial Self Sufficiency		
Achieve self-financing of the irrigation service agencies and WUAs, to enable funding of O&M and contribution to investments and build financial capacity. Also improve efficiency of O&M, introduce independent (non-political) price regulation, and pilot water markets		
<ul style="list-style-type: none"> • Raise water charges to cover O&M costs; introduce collection by WUAs and the irrigation agencies, and volumetric pricing: (i) Substantial increase in water charges to cover O&M; (ii) improve collection rates; (iii) charge non-agricultural uses; (iv) collection by WUAs and irrigation service agencies and retained by them; and (v) transition to volumetric bulk sales to WUAs and other users. • Build financial capacity: create “Renewal funds” for WUAs and the service agencies • Investment cost sharing: WUAs to contribute a share of investment costs in rehabilitation and modernization. • Improve efficiency of O&M: through improved management, client-driven oversight and transparent billing and cost monitoring. • Introduce independent price regulation: pricing as commercial decisions between the irrigation service agencies and WUAs with regulatory safeguards: (i) establish independent state Water Tariff Board (WTB); and (ii) alternatively, first establish a state Water Charges Review Committee (WCRC) for annual reviews and decisions as an intermediate step. • Assess and pilot water markets: assess international experience with formal water rights and water markets and undertake piloting. 	<p>ID and WUAs</p> <p>Irrig. agency and WUAs WUAs with Irrig. agencies Irrig. agencies and WUAs State gov’t.</p> <p>GOI and interested states</p>	<p>Immed. to short-term for (i)-(iii); & 2-3 yrs. for (iv)/(v)</p> <p>Medium term</p> <p>Immediate introduction Continuous</p> <p>Short-term (for WCRC) & medium term (for WTB)</p> <p>Medium term</p>

Table 4.3 (cont.). Irrigation Service Delivery – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
B.2. Prioritize Expenditures		
Increase effectiveness of available government expenditures by prioritizing funding to improving irrigation sector performance and capacity building, focusing remaining funds on a limited number of works sites to successively complete viable investments. Establish self-selection and expenditure and investment review procedures to implement these objectives.		
<ul style="list-style-type: none"> • Re-order Government Expenditure Priorities to emphasize: (i) full funding of maintenance works (applicable in transition phase until cost recovery fully covers O&M); (ii) full funding of institutional capacity building (training, computerization, communications equipment, consultants, study tours); (iii) rehabilitation and modernization in association with WUAs; and (iv) sharply focused remaining funds on a limited number of sites at any one time for near-term completion. 	State gov't. and ID	immediate and continuous
<ul style="list-style-type: none"> • Introduce "Drivers" for Achieving Expenditure Prioritization: (i) self-selection through cost sharing/participation; (ii) annual irrigation expenditure reviews by states; (iii) use of discounted cost-benefit procedures; and (iv) improved technical evaluations of investments. 	ID and State Gov't.(with advice from MOWR, Planning and Finance Commissions)	short-term and continuous
B.3. Access to Credit, Private Sector and Capital Markets		
Build financial viability and procedures for access to credit, private sector investment and capital markets (fundamentally depends on full cost recovery including on depreciation and interest.		
<ul style="list-style-type: none"> • Review Microfinance Opportunities: review opportunities and modalities for viably expanding credit. Especially target groundwater irrigation and intensify on-farm water management. 	NABARD with private sector, MOA and MOWR	short to medium term
<ul style="list-style-type: none"> • Promote Private Sector Investment and Capital and Debt Market Financing: Form working committee to examine issues and options 	GOI and private sector	medium term
C. Technical Actions To Improve Irrigation Performance		
<i>Objective:</i> Improve performance of irrigation systems and increase agricultural productivity		
C.1. Improve Water Operations Management		
Undertake participatory scheme diagnostics and prepare POMS for improved operational efficiency, equitable water distribution, better water control and timely delivery of water.		
	ID & WUA in assocn. with AD	1st Field Action

Table 4.3 (cont.). Irrigation Service Delivery – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
C.2. Upgrade Maintenance and Rehabilitate and Modernize Systems		
<ul style="list-style-type: none"> • Full Annual Maintenance: <ul style="list-style-type: none"> • Full funding of annual maintenance to required levels (by Finance Dept. (FD) until full cost recovery achieved. Then by WUAs and the irrigation agencies • Jointly (WUAs and ID) prepare annual Maintenance Plans for each command • Joint monitoring of maintenance by WUAs and ID (works & costs) • “Professionalize” planning and implementation of maintenance (staff training, equipment & modern maintenance planning, management and monitoring techniques); • Rehabilitate Surface Irrigation Schemes <ul style="list-style-type: none"> • Undertake irrigation and drainage scheme rehabilitation by WUAs and the irrigation agency (jointly identified and implemented program) • appropriate cost sharing arrangements to ensure client “ownership” and demand-led investment • Modernize Schemes <ul style="list-style-type: none"> • Undertake further scheme level improvements for higher levels of agricultural productivity (Jointly identified and implemented with cost) 	<p>FD, WUA & Irrig. agency</p> <p>WUAs & irrig. agency WUAs</p> <p>WUAs and Irrig. agency WUAs</p>	<p>Immediate</p> <p>1 year and continuous</p> <p>Short term start demand led</p> <p>Medium-term</p>
C.3. Improve On-farm Surface and Groundwater Delivery		
<ul style="list-style-type: none"> • Improve water courses, field channels and field drains (by WUAs with TA from the irrigation agency) • Introduce drip and sprinkler irrigation (by individual farmers with private sector and NABARD) • Upgrade energy efficiency of tubewells and pumpsets (research, demonstrations, private sector) • Improve WUA/farmer knowledge of on-farm water management and crop needs 	<p>Farmers and private sector</p> <p>AD/Irrig. agency & WALMIs</p>	<p>Short to medium term</p> <p>AD / WUAs AD/WALMI AD/agribusi.</p>
C.4. Improve Agricultural Technology		
<ul style="list-style-type: none"> • Upgrade farmer knowledge of agricultural technology through ag-extension and training support • Train WUA representatives as “agricultural motivators” • Promote agricultural diversification 	<p>AD / WUAs AD/WALMI AD/agribusi.</p>	<p>Short term Short term Continuous</p>
C.5. Improve Design and Construction Quality		
Optimize designs for intended irrigation service and ensure quality construction, both activities to involve WUAs		
<ul style="list-style-type: none"> • Design for Appropriate Irrigation Intensity and Service <ul style="list-style-type: none"> • appropriate assessment of desired irrigation intensity during scheme designs, POMs and plans for scheme rehabilitation and modernization • Assure Construction Quality and Cost Consciousness <ul style="list-style-type: none"> • Introduce Quality Control/Quality Assurance (QC/QA) procedures • Bring WUAs into construction supervision and monitoring • WUA contributions to rehabilitation and modernization construction costs (cost sharing) • WUA implementation of simpler works 	<p>Irrig. agency with farmers</p> <p>Irrig. agency WUA & ID</p>	<p>Design or POM stage</p> <p>Short term Short term</p>

**Table 4.4.⁸⁷ Urban Water Supply and Sanitation – Detailed Matrix of Recommendations
Part I. The Core Agenda**

<i>Core Recommendations</i>	<i>Responsibility</i>	<i>Time Frame</i>
<p>Objective: The strategy is to change incentive structures so that organizations and people in the sector will deliver sustained, efficient service improvements to customers. To do this we propose that new rules for the game be set; the new framework allow and encourage local level innovations; and fostering a demand-led response for assistance, which will emerge once players have the motivation to improve performance.</p> <ul style="list-style-type: none"> • Devolve UWSS responsibilities to municipal authorities. Mandate key good practices such as accounting separation, long term plans and consumer consultation • Reform the state UWSS providers: separate policy and regulatory functions from operations; disaggregate operations into functional areas; and commercialize/privatize entities • Rationalize tariff structures and tariff-setting procedures through legislative changes and a system of incentives and sanctions • Reform financing systems to enable direct financial market access for local authorities and enterprises, and new forms of financial intermediation; supported by leveraging local resources • Create a comparative competition facility • Implement local innovations, including: involve the private sector in a variety of ways; develop new approaches to serving and involving disadvantaged groups; reform tariffs; increase efficiency, improve technical and operational practices; and access new source of finance • Demand led capacity building. Provide technical assistance, in response to municipal and utility requests 	<p>State Governments</p> <p>State Governments</p> <p>State Governments</p> <p>Central and State Governments</p> <p>Central and State Governments</p> <p>Municipalities, Private Sector, State Governments, utilities, Central Governments, development agencies, community groups</p> <p>Private Sector, State & Central Governments, development agencies</p>	<p>short term</p> <p>short term</p> <p>urgent</p> <p>short to medium term</p> <p>medium term</p> <p>medium term</p> <p>medium to long term</p>

⁸⁷ This is Table 5.1 of the India WRM Urban Water Supply and Sanitation Report (World bank, 1998c), with format modified.

**Table 4.4 (cont.). Urban Water Supply and Sanitation – Detailed Matrix of Recommendations
Part II. The Implementation Plan**

<i>Recommendation</i>	<i>Responsibility</i>	<i>Time Frame</i>
A. Municipal Reform Agenda		
Objective: Create a legal and institutional structures which will encourage good practice at the local level. Allow for incremental opportunistic improvements within a framework which aligns organizational and individual incentives with the public interest		
A.1. Enabling Policies		
• Develop consensus on state water reform strategies	State Governments	short term
• Prepare model laws and procedures for devolution	Central Government	short term
• Pass state laws which devolve power over UWSS to municipalities, in line with 74 th Amendment, (where this has not already been done) and implement institutions envisaged by the 74 th Amendment, including financial reforms	State Governments	short to medium term
• Develop a state level strategy outlining measures for achieving this. <i>Reorienting the use of public resources for greater leveraging:</i>	State government	urgent
• <i>Develop plans for a project development fund</i>	State government, financial intermediary	medium term
• <i>Develop a system of incentives and sanctions</i> to induce good municipal practice	State government, financial intermediary	urgent to short term
A.2 Democratic decentralization and municipal professionalization		
Institute integrated municipal development planning, including capital investment plan	Municipalities	short to medium term
Reform procedures for accounting, auditing, procurement, etc.	Municipalities	urgent
Create cadre of skilled, specialist urban managers who will not be frequently rotated	Central, State and Municipal Governments	urgent to short term
Develop sample methods and procedures for all of above	Central and State Governments	short to medium term

**Table 4.4 (cont.). Urban Water Supply and Sanitation – Detailed Matrix of Recommendations
Part II (cont.). The Implementation Plan**

<i>Recommendation</i>	<i>Responsibility</i>	<i>Time Frame</i>
A.3. Commercialization and private sector participation		
Assist municipalities to adopt an incremental, opportunistic strategy, starting with:	Central and State Government, Municipalities, business and civic groups	short to medium term
<ul style="list-style-type: none"> • corporatization of existing providers, and contracting out of UWSS responsibilities by municipalities; and • private participation in: financially viable areas; progressive municipalities - state governments and development agencies work with them to develop best practice; and easier types of PSP, such as, service and management contracts, and BOTs 		
Develop models - for example, procurement guidelines, model contracts, toolkits to help municipalities in a range of situations	Central and State Government	short term
Pass enabling laws	Central and State Governments	short term
A.4 Customer responsiveness and role of civil society		
Require customer consultation by state law - consultation means an active duty to seek views, and to take those views into account, not a passive duty to publish.	State Government	urgent
Institute consultation through ward systems and other mechanisms, over customer priorities, and service level/tariff trade-offs	Municipalities	urgent
Develop and publish citizens' charters for water and sewerage services	State governments and municipal authorities	short to medium term
Support development and strengthening of civic-community groups	Central government, State government	short term

**Table 4.4 (cont.). Urban Water Supply and Sanitation – Detailed Matrix of Recommendations
Part II (cont.). The Implementation Plan**

<i>Recommendation</i>	<i>Responsibility</i>	<i>Time Frame</i>
B. State Level Reform Agenda	Responsibility	Time Frame
Objective: Create a legal and institutional structures which will encourage good practice at the local level. Allow for incremental opportunistic improvements within a framework which aligns organizational and individual incentives with the public interest		
B.1. State-level institutional restructuring and regulation		
Implement reforms of state water boards, public health engineering departments, and other entities, including disaggregation into discrete functional units, commercialization and partial or full privatization	State governments	short to medium term
B.2 Multi municipal schemes		
Implement institutions and procedures to develop and manage multi-municipality bulk schemes, such as Planning Committees and integrated competitive procurement	State governments & municipalities	medium to long term
Implement multi-municipal schemes that address the needs of small, medium, and large towns	State governments & municipalities	medium to long term
B.3 Better service for disadvantaged groups		
<ul style="list-style-type: none"> • Develop effective universal service obligation, and requirement to consult with disadvantaged groups • Implement participatory approaches to assess community preferences and willingness to pay. Provide services and explicit, transparent subsidies in line with consultations • Integrate planning for slum areas into mainstream of UWSS planning • Include provision for disadvantaged in PSP contracts 	State governments Municipalities Municipalities Municipalities	urgent urgent to short term short term short to medium term
<ul style="list-style-type: none"> • Assist in financing connections in disadvantaged areas, through development of community credit facilities and instalment payments 	Municipalities	short to medium term

**Table 4.4 (cont.). Urban Water Supply and Sanitation – Detailed Matrix of Recommendations
Part II (cont.). The Implementation Plan**

<i>Recommendation</i>	<i>Responsibility</i>	<i>Time Frame</i>
B.4. Regulation and comparative competition		
• Develop models for regulation and comparative competition, including data definitions, analytic techniques	Central Government	short to medium term
• Supervise municipalities. Consider whether to establish a State UWSS regulator, to supplement regulation of UWSS providers by municipalities. Set up institution to collect and disseminate comparative information	State governments	medium term
• Through consultation, establish desired package of service standards and tariff levels. Implement through contract with UWSS provider. Develop approaches which will inform the public and citizens groups, such as 'report cards' on service standards, and league tables	Municipalities	medium term
C. Financial reforms		
Objective: Promote financial viability through tariff reforms and efficiency gains. Promote market-oriented financing systems to enhance the incentives for efficiency and financial viability as well as increase the capital available to financially viable entities in the sector.		
C.1. Tariff reforms		
• Develop models of rational tariff structures and procedures for Indian cities, and assist selected municipalities to reform	Selected state government, external agencies	urgent
• Develop state guidelines to move towards rational tariff structures as developed above.	Selected state governments	urgent
• Develop and implement a system of incentives and sanctions, for the state government as well as market oriented financial intermediaries to encourage municipalities to reform	State government, Market financial intermediaries	urgent to short term
• Identify potential extra-budgetary sources for support to disadvantaged groups at the city level	Municipal government, business	short term
• Support urban NGOs and other interested financial intermediaries to develop community funds and savings and credit groups among low income communities	State, Municipal gov'ts NGOs, Community groups, FIs	short term

**Table 4.4 (cont.). Urban Water Supply and Sanitation – Detailed Matrix of Recommendations
Part II (cont.). The Implementation Plan**

<i>Recommendation</i>	<i>Responsibility</i>	<i>Time Frame</i>
C.2. Develop direct market access for finance	Responsibility	Time Frame
<ul style="list-style-type: none"> Set legal requirements for direct market access by municipal authorities or enterprises, including: a cap on total borrowing, credit rating and long term plans for market borrowing 	State governments, Central government	medium term
<ul style="list-style-type: none"> Develop and implement a monitoring system for municipal debt 	State governments	medium term
<ul style="list-style-type: none"> Identify an appropriate authority to regulate market borrowing by municipal authorities and enterprises and develop detailed disclosure requirements 	Central Government, SEBI	medium term
<ul style="list-style-type: none"> Develop structured municipal bond issues with willing and able local authorities 	Investment bankers, Financial intermediaries, External agencies	medium to long term
<ul style="list-style-type: none"> Support project development in a commercial format for municipalities and utilities to raise finance in the debt market directly 	Municipalities and utilities	short to medium term
C.3. Developing sustainable credit enhancement and insurance opportunities		
<ul style="list-style-type: none"> Explore the possibility of a commercial credit guarantee facility, either new or through an existing financial intermediary 	Central and State governments, IDFC, other national financial intermediaries	medium to long term
<ul style="list-style-type: none"> Develop State-level debt service reserve fund facility on a commercial basis 	State governments, financial intermediaries	medium to long term
<ul style="list-style-type: none"> Support financial institutions to develop new financial products for credit enhancement 	Financial intermediaries	medium term
C.4. Promoting market oriented financial intermediaries		
<ul style="list-style-type: none"> Reorienting existing urban sector development finance intermediaries toward the market. Where necessary, consolidate state-level financial intermediaries. 	Central government, State governments	urgent
<ul style="list-style-type: none"> Develop and implement policies to facilitate interest of all-India development finance intermediaries and other market players in urban infrastructure 	Financial intermediaries, External agencies, Central government	short to medium term
<ul style="list-style-type: none"> Developing new urban sector financial intermediaries with private control and management 	State governments, other financial institutions, External agencies	medium term

Table 4.5.⁸⁸ Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
A. Establish an Enabling Environment		
Objective: To ensure a politically, legally and institutionally supportive environment that will facilitate the implementation of the reform process with particular emphasis on devolution of responsibilities to grass-roots levels and, in particular, user implementation, a demand-oriented approach, full cost recovery and financial sustainability (also refer Sections B & C below).		
A.1. Public Awareness: Implement a widespread public awareness campaign on the scarcity value of water to convince voters and politicians of the need to: (i) levy water charges on those users in proportion to benefit received (industry, farmers, large consumers); (ii) ensure sufficient resources to maintain investment and assure an adequate level of service for all; (iii) limit reliance on limited government funding; and (iv) eliminate subsidies for water supply (with possible transparent targeted subsidies for impoverished groups)	Central and state Governments	Urgent
A.2. Give Priority to Drinking Water in Water Resource Use: Update the National Water Policy, formulate state water policies, and prepare groundwater legislation, to give clear priority to drinking water over other uses as already given in the NWP.	Central and State Governments	Short term
A.3. Redefine and Reduce Government Role: Develop and implement national and state policies defining the role of each administrative level of the public sector in the RWSS sector, including policy on cost recovery, elimination of latrine subsidies, the level of commitment for initial service coverage, rehabilitation and replacement, expansion, and O&M.	Central and State	Urgent
A.4. Full Cost Recovery and Capital Cost Sharing: Implement O&M cost recovery and cost sharing policies for demand-led investment in the RWSS sector, defining eligibility criteria for provision of matching government funds to communities for new schemes and rehabilitation or replacement of existing schemes.	Central and State	Urgent
A.5. Decentralization of Responsibilities: Devolve management responsibilities and resources to the panchayats and VWSSCs, with appropriate authority and incentive to generate their own revenues.	State	Short term
A.6. Institutional Strengthening: Implement institution strengthening activities (including development of management information systems, financial systems, monitoring and evaluation systems), management training to directly facilitate decentralization to district and block levels as appropriate, and civil service reforms necessary to ensure the sustainability of the former.	State	Short term

⁸⁸ This is Table 4.6 of the India WRM Rural Water Supply and Sanitation Report (World bank, 1998d), with format modified.

Table 4.5 (cont.). Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
B. Ensure Institutional Sustainability		
Objective: Implement a state RWSS decentralization strategy emphasizing a user-driven demand-oriented approach, maximizing the role of users in decision making and implementation, and shifting government's role to one of facilitator rather than service provider, by: clearly defining the mandate and roles of users as well as state, district, and block levels; decentralizing functions to the lowest level appropriate; reorienting district and block administrations to support the gram panchayats and VWSSCs; & facilitating participation of NGOs and the private sector.	State	Short term
B.1. Enable panchayat institutions and user groups to assume the lead in RWSS decision making:	State, District, Block, Gram Panchayat and VWSSCs	Short to medium term
<ul style="list-style-type: none"> • Establish village water supply and sanitation committees (VWSSCs) associated with under the gram panchayats; • Have VWSSCs and gram panchayats prepare an inventory of all public water supply and sanitation assets within the gram panchayat (as part of the Gram Plan); • Have VWSSCs and gram panchayats assess the condition of all assets in accordance with issued standards, with assistance provided by the block and district administration; • Have VWSSCs and gram panchayats prepare cost estimates to rehabilitate or replace public water supply and sanitation assets to achieve the service levels designed and comply with issued cost standards, with assistance provided by the block and district administrations; • Transfer ownership of existing assets to the panchayat raj institutions, which will make a formal commitment to provide matching funding for rehabilitation or replacement of existing schemes in accordance with the Gram Plan: 25 percent by local administrations, 25 percent from state agencies, and 25 percent from central agencies; • Have VWSSCs along with the gram panchayats prioritize works, in line with available funding (25 percent must be raised from user contributions and the gram panchayat's own resources); • Have district and local administrations and VWSSCs prepare a Gram Plan for water supply identifying not covered and partially covered areas as well as water quality, rehabilitation and replacement, augmentation and environmental sanitation needs; • Undertake a participatory validation of not covered and partially covered habitations (taking into account private sources). 		

