INDIA

ASSESSMENT 2002

water supply & sanitation

A WHO-UNICEF SPONSORED STUDY

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October 23, 2002

The recently concluded World Summit for Sustainable Development held at Johannesburg and the earlier Millennium Declaration of the United Nations have both laid stress on the global goal of halving by 2015 A.D. the population without access to water supply and sanitation. In India, due to committed and concerted action by the State Governments and the Government of India, considerable success has been achieved in providing safe drinking water to rural and urban populations. Sanitation coverage in urban areas has been improving while in rural areas, a lot is still to be done.

At the same time, the issue of sustainability and maintenance of the quality of water supplied is an area of concern. The entire water supply and sanitation programme has hitherto been operated as Government-managed, without the active participation of the beneficiaries. It is estimated that by 2025, more than fifty per cent of the country's population will live in cities and towns and thus the likely demand for infrastructural facilities is expected to rise sharply posing a challenge to urban planners and policy makers.

It is unlikely that, in the future, Government alone would be in a position to mobilise all the projected demand of funds by the sector, especially in view of resource constraint and competing demands on even the available resources. In this context, Government of India has taken significant steps to introduce reforms initiatives in the water supply and sanitation sectors aimed at better involvement of the users, both in cost sharing as also in operation and maintenance.

The WHO-UNICEF sponsored Assessment Report of Water Supply & Sanitation in the country is thus most timely and will give a fillip to the current reform processes, promote cross-sectoral coordination and planning and also stimulate investment. The report highlights what we have so far achieved, what is still to be done and the areas meriting focussed attention. Improved inter-sectoral coordination among various agencies involved directly or indirectly with water supply and sanitation has been rightly flagged as an important issue.

I commend the efforts put in by the National Consultant, Mr. Sunder Subramanian, in finalising the Report in a very short time. I also acknowledge the cooperation extended to the Consultant and the Planning Commission by the Department of Drinking Water Supply, Ministry of Urban Development and other Ministries/Departments in preparation of the Report.

K. C. PANT

Preface

Working on this report at the Planning Commission of India has been an invigorating experience. At the same time, all through its writing, there were dilemmas of various kinds. It is important, at the outset, to outline at least some of these. The size of this report was essentially governed by the guidelines by WHO and UNICEF for the country assessments. The guidelines essentially were meant to ensure a degree of standardisation across country reports. Considering the size and diversity of India and the multiplicity of institutions involved in water and sanitation interventions across the length and breadth of India, one significant and obvious dilemma was that it was impossible to acknowledge each one of them. The fact that some institutions and some interventions have been referred to in this report does not in any way mean that the others are in any way less important or significant. This is particularly true of NGOs and their interventions and of the roles of the various external support agencies, which have in many instances, made invaluable contributions to the sector.

A note about 'coverage' data used in the report – while some of the overall stated coverage figures are impressive, the data also should be approached with some caution as they do not take into account infrastructure or schemes that have become permanently defunct in the interim. The figures also do not reflect seasonality of supply, adequacy of storage and treatment or financial viability of systems. Another problem with 'coverage' data is that it does not take into account water quality issues. For example, an area may be considered officially 'covered' – but if the created source has high iron content, the taste of the water would invariably force users to turn to alternative unprotected sources. This of course means that there can be significant differences between 'access' to a given service or resource and actual 'use' of the service/resource. As in the Global Water and Sanitation Assessment 2000 Report, water supply and sanitation coverage data used in this report are from various household level user surveys conducted by different agencies and not from service providers. Thus, official coverage figures may be somewhat higher.

Terminology also has its problems. For example, a habitation, which is 'fully covered', will not stay that way for very long, owing to natural increases in population and other natural and man-made factors. For example, in 1972, surveys revealed that out of 580,000 revenue villages there were 150,000 drinking water 'problem villages' in India. By 1980, some 94,000 villages were covered by Government and 56,000 were left uncovered. However, the 1980 survey put the number of problem villages actually at 231,000, and not merely 56,000. By 1985, all but 39,000 villages were covered but the new survey showed 161,722 problem villages. Again, by 1994, they were all covered leaving only 70 uncovered villages. By this time, the inadequacy of the 'village' as a unit for measuring coverage was recognised, and the 'habitation' was chosen as the unit. The 1994 survey revealed 140,975 problem habitations. This time the number included both 440 revenue villages as well as rural hamlets (the total of which is about 1.42 million, henceforth called habitations).

Finally, a note on the order of chapters in this report. While the guidelines of country assessment reports had prescribed the report structure in detail, some changes have made in this report. The 'Introduction' and 'Background' chapters have been merged to form a single larger "introduction' chapter.