Table 4.5 (cont.). Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
B. (cont.). Ensure Institutional Sustainability		
B.2. Enable, promote and facilitate participation of NGOs and the private sector; define appropriate roles of these non-government as well as external agencies:		
<ul style="list-style-type: none"> • Prepare an inventory of registered and qualified NGOs for panchayat raj institutions and sector agencies and revise current government regulations to allow panchayat raj institutions and sector agencies to recruit NGOs; 	State and District	Urgent
<ul style="list-style-type: none"> • Provide private sector preferential financing to encourage private sector involvement in RWSS delivery, support and O&M services; 	Central and State	Short term
<ul style="list-style-type: none"> • Allow block and district engineering departments, NGOs, and the private sector to provide maintenance and repair services on a (cost reflective) contract basis to the responsible local administration; 	State	Short term
<ul style="list-style-type: none"> • Have external support agencies focus on supporting institutional reform of the water agencies necessary to support and consolidate the decentralization process as well as consolidate the coverage already achieved. 	Central and External Support Agencies	Urgent
B.3. Strengthen institutional capabilities in consumer orientation, policy development, planning, implementation, O&M, monitoring and evaluation, and promotion of health and sanitation:		
<ul style="list-style-type: none"> • Develop participatory guidelines and manuals for planning; recruit, transfer and train staff within existing cadres to strengthen capabilities, supplementing them with NGOs & private consultants; 	State	Urgent, Short term
<ul style="list-style-type: none"> • Offer training to staff in design and supervision. 		Short term
B.4. Restructure public sector institutions.	State	Medium term
		Short to long term

Table 4.5 (cont.). Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
B. (cont.) Ensure Institutional Sustainability		
B.5. Strengthen operational guidelines and procedures for RWSS agencies:		
• Develop standard operations and maintenance procedures and communicate them to the responsible local administrations;	State	Short term
• Improve design and specifications to reflect the field situation and make programs responsive to user needs;	State	Medium term
• Update approval and sanctioning procedures to fit the decentralized roles and responsibilities (more sanctioning powers to lower levels);	State	Short term
• Strengthen pre-qualification criteria so that only qualified suppliers, consultants, contractors, and NGOs are involved;	State	Medium term
• Implement transparent procurement procedures that consider quality as well as cost criteria.	State	Short term
• Improve quality control through formal procedures and guidelines and provide opportunities to conduct independent quality audits and involve local communities (users) in site supervision;	State	Urgent
• Develop and implement a monitoring and evaluation system with indicators also covering activities other than physical implementation.	Central and State	Urgent
• Development and implement a system ensuring that national drinking water standards are adequately monitored and adhered to.	Central and State	Short to medium term

Table 4.5 (cont.). Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
C. Ensure Financial Viability and Sustainability		
Objective: Implement full cost recovery of operations and maintenance and replacement costs to ensure sustainability of sector investment. Implement a demand-driven, cost-sharing approach ensuring that the panchayat raj institutions and VWSSCs are partners to make capital investment more efficient and transfer ownership. Encourage sector financing by rural credit facilities and private sector investors.		
C.1. Implement a demand-driven approach:		
<ul style="list-style-type: none"> • Have VWSSCs and gram panchayats, assisted by block and district administrations, prepare preliminary design and cost estimates for alternative public water supply and sanitation schemes, combining the least-cost technology and the minimum service level to constitute the least-cost option that will be used to determine the level of matching funding; • Have village water supply committees and gram panchayats choose the level of service they wish and raise sufficient funding for the full incremental cost; • Have village water supply committees and gram panchayats prioritize works eligible for matching grants in accordance with available funding (a total of 50 percent, of which 40 percent must be raised from the gram panchayat's own resources and 10 percent from user contributions). 	Village Water Supply and Sanitation Committees, Gram Panchayats, and the State	Urgent to short term
C.2. Increase user charges to fully recover O&M costs:		
<ul style="list-style-type: none"> • Increase water charges and bulk water prices to fully recover O&M cost (as well as cover replacement costs); • Improve assessment and collection procedures; • Introduce indexing mechanisms to automatically adjust water charges to inflation and cost increases. 	State, District and Panchayats	Urgent
C.3. Reduce O&M costs:		
<ul style="list-style-type: none"> • Transfer O&M responsibilities to local bodies (panchayats institutions) and their VWSSCs; • Encourage participation of local operators and contractors; • Use local materials and labor; • Reduce overhead components of O&M activities. 	State, District and Panchayats	Short to medium term

Table 4.5 (cont.). Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
C. (cont.) Ensure Financial Viability and Sustainability		
<p>C.4. Introduce and implement capital cost sharing policy:</p> <ul style="list-style-type: none"> • For new schemes, implement capital cost sharing of 10% by users, 40% by panchayats, and 25% each by central and state governments; • For scheme rehabilitation and replacement, implement capital cost sharing of 25% each by users, panchayats, central and state governments. 	Central, State, Panchayats	Short term
<p>C.5. Make RWSS agencies financially self-sufficient and strengthen their capabilities in financial management:</p> <ul style="list-style-type: none"> • Allow RWSS agencies to retain proceeds from water charge/price; • Fully fund O&M and other recurrent expenditures from revenues; • Provide access to RWSS agencies to receive training in financial management; • Minimize recourse to state Treasury; • Facilitate access to additional sources of revenue for panchayats and other RWSS agencies. 	State, District and Panchayats	Short to medium term
<p>C.6. Re-prioritize Public Expenditures in RWSS:</p> <ul style="list-style-type: none"> • Give top priority to adequate O&M funding; • Give high priority to institutional capacity enhancement, including investments/expenditures to make systems more user-responsive and performance-oriented. 	State, District, Panchayats	Urgent
<p>C.7. Implement effective accounting and auditing procedures, billing and collection systems, standard financial reporting formats, and simple but well-defined financial management and accounting systems.</p>	State	Urgent to short term
<p>C.8. Amend existing legislation and regulations so that panchayat raj institutions are legally entitled to enter into financing and loan agreements with government-sponsored rural credit facilities or private sector financial institutions.</p>	State	Medium term
<p>C.9. Establish a system for providing loan guarantees by the block and district panchayat raj institutions or the state, as necessary.</p>	State	Medium term

Table 4.5 (cont.). Rural Water Supply and Sanitation – Detailed Matrix of Recommendations

<i>Recommendations</i>	<i>Responsibility</i>	<i>Time frame</i>
D. Protection of Water Resources		
<i>Objective:</i> Implement measures to assure priority usage of water resources to drinking water and to protect the quality and sustainability of groundwater resources.		
D.1. Define appropriate remedial measures to address water quality problems.	Central	Short term
D.2. Design a strategy for developing water supply schemes in areas with water quality problems that meet safe drinking water requirements and acceptability (preference) of users.	Central	Short term
D.3. Develop technology options for solving water quality problems (fluoride, iron and arsenic) both at village and household level as well as for larger piped schemes.	Central	Short term
D.4. Develop groundwater legislation and regulations, and develop regulators' capabilities to manage and protect groundwater resources.	State	Short to medium term
D.5. Develop institutional capabilities for multi-sectoral water allocation, planning and management, including features to prioritize allocation for drinking water and protection/mitigation against pollution (refer GOI-World Bank, 1998).	State	Short to medium term

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⁸⁹ For a more extensive reference list used in the preparation of the India water review, refer to the references in the specialist India Water Resources Management Sector Review reports (World Bank 1998 a, b, c, d and e).

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**India Water Resources Management Sector Review
Initiating and Sustaining Water Sector Reforms**

ANNEX 1

**INDIA WATER RESOURCES ASSESSMENT, INTER-STATE ISSUES,
AND ENVIRONMENTAL AND HEALTH ISSUES**

A. Water Resources Assessment

A1.1. *Rainfall.* The average annual rainfall in India is about 1170 mm. There is considerable variation in rain both temporally and spatially. Most rain falls in the monsoon season, confined to three or four months in the year, necessitating the creation of large storages for maximum utilization of the surface run-off. Within any given year, it is possible to have both situations of drought and of floods in the same locality. Regional variations are also extreme, ranging from a low value of 100 mm in Western Rajasthan to over 11,000 mm in Meghalaya in north-eastern India. Higher rainfall is found in eastern and northeastern India and some deltaic localities -- for instance, Assam, eastern parts of Uttar Pradesh, Bihar, West Bengal, northern Orissa, and the Cauvery delta -- where rainfall is typically greater than 1000 mm. In western India -- Punjab, Haryana, western Uttar Pradesh, and Rajasthan -- and in rainshadow areas of the deccan plateau, rainfall ranges from 300 mm to 800 mm (refer Boxes A1.1 (a) - (d) for more details).¹ Possible changes in rainfall patterns in the coming decades, global warming and other predicted or observed long-term trends on water availability, could affect India.²

A1.2. *Surface water.* India's average annual surface run-off generated by rainfall and snowmelt is estimated to be about 1869 BCM. However, it is estimated that only about 690 BCM or 37 percent of the surface water resources can actually be mobilized. This is because (i) over 90 percent of the annual flow of the peninsular rivers and over 80 percent of the annual flow of the Himalayan rivers occur over a four-month period; and (ii) potential to capture such resources is complicated by limited suitable storage reservoir sites. Water availability is highly variable, with the Himalayan rivers being semi-perennial due to snow melt supplies as well as rainfall, while most peninsular rivers are dry for about eight months of the year. Utilizable run-off is very variable. For some rivers a substantial part of run-off is being or could be utilized. By contrast the Brahmaputra, due to the flood flow nature of the river, may only be able to utilize 24 BCM out of its average annual flow of 586 BCM.

A1.3. *Groundwater.* India's rechargeable annual groundwater potential has been assessed at around 431 BCM in aggregate terms. About half of this amount is located in the Ganga-Brahmaputra-Barak system. On an all-India basis, again using aggregate figures, it is estimated that about 30 percent of the groundwater potential has been tapped for irrigation and domestic

¹ Such regional variations have evident impacts for all water users. For instance, in agriculture, in the higher rainfall areas of India, supplemental irrigation has a positive impact on agricultural productivity because of the unpredictability of and gaps between monsoon showers. In dryer areas, irrigation is essential for achieving high productivity agriculture.

² For instance, snow-melt patterns from the Himalayas in northern India could be affected, altering the timing and amount of run-off.

use. However, these figures are substantially influenced by the surplus areas of eastern and northeastern India. The regional situation is very different and large parts of India have already exploited almost all of their dynamic recharge. Haryana and Punjab have exploited about 94 percent of their groundwater resources. Areas with depleting groundwater tables are found in Rajasthan, Gujarat, most of western Uttar Pradesh, and in all of the Deccan states. In Tamil Nadu and Karnataka, for instance, basins with falling groundwater tables are increasingly found and are already negatively impacting sources of rural water supply and groundwater irrigators. Resource depletion trends are quite alarming. For instance, in 1984-5, 253 of the 4272 "blocks" in listed states in India were classified as "over-exploited" or "dark" (seriously depleting) in the Central Groundwater Board's classification system. By 1992-3 this situation had become 383, representing an increase of over 50 percent³. The converse situation -- rising groundwater tables and salinization -- are also increasingly found in India, due to poor drainage or the cumulative impact of irrigation. In particular, this is a problem in localities of northern and western India; for instance, in Uttar Pradesh, Haryana, Punjab, and Rajasthan. Paradoxically, these are amongst the same states where the more general and widespread problem of depletion is found.

A1.4. *Water Resource Availability.* India's current and future situation can be gauged by the trend in water availability, already shown in Figure 1 of the main text above. More revealing still is analysis by river basin. Occurrence of water availability at about 1000 cubic meters per capita per annum is a commonly taken threshold for water indicating scarcity (UNDP).

A1.5. Investment to capture additional surface run-off will become increasingly more difficult and expensive in the future. This is a natural consequence of India's past success in developing its irrigation sector. The massive investment in irrigation development since the 1950s, which resulted in surface irrigation expanding from 16 million hectares in 1951 to an estimated 45 million hectares by 1996,⁴ is now reaching practical limits in many of India's river basins. Further investment in water augmentation is now no longer possible in some states and basins. Even where significant expansion remains feasible, the development options are usually more technically difficult and costly. As described above, groundwater resources are also increasingly limiting. The expansion of groundwater usage has been even more dramatic than that of surface water. From 1951 to 1996 groundwater irrigated area expanded almost seven-fold, from 6.5 million hectares to an estimated 44.3 million hectares.⁵ In short, both for surface and groundwater resources, a situation where resources were substantially under-utilized and where considerable development potential existed, has transformed in little more than a generation to a situation of water scarcity and limited development options.

³ The total number of blocks does not include Andhra Pradesh, Gujarat, and Maharashtra. The number of over-exploited and dark blocks/talukas/mandals/watersheds does not include blocks in Kerala and Maharashtra, mandals in A.P., talukas in Gujarat, watersheds in Maharashtra. The groundwater resource situation is discussed in more detail in the "India - Water Resources Management Sector Review, Groundwater Regulation and Management Report (World Bank, 1998).

⁴ This figure is the (targetted) created irrigation potential; 39.1 million hectares is the (targetted) utilization (CWC, 1996, pp. 85-86).

⁵ This figure is the (targetted) created irrigation potential; 40.8 million hectares is the (targetted) utilization (CWC, 1996, pp. 85-86).

B. Inter-State Water Issues

A1.6. *Inter-State Cooperation.* Another issue is the competition for water between riparian states in a river basin. The catchment areas of all major river basins in India are located in more than one State, and many rivers have a number of riparian States. For instance, the Ganges basin is shared between eight of India's States (Uttar Pradesh, Himachal Pradesh, Haryana, Rajasthan, Delhi, Madhya Pradesh, Bihar, West Bengal) and is also shared with Nepal, Bangladesh, and China; the Krishna Basin is shared between Maharashtra, Andhra Pradesh, and Karnataka; and the Cauvery is shared between Karnataka, Tamil Nadu, Kerala, and Pondicherry. It is well recognized that water planning and management needs to be done on a river basin basis, and this is clearly stated in India's National Water Policy. However, in India's Constitution, water is a "State Subject" and under India's federal administration, the states have substantial autonomy over water usage within their jurisdiction (paras 3.07 to 3.08). Complicating this is the very limited development as of yet of administrative structures for managing water on a river basin basis and especially across state boundaries. As a result, there is limited cooperation between states for cross-state riparian issues.

A1.7. In the early decades after Independence, the limited institutions and legal structures for holistically managing water on a river basin basis and especially across state boundaries did not materialize as major constraints. This was primarily because in most river basins potential for further development was still present, enabling piece-meal investment and usage without the appearance of conflict. In few basins does this remain the situation. In some basins, for instance the Cauvery and Krishna basins, inter-state riparian competition has been highly visible for some time. In most other basins, recognition of actual or potential competition between states is growing, but the instruments to deal with this are still rudimentary. This situation is further exacerbated by the mounting pressures from urban and industrial demand, also crossing state boundaries. The needs of Chennai (formerly Madras) are now being partly met by water from the Krishna basin outside the state of Tamil Nadu. The growing water needs of Delhi will need to be serviced from such states as Haryana, Punjab and Uttar Pradesh. The need to build inter-state cooperation is further accentuated by rapidly growing environmental issues.

A1.8. *Inter-basin Transfer of Water.* Inter-basin transfers of water from surplus basins (e.g., Brahmaputra, Mahanadi, and Lower Godavari) to deficit basins have been considered a solution to problems of regional and inter-basin disparities in water availability. However, the necessity to construct large reservoirs to store monsoon flows and to divert water involves enormous economic, social, and environmental costs. Additionally, concurrence of the basin states to the fact that the basin is indeed surplus and to the extent of that surplus is also required. This is a politically sensitive and difficult task given states' reluctance to relinquish water perceived as rightfully theirs. A recognition of these problems has yet to take hold in India and be translated into a study of more cost-effective, feasible options.⁶ These include water-saving technologies in irrigation and industry, recycling and re-use of municipal and industrial wastewater, agronomic options (e.g., improved water management, agronomic practices requiring less water, and the introduction of less water-intensive crops), and watershed and groundwater management (e.g.

⁶ This does not preclude the option of inter-state basin transfers where economically, socially and environmentally feasible.

groundwater recharge).⁷ Technology improvement, water conservation and re-use and other forms of demand management need to be given much more emphasis rather than the traditional supply-side oriented approaches of the past.

A1.9. *International Rivers.* Assessment of options for international rivers (e.g., the Ganges and Brahmaputra) is not the subject of this report. However, the issues discussed regarding rivers only within India would have broadly similar application to such international rivers. Options for inter-state rivers in India's federal structure, as discussed in this report, are also broadly similar to typical issues encountered between riparian countries. Several very positive features for basins shared between India and other countries are worth noting. The first is the successful Indus Treaty between India and Pakistan. This provided clarity on usage of Indus waters and permitted non-conflicting investment. The second is the very positive recent treaty (1996) on water sharing between India and Bangladesh regarding the Ganges.⁸ Thirdly, discussions have taken place between India and Nepal regarding shared rivers (headstream tributaries of the Ganges river), culminating recently in the landmark "Mahakali Integrated Development Treaty" (February 1996).⁹

C. Environmental and Health-related Issues

A1.10. The third major set of issues may be broadly grouped as "environmental" in nature. They include issues of water quality ranging from agro-chemicals, industrial pollution and domestic pollution, impacts of water use on groundwater levels, including depletion or conversely waterlogging and salinity, soil erosion and siltation, degradation of wetlands, impacts on flora and fauna, and various health-related problems. Many of these problems are less evident to the general population than the more visible quantity-related issues. Groundwater related issues, for instance, are gradual in impact. Rising water tables in northwest India due to over a hundred years of irrigation have only in some localities reached the root zone, yet if this trend continues without appropriate drainage, large tracts of currently irrigated lands will become salinized and go out of production. Similarly, the impacts of pollution are only gradually perceived, yet the costs in terms of human and environmental health can be enormous.

A1.11. Water quality and water quantity issues are inter-linked. The preservation of water quality has direct implications for water supply as water quality determines effective water availability. Similarly, a minimum quantity of water is required to maintain the assimilative capacity of a water body to receive effluents and/or to guard against contamination (e.g., saline intrusion).¹⁰

⁷ A further concept is the possibility of "virtual water" import through foodgrains and industrial products from water surplus to water short basins, as discussed by Tony Allan (School of African and Oriental Studies, University College London).

⁸ "Treaty Between the Government of the Republic of India and the Government of the People's Republic of Bangladesh on Sharing of the Ganga/Ganges Waters at Farakka".

⁹ The Treaty, based on a modified 1920 Agreement, commits the two countries to water sharing and joint power development in the Mahakali basin. India and Nepal have two additional agreements on management of joint waters: the "Gandak Irrigation and Power Agreement" (signed 1959 and amended 1964) and the Kosi River Treaty for water sharing (signed 1964 and amended 1966).

¹⁰ This, for instance, is a need being studied for India's Yamuna River, a possible conduit for release of salts in drainage water from fertilizers. In Africa the OMVS, the River Basin Organization to manage the Single River in the name of the governments of Mali, Senegal and Mauritania, is studying the use of once yearly artificial

The inter-relationship between water quality and quantity is clearly demonstrated in large cities, such as Delhi, where limited water supply is often unsafe for consumption. Environmental and health issues are, therefore, integral to both inter-sectoral and inter-state issues and are discussed within these contexts in the recommendations of this report. Below is a summary typology of some of the environmental and health issues involved.

A1.12. Agricultural Pollution. Agro-chemicals -- fertilizers and pesticides -- are the main contributors to surface water pollution from agricultural areas. Although the average rate of fertilizer per hectare is relatively low in India,¹¹ the use of agro-chemicals is unevenly spread throughout the country. In states where consumption is high, such as Punjab, Tamil Nadu, Andhra Pradesh, and Haryana, eutrophication of lakes, reservoirs, and tanks are environmental concerns. Additionally, a number of pesticides that are classified by WHO as highly hazardous and are either banned or highly controlled in Western countries are commonly used in Indian agriculture.¹² The impact is far more permanent on the groundwater resources (para 2.24).

A1.13. Industrial Pollution. The release by industry of untreated toxic organic and inorganic wastewater pollutants into watercourses is also a widespread problem.¹³ Initiatives have begun to address this problem, including the establishment of Common Effluent Treatment Plants (CETPs) for clusters of small-scale industries. However, in addition to implementation problems, the majority of industries are not connected to CETPs and only about half of the large and medium-scaled industries in India have effluent treatment systems (many of them only partial). Even among those industries with systems, few have yet achieved stipulated emissions standards.¹⁴ A total of 1,532 "grossly polluting" industries have been identified in 24 states by Central and State Pollution Control Boards.

A1.14. Domestic Pollution. Rapid population growth and urbanization have also placed tremendous pressure on the country's fragile water resources. The primary sources of water pollution from the domestic sectors (urban and rural) include human and animal waste and runoff from solid waste, garbage dumps, and street litter accumulation. Lack of water delivery and sanitation facilities, in addition to poor system maintenance, has resulted in severely contaminated water and a high incidence of water-related disease. The complex and multi-faceted impacts of such pollution on the economy and well-being of local communities is illustrated in the case of Bellandur tank (refer World Bank, 1998a, Annex Box A2.2).

floods to mimic the former natural conditions prior to construction of Manantali Dam: flood recession agriculture, dry season pastures for semi-nomadic peoples, fisheries which depend on flooding, aquifer recharge for drinking water supply for villages, etc.

¹¹ Average world fertilizer concentrations per hectare of arable land in 1991 were 95.2 kgs., while for Japan, Korea, USA, Pakistan and India, the amounts were 400.1, 416.2, 97.0, 91.2, and 74.3 kgs., respectively.

¹² The data on the presence of pesticides in water are very limited. However, studies which have been undertaken, for example on the Ganga River, indicate levels of various chemicals (HCH, DDT, endosulfan, methyl malathion, malathion, dimethoate, ethion) which exceed international quality standards.

¹³ Industrial effluents also contribute substantially to organic pollution, and in some cities represent over 50% of urban organic load. In Cauvery basin, for example, the contribution of industrial effluents to the total urban load (domestic + industrial) varies from 1% (District of Coorg) to 81% (District of Mandya).

¹⁴ It has been estimated, based on information obtained through interviews with State Pollution Control Board senior officers, that in Andhra Pradesh alone, there are 526 large/medium- and 1208 small-scale polluting industries. Out of these, only 29% are complying with standards.

A1.15. *Environmental-related health problems.* It is estimated that at least 5 million urban dwellers lack access to clean drinking water and a far larger number of people do not have access to even the simplest of latrines. Degradation of water quality from industrial and domestic pollution is a major cause of environment-related illness. In large cities such as Mumbai and Calcutta, contamination of water in piped distribution systems due to inadequate maintenance has resulted in high rates of water-borne infection, including diarrhea and enteric disease.

A1.16. In rural areas unsafe drinking water due to discharge of raw sewage and inadequate disposal of domestic solid waste is a major health problem. In many cases existing tubewells and hand pumps have broken down and remain out of operation, forcing users to collect water from unsafe sources.¹⁵ Given that 80 percent of rural domestic water supply is from groundwater (50 percent for urban areas and industry), contamination from agricultural and industrial sources means that water availability of a required quality is already severely strained.

A1.17. The health costs associated with impure water are staggering. In Maharashtra alone, about 0.7 million people suffer from various water-related illnesses, out of which approximately one thousand die each year. For children the situation is particularly serious: 0.5 to 1.5 million children under the age of five die annually from diarrhea alone.¹⁶ It is estimated that approximately 30.5 million Disability Adjusted Life Years (DALYs) are lost each year in India due to poor water quality, sanitation, and hygiene.¹⁷ These and other issues are a constant preoccupation of the various government health departments involved and of agencies such as the Rajiv Gandhi National Drinking Water Mission (RGNDWM). Some notable successes have been achieved, such as the eradication of Guinea Worm. However, sanitation remains a critical issue and is likely getting worse as population pressure builds. Problems with trace elements also need handling: for instance, presence of arsenic in groundwater in parts of West Bengal or high fluoride levels in parts of Karnataka.

A1.18. *Groundwater Degradation.* The presence of naturally occurring trace minerals --fluoride, arsenic, iron -- is a source of groundwater contamination.¹⁸ However, toxicity of groundwater has been increased further by the leaching of agricultural, as well as industrial, chemicals into soils. In states such as Gujarat, groundwater has been degraded by increases in nitrate concentrations due to applications of fertilizer to cultivate cash crops, including oil seeds, cumin, sugarcane, cotton and groundnut. Land disposal of untreated wastewater and hazardous wastes from industries poses a severe threat to groundwater quality. Heavy metal contamination is particularly common in thermal power, tannery, and mining intensive areas. Additionally, excessive withdrawals of groundwater, coupled with decreased recharge rates, has resulted in

¹⁵ In a study conducted by AIIHPH (1993), it was observed that almost 90% of the villagers use pond water for bathing and washing utensils and clothes. More than 50% use the same for cooking.

¹⁶ World Development Report (World Bank, 1997).

¹⁷ Morbidity and mortality estimates can be aggregated into a single impact called DALYs -- Disability Adjusted Life Years (World Bank, 1995a).

¹⁸ In many parts of India, these toxic inorganics are found to be beyond permissible water quality limits for drinking purposes and present a severe health risk.

contamination from salt water intrusion in coastal areas. Aquifer degradation is a particular problem in states such as Gujarat, West Bengal, and Tamil Nadu.¹⁹

A1.19. *Groundwater Depletion.* The number of blocks that have been classified to have reached either the "over-exploited" status or the "dark" status is less than 10 percent of the total number of blocks.²⁰ However, blocks classified as dark or critical have been growing at a continuous rate of 5.5 percent, as indicated in para 2.04. At this rate 36 percent of the blocks would have become over-exploited within 20 years.²¹ Furthermore, substantial declines in the water-table occur before a block reaches the "dark" or the "over-exploited" status. Such declines have impact on a number of users. Of particular concern, reduction of water-levels due to over-extraction by irrigation users has resulted in drying up of domestic water wells in many areas.

A1.20. *Waterlogging and Salinity.* Over-use of irrigation water and lack of adequate drainage has led to environmental damage in the forms of water-logging and increased salinity levels. Surveys conducted by the Central Soil Salinity Research Institute reveal that there is a major problem of water-logged and salinity-affected areas in irrigation canal command areas. Available data from these surveys indicate that out of a total of 11 million hectares of command area in 12 major irrigation projects, two million hectares are characterized by waterlogging and another 0.95 million hectares, by soil salinity.²² The Ministry of Agriculture estimated in 1990 that the extent of land affected by waterlogging in India was 8.5 million hectares. Yet farmers and the general public are often insufficiently aware of the long-term impacts resulting from waterlogging, such as salinization.

A1.21. *Watershed and Catchment Degradation.* Weaknesses in land management are inextricably linked with India's water resource management problems.²³ Mounting population pressure with still insufficient techniques applied for watershed, land and water resource management have caused loss of forest land and over-grazing. About 6,000 million tons of top-soil are lost annually in India through erosion. Not only are soils degrading but also the retentive capacity of the land is reduced by lack of vegetative cover. Flash flood run-off is thus exacerbated rather than the more beneficial absorption of rain-fall as groundwater. This further limits cropping possibilities on residual moisture and exacerbates groundwater depletion,

¹⁹ In Gujarat, chloride levels over 1,000 mg/l have been detected (CGWB, 1991). In Tamil Nadu, saline intrusion in one area where groundwater is extracted to supply water for Chennai (Minjur well in Chingelput district) increased from 2 km inland in 1969 to 8 km in 1991 (CGWB, 1991).

²⁰ Not including A.P., Gujarat, and Maharashtra. "Groundwater Resources of India" (Central Groundwater Board, Ministry of Water Resources, GOI, 1995).

²¹ "India: Water Resources Management Sector Review, Groundwater Regulation and Management Report" (World Bank, 1998).

²² Estimates of waterlogging vary by source because some estimates include areas waterlogged during the monsoons as well as lands affected by seepage from canals and poor on-farm irrigation practices. Painuly (1995) reports that, on the average, India's major irrigation systems barely serve 40% of their command area. If evaluated against the area actually served by canal projects, about 50% of this area is either waterlogged or affected by soil salinity.

²³ The following reports also deal with these issues: (i) "India: Review of Rain-fed Agriculture and Watershed Development" (World Bank, 1988); (ii) "India: Review of Wasteland Development" (World Bank, 1988); (iii) "India: Irrigation Sector Review" (World Bank, 1991); (iv) "India: Policies and Issues in Forest Sector Development" (World Bank, 1993).

including drying up of traditional sources of rural drinking and domestic water. The many catchment management and local level micro-catchment management techniques already known and promoted in India need more wide-spread adoption.

A1.22. River, Reservoir and Canal Siltation. Part of the above top-soil losses flow into the streams and rivers causing changes in their hydraulic regime. Siltation is a problem in surface water canals and India's many reservoirs and tanks. This adds to maintenance costs in canal and drainage networks and, for the reservoirs and tanks, significant loss of storage capacity: at an annual rate estimated to range from 0.5 to 1.2 percent.²⁴ Losses in storage translate into reductions in hydroelectric power production, inadequate irrigation water storage, and reduced flood protection.

A1.23. Biodiversity loss and Wetlands Reduction. Most of India's wetlands are directly or indirectly linked with the major river systems such as the Ganges, Brahmaputra, Tapi, Godavari, Krishna and Cauvery. Despite the fact that a significant proportion of the country's wetlands are under some form of protection, many of these systems are threatened from increasing and uncontrolled human pressures on the country's natural habitats. The primary cause of biodiversity loss in wetlands has been the conversion of natural ecosystems for agricultural and industrial development and the expansion of urban areas, as well as the environmental destruction these activities have generated. Water-related projects have, additionally, had a major impact on the ecological integrity of water systems. The construction of dams and the diversion of rivers for irrigation, hydropower and navigation have increasingly resulted in modification and loss of India's aquatic ecology (refer World Bank, 1998a, Annex Box A2.10).²⁵

A1.23. Coastal Zone Habitats. Coastal habitats are also at risk. For instance, the destruction of coastal areas due to human encroachment has decimated mangrove forests along the Indian coastline. In estuaries or other brackish water environments shrimp culture, as well as other fauna and flora, has sometimes been affected by pollutants. Typical coastal environment issues and coastal management possibilities are discussed in World Bank (1998a) Annex Box A2.3.

²⁴ In Tamil Nadu, where there are 61 major reservoirs and about 39,200 tank storage systems, studies conducted by the Institute of Hydraulics and Hydrology and by the Gauging Division (Water Resources Organization/PWD) have shown high losses in the capacity of reservoirs and tanks, with rates of siltation reported as high as 2.6% annually and loss of capacity reaching as high as 58% (Kundah reservoir).

²⁵ For example, the fresh water Gangetic Dolphin, endemic in the Ganga river, is on the verge of extinction due to the destruction of its habitat from changes in the river hydrology.

Box A1.1 (a). Regional Diversity in Water Issues:

Northeast India—Arunachal Pradesh, Assam, Meghalaya and others

Characteristics: In the humid Northeast, average annual rainfall is normally 2700 mm, but may be as high as 11,000 mm particularly in Meghalaya. In the non-monsoon months, drinking water scarcity exists in pockets. The water resources and hydropower potential is generally very high; however there's been minimal development, with only around 25% of the surface water and less than 4% of replenishable groundwater resource having been developed. Further, only 166 MW (out of 31000 MW) of the estimated potential of the Brahmaputra and 15 MW (of 2000 MW) of the Barak have been installed. Endemic problem of floods, river bank erosions and soil erosion/land degradation is experienced.

Environmental and Health concerns: Water quality is presently not a major issue except for sediment load contributed through erosion. Collieries, lime and dolomite mining could be a source of pollution in the future. Iron content in groundwater is a particular problem. Water-related diseases in this region include guinea worm and cholera.

Challenges: States in the NE should work toward developing their hydropower potential, but this should be done within the context of a sectorally-integrated river basin plan. Soil and water conservation measures will be necessary and could be achieved through control of deforestation and terracing of hills. Run-off in the hills will need to be captured and water conserved to enable development of minor irrigation. Measures will need to be introduced to control periodic flooding.

Box A1.2 (b). Regional Diversity in Water Issues:

South India—Karnataka, Andhra Pradesh, Kerala, Tamil Nadu, Goa

Characteristics: Rainfall in the South varies in nature between the interior plains and the coastal region, ranging from about 600 mm to 1500mm. In the alluvial areas of Andhra Pradesh, Tamil Nadu and Kerala, surface and groundwater resources have been heavily exploited, with water tables falling by less than one meter to several meters/year. Basins with falling groundwater tables are also increasingly found in Karnataka and are already negatively impacting sources of rural water supply and groundwater irrigators. In the coastal Tamil Nadu, extensive pumping of groundwater across millions of acres has allowed saltwater to infiltrate the aquifer, thereby rendering the water unfit for domestic or agricultural use (Repetto, 19..).²⁶

Environmental problems include water pollution from the heavy application of agro-chemicals—fertilizers and pesticides—in states such as Tamil Nadu and Andhra Pradesh. The use of nitrogen, phosphate and potassium fertilizers may have caused several hundred mg/l of nitrates in groundwater in parts of Andhra Pradesh (Tyagi, 1987). Discharge of untreated tannery and textile wastes in Andhra Pradesh has further contributed to water pollution (Roy, 1991). Water-related disease prevalent in this region includes guinea worm (Roy, 1991).

Challenges: This region faces similar challenges as the Northwest and will need to address the full range of measures discussed in this report for improving resource allocation and management, including environment protection and water quality.

Box A1.2 (c). Regional Diversity in Water Issues:

East and Central India—E. Uttar Pradesh, Bihar, W. Bengal, Orissa, North coastal Andhra Pradesh, Madhya Pradesh

Characteristics: Higher rainfall is found in these rainy alluvial areas and availability of water—both surface and ground—is high. Groundwater resources are generally underexploited, although aquifer degradation is a problem in West Bengal. This is due to much slower rural electrification, smaller plots and landholdings which make the incremental benefits of irrigation lower compared with other areas. As a result, farmers have not had sufficient incentive to invest in groundwater pumps. Agricultural yields tend to be low due to excess water and insufficient drainage infrastructure on agricultural lands. Farmers face high risk of agricultural production losses from floods.

Ecological problems are exacerbated due to heavy application of fertilizers, the run-off of which has encouraged the growth of aquatic weeds such as water hyacinth. Already 40% of the total culturable area (of Orissa, W. Bengal, Bihar and Assam) is infested. Additionally, high levels of iron concentration in groundwater poses severe health risks in states such as Orissa, Bihar and Uttar Pradesh. Water-related diseases that are prevalent in this region include guinea, cholera and Typhoid (Roy, 1991).

Challenges: The issue here is the need to invest in drainage networks, and establish flood protection structures and mechanisms. Further development of water may be undertaken but should be balanced by improved and integrated water planning, allocation and management. The lower private benefits from groundwater extraction point to the need for cooperative institutions and arrangements (facilitated by government, NGOs or the private sector) to initiate and share the costs of tubewell installation.

²⁶ Saline intrusion in one area of Tamil Nadu, for example, where groundwater is extracted to supply water for Chennai (Minjur well in Chingelput district), increased from 2 km inland in 1969 to 8 km in 1991 (GOI, 1991).

Box A1.2 (d). Regional Diversity in Water Issues:

Northwest India—Punjab, Haryana, Western Uttar Pradesh, Rajasthan, Gujarat, Maharashtra

Characteristics: Rainfall in this region is low, typically ranging from 300 mm (Rajasthan) to 800 mm (Haryana). Haryana and Punjab have already exploited about 94 percent of their groundwater resources. Rajasthan, Northern and coastal Gujarat and Western Uttar Pradesh are also experiencing depleting groundwater tables in certain areas, with water tables falling by less than one meter to several meters/year (World Bank, pg. 43). Paradoxically—and a direct result of the cumulative impact of irrigation and poor drainage—Uttar Pradesh, Haryana, Punjab and Rajasthan are also confronting the converse situation of rising groundwater tables and waterlogging, plus increasing sodicity and salinization of soils.

Environmental and health concerns. In the coastal areas of Gujarat, saltwater intrusion into the aquifer, due to extensive pumping of groundwater, has eroded the water quality beyond the point of usefulness for domestic or agricultural purposes. The high consumption of agro-chemicals (i.e., fertilizers and pesticides) in Punjab and Haryana has also contributed to water pollution and led to eutrophication of lakes, reservoirs and tanks. In Gujarat, groundwater has been degraded by increases in nitrate concentrations from applications of fertilizer to cultivate cash crops, including oil seeds, cumin, sugarcane and groundnut. Similarly in parts of Punjab, Uttar Pradesh and Maharashtra, the use of nitrogen, phosphate and potassium fertilizers, may have caused several hundred mg/l of nitrates in groundwater (Repetto, 1994). Groundwater quality has also been affected by pollution from industrial sources, such as textile dyes in arid Rajasthan and Gujarat. Water-related diseases prevalent in this region include guinea worm, cholera and typhoid. The presence of naturally occurring trace minerals, such as high fluoride concentrations in groundwater in Rajasthan and Punjab, pose particular health risks.

Challenges: In this region, the main need is no longer the development of water resources, but rather how to manage them within already full utilization levels, and address the growing concerns over pollution and water quality. The full range of measures discussed in this report for improving resource allocation and management, as well as increasing the efficiency of water service delivery, will need to be assessed and implemented in this region. There will further need to be improved agricultural extension support to change water and input application methods.

**India Water Resources Management Sector Review
Initiating and Sustaining Water Sector Reforms**

**ANNEX 2
TREATING WATER AS AN ECONOMIC GOOD
WITH PRIVATE AND PUBLIC GOOD DIMENSIONS²⁷**

A2.1. The public-good dimension of water and the substantial externalities attending its use necessarily call for an important public sector role. This role, however, needs to be defined keeping in view the role the private and non-public sectors will have play in achieving effective and sustainable water resources management. Defining respective responsibilities of public and private stakeholders will depend on the activity to be performed or the objective to be achieved, whether it has low or high degrees of subtractability²⁸ and excludability.²⁹ The private sector will opt to engage in activities with high subtractability and excludability, and desired (or optimal) levels of output will tend to be produced. For activities characterized by low subtractability, private sector activity will result in less than desired levels of output since it is difficult to get consumers to pay, and government investments or subsidies may be appropriate. Activities characterized by low excludability result in overuse of the resource, and government intervention to regulate use may be necessary. For the last case of low subtractability and excludability, the government will have to take responsibility for the activities, but may contract out management to the private sector.

A2.2. The two-way classification of good and services based on the characteristics of subtractability and excludability is useful in this regard, as follows: (i) private goods (high subtractability and excludability), such as deep tubewell groundwater pumps; (ii) open access goods (high subtractability and low excludability), such as groundwater aquifers with low recharge rates; (iii) toll goods, (low subtractability and high excludability), such as conventional sewerage systems and navigation facilities; and (iv) largely public goods (low subtractability and excludability), such as flood control and large multi-purpose dams. Tables A2.1 characterizes various water activities, and Table A2.2 indicates the degree to which various types of activities can be subjected to market forces.

²⁷ This Annex draws heavily from World Bank (1993) Appendix A.

²⁸ Subtractability occurs with most traditional goods, such as ice cream, when one person's use or consumption of a good or service decreases or subtracts from its value to others who use the same good or service (if one person eats the ice cream, another person cannot have it).

²⁹ Excludability is present when it is possible to prevent a consumer, who doesn't meet the conditions set by the supplier, from using the resource. Many water-related activities are characterized by the difficulty of excluding people from their use (for example, large irrigation schemes based on gravity flow, where the monitoring of individual use is costly, village wells, and flood control).

Table A2.1. Characteristics of Public and Private goods, Market Power, and Externalities in Water Sector Services

Type of System	Nature of the good		Market power,		Comment
	Subtractability	Excludability	contestability	Externalities	
<i>Wastewater management</i>					
<i>Conventional sewerage</i>					
Street sewer line	L	H	L	PH,WP	Toll goods
Pumping stations	L	H	L	PH, WP	Toll goods
Treatment plants	L	H	L	PH, WP	Toll goods
<i>Intermediate- or low-cost sewerage</i>					
Condominial sewerage	M	M	M	PH, WP	Public good characteristics
Localized treatment	M	M	M	PH, WP	Public good characteristics
Other intermediate sewerage	M	M	M	PH, WP	Public good characteristics
Basic sanitation (pit latrine)	H	M	H	PH, WP	Private good characteristics
<i>Water supply</i>					
<i>Piped water</i>					
Trunk system (intake pumping station)	H ^{a/}	H	L	PH, GD	Private good characteristics
Distribution system	L	M	L	PH	Public good characteristics
<i>Terminal equipment</i>					
Common (hand pump)	M	L	H	PH	SF, public good characteristics
Individual (home faucet)	M	H	H	PH	Private good characteristics
Village wells	M	L	H	PH	SF, public good characteristics
Vending (tanker trucks)	H	H	H	PH	Private good
<i>Irrigation</i>					
<i>Surface water</i>					
Trunk system (dam, main canal)	M ^{b/}	M	L	WL,E	Public good characteristics
Distribution system (secondary and tertiary canal)	M ^{b/}	M	M	WL, ND	Public good characteristics
<i>Terminal system (on farm), gravity</i>					
Field-to-field irrigation	H	L	H ^{c/}	V/L, ND, S	Open access resource
Individual farm	H	H	H ^{c/}	WL,ND, S	Private good, HTC
Terminal system requiring lift	H	H	H ^{c/}	WL,ND,S	Private good
<i>Groundwater</i>					
<i>Deep tubewells</i>					
Pumping facilities using open access	H ^{a/}	H	M	GD	Private good using open access resource
Distribution system	M	M	M	WL,S	Public good characteristics
Terminal system	H	H	H ^{c/}	WL,S	Private good
<i>Shallow tubewells</i>					
	H ^{a/}	H	H	WL,S	Private good using open access resources
<i>Run of the river systems</i>					
Headworks	M ^{b/}	M	M		Public good characteristics
Distribution system	M ^{b/}	M	M	WL, S	Public good characteristics
Terminal system	H	H	H ^{c/}	WL,S	Private good, HTC
<i>Small dams and reservoirs</i>					
Headworks	M ^{b/}	M	M		Public good characteristics
Distribution system	M ^{b/}	M	M	WL,S	Public good characteristics
Terminal system	H	H	H ^{c/}	WL,S	Private good, HTC
<i>Flood control structures</i>					
	L	L	L	PH	Public good
<i>Hydropower generation</i>					
	M	H	H		Private good
<i>Instream uses</i>					
Amenity uses	L	L	M		Public good
Access for fishing and recreation	M	M	M	WP	Can be open access resource
<i>Navigation</i>					
Piers and locks	M	H	H	WP	Toll good characteristics
River channel	L	M	H	WP	Could be toll good or public good

Note: PH, public health; WL, waterlogging; WP water pollution; GD, groundwater depletion; ND, introduction of new diseases; SF, difficult to exclude users due to social factors; S, salinization; E, erosion during construction and because of migration into the area; L, low; M, medium; H, high; HTC, high transaction costs for trades beyond the tertiary canal.

Source: World Bank (1993), Table A-1.

^{a/} The degree of subtractability associated with a given well actually depends on the nature of the aquifer from which the well is drawing. High water resource scarcity is assumed.

^{b/} The degree of subtractability depends on the scarcity of water and the capacity of the canal.

^{c/} Function is usually performed by private firms.