Sunder Subramanian
Consultant

Acronyms

AIIH &PH	All India Institute of Hygiene and Public Health
ARWSP	Accelerated Rural Water Supply Programme
AUWSP	Centrally Sponsored Accelerated Urban Water Supply Programme for Small Towns
BCM	Billion Cubic Metres
BoD	Biological Oxygen Demand
CBHI	Central Bureau of Health Intelligence
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CRSP	Centrally Sponsored Rural Sanitation Programme
CWC	Central Water Commission
DFID	Department for International Development, Government of the UK and Northern Ireland
DJB	Delhi Jal Board
DPR	Detailed Project Reports
FC	Fully Covered
GAP	Ganga Action Plan
GDP	Gross Domestic Product
GEMS	Global Environmental Monitoring Systems
GIS	Geographic Information Systems
GoI	Government of India
HDI	Human Development Index
HIS	Hydrological Information System
HRD	Human Resource Development
HUDCO	Housing and Urban Development Corporation
IEC	Information, Education and Communication
ITN	Indian Training Network
JMP	Joint Monitoring Programme
LIC	Life Insurance Corporation of India
MINARS	Monitoring of Indian National Aquatic Resources
MoA	Ministry of Agriculture, Government of India
MoEF	Ministry of Environment and Forests, Government of India
MoF	Ministry of Finance, Government of India
MoHFW	Ministry of Health and Family Welfare, Government of India
MoRD	Ministry of Rural Development, Government of India
MoUD	Ministry of Urban Development and Poverty Alleviation, Government of India
MoWR	Ministry of Water Resources, Government of India
MSW	Municipal Solid Waste
NC	Not Covered
NEERI	National Environmental Engineering Research Institute, Nagpur, India
NFHS	National Family Health Surveys
NGOs	Non-Governmental Organisation
NHRDP	National Human Resource Development Programme
NICD	National Institute of Communicable Diseases
NLCP	National Lake Conservation Plan
NRAP	National River Action Plan
NRCD	National Rivers Control Department
NSS	National Sample Surveys
O & M	Operation and Maintenance
OECF	Overseas Economic Cooperation Fund, Government of Japan
PC	Partially Covered
PEO	Programme Evaluation Organisation, Planning Commission of India
PRIs	Panchayati Raj Institutions
RCRSP	Restructured Central Rural Sanitation Programme
RGNDWM	Rajiv Gandhi National Drinking Water Mission
RWSS	Rural Water Supply and Sanitation
SDP	State Domestic Product
SIDA	Swedish International Development Agency
TERI	Tata Energy Research Institute
TSC	Total Sanitation Campaign
ULBs	Urban local bodies
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
UWSS	Urban Water Supply and Sanitation
VAMBY	Valmiki Ambedkar Awas Yojana
WHO	World Health Organization
WSP-SA	Water and Sanitation Program South Asia
WSSBs	Water Supply and Sewerage Boards
YAP	Yamuna Action Plan

Executive Summary

With a landmass of 3.29 million square kilometres and a population of just over a billion, India is a mosaic of pluralistic diversity. Endowed with enormous natural resources, it also has the second largest pool of technical and scientific personnel in the world. The Indian economy has grown steadily, and economic liberalisation has unleashed the vast potential of the private sector, which today accounts for nearly 75 per cent of GDP. Human development has improved significantly, by nearly 26 per cent in the '80s and by another 24 per cent during the '90s. However, significant HDI disparities exist between various states and between rural and urban India. In the five decades since independence, India has witnessed phenomenal development of water resources and self-sufficiency in food grains, rapid expansion in the urban, energy and industrial sectors, and drinking water infrastructure for about 85 per cent of India's urban and rural population. However, this achievement has been at the cost of groundwater depletion, water logging, water quality degradation and pollution and increasing salinity levels affecting large areas. Sectoral demands for water are growing rapidly in line with urbanisation (estimates suggest that by 2025, more than 50 per cent of the country's population will live in cities and towns), population increases, rising incomes and industrial growth, and urban India is fast emerging as centres of demand growth. As a result, per capita water availability has been falling.

Water supply and sanitation were added to the national agenda during the first five-year planning period (1951-1956), and increasing investments have been made in subsequent plans. A new National Water Policy was adopted in 2002, according primacy to drinking water, as in the earlier policy. Some states such as Karnataka, Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu have already drafted state policies based on the new national policy.