Table A2.2. Market Conditions and Public Policy to Assure Efficient Production and Management of Water Resources

Type of good	Provision	Production
Public goods	Full or majority public ownership and public capital financing to ensure adequate allocation of resources.	Where feasible and desirable, rights should be granted to private sector or water user organizations to operate publicly owned facilities under regulation and contract. Otherwise, the public sector should produce the service, such as flood control and large multipurpose dams.
Toll goods	If there are concerns with equitable access to users, market power, scarcity of substitutes, or optimal provision of the good or service, public regulation will be needed regarding property rights, conditions of competition, and quality and pricing of toll services. Since the services are not fully subtractable, a two-part pricing system (one part being a fixed access/connection charge, one part being variable, based on extent of use) is appropriate; but if subtractability is very low, some public financing mechanism (for example, through benefit taxes such as land taxes) might be necessary to supplement direct user charges. Conventional sewerage and navigation are good examples of toll goods.	Should be private, or based on a user organization subject to regulation as noted.
Open access goods	Typically full or majority public ownership with the public being defined to include communities of water users (for example, a community of irrigators).	Mostly private or based on a user organization, but regulation is needed to grant limited property rights (rights to exploit resources or generate services from facilities). Pricing should be based on the scarcity value of the good, but since nonpayers cannot be excluded, indirect financing through a budgetary mechanism may be needed (see the discussion on toll goods). Regulations are also needed if overuse of a resource such as groundwater can destroy its future usefulness (for example, salt water intrusion and aquifer compaction).
Market power	Policies and regulations that remove barriers to entry and competition (for example, allow equitable access of potential entrants to capital financing), promote contestability (for example, contract out the operations of water supply systems, the maintenance of irrigation canals, or the collection of water fees), and facilitate availability of substitute services (for example, navigation and hydropower as transportation and energy substitutes, respectively). If minimum investment requirements are very large (economies of scale), some public investment or public capital financing may be needed, which is likely to be the case for large dams and canal systems. For the remaining elements of natural monopoly, regulation of pricing is needed (for example, water companies and electric utilities).	

Table A2.2 (cont.). Market Conditions and Public Policy to Assure Efficient Production and Management of Water Resources

Type of good	Provision	Production
Externalities	Regulation of investment (for example, land use zoning) and of operations and technical standards (for example, the level of pollutants that a municipal waste treatment plant is allowed to release into a river) are needed. Taxes, fees, or subsidies are imposed to influence private incentives for investment or operation. Regulations are passed that mandate public access to information (for example, the amount of chemicals being released into a lake by industrial firms). The larger externalities (positive or negative) are, the more justified is public involvement in regulation, provision, and even production (for example, building wastewater treatment plants).	
Merit goods	Regulation is needed to ensure equitable access to services (such as minimum or universal water services). Investment planning is needed to ensure that some minimum form of service is available. Public financing of investment or current operations is needed for goods whose consumption is considered a social benefit. For other goods, such as wastewater disposal, for which equitable access is considered important, public subsidies of investment or current costs should target groups of users most in need of financial assistance. Pricing policy may be used to differentiate among income groups such as block rates in municipal water supply (may be linked to budget subsidies or cross-revenue subsidies for low-income users).	Mainly private or user organizations, but the public sector may, as a last resort, produce the service if no other source is available.

Source: World Bank (1993), Table A-2.

**India Water Resources Management Sector Review
Initiating and Sustaining Water Sector Reforms**

**ANNEX 3.
EXECUTIVE SUMMARIES
FROM THE FIVE SPECIALIST TECHNICAL PAPERS**

CONTENTS

1. Executive Summary from the Intersectoral Allocation, Planning and Management Report (World Bank, 1998a)	125
2. Executive Summary from the Groundwater Regulation and Management Report (World Bank, 1998b)	133
3. Executive Summary from the Irrigation Sector Report (World Bank, 1998e).....	143
4. Executive Summary from the Urban Water Supply and Sanitation Report (World Bank, 1998c).....	151
5. Executive Summary from the Rural Water Supply and Sanitation Report (World Bank, 1998d).....	159

INDIA WATER RESOURCES MANAGEMENT SECTOR REVIEW INTERSECTORAL ALLOCATION PLANNING AND MANAGEMENT REPORT

EXECUTIVE SUMMARY

THE NEED FOR BETTER MANAGEMENT

- i. India faces an increasingly urgent situation; its finite and fragile water resources are stressed and depleting while different sectoral demands are growing rapidly. If India's aspirations for continued economic growth and improved social and environmental conditions are to be met, fundamental changes in how water is allocated, planned and managed must occur.
- ii. This situation has developed incrementally, but is nevertheless dramatic. At Independence, population was less than 400 million and per capita water availability over 5000 cubic meters per year (m^3/yr). Today, fifty years later, population has grown to 945 million and per capita water availability has fallen to hardly more than 2000 m^3/yr . The situation is already critical at river basin and local levels: six of India's twenty major river basins have less than 1000 m^3/yr and environmental problems and localized shortages are endemic in all basins.
- iii. Environmental problems include water quality degradation from agro-chemicals, industrial and domestic pollution, groundwater depletion, waterlogging, soil salinization, siltation, degradation of wetlands, ecosystem impacts, and various health-related problems. Environmental and health-related issues are less evident than the more visible quantity-related problems, but are critically important to social welfare and resource sustainability.
- iv. The current inter-sectoral and inter-state constraints will build rapidly in the coming years. Population is expected to grow by some 40 to 50 percent before eventual stabilization, and will be combined with major changes in the composition of demand resulting from rising incomes, urbanization and rapid industrialization. Industrial needs will be a high economic priority; agriculture, with two-thirds of production dependent on irrigation and accounting for 83 percent of consumptive water use, continues to remain crucially dependent on water; and the availability of rural drinking water is a fundamental societal need. Conflict between sectoral uses—domestic needs in rural and urban areas, agriculture, industry, energy, ecological, flood control, navigation, fisheries, recreation, ceremonial and religious—is already a serious problem.
- v. The past management of the country's water resources has been unable to cope effectively with these issues. Water has been developed rather than managed. Comprehensive management—on a river basin basis, multi-sectorally, conjunctively for both surface and groundwater, incorporating both quality and quantity aspects of water—is largely lacking. Cooperation between states sharing river basins has been limited and sometimes highly contentious. Management of water has been through a top-down approach and has become virtually a government monopoly. A "supply-side" approach—exploiting additional water resources—has been predominantly used. This approach has resulted in major economic, social and environmental costs. In recent years, however, there has been realization regarding the need to address these problems.

vi. India has major achievements in the water sector to its credit. A major spurt in development of water infrastructure since Independence allowed India to harness much of the country's water resources. These investments have made a vital contribution to India's food security, taking India from a situation of frequent famines and social vulnerability in the 1950s and 1960s to a self-sufficient and even exporting country. Water infrastructure investments have also enabled the rapid expansion of the urban and industrial sectors and the increased availability of safe drinking water in rural villages. Further, as described in this report, a variety of policies, legislation and institutional initiatives have been taken by India to better manage its water resources as resource constraints have become increasingly apparent. In comparison to most other developing countries, it could be said that India's water resources management initiatives are more comprehensive than generally found elsewhere. The problem, however, is that almost in every country there is need for significant improvement. India's needs are particularly severe because of its rapidly developing water constraints, environmental problems, huge population, regional inequalities in water availability, the federal administrative structure, and rapid demographic and economic growth. In such circumstances, while much has been achieved, particularly on the development front, a great deal still remains to be achieved as regards water resources management. India can, and must, allocate, plan and manage its water resources better.

vii. The need to better manage the nation's water resources is well recognized by India's planners and policy-makers. This report, prepared jointly by the Indian Government and the World Bank and benefiting from a "Brainstorming Session", three regional consultation meetings and a "National Workshop" chaired by the Ministry of Water Resources (MOWR) and with multi-sectoral representation from across India (both government and non-government sectors), attests to the actions and broader thinking now underway. The need now is to translate these reflections and initiatives into a more comprehensive action agenda.

THE REFORM AGENDA

viii. There are two broad issues that need addressing. First, solutions must be found for competing inter-sectoral demands. Mechanisms must be developed for allocating scarce water resources between competing uses—irrigation, rapidly expanding domestic and industrial needs, hydropower, environmental requirements, etc. Second, water must be managed on a river basin basis, including between states sharing the same river basin.

ix. The findings of this report are that a comprehensive approach is required. A combination of mechanisms need to be used in the fields of: (i) policy; (ii) legislation and regulations; (iii) institutions; (iv) economic incentives; (v) technology; and (vi) data, analysis and public information. Detailed recommendations in each of these areas forms the main subject matter of this report. Within this framework, several overarching attention areas have also emerged. First, a public-private sector partnership is required. The present almost exclusive domain of the public sector needs to broaden out to include the private sector—civil society groupings, academics, NGOs, industry, etc.—in decision-making and implementation. Second, decentralization, stakeholder participation, and involvement of grassroots organizations is required. Central to these will be the creation of public awareness, transparency of information

and two-way flows of information, and maximal participation in decision-making and implementation by civil society and the various stakeholders involved. Third, the traditional “supply-side” oriented approaches of the past, where response to problems has been sought through primary reliance on exploiting additional resources, must be balanced by “demand management”: improving the productivity of existing resources through the combined use of technology, incentives, public awareness and other actions.

x. A key need is to develop a new “enabling environment” that can influence the myriad of actors involved: each and every household, private businesses, and the various social, administrative and political aggregations (villages, socio-economic strata, municipalities, districts and states). This will require establishing an “incentive framework” that influences these actors. Direct impact will be felt through financial incentives or regulatory actions actually enforced. These translate the policy, legislation, institutional and technical capabilities into impact at the level of the individual. The incentive framework must also provide the right directions for the higher organizational aggregates: state governments and their various water-related departments, river basin organizations, the different Central Government agencies, and grassroots organizations. For these, policies, legislation, institutional structures and interlinkages, approval processes, capacity building, information, and financial incentives and leverages, also come into play.

xi. The Action Plan discussed below has taken into account that, while initiatives are underway at the center and in some states, for most states and river basins, the country is starting largely from scratch as regards water resources management. The change process must recognize the realities from which change must commence. Many of the recommendations are, thus, start-up in nature, comprising primarily the short and medium-term agenda. These actions should not, however, be considered the end of the line. Policy-makers and implementors should keep in their sights the best examples of success worldwide, a number of which are discussed in the main text and in boxes in Volume II.

xii. As the reform program is implemented, a long-term vision needs to be in constant focus. As soon as possible, management of water resources in India will have to be on a river basin basis, including a sophisticated management apparatus, incorporating all sectoral uses and stakeholders and crossing state boundaries. The report’s recommendations start this process, but reported success stories such as the Murray-Darling Basin in Australia, including major emphasis on public awareness and participation, illuminate the possible further actions. The development of water policies, legislation and regulatory structures in India should look to the world’s best-practices, with appropriate adaptations for India’s circumstances, even if a phased approach is required to get there. Pricing and other market allocation mechanisms need to evolve as quickly as possible to meaningful instruments guiding resource allocation and usage practices. Appropriate lessons in this regard can be drawn from the tariff structures used by the world’s best-practice water utilities (e.g., Singapore, EMOS in Santiago, Chile, and initiatives underway in Buenos Aires, Argentina), water marketing arrangements found in the Western U.S.A. and Chile, and pricing as an environmental management mechanism in the Netherlands. A major drive is required to improve technology for increased productivity of water in all sectors, with lessons for agriculture from countries such as Israel, Jordan and California. Hydrological data

and modeling capabilities must progress to the levels found in other advanced countries in the world. The eventual institutional structures in India will be a major transformation from the present and even the initial restructurings in the reform process: for instance, evolution to commercialized water services as found in some countries (e.g., U.S.A., U.K. and Chile); and government agencies eventually restricted to policy, planning and regulatory activities (e.g., the U.K. and evolving in a number of other countries). India's long-term sights must, necessarily, be far-reaching. The eventual goal must be the best, rather than marginal change. This will be essential, and has to be achieved as rapidly as possible if the nation is to achieve its social and economic objectives. The Action Plan summarized below will enable an energetic start in these directions.

ACTION PLAN

xiii. All reform areas—(i) policy, (ii) legislation and regulations, (iii) institutions, (iv) economic incentives, (v) technology, and (vi) data, analysis and public information—require attention, and mutually support each other.

xiv. **Improving the Policy Framework:** India's National Water Policy (NWP) (GOI, 1987) provides a broadly favorable environment from which to begin. It is in need of updating, but the principal problem is that it has not been translated into action. As per Entry 56 of List I of the Constitution, development and management of water is primarily a "State Subject," yet minimal action has been taken at state levels. Very few states have formulated a State Water Policy, and coherent agendas for improving water resources management are similarly absent. Not surprisingly, the implementation mechanisms for managing water are also absent or rudimentary in most states. It is recommended that each state prepare two guiding documents: (i) a State Water Policy responsive to its needs and in line with the principles of the NWP, and (ii) an Action Agenda outlining the specific actions intended. The Central Government should help guide the policy and reform agendas and update the NWP.

xv. **Strengthening the Legislative and Regulatory Framework:** The major gap is at state levels where the enabling legislative and regulatory framework for inter-sectoral water allocation and management is largely absent. The areas where legislation needs review and revision and, in some areas, creation are:

- Amending legislation to enable: creation of new water allocation and sharing institutions; strengthened regulatory powers, pollution control measures, establishment of multi-sectoral water stakeholder associations, participation of private sector and civil society, and new forms of water tariffs, including volumetric charging;
- Establishing groundwater legislation and a regulatory framework for groundwater management;
- Assessing options for defining and making transferable surface and groundwater rights.

xvi. At central and inter-state levels, there is a need to adjust two existing Acts to enable the center to play a stronger catalyzing role in the creation of river basin organizations (RBOs) and the resolution of inter-state water disputes. The first priority should be to amend the River Boards Act. The Act should be amended to give powers to the Central Government to enable

establishment of RBOs. RBOs could take many different forms, ranging from fairly informal structures facilitating dialogue and planning between states, to begin with, to more formal institutions with executive powers, possibly evolving to these over time. A second need is to adjust the Inter-State Water Disputes Act to substantially streamline Tribunal Award procedures within a mandatory time-frame. The adjustments to the Act should include provisions that: (i) the center can establish a Tribunal one year after receipt of a grievance from a riparian state if agreement is not reached between concerned riparian states, and (ii) following a Tribunal decision, a mandatory mechanism for effective implementation and monitoring of the Award is established.

xvii. **Establishing Government and Non-Government Institutions:** Institutional mechanisms need to be created or strengthened, particularly at state, grassroots and basin levels:

- **Creating State-level Institutions:** The most critical gap is at state levels where, apart from a handful of states, there is a complete absence of institutions to plan, allocate and manage water on a multi-sectoral basis and along river basin lines. The needs are: (i) establishing a multi-sectoral state-level institution comprised of a State Water Resources Board (SWRB) and its technical support unit—a State Water Planning Organization (SWPO)—including provisions for environmental capability; (ii) re-organizing the state bulk water supply agency (usually the Irrigation Department) along river basin lines and adjusting its mandate to include a broader role in water resources management; and (iii) creating river basin organizations for basins or portions of basins within the state.
- **Establishing Grassroots Institutions:** Grassroots institutions to implement local-level resource management initiatives need to be fostered. Many water resources management issues—e.g., conflicts between rural water supply needs and agricultural water pumping; or a local industry polluting village water bodies—have their origin and prospects for resolution at such micro levels.
- **Creating Inter-State River Basin Organizations (RBOs):** For all inter-state basins, riparian states should seek to form RBOs as a matter of priority, and should be strongly encouraged, including provision of incentives, by the center. The report provides guidance on the wide range of models that could be followed, both internationally and from success stories in India.
- **Strengthening Central Institutions:** The Central Government apparatus needs to be more sharply focused to enable it to play a more pro-active role and to better integrate the activities of the different central agencies connected with water. The National Water Resources Council (NWRC) and National Water Board (NWB) need to be strengthened with an operational level Technical Committee and a permanent multi-sectoral professional Secretariat or National Water Planning Organization (NWPO). Also, MOWR and its agencies (e.g., CWC, CGWB and NWDA) should establish mechanisms for closer interaction.
- **Adjusting Central Government's Role:** The center's role should include fostering public participation and change through information and public awareness, and capacity building for local and state-level institutions. For state governments it would provide financial incentives, appropriate instruments and facilitation of state initiatives and capacity building through: (i) monitoring of state water resources reform agendas as part of Plan approval processes during consideration of water investment proposals; (ii) encouraging inter-state cooperation through

usage of a River Basin Development Fund for multi-state basin developments where a RBO and basin plan exist; and (iii) providing technical assistance support and related financing of consultancies, training and equipment to states for their reform and capacity building programs.

- **Building Non-Governmental Participation:** This orientation should underlie all initiatives. Initially, given government's present monopoly role, the lead in this process will have to come substantially from government. Civil society, academia, NGOs, industrialists and water user groups should be brought into decision-making and institutions as quickly as possible. Particular attention should be given to fostering involvement of traditionally marginalized groups which have a large stake in water resources issues, such as women and the poor. As non-governmental participation is developed through public awareness and capacity building, and additional responsibilities are shouldered, the center and state institutions can modify their role accordingly.

xviii. **Introducing Economic Incentives:** Major change is required in the system of prices and other economic incentives affecting water use and allocation. Although price instruments exist, the levels of existing incentives and the form in which they are applied result in minimal, and in some cases negative, impact. There is urgent need to bridge this "incentive gap" through:

- **Intra-Sectoral:** (i) establish meaningful water prices (usually requiring significant increases) for irrigation, urban and rural water supply and sanitation, at least reflecting the costs of service provision and charged volumetrically; (ii) increase agricultural power tariffs and charge volumetrically to establish incentives for groundwater and power conservation; (iii) tackle distortions in agricultural commodity and input prices and domestic marketing policies currently encouraging excessive water use and regional imbalances; (iv) establish pollution taxes and other incentives to encourage adoption of water conservation, treatment, reuse and pollution control practices; and (v) establish, where required, targeted measures to protect poverty groups.
- **Inter-Sectoral:** Develop economically-based water re-allocation systems by: (i) introducing economic analysis and compensation packages in administrative re-allocations; (ii) developing the brokering of compensated water trades (between, for instance, agricultural water users associations and industries or municipalities); and (iii) piloting, with appropriate social and environmental safeguards, voluntary water transactions through formal water markets.
- **Inter-State:** Encourage multi-component (including non-water investments) basin development plans for inter-state river basins enabling mutually beneficial gains.

xix. **Technological Improvements:** All water sectors have substantial room for improving the productivity of water use. A major drive should be launched in all sectors to: (i) increase water use efficiency; (ii) improve productivity of end use; (iii) employ water conservation, water treatment and water recycling and reuse technologies; and (iv) enable transfer and reuse between sectors.

xx. **Improving Modeling, Data, Performance and Environmental Monitoring, and Public Information:** Significant improvement is also required in data and analysis, necessary to support all of the above actions. The main needs are to: (i) prepare river basin plans, state water

plans incorporating river basin or sub-river basin plans within the state, and environmental management plans; (ii) strengthen hydrological measurement networks and institutions; (iii) establish performance and environmental monitoring systems for water provision services in all sectors; (iv) involve stakeholders in all water planning and allocation decision-making; and (v) launch a major public information program to educate and enlist the support of the general public for the reform agenda.

GETTING STARTED

xxi. The above Action Plan is presented in full in Matrix 2 of the main report, including state and central-level responsibilities and a suggested time-frame. Particularly at state levels, there will be need to take into account the specific circumstances of the state concerned. No uniform prescription or blueprint will be appropriate for all circumstances. The key need is to make a start. A strategic, but also opportunistic, approach will often be needed, tackling first those issues considered most important and susceptible to change. Some actions, however, are particularly critical at the beginning, as they provide a foundation for other subsequent steps (refer Diagram 2—“Getting Started”).

xxii. State-level Start-up Actions: The first need in each state will be to set out a policy framework and Action Agenda. To this effect, an Interim Water Resources Task Team should be established quickly to assess the situation in the state and to draft two guiding documents establishing the agenda for change: the State Water Policy and the Action Agenda. These documents should be reviewed extensively within the state, including consultation with civil society and major constituencies. The following actions will be likely short-term needs:

- Establish Institutional Capability: Forming a SWRB and its SWPO will be required to steer and implement further actions.
- Create Public Awareness: A multi-media campaign should be launched to create awareness and understanding of the changes required.
- Review and Establish Economic Incentives and Mechanisms: A review should be made of existing incentives for water use and conservation, focusing on areas particularly in need of change and where change can be introduced quickly.
- Initial Review of State Water Legislation: A review should be undertaken to identify key areas requiring change or enactment of new legislation, for example on groundwater protection and management.
- Launch Initiatives for Inter-State Basins: Possibilities will vary depending on the present degree of cooperation between the concerned riparian states. In all cases, some steps towards further cooperation are possible and should be identified and undertaken.
- Introduce Technological Improvements: A quick review should be undertaken in all sectors of opportunities for enhancing productivity and water use efficiency.
- Improve Modeling, Data, Performance and Environmental Monitoring, and Public Information: Identify the state-specific actions needed and implement.

xxiii. Central-level Start-up Actions: Actions in the short term should be to help create awareness of the issues amongst civil society and government. At the level of the states, it would provide technical assistance and create financial incentives and levers encouraging change. At

the central level, it would make targeted adjustments in the institutional structure and legislation. To get these actions underway, a cross-ministerial Interim Water Resources Task Team should be established to prepare a short-term Action Agenda for Central Government's role. The following actions will need to be at the forefront:

- Public Awareness: A vigorous program to this effect should be launched, including use of media, literature, workshops and study tours.
- Guidance and Capacity Building: This will require multi-disciplinary capabilities, and an advisory role ranging from the general and conceptual to highly specific advisory capability to help states devise and implement specific actions. The center should also help train and build capacity of local-level institutions.
- Funding for State Initiatives: A funding provision should be provided for ready access by states to finance initiatives at the state or basin level.
- Applying Approvals Leverage: Develop and apply in the Plan-approvals process a system for monitoring state progress in water resources management reform.
- River Basin Development Funding: Provide centrally-sponsored-scheme Plan funding for multi-state river basin development where RBOs and basin plans exist.
- Reviewing Existing Legislation and Procedures: Amendments of the River Boards Act and the Inter-State Water Disputes Act should be a priority.
- Strengthening Central Institutions: The short-term need is to establish or strengthen capacity to handle the areas above, including making the NWRC more operational.