The primary responsibility for providing drinking water and sanitation facilities in the country rests with the State Governments, and, more specifically, the local bodies in the urban areas. The Centre allocates funds and also ensures that funds are provided in State budgets, and progressively larger allocations have been made for water supply and sanitation in the various Five Year Plans. National policy guiding India's approach to water supply and sanitation in the Eighth, Ninth and now the Tenth Plan broadly follow the guiding principles of the New Delhi declaration, adopted by the United Nations General Assembly in December 1990. While the nodal agencies for rural and urban water supply and sanitation are the Rajiv Gandhi National Drinking Water Mission and the Ministry of Urban Development and Poverty Alleviation respectively, a variety of other institutions play direct or indirect roles. These include various ministries and departments, financial institutions, external support agencies, NGOs, and the private sector.

The agriculture sector accounts for between 90 to 95 per cent of surface and ground water in India, while industry and the domestic sector account for the remaining. Wide regional disparities in water availability also exist. Between 69 to 74 per cent of India's rural population take their drinking water from protected sources, leaving an unserved population of 26 to 31 per cent. Between 91 to 93 per cent of India's urban population take their drinking water from protected sources, leaving an unserved population of between seven to nine per cent. Water quality problems include Fluoride (66 million people across 17 states are estimated to be at risk), excess Arsenic in ground water (nearly 13.8 million people in 75 blocks are reported at risk), varying iron levels, presence of nitrates and heavy metals, bacteriological contamination and salinity.

Analysis of sanitation coverage data from various sources shows that despite the acceleration of coverage under the Eighth Plan, only between 18 to 19 per cent of all rural households have a toilet. However, there has been increase in coverage, from around 10 per cent in 1990. At the same time, between 75 to 81 per cent of all urban

households in India have toilets, an increase from the 1990 figures of around 64 per cent. As in the case of water supply, disparities across states exist.

On the urban front, while access to household toilets in urban India is relatively high, sanitation beyond home toilets is a different story. Out of 300 Class-1 cities, about 70 have partial sewerage systems and sewage treatment facilities. Of the total wastewater generated in the metropolitan cities, barely 30 per cent is treated before disposal. Thus, untreated water finds its way into water systems such as rivers, lakes, groundwater and coastal waters, causing serious water pollution. There has also been a significant increase in MSW generation in India in the last few decades. This is largely because of rapid population growth and economic development in the country, and solid waste management has become a major environmental issue in India.

At the same time, several important measures are being taken to deal with the above issues. On the water resources management front, the National Water Policy, 2002 recognises the need for well-developed information systems at the national and state levels, places strong emphasis on non-conventional methods for utilisation such as inter-basin transfers, artificial recharge, desalination of brackish or sea water, as well as traditional water conservation practices such as rainwater harvesting, etc to increase utilisable water resources. It also advocates watershed management through extensive soil conservation, catchment area treatment, preservation of forests and increasing forest cover and the construction of check dams. The policy also recognises the potential need to reorganise and reorient institutional arrangements for the sector and emphasises the need to maintain existing infrastructure. Under the NRAP, certain stretches of major rivers with high or intermediate levels of pollution have been identified by the Central Pollution Control Board, and action is underway to reduce the pollution load. Many other similar measures are underway.

In line with the 73rd Constitutional Amendment and increasing recognition that centralised, government controlled, and supply driven approaches need to be changed to more decentralised, people centric and demand responsive approaches has led to the revamping of the ARWSP, and the inception of the Sector Reforms programme. This major paradigm shift in thinking and policy, launched in 1999, incorporates the principles of (a) adoption of demand responsive approaches based on empowerment, to ensure full participation in decision making, control, and management by communities, (b) shifting the role of governments from direct service delivery to that of planning, policy formulation, monitoring and evaluation, and partial financial support, and (c) partial capital cost sharing, in either cash or kind or both, and 100 per cent responsibility of O & M by users. Sector Reforms are currently being undertaken in 67 districts across the country, and is likely to increase to 75 soon. Likewise, keeping in view the relatively poor sanitation coverage and the past experiences of the central government, the RCRSP that came into being from 1st April 1999 advocates shift from a high subsidy to a low subsidy regime, advocates a greater household involvement and demand responsiveness, provides for the promotion of a range of toilet options to promote increased affordability, has strong emphasis on IEC and social marketing, provides for stronger back up systems such as trained masons and building materials through rural sanitary marts and production centres and includes a thrust on school sanitation as an entry point for encouraging wider acceptance of sanitation by rural masses. The TSC also provides assistance for construction of individual household toilets, sanitary complexes for women, school sanitation, construction of drains and garbage pits and alternative delivery systems such as rural sanitary marts. The TSC is being carried out in 27 states/UTs. In addition, recognising that water and sanitation in schools are critical to the formation of proper attitudes and habits for hygiene, sanitation and safe water use and that schools are powerful channels for communicating hygiene messages to households and communities, school sanitation programmes are being given high priority in the Tenth Plan. Likewise, important measures are being undertaken to enhance HRD, to mitigate water quality problems, and to raise awareness levels and improve hygiene behaviour.