INDIA WATER RESOURCES MANAGEMENT SECTOR REVIEW GROUNDWATER REGULATION AND MANAGEMENT REPORT

EXECUTIVE SUMMARY

Context

i. The importance of groundwater to India's economy and development prospects should not be underestimated. The resource is of importance as a source of drinking water and food security for the 950 million inhabitants of India, supplies 80 percent of water for domestic use in rural areas and perhaps 50 percent of water for urban and industrial uses. Over the last three decades, the rapid expansion in use of groundwater primarily for irrigation has contributed significantly to agricultural and overall economic development in India. Groundwater irrigation potential, the number of wells, and the number of energized pump sets have grown exponentially since the early 1950s. With more than 17 million energized wells nationwide, groundwater now supplies more than 50 percent of the irrigated area and, due to higher yields in groundwater-irrigated areas, is central to a significantly higher proportion of total agricultural output. In addition, in drought years, groundwater represents the primary reliable source of irrigation.

ii This rapid development in groundwater, however, has had a price. In many arid and hard-rock zones, increases in overdraft areas and associated water-quality problems are emerging. Blocks classified as dark or critical increased at a continuous rate of 5.5 percent over the period 1984–85 to 1992–93. At this pace, and without regulatory or recharge measures, over 35 percent of all blocks will become over-exploited within 20 years. Sustainability of the resource base is thus critical for meeting an array of basic needs—from health to economic development.

A. ASSESSMENT AND ISSUES

From Development To Management

iii. The core groundwater challenge facing India is the shift from development (i.e., additional extraction activities) to management. Concerns of overdraft and a broad array of other management needs are emerging in many areas and are of fundamental importance to resource sustainability. The emphasis on management needs, does not imply that groundwater resources in India are fully developed. Additional extraction could still be supported in a few localities. However, focus on development activities must now be balanced by management mechanisms to achieve a sustainable utilization of groundwater resources.

iv. At issue also is the appropriate role for the government in the various activities of the sector. Although facilitated by the provision of institutional credit and subsidized energy supplies, most groundwater development has been accomplished successfully through the private investment of millions of farmers (MOWR, 1996). Groundwater development will thus likely continue in most regions regardless of government intervention, due to continued privately funded investments by farmers who now understand the benefits of groundwater irrigation. In contrast, direct government involvement through the development of public tubewells, though

costly, has achieved little success and currently contributes a very minor fraction of the total area irrigated with groundwater. While the continued availability of credit may be important to maintain, particularly for poor farmers who need to replace or upgrade existing wells, large-scale direct government support for groundwater development is largely unnecessary today.

v. Although the private sector will continue its prominent role in groundwater development, private sector initiatives are unlikely to address the many management needs. Protection of drinking water sources, pollution control, groundwater recharge, and environmental concerns such as overdraft and associated water quality problems, are the key issues needing to be addressed. Overdraft is, however, only a fraction of the management challenge associated with groundwater. Large areas, particularly in the command of surface irrigation systems, suffer from waterlogging and problems associated with salinity or alkalinity. Furthermore, the impact of development on the environment and non-agricultural users can be major even where overdraft or waterlogging are absent. Seasonal fluctuations in the water table can affect shallow wells, low seasonal flows in surface streams and pollution loads. This can have a major impact on the availability of drinking water, on the poor, and on the environment. In addition, there is the question of water quality and pollution. Pollution or deterioration in water quality can reduce the availability of water in ways that are far less reversible than overdraft. Non-point-source pollution from agriculture and other sources combined with point-source pollution represents a major challenge for groundwater management (MOWR, 1996). These issues will appropriately require leadership and facilitation primarily from the government. Unless management capacity is developed, the resource base will be undermined, with major impacts on the environment, domestic users, agriculture, and industry. Governmental efforts thus need to shift from development to these far more complex management needs.

vi. The combination of challenges now emerging necessitates a broad-based approach to groundwater management. To date, most management responses to overdraft have focused on supply-side solutions such as groundwater recharge. Although recharge activities are important and should be enhanced, they represent an extremely limited aspect in a much broader array of potential interventions. On the supply side, conjunctive management approaches involving the operation of surface systems can improve the availability of both ground and surface water. Overall, however, demand-side interventions are of equal, if not greater, importance than those on the supply side. Improvements in irrigation efficiency, expansion of low-water-intensity cropping patterns, and encouragement of municipal and industrial water conservation, need to be core components of programs to manage water scarcity. Overall, groundwater management approaches need to focus on the inter-linked hydrologic and use systems as a whole rather than primarily on supply-side aspects.

vii. Similar broad approaches are needed to monitor and address environmental impacts and concerns, such as waterlogging and pollution. These need to be integrated effectively into groundwater development and management approaches. These systemic environmental implications, however, should not be neglected by focusing narrowly on overdraft or waterlogging. In addition, it is important to recognize the high level of variability in management needs, which can differ fundamentally even between adjacent areas. Furthermore, impact evaluation needs to be focused at the system as well as the local level. Pollution is also a major threat at the system level. Where waterlogging is concerned, controlling the inflow of

surface supplies may be far more efficient than attempting, as is often done, to pump out excess groundwater. This is particularly true where groundwater is of poor quality. Likewise, attempts to limit the introduction of pollutants to the hydrologic system through land-use planning and the encouragement of low-fertilizer-and-pesticide-intensity agriculture will be much more effective than efforts to remediate aquifers once polluted.

Institutional Re-orientation

viii. Though groundwater in India is constitutionally a state responsibility, the center maintains equal capability to undertake groundwater activities. Under present arrangements there is substantial duplication of activities between state and central governments, particularly in the area of undertaking broad assessments of recharge and extraction as a basis for targeting development finances. While this is a valuable mechanism for cross-checking data from different sources, it is also a relatively inefficient use of scarce resources. The cost of this is recognized in India, and efforts are under way to minimize expenditures stemming from duplication of water-level measurement (MOWR, 1996). A further and more critical source inefficiency, is the focus of the CGWB on macro-level data and analysis, while state groundwater organizations (SGWOs) focus on micro levels. Effective analysis of hydrologic system dynamics cannot be differentiated into macro and micro components but rather depends on the scale of the system being studied. The consequence of the macro-micro distinction is the perpetuation of development-focused assessments of water balance to the neglect of management capacity development in center and state agencies in activities—such as in scientific research versus implementation—where they have different comparative advantages.

ix. Aside from these issues, existing organizations lack capacity in key management areas. Management is not primarily a technical challenge but depends heavily on social, economic, legal and other considerations. At present, most groundwater organizations are dominated by engineers. Even in the technical arena, most of capacity in the CGWB and SGWOs is concentrated on exploration and basic resource monitoring, not on the types of system analysis essential for management. An additional constraint is the lack of integrated approaches or effective communication between the various water and environmental organizations. Without effective institutional mechanisms to implement an integrated approach, sustainable management will be unattainable.

x. Attempts to regulate groundwater through restrictions on credit and electricity connections—the primary governmental management effort implemented to date—have had only limited success. While there is some evidence from NABARD that withdrawal of credit support for new wells reduces the number of new wells constructed, this will not be sufficient to address existing overdraft concerns. There will need to be initiatives by NGOs and local populations to address groundwater problems and these have begun to emerge in some areas. These indicate local concern and willingness to act in areas where groundwater problems are perceived as urgent. Frameworks need to enable local management initiatives and provide adequate technical support while also enabling government management where locally based approaches are not viable. Frameworks also need to establish a *process* by which management can be initiated and gradually evolve with regard to the issues addressed and tools used. This is essential because as

yet, limited institutional capacity exists for addressing the broader array of groundwater management needs emerging in different parts of the country.

xi. Effective management will also require strong data collection and analytical input. Descriptions of groundwater availability and the functioning of hydrologic systems underpin major investment programs and management decisions. As such, data and analysis are a fundamental tool in political and philosophical debates. With this in mind, there is a need to fill the critical gaps in data availability and assessment, in particular with regard to groundwater pollution, and on hydrologic systems in the hard-rock regions that underlie two-thirds of India (MOWR, 1996). Throughout India, governmental organizations at central and state levels systematically collect large quantities of valuable groundwater data. The monitoring activities focus primarily on groundwater development aspects, and there is a large degree of overlap between different agencies. To facilitate the ability of the organizations involved to build the common social consensus essential for effective management, data collection and analytical systems should be transparent and accepted as reliable by all actors.

xii. While the current data collection and assessment system has served a useful purpose by encouraging the collection of a standard data set, it has had limited practical use. Extraction and recharge estimates developed using MOWR's Groundwater Estimation Committee (GEC) methodology provides little information on groundwater dynamics and interaction with surface water systems. It encourages data processing rather than scientific evaluation. Because it also omits dimensions of water quality and pollution, or the array of environmental and socioeconomic impacts that groundwater development can have long before overdraft conditions occur, it provides limited advance warning of emerging problems. Focusing analysis on hydrologic units such as watersheds and aquifers, rather than on administrative units, would improve the estimates. This is recognized by the CGWB and is likely to be incorporated in ongoing revisions to the GEC methodology. The better approach, however, would be to adopt direct indicators of groundwater conditions, such as long-term trends in the level and quality of water and pollutant concentrations in groundwater which could signal emerging problems—of quality as well as quantity—more reliably and transparently than estimates based on the water balance approach.

Legal and Regulatory Framework

xiii. Systematic approaches to management require a solid legal framework if they are to be implemented. Groundwater legislation will ultimately be essential for management. There is, however, little unanimity regarding the form such legislation should take in order to be effective. As a result, a careful review of legislative issues is essential. Given the wide disparities in opinion in India regarding the appropriate legal frameworks,³⁰ the review should involve a wide range of participants from both within and outside government, such as non-governmental organizations (NGOs), academics and representatives from different states. Substantial international experience regarding establishing effective legal frameworks for groundwater management should be reviewed and could serve as useful examples, although adaptation and

³⁰ For instance, legal approaches proposed by Chhatrpathi Singh (Centre for Environmental Law), Vishal Narayan (Tata Energy Research Institute), and Maria Saleth (Centre for Economic Growth) are quite different from those proposed by the government and outlined in the model bill prepared by the CGWB.

possibly extensive modification to reflect the Indian context would be required. Experimentation with alternative management approaches using existing legal avenues and administrative powers may also be important in order to frame appropriate legislation.

xiv. The CGWB has prepared a model legislation for groundwater regulation. Several versions of the proposed legislation have been circulated to state governments, and the latest version is currently under revision. The current version focuses on regulation and addresses management as well as overdraft regulation. Earlier versions advocated establishing a centrally controlled, technically dominated Groundwater Authority in each state. These versions contained no provisions for ensuring the effective participation of local populations in management or regulation. Regulatory or management approaches based primarily on powers vested in state or central government entities face strong opposition at local levels, in academic circles, and in many field and research NGOs.³¹ It is, furthermore, far from clear how implementation could occur.

xv. The recent interim order issued by the Supreme Court establishing the CGWB as a central Groundwater Authority provides an important opportunity for developing and passing effective legislation and corresponding regulatory and management mechanisms at the central and state levels. However, the development of effective management systems will take time. There are no simple solutions. Development will require an energetic and adaptive process that enables piloting and the evolution of management capacity at all levels from the central government to the individual user.

Water Markets

xvi. With increasing scarcity and demands on water resources in India, and the emergence of quality and pollution problems, use of market mechanisms to reallocate water between adjacent farmers or between farmers and urban areas (for domestic or industrial purposes), is evolving and in some areas is becoming prevalent. For the time being, such market activity in India is largely based on groundwater resources. The market is currently informal in that sales occur outside a formal water rights and institutional framework, and thus the ability to regulate not only the sales but also the extent of groundwater extractions is limited if not impossible. Large regulated water markets essential for re-allocating increasingly scarce groundwater and surface water supplies to high-priority uses, have yet to develop.

xvii. To enable the orderly development of markets, the implementation of a regulatory framework will be crucial. Unregulated development of large-scale formal markets for water would have major negative consequences. In the absence of a functioning water rights system and institutional framework for management, water sales would occur with little consideration for third-party and environmental impacts or resource sustainability. Experiences in other countries indicate that these impacts could be significant. Expanding the role of markets into a formal mechanism for water allocation necessitates a reform of the water rights framework, and

³¹ Academic and NGO representatives attending the workshop sponsored by the Government of India and the World Bank on Ground Water Regulation and Management (February 17–18, 1997, New Delhi) strongly criticized the proposed legal frameworks emphasizing governmental regulation as opposed to more participatory strategies.

the development of effective management institutions. Practical approaches to both these aspects represent the major challenge facing the development of markets.

Economic Incentive Mechanisms

xviii. The pace of groundwater withdrawals and use is intimately tied to energy prices. Currently, power is supplied to rural areas at subsidized prices, quoted on a per-horsepower basis of groundwater pumps (i.e., flat rate pricing structure) rather than based on actual quantities consumed. The use of flat rates for electricity, combined with less than fully reliable power supplies, encourage individuals who own wells to maximize pumping of groundwater and sales to neighboring farmers in informal water markets. Where diesel pumps heavily dominate the market, pumping costs and thus water prices in the informal markets are much higher, tending to induce more efficient and sustainable withdrawals and use of groundwater. Energy pricing and other indirect avenues for influencing conditions in informal water markets may represent the most viable avenue for policy action in the absence of, or in addition to, direct pricing of groundwater.

xix. Although energy prices may be one of the strongest levers for influencing the functioning of informal water markets, the question of energy pricing should not be evaluated from a water market perspective alone. An associated problem of subsidized rural power prices are the major financial losses incurred by state electricity boards (SEBs) which range from 5 to 7 percent of total state receipts. A large portion of these losses have been attributed to the agricultural sector, where flat rates are prevalent and collection of electricity charges are low. There is evidence to indicate that agricultural power consumption is far lower than reported by SEBs in all states studied and possibly the country as a whole. Provision of unmetered power to the agricultural sector creates an accountability gap and generates incentives and opportunities for large unaccounted losses to be attributed to agricultural use. Unless the accountability gap is closed, there will be no basis for addressing concerns over SEB finances which will remain precarious.

xx. Cost reflective prices to agriculture based on an efficient cost structure will of course have to be associated with improved quality and reliability of supply. It is unreasonable to expect consumers to pay higher rates for power unless the quality of service improves. Affordability would not be an issue under a regime of cost efficient service delivery. Farmers and other consumers time and again have demonstrated their willingness to pay for quality reliable services.

B. THE REFORM AGENDA

xxi. Resources management requires an integrated approach. Groundwater cannot be managed in isolation of critical considerations such as: integration with surface water; incorporation of water quality, pollution, environment, and health issues; and a broad array of resource allocation, economic and social concerns. Much more attention will also need to be given to end-use efficiency and supply allocation between competing uses. These new challenges require integrated understanding of resource dynamics and more refined approaches to data collection and analysis. They also require new institutions capable of ensuring the direct involvement of users in the management process. With millions of wells scattered throughout

rural India and entrenched traditions of private ownership, user involvement is essential for effective management. Finally, development of effective management systems will take time. There are no simple solutions, and development will require a process that enables piloting and the evolution of management capacity at all levels, from the central government to the individual user. Table I below summarizes the key reform actions. A detailed Matrix of Recommendations is presented in Table 6.1, listing agencies responsible and time frame for action.

Table I. Recommended Plan of Action - Summary

Recommendations

A. REORIENT THE APPROACH TO GROUNDWATER MANAGEMENT

Objective: To achieve a shift in policy and operations from development to management of groundwater resources, including integration of environmental issues.

A.1. *Shift the emphasis from development to management.* The primary challenge facing the organizations dealing with groundwater in India is management, not development. The activities of government organizations and policies affecting groundwater need to reflect this. *Because groundwater management experience is a new area in India and solutions are not clear-cut, pilot management projects will initially be essential to guide the finalization of feasible management options and arrangements.*

A.2. *Integrate Environmental Considerations.* Groundwater development has proceeded with little consideration for environmental implications. These now need to be incorporated through integrated approaches to water management. As a first step toward this, environmental cells should be created in central and state groundwater organizations.

B. CREATE LEGAL AND REGULATORY MECHANISMS.

Objective: Develop legal and regulatory framework that has broadbased community support and is implementable. Utilize pilot management projects to build community support for regulation.

B.1. *Create Legal Frameworks, Institutions and Processes to Enable Management.* In the present context where little unanimity exists on the form that legislation or regulation should take, a broad-based public consultation and review of legislative issues should be undertaken, and pilot projects should be initiated using existing administrative powers to test both the centralized regulatory approach proposed in existing model legislation and the alternative participatory institution-based approaches outlined in this report. These activities will provide a basis for formulating appropriate and implementable groundwater legislation.

B.2. *Evaluate existing and potential roles for water markets.* Informal markets for irrigation and domestic water are widespread. Formal water markets, *if established within an effective rights, institutional and regulatory framework*, could play a major role in addressing water allocation challenges. The impact of policies (particularly regarding energy pricing) on the functioning of water markets needs to be evaluated as part of policy formation. Investigation of rights, institutional and regulatory frameworks is critical for effective implementation of water markets and should be a component in management pilot projects.

Table I (cont.). Recommended Plan of Action - Summary

Recommendations

C. REFORM INSTITUTIONAL STRUCTURES AND OPERATIONS

Objective: Strengthening of Institutional structures and procedures that support the emphasis on management, and the development and strengthening of supporting data and other systems.

C.1. Reorient government organizations. The activities of government organizations involved in groundwater should emphasize participatory management support rather than development. Given the large number of private wells, *community participation is essential, and governmental organizations need to develop capacities supporting this.* Social science, outreach, and education capacities of groundwater organizations should be strengthened. In addition, management requires effective coordination and communication between agencies.

C.2. Create Data and Analytical Tools Essential for Management. High-quality data and scientific analytical techniques are required to meet management challenges. Greater reliance should be placed on direct indicators of groundwater conditions (i.e. water level, point and non-point pollution, and quality trends) combined with detailed hydrogeologic analysis of the aquifers. A two-stage approach to analysis should be adopted in which trends in the water level and quality, water balance estimates using the revised GEC method, and the designation of sensitive zones, are used to target the scientific analysis essential for policy decisions.

D. INTRODUCE TECHNIQUES AND INCENTIVES FOR SUSTAINABLE GROUNDWATER MANAGEMENT

Objective: Providing and strengthening incentives that will induce sustainable extraction and use of groundwater resources.

D.1. Identify Techniques and Programs for Sustainable Groundwater Management. Incorporation of the full range of approaches to groundwater management as core functions of groundwater management organizations is a must. Approaches include: conjunctive management, end-use conservation, land-use planning, agricultural and other pollution-avoidance techniques, and groundwater recharge techniques (both modern and traditional).

D.2. Improving Agricultural Power Supplies and Pricing Structure. An overall program of energy sector reform involving institutional changes, improvements in the quality of supply and price adjustments, is essential to address rural power supply and SEB financial problems. Users should pay the full cost of the energy they consume, but price increases cannot be justified in absence of better quality services. Restructuring of the SEBs per se will not be enough. Commercialization and corporatization of the SEBs will be necessary.³²

D.3. Channel Investment to Emerging Needs. Investment programs should reflect the shift in emphasis from development to management. Government support for development is no longer necessary except where: (a) groundwater development levels are low; (b) substantial scientifically-documented groundwater potential exists; (c) additional irrigation is required to raise agricultural productivity; and (d) farmers are unfamiliar with groundwater irrigation or unable to afford new wells. Any government funding, even in the excepted cases above, should be through credit and institutional support to private or cooperative development rather than public wells, and should focus on improvements in energy supply, water conservation, and development of a management information base.

³² Detailed recommendations for power sector reforms are presented in: India Orissa Power Sector Restructuring Project Staff Appraisal Report (PSRP; Report No. 14298-IN), and Haryana PSRP (Report No. 17234-IN).

C. PHASING OF REFORMS

xxii. The ultimate shape of these reforms will evolve out of a long-term process. This shape will reflect experiences gained, needs identified and results achieved in initial phases. Over the short term, therefore, highest priority should go to initiating those activities essential for starting and guiding the overall process of reform. In this context, five sets of activities should be initiated as soon as possible:

- *Establishment of a broad-based public consultation, including NGO and academic representatives, to review legislative issues and guide the design and implementation of pilot groundwater management projects.* Participatory approaches can and need to be developed (in the context of the newly formed Central and State Groundwater Authorities) that draw on the extensive experience of NGOs and other groups working with rural communities. It is only through inclusion of users that many of the problems that have blocked effective management in the past may be overcome. Commencement of the consultation process is, therefore, an important first step.
- *Initiation of pilot projects to test and evaluate management approaches.* Practical experience with many potential groundwater management approaches is lacking in the Indian context. Evaluation of the potential roles for local user-based institutions, water markets, and governmental regulation is essential in order to define long-term management strategies and the reform and legislative foundations they may require. Pilot projects that can be undertaken using existing administrative authority, and used to evaluate and clarify the roles of the various parties, should be initiated in the first phase. Supporting research and evaluation of experiences in other countries, are also important first-phase activities.
- *Initiation of proposed reform of the power sector.* SEB finances and other weaknesses of the electricity sector pose high risk to continued delivery of power services. Incremental improvements to the SEBs will not resolve the problems. SEBs should be commercialized and corporatized (if only initially as public companies). Commencing the process to transform SEBs into business entities will enable the identification and quantification of sources of financial loss.
- *Establishment of an environmental cell in the CGWB and state groundwater boards.* This does not need to be initiated on a large scale during the initial phases of reform. It is, however, important to begin building environmental capacity within groundwater organizations, both to guide the proposed pilot management projects and to assist as data collection systems are expanded to monitor pollution.
- *Design of data collection systems for monitoring groundwater pollution with the intention of initiating pollution monitoring as soon as possible.* Evaluation of pollution problems and management needs requires data. In addition, the ongoing Hydrology Project will provide a vehicle for the development of monitoring systems.

xxiii. Most other activities identified in this report as important for the transition from development to management could be implemented either in the course of ongoing activities or during later phases as results become available. The primary exception is the promulgation of national groundwater legislation. The form legislation should take depends heavily on the results of research and pilot activities. Promulgation should, therefore, occur once results from the first phase are available.

INDIA WATER RESOURCES MANAGEMENT SECTOR REVIEW

IRRIGATION SECTOR REPORT

EXECUTIVE SUMMARY

Background and Issues

i. India's irrigated agriculture sector has been fundamental to India's economic development and poverty alleviation. Some 28% of India's GDP and 67% of employment is based on agriculture, and, in turn, irrigation is the base for about two-thirds, possibly more, of total agricultural output. The rapid expansion of irrigation and drainage infrastructure has been one of India's major achievements. From 1951 to 1995, gross irrigated area (includes double cropping) expanded four-fold, from 23 million ha to 88 million ha. Coupled with introduction of associated high yielding varieties and fertilizer, the higher productivity and reliability of irrigated lands enabled the "Green Revolution" commencing in the 1960s. As a result, India has moved from the specter and actuality of food imports and periodic famines to self sufficiency, food exports and progressively more diversified production.

ii. The major expansion of irrigated area has occurred on all fronts. Major and medium surface schemes have increased three-fold from 1951 to 1995, while groundwater irrigation, largely through private investment, has expanded seven-fold. Today, groundwater irrigation comprises 39% of irrigated area, canal irrigation 47%, and other irrigation (mainly tanks) 14%. The resource commitment to irrigation and drainage has been huge; since Independence, over Rs 600 billion or US\$80 billion in constant 1980 prices have been invested by government. Together with China, India's irrigated area now far exceeds that of other countries.

iii. The major emphasis on development has, however, been achieved at a cost. The emphasis on new construction has diverted attention from the need to ensure the quality, productivity and sustainability of the services. Further, a governmental and subsidy based approach has been used. This has resulted in irrigation and drainage services which, while enabling significantly higher productivity than from unirrigated lands, are well below their potential.

iv. The typology of irrigation and drainage management issues facing India is common to many developing countries. Most of these relate to the public sector managed surface irrigation systems. They comprise physical, institutional and financial/economic constraints. These must be seen and tackled primarily at the levels of the states as, in India's federal structure, irrigation management is handled separately by each state. While state situations vary, there is substantial commonality in the constraints encountered. The differences are primarily in the degree of impact, rather than in the issues themselves.

v. Common physical constraints include, in particular, poor maintenance, resulting in progressive deterioration of the surface irrigation systems, and poor water management due to ineffective control structures for surface irrigation and inappropriate incentives for groundwater

use. The institutional constraints start most importantly with the persistence of purely public sector management without accountability to the client, i.e., the farmers. Further, there is no direct link between the irrigation service provided, revenues generated, expenditures, and staff incentives. The state Irrigation Departments (IDs) are traditional government departments which in most cases have changed little over time. Administration is centralized, lacks the accountability, corporate management skills and client focus of the private sector, and tends to be remote, top-down and with minimal contact with farmers. Staff structures are dominated by civil engineering skills, with limited presence of other disciplines: and coordination with other government departments, especially agriculture, usually needs strengthening. The main financial constraints are, firstly, very low water charges, requiring continual subsidization by state governments of operations and maintenance (O&M), and the entirety of construction, and, secondly, partly as a consequence of the weak revenue generation, persistently inadequate allocations for O&M, most of which go to staff salaries leaving negligible amounts for actual maintenance works. Finally, incentives for efficient water use are largely absent. Surface water charges are, in addition to being low, based on area rather than charged volumetrically, and electricity for groundwater pumping is also heavily subsidized and on a fixed rate basis.

Directions for Future Growth

vi. India's primary reliance on irrigated agriculture as the main engine of agricultural growth is likely, based on the current still low growth of rainfed agriculture, to continue. India's historic agricultural growth rate of about 3% has come primarily from the irrigated sector. Under the Ninth Plan, the targeted objective is to raise agricultural growth to 4.5% per annum. Such a challenge would require a 112% increase in agricultural output by 2015. Even continuing with 3% growth would mean a 65% increase by 2015. If most of the growth must come from irrigation, the production growth from irrigated agriculture would need to be even higher than these figures.

vii. There are two main, and not mutually exclusive, options for achieving continued or higher growth from the irrigated agriculture sector: expansion of irrigated area, as done in the past; and, enhancing the productivity of existing irrigated agriculture. The first option, area expansion, is encountering increasing constraints. Already, India has developed over 75% of its surface irrigation potential, and the districts with full or over-exploitation of groundwater are also mounting. In a number of states and river basins, surface and groundwater resource constraints are already serious. Further, environmental constraints are becoming more acute, and demands for water from other sectors are increasing rapidly. Another issue is the fiscal constraint. Irrigation's share in Plan budgets has fallen from 22% in the First Plan to 7% in the Eighth Plan. Since 1986, irrigation expenditures have been stagnant in real terms, while the average costs of investment in new irrigation have increased due to the progressively more difficult engineering solutions that must be found as the easier development options are used up. Targeted prioritization of government funds, as well as generating revenues from within the sector and attracting private sector financing are increasingly needed.

viii. The second growth option is to exploit the hidden irrigation and agricultural potential within the existing irrigation development, through productivity enhancement. This has much

larger potential than area expansion. The “yield gap” between Indian demonstration farms and actual Indian yields, and between Indian yields and yields in other countries shows significant room for improvement. Similarly, while only a few comprehensive programs have been mounted in India focussed on productivity enhancement, and most of these only recently, the results beginning to come through are encouraging. Results from other countries that have embarked on irrigation improvement programs also illustrate the potential, and, together with India’s own experience, illuminate the paths to follow.

ix. Several conclusions may thus be drawn. The first is that a paradigm shift in emphasis is required. From the past almost exclusive reliance on area expansion through new investment, emphasis must shift strongly towards improving the performance of existing irrigated agriculture. This change applies to all states. While in those states and basins where development potential still exists area expansion can also continue, even in these situations, the likely larger impact will come from performance improvement. Enhancing the productivity and sustainability of irrigated agriculture should move to the front of the state agenda. Second, radical change will be required. Marginal changes in irrigation practices will not achieve the performance impact required. To achieve, for instance, 4% growth in irrigated agriculture, productivity per unit area of irrigation will need to double by 2015. The Green Revolution was based on a radical transformation of the production function; from rainfed conditions to irrigated conditions linked with use of improved seed and fertilizer. A “Second Revolution in Irrigated Agriculture” is required now, but the technology change of the first revolution is largely exhausted. The new revolution must instead tackle the indigenous constraints in the irrigated agriculture sector. Primarily, these relate to how the sector is managed, from which higher productivity and sustainability can be achieved. And they substantially depend upon institutional transformation and establishment of an incentives framework enabling change. Third, a comprehensive and interlinked approach is required, tackling the institutional, financial and technical constraints together to achieve the full potential of irrigated agriculture.

The Framework for Reform

x. The physical, institutional and financial problems which affect the Indian irrigation sector are operationally inter-related. Problems in one area affect others and, in turn, are affected by others. From the policy reform perspective, they can be articulated as a “vicious circle”, where the different facets of the irrigation problem interact with each other and mutually reinforce themselves, keeping the irrigation sector at a low level of performance.

xi. The frequently found *poor quality of the irrigation service* can serve as a starting point. Combined with *inadequate agricultural technology*, it leads to low yields and then low incomes, which in turn lead to *farmer dissatisfaction* with the irrigation system. Under this condition, water rate revisions are resisted, leading to low cost recovery and *political pressure not to pay* for the service. *Low cost recovery*, in turn, is linked to *underfunding of the operation and maintenance* of the conveyance systems which adds to the *poor quality and state* of most systems, and compounded by the inappropriate structure, policies and staff skills of many *state IDs*, closes the circle by perpetuating the *poor quality service*.

xii. This circle needs to be changed to a “virtuous circle”, where mutually reinforcing influences build on each other to create conditions for the sectors productivity growth and sustainability. The key need is to change the incentives structure, both at the level of the service provider (the present government monopoly) and the client (farmers). At present, neither has incentives for change. For government, the lack of accountability to the client means that all incentives are internal to the government department. There are no external incentives to be cost efficient, to be financially self-sufficient, to improve the quality of services, or to link up with other government services, the private sector and civil society. For the farmer, there are also no incentives to improve the service as they are detached from decision making and feel they have little influence. Their only leverage is through political pressures resisting to pay for surface water irrigation and electricity charges for ground water pumping.

xiii. This incentives gap for both service provider and user must be tackled. A first need is to bring the farmers into the management of irrigation systems and to create client driven pressures on the service provider to improve performance. A second and parallel need is to change the role, structure and financing of the Irrigation Department; to become fully accountable to the client, and funded by the client, so that the farmer is in the driver’s seat. The third need is to upgrade the irrigation service and agricultural extension, so that benefits from institutional and financial change can be realized. This needs to be done in a partnership with water users associations, and in a demand-led process involving cost sharing in investment, with as much work as possible implemented by the WUAs.

The Reform Agenda

xiv. Three broad action areas need to be tackled: (i) institutional reforms to involve farmers and restructure IDs to client-driven commercially operated and autonomous entities; (ii) restoring the sector’s financial viability and cost effectiveness including measures to enable private sector financing; and (iii) improving technical performance through upgrading irrigation systems and agricultural extension.

Institutional reforms

xv. **Irrigation Management Transfer:** This would be at the heart of the reform agenda. As found in countries such as Mexico and Chile, and beginning to emerge in India (Andhra Pradesh and Orissa), farmer organizations can better manage and maintain surface systems than government and have the direct incentive to do so. Similarly, groundwater irrigation should remain privately managed for small wells, and management of large public tubewells should be transferred to community management as successfully done in West Bengal. The main needed change is in the entirely public sector surface irrigation schemes. Typical past approaches used in India for water user associations, involving small, disparate support to individual WUAs, need supplanting by the kind of systematic and comprehensive approaches successfully applied in countries such as Mexico, and being piloted or underway in Orissa, Andhra Pradesh, Tamil Nadu and Rajasthan. Key features required include: a grass-roots and democratic base; a demand and client-led approach including participation in planning right from the outset and cost sharing for

investments; early achievement of financial self-sufficiency; a clear legal framework, usually requiring new legislation; a whole-command approach, through establishing farmer organizations and an apex body for the entire system rather than isolated parts of it; strong technical support and provision of access to funds for self-improvement; features in the election process and administration to ensure equal participation of women, tail-enders, and smaller farmers; and concurrent establishment of water rights. The proposed new approach, borrows both from the more recent initiatives and lessons learned in India and from international examples adapted for India's circumstances. The likely most suitable structure in India based on experience to date is a pyramidal organisation with base level WUAs at tertiary (minor) level, federated to distributory, then system level entities. As applied in Mexico, Turkey and India's Andhra Pradesh, a major drive is recommended. This requires detailed working out by each state of the approach to be used, and subsequent major effort in public awareness, training and support to the new institutions.

xvi. **Restructuring the State Irrigation Institutions:** The core need is to establish a commercially operated service agency specifically for O&M, funded by farmers and answerable to them. This will generally require unbundling the existing ID into such a "Water Service Agency" (WSA), or a number of WSAs in larger states. Another need, with growing importance as private sector investment opens up, is to establish an independent regulatory entity for regulation of prices and costs, as present in Orissa's power sector or the UK water sector. An initial start could be establishing a formal state water pricing committee, but this should be given wider and more autonomous powers over time. The ID would become a smaller entity with functions reduced to such areas as policy formulation, design, investment funding, and legislation. Associated with such restructuring, multisectoral capabilities for water planning, allocation and management should also be established. A second need is to mount a sustained drive to upgrade the institutional capabilities of the ID, WSA(s) and other institutions. The main needs are decentralizing management to basin levels, reorganizing to create internal specialization, including in corporate management skills, staff training, broadening skill mixes by bringing in other specializations, and improving staff incentives. Thirdly, a partnership culture needs to develop, most importantly a tripartite partnership between WUAs, ID and AD (starting, for instance, with joint walkthroughs at planning stages, regular coordination meetings, joint offices in the field) but also between government and civil society as a whole. Finally, private sector involvement can be significantly increased, as already underway in India's urban water supply and power sectors. Options include contracting out of discreet activities, management contracts for irrigation schemes with local agribusinesses, and contracts with private firms to assist with or manage WSAs or part of ID activities.

Achieving Financial Viability and Sustainability

xvii. The sector's financial crisis needs to be broken: (i) seriously deficient funds going to O&M and still lower funds generated within the sector for O&M, thus creating perpetual reliance on government subsidies which for decades have proven inadequate; (ii) inefficient use of government money due to lack of appropriate expenditure prioritization; and, (iii) a sector so unviable that the obvious remedy when government funds are short, accessing private investment, is effectively precluded

xviii. **Achieving Financial Self-Sufficiency:** The unavoidable need is to raise water charges to the level required to at least cover the full needs of O&M. This will generally require a several-fold increase in water charges, and would best be done in one step, or along a pre-announced time-bound path over three to four years. The bolder single-step or very short-term approach is generally preferable and has been initiated in Andhra Pradesh, with its three-fold increase in 1997, and more recently in Orissa (150% increase in 1998). Coverage of O&M needs is the core requirement as it enables financial self-sufficiency for operations of the ID/WSA and WUAs. Beyond this, consideration should be given to building financial capacity of WUAs and WSA through additional contributions to a 'renewals fund.' Linked to this, transition is needed from collection by the revenues department to collection by WUAs and the ID/WSA. As in Mexico and planned in Andhra Pradesh, the farmer organizations would retain their share to cover their O&M expenses, passing on agreed portions to the ID/WSA to cover the service agency's O&M costs. Transition to volumetric pricing is also needed for both electricity for pump-sets and for surface water. For the latter, charging could be for bulk sales by the ID/WSA at the whole WUA level. Other needed measures include: improving collection rates, exploiting additional revenue sources through appropriate charging for ID/WSA bulk water services to municipalities and industries, cost monitoring and cost-efficiency measures, computerized billing including transparent information on service costs and cost structures, and piloting of water markets.

xix. **Expenditure Prioritization:** The past dominance of construction in government expenditure has, perversely, been an influencing factor on the slowdown of surface irrigation expansion in recent years. With funding of maintenance generally neglected, effectively irrigated area may have declined in some states. Further, the frequently found spread of expenditures across a large number of construction sites slowed completion on any one site. The relatively small but still crucial needs for institution building have also tended to be neglected. A reversal of priorities is required. First and foremost, until ID/WSAs and WUAs become fully self-sufficient, maintenance needs must be secure. Similarly, the smaller but also essential requirements for institutional capacity building (training, equipment, consultancy), particularly for the new government and WUA institutions, need full funding. The next priority should be the needs for rehabilitation and modernization of existing schemes, essential for improving performance and effective irrigated area. Remaining funds then need to be prioritized at any one time to a limited number of construction sites, with emphasis on short-term completion. "Drivers" to help achieve these priorities can be introduced by the states: cost sharing and requirements for community participation in investment would provide a built-in self-selection and demand-led process; annual expenditure reviews need to be introduced; and investment analysis tightened, both through introduction of discounted cost-benefit analysis for all investments, and enhanced technical evaluations. The limited existing government funds would thus be much more effectively used.

xx. **Accessing Credit, Private Sector and Capital Markets:** Irrigation's share in Plan funding has eroded over time, to 8-6% between 1990 to 1995. Given the increasing demands from other sectors, limited public funds for irrigation are likely to be a continuing reality in the future. Alternative funding needs to be explored, but needs, as a precursor, financially viable irrigation sector entities, including a return on capital. Several bond issues have been made in

recent years (Maharashtra, Karnataka, Andhra Pradesh, Gujarat), but closer analysis raises questions about the intrinsic viability of such bonds. Thus, Maharashtra has successfully issued bonds with government backed guarantees for its new Krishna Valley Development Corporation. However, until the corporation achieves commercial viability, the issues, while secure for the investor under the government guarantee, are, for government, essentially an alternative way of building government debt, and at high interest rates. The potential for both private sector direct investment in irrigation and for access to capital markets based on viable corporatized WSA and WUA institutions is, nevertheless, present. Private sector investment has been used in other countries and is commencing in other sectors in India. As recently done for the urban infrastructure sectors, these opportunities and how to access them should be developed. Credit and microfinance provide another opportunity, with particular relevance to private investment by farmers or WUAs: for groundwater irrigation and on-farm water management improvements (eg. drip irrigation, land levelling).

Technical Actions to Improve Performance

xxi. Paralleling the institutional and financial reforms, a concerted effort needs to be applied to upgrade the irrigation systems and improve access to more productive agricultural technologies.

xxii. **System Improvements:** Operations and maintenance both need to be significantly upgraded, and based on individual scheme diagnostics and a Plan of Operations and Maintenance, prepared jointly between WUAs, ID/WSA and AD. Maintenance activities need increased professionalization, based on detailed annual maintenance plans and performance monitoring. In most states, a major rehabilitation program will be required to restore infrastructure to operational status. Further modernization for still higher productivity is also possible. All of these actions are now being piloted by several states, and this experience can be supplemented by review of programs in other countries. Essential elements in these actions would be to ensure demand-led improvements and WUA "ownership" through their central involvement in planning, appropriate cost sharing in investment, and maximum implementation of works by the WUAs themselves. For the ID/WSA, attention also needs to be paid to improved design, construction quality and environmental assessment and mitigation.

xxiii. **Agricultural Technology:** For both groundwater and surface irrigation, on-farm water management and improved agricultural practices also offer scope for significantly improving water productivity and agricultural yields, and diversifying to more remunerative crops. The prime need is to provide upgraded agricultural, water agronomy and technology advice to farmers and WUAs. The great majority of farmers have limited access to advice, training and demonstrations in these areas due to the difficulties encountered by AD staff in both accessing farmers and state-of-the-art technology. The development of WUAs will provide a new forum for access by ADs, and a means for farmers to express their specific needs. Targeted incremental funding of ADs, linkage with universities and research agencies, and close partnership between AD, ID/WSA and WUAs could enable significant improvement and would complete the key features required for the "virtuous circle."

Implementation and Getting Started

xxiv. The above agenda, detailed in Chapter 3 and the matrix with the Action Plan for the Reform Agenda in Chapter 4, will need to be individually tailored to each state's circumstances and needs. The diversity in India precludes an absolute blue-print of the approach and the sequence of reforms. It is thus recommended that each state establish a core team to assess the state situation and prepare an Irrigation Sector Policy. This would diagnose the current situation, articulate the long-term vision and detail the short and medium-term steps to get there. The team should include careful assessment of the state situation supplemented by visits to other states and selected international examples. Although a step-wise approach will often be necessary, the best examples of reform -- including Mexico, Turkey, and recently commencing in Andhra Pradesh -- indicate that a bold and comprehensive agenda would likely be more successful than a gradualist approach. Also emerging from experience is that the reform process is itself adaptive, requires monitoring, evaluation and adjustment as it proceeds, and provides further opportunities as it develops. For the center, a valuable catalysing role can be played through awareness creation, technical assistance, and the sponsoring of workshops. Similarly, encouragement can be given during the review process of state programs, and central Plan financing can be oriented to assisting with financing of state reform programs. Civil society and the private sector (universities, NGOs, private businesses) should also be encouraged to contribute, and will be an increasingly important source of ideas, technology, institutional support and investment as the reform program proceeds.

INDIA WATER RESOURCES MANAGEMENT SECTOR REVIEW **URBAN WATER SUPPLY AND SANITATION REPORT**

EXECUTIVE SUMMARY

i. The Government of India's economic policies are aimed at increasing economic growth, improving market efficiency and competitiveness, and integrating the Indian economy with global markets. The changes required to achieve these objectives will have great implications for urban centers where much of the population and industrial growth is expected to occur. The demands on the Urban Water Supply and Sanitation (UWSS) sector, which serves both urban domestic and industrial needs, will be tremendous. To date, the UWSS has under-performed against expectations. Quantities of water delivered are inadequate and service is unreliable, requiring consumers to make alternate arrangements which are more costly in terms of time and money, particularly for women and the poor. Low quality of service is endemic, resulting in deleterious impacts on consumers, especially the poor, as well as on the environment. The UWSS sector needs urgent attention both to meet the new demands and to ensure that all city-dwellers have access to basic services at reasonable costs.

Current situation

ii. India's UWSS sector faces many problems and is currently bound-up by a vicious circle of circumstances. Notably:

- many UWSS providers are not financially viable and are unable to maintain services without extensive subsidies;
- existing UWSS services fall short of full coverage of the population, and are often of low quality due to insufficient funding of O&M. Sanitation services, in particular, are generally inadequate and access to acceptable UWSS services are extremely limited for those in poor communities; and
- environmental degradation—the resource as it is currently used is increasingly insufficient and over-exploited.

iii. These problems are well understood in India. The traditional response to them has been to centralize control at the state level, concentrate scarce skills and provide technical (i.e. engineering) assistance to the cities. There is general agreement in India that this traditional response has not worked well. This is because most UWSS managers lack the necessary management skills, autonomy and accountability for their performance. That is, the UWSS providers tend to lack clear objectives for management, lack transparency and accountability to consumers, and have been subject to a history of extensive political involvement at the detailed operational level.

iv. In recent years, a fundamental policy change has started to emerge for the sector in India, as in other parts of the world (such as South Africa and Brazil), towards delegation of responsibility and accountability to local levels, balanced against a national/state policy framework. This commencement is a positive change in India with its huge diversity of local priorities and situations. The developing consensus in India for financial reform in the UWSS

sector is even more advanced than that for institutional reform. This decade has seen capital markets develop and expand across most sectors of the Indian economy, and financial reform in the UWSS sector is a logical extension of this trend.

v. Several examples of institutional and financial reforms provide insight into what has been possible in some places (both in India and overseas). These reinforce the emerging consensus—that it is the poor incentives in the current systems and arrangements which underlie the paradox that the problems of India's urban water and sewerage sector are well known, but nevertheless persist.

The way forward—an incentive-based enabling strategy

vi. This report's recommended strategy aims at transforming the current vicious circle into a virtuous circle and focuses on improving the incentives faced by UWSS institutions through appropriate democratic governance, ownership and management structures, and through appropriate financing systems. These improved incentives will permit and encourage operational efficiency and effectiveness which, along with appropriately tariff levels set to reflect full costs, will ensure sound financial viability of the UWSS agencies, enable participation of the private sector, and attract funding for capital investment in the sector.

vii. The key elements of the proposed incentive-based approach are:

- *democratic decentralization* - to give municipalities incentives to make choices in the best interests of citizens;
- *commercialization of UWSS providers*, and private sector participation - commercialized managers have incentives to operate systems efficiently; and
- *market-oriented financial systems* - these will promote financial viability and efficiency in utilization of resources mobilized on market terms.

Institutional reform

viii. A key element of the proposed institutional reform focuses on municipalization through implementation of the 74th Constitutional Amendment. Provision of water and sanitation services should become the responsibility of municipal governments. They may, however, discharge this responsibility through a variety of arrangements including through a municipal department, or a municipal enterprise, a contract with the reformed state utility, or a contract with a private provider. In some cases several municipal authorities may wish to pool their operations by entering into joint contracts for UWSS services.

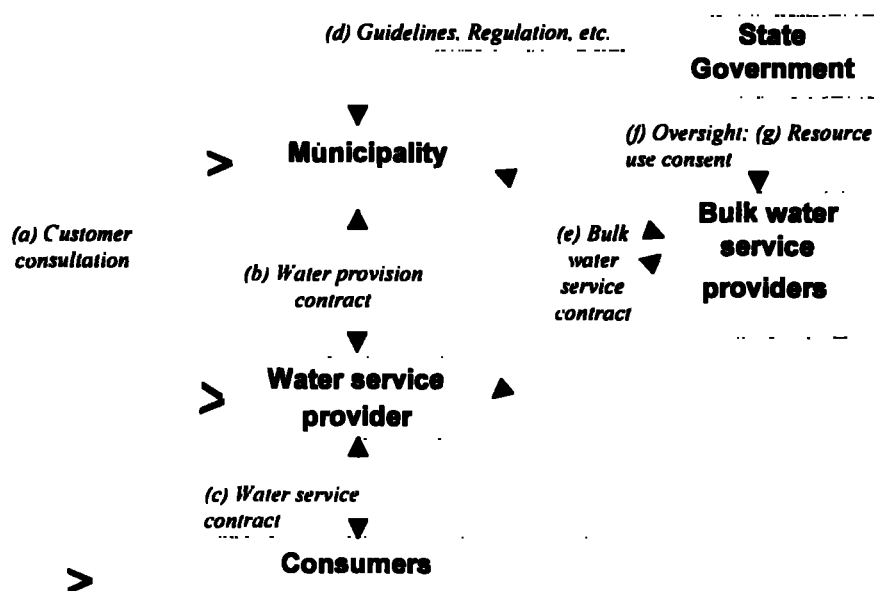
ix. Devolution of responsibilities to municipal authorities will also need to be accompanied by mandating key good municipal and utility practices. Examples of good practices include preparation of integrated long-term development plans, inter-municipal cooperation and customer consultation and responsiveness.

x. The existing state-owned providers need to be radically reformed. The specific elements of reform will vary from state to state, but will include: unbundling by functions such as bulk

supply, operations and technical services; removing monopolies to encourage competition; and corporatization of disaggregated entities leading in some cases to privatization. The new water utilities must have full autonomy (organizational, managerial, financial) irrespective of their ownership (whether government or private) so that they can operate effectively like commercial entities.

xi. These reforms should be supported by (i) enhancing private sector participation, (ii) developing appropriate comparative competition facilities, and (iii) development of civil society-based associations to improve customer responses and feedback mechanisms. Private sector participation will especially help to enhance efficiency and improve service delivery. The envisioned sector structure is sketched out in Figure E.1.

Figure E.1. Possible UWSS sector structure



Notes:

a. Customer consultation: The municipality consults with consumers. Customers' priorities guide planning, and the water service provision contract.

b. Water provision contract: Where the municipality uses an independent provider, it will enter into a water provision contract governing coverage, tariff setting and service standards.

c. Water service contract: Specifies consumers' rights and obligations.

d. Guidelines, Regulation, etc.: state government will support municipalities. For example, the state may issue high-level guidelines for contents of development plans, contracts and/or public consultation.

e. Bulk water contract: Bulk water service providers will provide bulk service under contract to the municipality (or the distribution service provider). The contract will specify price, quantity, reliability, etc.

f. Oversight powers: state government may supervise bulk water service suppliers to prevent exploitation of monopolies.

g. Resource use consent: There will be a resource use consent which will govern the bulk provider's access to the resource (details forthcoming in the India Resource Management Strategy review report (World Bank, 1998)).

Financial reform

xii. Tariff rationalization is an essential pre-requisite to financial viability of UWSS agencies, and to increasing financial flows to the sector. The UWSS agencies must have the autonomy and authority to set tariffs to ensure full cost recovery, with flexibility to provide special consideration to the poor. Any subsidies provided to the poor (whether through cross-subsidization or direct government transfer to the utilities) should be explicit, transparent and well-targeted. Tariff increases should be undertaken periodically, and be indexed to inflation. At the same time, improvements in operating efficiency are essential for effectiveness of the utilities, and are the express objective of the institutional reforms outlined above. UWSS providers should not simply be allowed to pass on their inefficiencies to consumers in the form of higher tariffs.

xiii. If the sector is to access new finance, project preparation and appraisal skills also need to improve. The institutional reforms to boost municipal capacity, commercialize UWSS providers, and involve the private sector, will assist in this regard. Further efforts are likely to be needed from state governments, and financial intermediaries involved in the sector. Social concerns, related to access for the poor, should be addressed through specific measures tailored to meet their needs. This could include a life-line block (or slab) rate, or community-based credit systems to spread payments (for private connections and other capital investments) over time.

xiv. Financial reforms should also include a development of community credit systems, and enable direct borrowing from the capital market for the more advanced entities. Debt-market scrutiny will provide the necessary lever to greater efficiency and transparency of credit programs and borrowing. New forms of financial intermediation should be made available to assist the move towards greater commercialization of UWSS sector borrowing through existing as well as new specialized financial intermediaries. New commercial credit enhancement and insurance facilities should be developed to enable the UWSS entities to create credit histories. The use of limited public resources should be reoriented to achieve better leverage of those resources.

xv. The proposed institutional and financial reforms are mutually supporting. An initial implication of financial reform, for example, will be that access to more commercial financial facilities will provide incentives for UWSS entities to improve their performances so as to receive better credit ratings (which, in turn, will reinforce the institutional reform by creating a demand for performance information - both ex post and ex ante). Furthermore, financial reform will create greater incentives to focus on financially viable investments.

Implementation

xvi. Given the huge range of local requirements and opportunities in India, a "one size fits all" approach to implementing the recommended framework is not appropriate. A three-pronged approach is proposed for the implementation strategy: (i) systemic changes - the changes which are essential to operationalize the incentive-based approach; (ii) innovations through windows of opportunity - these are locally-led, incremental, opportunistic innovations which will occur where conditions are suitable; and (iii) demand-led capacity building - technical assistance and

training to be orientated to local demand. This is intended to promote nation-wide reform while allowing not only flexibility to respond to local needs, but also offering the possibility of a faster track for more progressive states and municipalities.

xvii. *Systemic changes.* The set of systemic changes which are essential to operationalize the incentive-based approach includes five actions. First, devolution of responsibilities to municipal authorities, with key good practices such as accounting separation, long term plans and consumer consultation being mandated by law. Second, reform of the state utility boards by separating the policy and regulatory functions from operations, disaggregation of operations into functional areas and commercialization of disaggregated entities. Third, rationalization of tariff structures and tariff-setting procedures through legislative changes and a system of incentives and sanctions. Fourth, reform of the financing systems to: create a greater market orientation by enabling direct market access for local authorities and enterprises within a regulatory framework; and create new forms of financial intermediation, supported by a reorientation of public resources to provide greater leverage. Fifth, introduction of a comparative competition facility to enable assessment of utility performance. This will be useful both as a management tool and as an accountability mechanism.

xviii. *Innovations through windows of opportunity.* The second aspect of the implementation is the encouragement of locally-led incremental and opportunistic innovations which will occur within the new framework. Progress will, of course, vary between states and municipalities depending on enthusiasm, capacity and need. The types of innovations likely to occur include the following. There will be operational changes due to greater commercialization of the UWSS entities, which will initially result in a drive to achieve financial viability. This will mean greater interest in investing in those projects which will most quickly improve financial viability through improved operational and technical practices, such as reduction of unaccounted for water, and improved collection performance for water charges. There will also be new ways of providing access for disadvantaged groups. Finally, there will be increasing use of private sector participation. Initially these are most likely to be primarily intended to capture private sector know-how and will be through incentive-based management contracts as well as BOT contracts and concessions in selected, high potential areas.

xix. *Demand-led capacity building.* Thirdly, the reform process unfolds, technical assistance and training will be required to develop local capacity to manage, and contract for, their WSS services. This assistance will respond to explicit local demand which, in turn, will be developed by the opportunities the systemic changes will bring and learning about best practices employed elsewhere.

Towards an action plan

xx. Table E.1 outlines the proposed action plan for institutional and financial reform. Given the wide diversity of conditions and readiness across different states in India and even between different cities and regions within a state, it is difficult and inappropriate to generalize the detailed implementation sequencing plan. It is expected that each state will consider its options, develop a state-wide consensus and then prepare its own action plan. This must be done through a consultative process involving all the important stakeholders.

xxi. The strategy requires a reorientation in the role of government from being providers and financiers of services, to being facilitators and enablers. Specifically, the new roles envisaged for the central, state, and municipal governments are as follows.

xxii. *Central government.* The central government's role would be indirect but important. It would facilitate and encourage of state governments to undertake the reforms and evolve appropriate state strategies. Specific aspects of central government's role are: to disseminate examples and expose municipal sector specialists to best practices from India and other countries; to develop and provide standard formats and model legislation; to leverage limited government resources through appropriate mechanisms; and to promote comparative competition.

xxiii. *State government.* The state government's role will be very important in the recommended strategy, one of facilitator and enabler. Systemic changes will be implemented largely through a state UWSS strategy which will involve: legislative amendments for good municipal practices and tariff rationalization; institutional restructuring for state water authorities and financial intermediaries; multi-municipal schemes especially for the smaller municipal authorities which may lack capacity, in parallel with the water resource allocation and management plans in different regions; a plan for the use of public resources to maximize leverage; a plan for a comparative competition facility; and an advocacy and demand-led technical assistance and training plan. In addition, the state governments' will also need to explore and promote innovation in relevant areas as windows of opportunity emerge.

xxiv. *Municipal governments.* The enhanced role of municipal governments would necessitate significant institutional changes at the local level. Specifically, their role will be focused on implementing a number of good municipal practices. These would include professionalization of management, consumer consultation, tariff reforms and long term planning. Over time, they will need to contract out some services or separate specific operations to a commercialized entity.

xxv. *Non-governmental actors and stakeholders.* The nature of the enabling strategy outlined above also suggests an important role for other actors, especially the private sector, various professional associations, civil society associations, NGOs, market oriented development financial institutions (DFIs) and other private FIs, and a market oriented regulatory authority.

xxvi. The key to implementation of the proposed strategy through these identified interventions is action to produce visible results for the customers. The result and improvements in service provisions will help to cut through the "vicious circle" of problems with resultant deterioration of sector assets and be a stepping stone to the creation of the "virtuous circle"- thus helping to establish a sustainable UWSS sector for the future.

Table E.1. Summary Matrix of Recommendations

<p>Core UWSS Reforms</p> <p>Objective: The strategy is to change incentive structures so that organizations and people in the sector will deliver sustained, efficient service improvements to customers. To do this we propose that new rules for the game be set: the new framework allow and encourage local level innovations; and fostering a demand-led response for assistance, which will emerge once players have the motivation to improve performance.</p>
<ul style="list-style-type: none"> • Devolve UWSS responsibilities to municipal authorities. Mandate key good practices such as accounting separation, long term plans and consumer consultation
<ul style="list-style-type: none"> • Reform the state UWSS providers: separate policy and regulatory functions from operations; disaggregate operations into functional areas; and commercialize/privatize entities
<ul style="list-style-type: none"> • Rationalize tariff structures and tariff-setting procedures through legislative changes and a system of incentives and sanctions
<ul style="list-style-type: none"> • Reform financing systems to enable direct financial market access for local authorities and enterprises, and new forms of financial intermediation; supported by leveraging local resources.
<ul style="list-style-type: none"> • Create a comparative competition facility to collect and share performance data of Indian and foreign UWSS agencies/utilities to enable assessment of UWSS agency performance and provide benchmarks for improvement.
<ul style="list-style-type: none"> • Implement local innovations, including: involve the private sector in a variety of ways; develop new approaches to serving and involving disadvantaged groups; reform tariffs; increase efficiency, improve technical and operational practices; and access new sources of finance
<ul style="list-style-type: none"> • Demand led capacity building. Provide technical assistance, in response to municipal and utility requests

Table E.1 (cont.). Summary Matrix of Recommendations

Implementation Plan	
A	<p>Municipal Reform Agenda <i>Objective:</i> Create legal and institutional structures which will encourage good practices at the municipal level. Allow for incremental opportunistic improvements within a framework which aligns organizational and individual incentives with the public interest</p>
A.1	Implement enabling Policies: State water sector reform; model laws and procedures for devolution; and devolve responsibility and financial capability to municipalities..
A.2	Implement democratic decentralization and municipal professionalization: institute integrated municipal development planning; strengthen performance and monitoring functions,
A.3	Commercialize UWSS agencies and enable private sector participation:
A.4	Institute customer responsiveness in UWSS agencies and strengthen the role of civil society
B	<p>Appropriate State Level Institutions and Regulation <i>Objective:</i> Create legal and institutional structures which will encourage good practices at the state level.</p>
B.1	Restructure and decentralize state-level UWSS agencies
B.2	Enable multi-municipal schemes through appropriate institutional structures and procedures
B.3	Achieve better service for disadvantaged groups
B.4	Introduce regulation and a comparative competition facility
C	<p>Financial Reforms <i>Objective:</i> Promote financial viability through tariff reforms and efficiency gains. Promote market-oriented financing systems to enhance incentives for efficiency and financial viability as well as increase the capital available to finance viable entities in the sector.</p>
C.1	Implement tariff reforms
C.2	Develop direct market access for finance
C.3	Develop sustainable credit enhancement and insurance opportunities

INDIA WATER RESOURCES MANAGEMENT SECTOR REVIEW

RURAL WATER SUPPLY AND SANITATION REPORT

EXECUTIVE SUMMARY

BACKGROUND

i. Since the beginning of the Sixth Five-Year Plan (1980–85) and the launch of the International Drinking Water Supply and Sanitation Decade, India has substantially increased its commitment to the water supply and sanitation sector. Sector investments have increased and presently constitute about 3 percent of the national budget. Of the total budget allocated to the sector, approximately 60 percent has been earmarked for rural areas. Although the constitution considers rural water supply and sanitation to be the financial responsibility of state administrations, central government funding constitutes 40 percent of total investment in the sector. Significant achievements in coverage have been realized, with over 75 percent of the rural population (or 520 million people) now provided with public water supply facilities. Achievements in sanitation coverage have been less extensive, due to the lower attention it received compared with water supply. Only 3.6 percent of the rural population is covered at present; however, actions to improve coverage of sanitation have been stepped up recently, through provision of subsidies and technical assistance for household construction of sanitation facilities.

ii. National guidelines and investments in the rural water supply and sanitation (RWSS) sector, which have traditionally focused on extending coverage to rural areas, neglected to ensure that the quality of services to rural areas remained adequate. Public RWSS services today clearly do not adequately serve the needs of user communities. They are typically poorly designed and constructed, oftentimes designed and positioned at sites without consideration to community needs or preferences. Planning of RWSS services also takes place without due attention to resource availability or quality, and is rarely financially viable. The end result is a government dominated and target-driven service that has become unsustainable institutionally, financially and environmentally. There is growing awareness that in order to be effective, sector investments should be designed in accordance with the needs and demands of users. There should also be a transfer of ultimate ownership and responsibilities to users and their communities, in order for the assets and services to be sustainable. It will be essential, moreover, to shift from the target-oriented, supply-driven approach which pays scant attention to the practices and preferences of end-users, to a demand-driven approach which provides users with the services they want and are willing to pay for.

iii. The government now recognizes the need to improve the functioning and sustainability of the sector. Specifically, the government is committed to the following principles, as stated in the Eighth Five-Year Plan (1992–97): (i) water should be managed as a commodity; (ii) the provision of RWSS services should be based on expressed demand; (iii) emphasis should be placed on decentralization, user participation and private sector involvement; (iv) operation and maintenance should be managed at the local level with emphasis on financial sustainability; and

(v) sanitation programs should be integrated with those of water supply. In practice, however, these principles have seldom been reflected in sector operations for lack of effective mechanisms to translate the policy statements into action. A contributing factor that has impeded rather than aided in achieving the stated policy objectives of decentralized planning and implementation, demand-led investment, user involvement and cost recovery, has been the availability of unconditional RWSS sector funding from the central to the state governments. The target-oriented approach continues to guide activities and investments in the sector. Until the policy is linked to decisions regarding the investment program and effective mechanisms are established to guide sectoral operations, the coverage and quality of services will remain inadequate and sector viability, both institutionally and financially, will continue to deteriorate.

SECTOR ISSUES AND ASSESSMENT

Protection of Water Sources

iv. Protecting both the sustainable yield and quality of groundwater is critical to maintaining the sustainability of existing RWSS investments as well as to meeting future requirements with potable and affordable services. In addition to being the primary drinking water source for privately funded schemes, groundwater supplies 85 percent of the rural population served by public schemes. The need to protect groundwater for drinking purposes, however, has conflicted with the government's food security objectives and subsidies to the agricultural sector. These have encouraged the rapid and unregulated development of groundwater for irrigation. The result has been the over-extraction of groundwater and in certain localities, the depletion and contamination of groundwater resources.

v. Seasonal or permanent depletion of groundwater aquifers has serious social, financial, and institutional implications for the supply of drinking water in rural areas, including the need to continually replace dried-up water sources. Such replacement needs, particularly where requiring more complex and expensive technologies (such as a piped scheme from a more distant source or one requiring treatment facilities), have higher capital and recurrent costs, estimated on the order of 1,000 to 1,500 percent, compared with existing systems. The relatively advanced schemes, furthermore, are generally difficult to operate and maintain at the local level given the lack of technical skills, which would threaten the success of the decentralization effort. Monitoring and evaluation of resources, abstraction and quality of groundwater are generally fragmented and driven by the interests and objectives of various agencies.

Institutional Performance and Issues

vi. The current emphasis on targets and norms encourages excessive investment, undermines efficiency, and deters the transfer of ownership to the institutions responsible for operations and maintenance. Government domination of sector services has limited the potential scope for participation by non-governmental organizations and, to an even greater degree, the private sector. The weak incentive structure in the sector, including lack of financial discipline, cost minimization or commercial culture, or orientation toward consumers, heightens the perceived risk to the private sector and curtails their potential involvement. Most important of all, village user communities have been insufficiently involved in the process.

vii. One of the impacts of the sector's target-driven objective has been an inadequate planning and assessment process prior to investment. No attempt is made, for example, to assess the extent and status of privately-financed sources, even when they may constitute the primary drinking water source of a community. Neither are user preferences and willingness to pay for different levels of service ascertained. Effective planning is hampered by inherent institutional incentives to build more or better, rather than affordable and appropriate, schemes. Planning is further constrained by rigid design norms and lack of integration of environmental sanitation with water supply programs. Weak performance also extends to the quality of hydrogeological investigations, improper designs and construction, that have led to substantial cost overruns. Quality assurance and supervision activities are limited despite a comprehensive set of official controls. Monitoring and evaluation of central and state-financed programs by and large have been limited to ensuring that central government funding is allocated as required.

viii. According to the recent 73rd and 74th constitutional amendments, the states are devolving activities and responsibilities for development to the panchayati raj institutions. The constitutional amendments envisaged that the RWSS sector (consisting mostly of hand or small power pumps) would lend itself better to a decentralized structure, with engineers at the district and block levels to plan and implement programs. Decentralization to lower levels was also expected to facilitate integration of sanitation and water supply services, to ease the transfer of schemes to panchayats for operation and maintenance, and to engage user communities in sectoral decision making. Due partly to problems associated with financing from multiple sources, and the lack of managerial capacity to undertake demand-driven activities, the anticipated benefits of decentralization have not yet materialized.

ix. Instead, though decentralization is only beginning in most states, there is evidence already that the process is fraught with difficulties. Decentralization has simply passed the problems inherent in the state level engineering agency on to the decentralized sector agencies. Even in states with relatively strong panchayat institutions, progress with decentralization has been inadequate. The impact of decentralization so far has been a wide distribution of responsibilities across agencies (without corresponding strengthening of inter-agency coordination mechanisms), and a weakening of accountabilities. State-level agencies by and large retain a limited role in technology selection, scheme sanctioning, monitoring and training. State public health engineering departments also conduct investigations and drilling, while the district zilla parishad engineering departments now plan and execute works. Poor liaison between departments and an inefficient financial and technical approvals process, however, inordinately delay the implementation of sectoral programs.

x. Though local level panchayats are now responsible for operations and maintenance of commissioned schemes, they are reluctant to assume this role. Reasons for this vary but include lack of managerial autonomy, inadequate staff and financial support from the state government, the typically low quality of the schemes planned and constructed without their participation, and a lack of ownership of the assets. In consequence, the state government continues to own the assets, supply the technology, and deliver the services. Despite these external factors, the panchayats themselves face many inherent problems, which inhibit them from taking advantage of the limited autonomy offered them under the constitutional amendments. These include a

historical reliance on central and state guidance and funding, weak capacity, high politicization, and limited resources.

xi. Responsibility for management and operation of rural sanitation, including waste disposal in small towns and provision of latrine and environmental sanitation services, have also been devolved to the gram panchayats. Environmental sanitation consisting mainly of sillage and storm drainage is funded largely under an employment-generation program and is not integrated with water supply programs. Due to limited capacity or interest in implementing what are typically scattered rather than comprehensive sanitation programs, progress under the government's rural sanitation program has been very slow.

xii. Lack of integration of sanitation with water supply operations has compounded the managerial difficulties panchayats face in the sector. The inattention to hygiene practices, stemming from the failure to integrate sanitation programs with programs delivering health and hygiene education, prevents the realization of significant health and economic benefits. There is also little or no follow-up monitoring or evaluation of programs, and communities are unaware of, or lack access to, low-cost investment options. Absence of these programs curtail the emergence of demand for sanitation facilities in rural areas, thereby precluding improvements in current sanitation and hygienic practices. High subsidies provided by central and local governments for relatively expensive latrines, furthermore, inhibit the ability of local agencies to work toward financial sustainability of sanitation services.

Financial Issues

xiii. Despite the significant gains in extending rural water supply, the increasing level of government investment has not been matched by a proportionate increase in coverage, and has become less efficient over time. The sector has experienced rising per capita costs due to the increased investment in the more expensive piped water schemes compared with handpumps, and increasingly inefficient procurement practices. Total capital investment requirements, to fully cover rural populations and restore functionality (i.e. repair or rehabilitation) of distressed schemes, are estimated to range from Rs. 170 billion to Rs. 200 billion as a lower bound. If, however, national RWSS objectives are to be achieved (i.e. that a minimal level of 40 lpcd is provided, all schemes are made operational, and fully depreciated schemes are replaced) within 10 years, the capital investment budget will have to be at least two and a half times its existing level of Rs. 16–18 billion (US\$450-515 million) annually.

xiv. Achieving sector objectives will be challenging and will definitely require a significant improvement in the efficiency of government investments, but this will not be sufficient. Given fiscal deficit reduction goals and competing government priorities, substantial increases in government allocation are unlikely. At present, funding from external support agencies equals only 3 to 5 percent of the existing annual capital investment in the sector and is unlikely to have more than limited impact on RWSS asset creation in view of the enormous capital investment needs. Possibilities for direct investment by the corporate private sector is also limited, given the high inherent risk, long payback periods and low profitability of the sector. Supplementary financing from the private sector or capital markets could and will likely need to be forthcoming; however, private financing could be accessible only if sector operations are elevated to a

commercial level, including strengthening of financial management processes. Necessary first steps will have to be the realization of full recurrent cost recovery from users, capital cost sharing by users and government, and a reduction in operational costs.

xv. The broader concept of financial sustainability for the RWSS sector has yet to catch hold in India; and while the narrow concept of O&M cost recovery has been accepted as a policy objective, very little has been done to implement it. Except for some localities supported by externally-funded RWSS projects, fees for rural water services are typically indirect: many states include a nominal water charge in local building or land taxes. In almost all cases where rural water fees are actually levied, the amounts are nominal and charged only to households or commercial enterprises that are served by individual connections. No charges are levied to recover capital costs. The Central Water Commission reports that cost recovery of working expenses for rural water supply schemes in 1991–92 was about 1.8 percent, and less than 1.3 percent of total outlays if capital costs are factored in. In the absence of a separate accounting and financial reporting system for the sector, and the general lack of transparency, the amounts collected disappear into a general government fund rather than being applied directly for sectoral expenses. The inadequate financial accounting system further aggravates the ability to attend effectively to cost recovery concerns.

xvi. An estimated Rs. 29 billion (US\$830 million) is required annually to fund the appropriate level of operations and maintenance in the sector, excluding provisioning for depreciation of assets. This includes salaries, electricity (where required), chemicals and routine preventative maintenance as well as repairs. In absence of adequate cost recovery, the government is responsible for adequately funding O&M requirements, yet current funding allocations are grossly inadequate at about Rs. 2.5 billion (representing a twelfth of the estimated requirements). Funding constraints furthermore have crowded out allocations to the works component of O&M, due to absorption by the salaries and overhead component. Continued underfunding of operations and maintenance will have serious financial implications due to the resultant growing need for major repairs or rehabilitation, which typically cost more than preventive maintenance. Existing systems would also likely have to be replaced prematurely.

xvii. Total expenditure on local administration is about Rs. 170 per capita, or 6.6 percent of total government expenditure annually. According to a 1992 study of local government finances, local expenditure in 1986–87 as a percentage of total government expenditure was only 2.9 percent for rural areas. Clearly, financial resources and financial autonomy have yet to be devolved to the local level and do not match the responsibilities now under local jurisdiction. Gram panchayats are expected to assume the greatest responsibilities without adequate levels of personnel and financial resources, nor adequate financial autonomy. While self-financing through cost recovery will likely be difficult to implement, it could be achieved with appropriate policy and political support and a general shift in institutional and public perceptions regarding ownership, the need for cost effective operations and maintenance programs, and a reorientation of users' perceptions to one where they expect to pay for good quality services they want and can afford.

SECTOR REFORM STRATEGY

xviii. While the Eighth Five-Year Plan recognizes the key issues and problems confronting the sector, sector programs fall short of implementing the Plan. The reform strategy proposed here coincides almost verbatim with the points highlighted in the Plan. However, it goes much further to strengthen the Plan's policy statements and identify actions required to implement the Plan. The recommended reform strategy has three objectives. First, is to *ensure an enabling environment* for reform, i.e. a policy framework that politically, legally and institutionally supports the reform process. Second, is to *establish institutional sustainability* by: clarifying and rationalizing the roles and responsibilities of the various sectoral agencies; strengthening the facilitation or implementation capacity of existing agencies, as appropriate given the identified roles; supporting the decentralization process and devolving of responsibilities to village water committees and the panchayat raj institutions, including involvement where appropriate of NGOs; and, achieving full participation of user communities in sectoral decision making and project implementation. Third, is to *establish financial viability and sustainability* by implementing policies and actions to achieve capital cost sharing, full recurrent cost recovery and reductions of operating costs. Finally, an important *resources management* objective—to ensure adequate quantities and quality of water resources for domestic needs—must also be addressed.

Enabling Environment for Reform

xix. Several factors pose major risks to reform of the rural water supply and sanitation sector. These include: (i) a wavering willingness to charge for a good whose provision has traditionally been treated as a government responsibility; (ii) the pace at which the 73rd and 74th amendments to the Panchayat Raj Act are being implemented in each state; (iii) the pace and degree to which decentralization will occur; and (iv) the pace at which public administration or civil service reforms are undertaken. Each is highly subject to political will and the extent of government commitment. These constraints will have to be overcome through development of sector policy documents at state level particularly, and securing of commitment to the reform program.

xx. The proposed strategy focuses on establishing an enabling environment to support strengthening of institutions and financial viability, which will serve the broader objectives of public administration reform. The general approach focuses on several themes. During a transition phase, financial conditionality with the allocation of central and state funds will need to be the major force driving the reform process at both state and local levels. Conditionality for disbursement of funds must be explicitly defined, and strictly adhered to. This will be used to phase out the target-driven approach and government subsidies, and to phase in a demand-driven approach and full cost recovery. Public education and widespread communication will set the stage by convincing voters and politicians of the need and benefits of making and implementing difficult cost-sharing and cost recovery decisions. Implementation of a participatory demand-driven approach will ensure that users can directly influence the level of service they desire and can afford; and full cost recovery will ensure financial viability and sustainability. Finally, supporting public sector reform and institutional strengthening will ensure sustainability. External agencies can facilitate by supporting these reform efforts. Externally funded projects

should be consistent with the recommendations of this report and should assist the Rajiv Gandhi National Drinking Water Mission and the state governments in its implementation.

Institutional Sustainability

xxi. From an institutional perspective, the strategy recommends supporting the transfer of management and financial responsibility to the lowest appropriate level, i.e. the panchayat raj institutions and, in particular, user community groups. Transfer of responsibility would require corresponding provision of management and financial autonomy to local administrations and user communities, as adequate and appropriate for their roles. Given the responsibility and autonomy, these local groups will be tasked with overseeing planning and implementing sector activities. If required, these local groups would then be able to obtain a higher quality of services and minimize unit costs, through competitive selection of service providers among existing public agencies, non-governmental organizations, and the private sector.

xxii. Gram panchayats, and user community groups created under the panchayats, will require basic capacity strengthening for their new roles. They will also need sufficient incentives to increase their level of self-generated income and become more independent. In addition they will require: an understanding of the demand-driven approach and how to assess and meet community needs; the autonomy to prioritize and choose investments that best satisfy community needs; an ability to assess and appreciate the financial and social implications of their investment decisions; and an understanding of available technologies and how and from whom to best procure them. The panchayat raj institutions, with their user community groups, can improve the administration and provision of basic services to rural areas if they are given the opportunity, support, and resources to do so.

xxiii. Achieving institutional sustainability will also entail strengthening the general management capacity of state and local water and sanitation agencies while at the same time restructuring those organizations so that they may implement a delivery system oriented toward customer service. State and district RWSS agencies as well as the central agency will further need to build up a capacity to facilitate the formation, strengthening and operational activities of local level entities. Equally important is the need to encourage the participation of non-governmental organizations and the private sector by making the regulations and procedures governing procurement and contracts more flexible, and offering financial incentives in the form of preferential rates or tax incentives. NGOs, for example, play a critical role as facilitators for user community group formation and strengthening in the ongoing Bank-assisted Uttar Pradesh Rural Water Supply and Sanitation Project, as well as in various initiatives in other states.

Financial Viability and Sustainability

xxiv. Provision of water supply and sanitation services have an economic value not only to society but also to private users. Continued subsidization of sector services by the government distorts the signals to users of the scarcity value of water. It also undermines any efforts to promote a more efficient and sustainable use of water. Substantial central and state funding, moreover, encourages local administrations to make unbounded requests on behalf of their constituents, while discouraging the assumption of responsibility for operations and maintenance

at local levels. Without an effective program to recover costs of providing water services, the government's objective of universal access to potable water and sanitation facilities will be an unattainable dream. The major objective of the strategy, therefore, is to achieve full cost recovery of operations, maintenance, replacement and capital costs in the long term. In cases where funds are borrowed to finance the investments, the annual interest payments would also be recovered from users.

xxv. During the transition period, the proposed strategy is to fully recover recurrent costs (i.e. O&M) immediately through user charges. The strategy further envisions an equal sharing of capital costs between state and center governments on the one hand, and panchayats and users on the other. For new schemes, a nominal 10 percent share of capital costs as a minimum will be required from users, as an equitable compromise between the old and new pricing regimes. The remainder of costs would be shared by the various governmental levels: 40 percent borne by panchayats out of their general tax receipts, and 25 percent each will be paid by center and state levels. For scheme rehabilitation and replacement, users and the three administrative levels will each bear 25 percent of the capital costs, making them equal partners in the sector.

xxvi. The pre-defined capital cost sharing formula is expected to drive investments and serve as a financial conditionality for matching funding, as well as enable a more demand-driven approach to emerge. Capital cost contributions from users will encourage affordable investment profiles and more realistic user expectations, while matching government funding will be conditional on the implementation of tariffs to recover the full cost of operations and maintenance and establish an adequate replacement fund. Coming full circle, full cost recovery of both recurring and replacement costs will enable responsible local administrations to maintain assets properly and sustain adequate levels of services at affordable prices. In the long term, it will also ensure the financial viability and sustainability of investments in the sector.

xxvii. Establishing financial viability and sustainability of the RWSS sector will be critical for attracting private sector financing for capital investments to bridge the gap between government resources and sectoral needs. This would be in addition to the already substantial own-financing of RWSS facilities by households and non-governmental organizations. The sector does not currently offer sufficiently attractive returns in either the short or the long term. Such disincentives discourage even government-supported credit facilities such as HUDCO and the Life Insurance Corporation of India which, despite mandates to support both infrastructure and rural development, invest only a minor proportion of their total portfolio in RWSS. The key to mobilizing market financing or inducing corporate interest in RWSS investments will be reforms to enable cost-reflective pricing of services, plus the associated reforms discussed above to achieve a commercialised demand-oriented culture in RWSS entities to tailor operations to the needs of user communities, and structure investments according not only to community needs but also to their abilities to pay. In addition to user involvement in all sectoral decision making, it will be important to strengthen corporate financial management capabilities in the water agencies to instill financial discipline and effective handling of cost and pricing issues.

xxviii. Full recurrent cost recovery and an annual contribution to a replacement fund are generally affordable for the vast majority of the rural population. If the World Bank's guideline of 3 percent of household income is used to determine affordability, cost recovery for basic WSS

technology alternatives is generally affordable by over 80 percent of the rural population. In situations where the cost burden (i.e., the capital cost share and full cost of operations, maintenance and replacement) for communities of the least expensive feasible technology generally exceeds a community's ability to pay out of incomes, then payment in-kind, user access to credit facilities, or a direct and transparent subsidy arrangement could be implemented. Where wide disparities exist between socio-economic groups of consumers, cross-subsidization may be an appropriate and practical option. A progressive tariff with different pricing tiers for different uses and different classes of customers can be considered at various administrative levels (i.e. the gram panchayat, district, or state) as appropriate. Such a tariff structure if well-designed, could support cross-subsidization from one region to another, from urban to rural areas, from one class of user to another, or from high to low consumption.

Protection of Water Sources

xxix. Safeguarding the availability and quality of rural drinking water in India is also a priority need, for without appropriate mechanisms now to give rural drinking water effective priority over other uses and protect groundwater sources from excessive abstraction and contamination, the situation will deteriorate further and the costs of providing good quality drinking water will continue to escalate. Implementing the National Water Policy that explicitly assigns drinking water priority over other uses is an important first step that most states have yet to take. Adoption of effective legislation and mechanisms to regulate and manage groundwater use and thus ensure a basic supply of rural (and urban) drinking water is a key associated need. These issues necessarily require a multi-sectoral and broader resources management perspective than is covered in this paper, which focuses on RWSS service delivery. Broader resource management issues are assessed in greater depth in the reports on "Intersectoral Water Allocation, Planning and Management," and "Groundwater Regulation and Management," also prepared as part of the Government of India-World Bank Water Resources Management Sector Review (1998a and 1998b, respectively).

Plan of Action

xxx. The strategy recommends a number of critical actions to be taken by the central as well as the state governments. Table I below summarizes the key reform actions. A detailed Matrix of Recommendations is presented in Table 4.6, listing agencies responsible and proposed time frame for action. These recommendations are already the subject of encouraging follow-up by the Government of India, a number of states, bilateral and multilateral agencies, and NGOs. Subsequent to initial discussion cum dissemination at a national workshop³³ in February 1997 of an earlier draft of this report, and report revisions to incorporate the outcome of the national workshop, further workshops at regional and state are being organized by the Rajiv Gandhi National Drinking Water Mission to disseminate the final strategy recommendations as reflected in this report. The recommendations are also being incorporated at project level in some states, in the design of projects supported by the World Bank, and in various bilateral agency and NGO-supported activities. There is now a need to broaden implementation to a formal national

³³ The national workshop on RWSS, held on February 20-21, 1997, was chaired by the Rajiv Gandhi National Drinking Water Mission. Proceedings of the workshop, including speech delivered by the Rural Development Secretary, Mr. Vinay Shankar, are reproduced in the Annex 1.

strategy that encompasses all elements of the report in a comprehensive approach. This sector reform process is under energetic initiation by the Government of India and merits full support to achieve the intended turnaround in sector performance.

Table I. Recommended Plan of Action - Summary

A. ESTABLISH AN ENABLING ENVIRONMENT

Objective: To ensure a politically, legally and institutionally supportive environment that will facilitate the implementation of the reform process with particular emphasis on devolution of responsibilities to grass-roots levels and, in particular, user implementation, a demand-oriented approach, full cost recovery and financial sustainability (refer Sections B & C below).

- A.1. Public Awareness.** Implement a widespread public awareness campaign to promote water as an economic good and the need to charge cost-reflective prices and implement conservation activities.
- A.2. Give Priority to Drinking Water in Water Resource Use.** Strengthen and implement national and state policies giving priority to drinking water, and prepare state specific legislation to protect groundwater resources.
- A.3. Redefine and Reduce Government Role.** Develop and implement national and state RWSS policies defining the role of public sector in the RWSS sector, and guidelines for sector operations regarding financial and institutional aspects.
- A.4. Full Cost Recovery and Capital Cost Sharing.** Develop and implement national and state RWSS cost recovery and cost-sharing policy that defines situations in which the community will be eligible for matching government financing for new schemes and rehabilitation or replacement of existing schemes.
- A.5. Decentralize Responsibilities.** Devolve management autonomy to local level administrations.
- A.6. Institutional Strengthening.** Strengthen institutional capabilities, including development of MIS, financial systems, monitoring and evaluation systems, and training at all administrative levels to facilitate the devolution process.

B. ENSURE INSTITUTIONAL SUSTAINABILITY

Objective: Decentralize and strengthen RWSS agencies, defining clear mandates at each administrative level, devolving functions to the lowest appropriate level, and encouraging participation of NGOs & the private sector.

- B.1.** Enable Panchayat institutions and user community groups to assume the lead in decision making for RWSS.
 - B.2.** Enable, promote and facilitate participation of NGOs and the private sector; define appropriate roles of these non-government as well as external agencies.
 - B.3.** Strengthen institutional capabilities to undertake consumer orientation, policy development, planning, implementation, O&M, monitoring and evaluation, and promotion of health and sanitation.
 - B.4.** Restructure public sector institutions.
 - B.5.** Strengthen operational guidelines and procedures for RWSS agencies.
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Table I (cont.). Recommended Plan of Action - Summary

C. ENSURE FINANCIAL VIABILITY AND SUSTAINABILITY

Objective: Implement full cost recovery of operations and maintenance and replacement costs to ensure sustainability of sector investment. Implement a cost-sharing approach ensuring that the panchayat raj institutions and community are partners to make capital investment more efficient and transfer ownership. Encourage sector financing by rural credit facilities and private sector investors.

- C.1. Implement a demand-driven approach.
- C.2. Increase user charges to recover O&M costs.
- C.3. Reduce O&M Costs.
- C.4. Introduce and implement capital cost sharing policy.
- C.5. Make RWSS agencies financially self-sufficient and strengthen their capabilities in financial management.
- C.6. Re-prioritize Public Expenditures in RWSS.
- C.7. Implement effective accounting and auditing procedures, billing and collection systems, standard financial reporting formats, and simple but well-defined financial management and accounting systems.
- C.8. Amend existing legislation and regulations so that panchayat raj institutions and village water supply and sanitation committees are legally entitled to enter into financing and loan agreements with government-sponsored rural credit facilities or private sector financial institutions.
- C.9. Establish a system for providing loan guarantees by the block and district panchayat raj institutions or the state, as necessary.

D. PROTECT WATER RESOURCES

Objective: Implement measures to assure priority usage of water resources to drinking water and to protect quality and sustainability of groundwater resources.

- D.1. Define appropriate remedial measures to address water quality problems.
 - D.2. Design a strategy for developing water supply schemes in areas with water quality problems that meet safe drinking water requirements and acceptability (preference) of users.
 - D.3. Develop technology and other innovative options for solving water quality problems (fluoride, iron and arsenic) both at village and household level as well as for larger piped schemes.
 - D.4. Develop groundwater legislation and regulations, and develop regulators' capabilities to manage and protect groundwater resources.
 - D.5. Develop institutional capabilities for multi-sectoral water allocation, planning and management, including water pricing mechanisms, and features to prioritize allocation for drinking water and protection/mitigation against pollution (refer GOI-World Bank, 1998).
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