Recognising the rapid rate of urbanisation and the poor conditions of urban water supply and sanitation systems, as well as the vicious circle of low tariff, poor recovery rates and therefore poor quality of services, the UWSS sector is also taking major policy reform steps. In this direction, the Tenth Plan has put forward several fiscal incentive measures to promote reforms such as the City Challenge Fund and the Pooled Finance Development Fund to encourage reform measures and prompt ULBs to become viable, credit-worthy entities to access market funds. The Plan also proposes the Urban Reforms Incentive Fund to encourage ULBs to take up financial strengthening and reforms and better enforcement of user charges, taxes, etc. Improving efficiency of existing systems/schemes is being advocated by conducting diagnostic studies of operational status, reviews of practices in management and finance, assessments of investment needs in terms of restoration, renovation and augmentation. Once implementation of efficiency enhancement measures is underway and viability is established, innovative schemes such as those mentioned above could be availed of, to further enhance efficiency and credit-worthiness. The Tenth Plan also calls for states to have benchmark rates for per capita expenditure and for proposed UWSS projects to be compared against the benchmark. The Plan also calls for any project to take into account the urban poor and marginalised. Once established or improved to become viable, the plan advocates for projects to be run along commercial lines. The reforms agenda also calls for substantial institutional development linked to support for improved services covering measures such as decentralising, commercialising or corporatising of institutions, enhancement of technical and managerial capacity, unbundling/rebundling of functions, appropriate forms of public-private partnerships, use of information technology, and improved private sector participation, to achieve sustainability. Detailed guidelines for these have also been prepared by the MoUD.

Water conservation in urban areas forms a major thrust area in the Tenth Plan, and several measures are proposed, including tariffs at appropriate levels to discourage excessive use, mandatory water efficient systems for flushing, reducing leakages and unaccounted for water, reuse and recycling of sewage, rainwater harvesting, etc.

Centrally sponsored low cost sanitation schemes continue to remain a key component of urban sanitation in the Tenth Plan and will continue to be propagated as not just a programme for urban poor or slum populations, but also as an appropriate intervention wherever the costly option of underground drainage is not feasible. A new scheme for community pay-and-use toilet complexes, and the VAMBY – housing for slum development with 20 per cent fund component for sanitation – is also proposed.

The Tenth Plan identifies MSW as a key area for action, especially the need for concerted action to improve flow of resources and the building up of systems. Priority action areas being advocated in the plan include compulsory production of compost from urban solid waste, identification of less capital intensive and intermediate technologies, provision of fiscal concessions and subsidies, and strict implementation of rules pertaining to bio-medical, municipal and hazardous wastes. There is also increasing emphasis on solid waste management, and legislation has been enacted by notifying the Municipal Solid Wastes (Management and Handling) Rules, 2000 with detailed guidelines and timeframes to be adopted.

The reform measures are already beginning to take effect. Significantly, improved performance in UWSS can be seen in cities such as Hyderabad, Chennai, Nasik, Surat, etc. and ULBs in Bangalore have adopted new technologies such as GIS for planning. In many cities such as Mumbai, freshwater is no longer supplied to industry – instead, recycled and treated municipal wastewater is provided. Replicability of interventions, appropriate institutional arrangements for implementation and O & M of UWSS schemes are being considered. The Government of India is also planning to establish a Water and Sanitation Mission for urban areas to support the reform process with technical, managerial and financial assistance.

The first five Plan periods were characterised by relatively negligible investments in water supply and sanitation. 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, and remarkable progress has been achieved on many fronts. However, the future numbers are daunting, and to achieve stated national and global goals for water supply and sanitation, many more millions have to be reached by the years 2015 and 2025.

While massive inputs have been made by the Government to supply potable water in urban as well as rural areas, sanitation, coverage, especially in rural areas is relatively low. Morbidity and mortality due to water-borne diseases have not declined commensurate with increase in availability of potable water supply. More importantly, young children bear a huge part of the burden of disease resulting from the lack of hygiene. India still loses between 0.4 to 0.5 million children under five years due to diarrhoea. While infant mortality and under five mortality rates have declined over the years for the country as a whole, in many states, these have stagnated in recent years. One of the reasons is the failure to make significant headway in improving personal and home hygiene, especially in the care of young children and the conditions surrounding birth. At the same time, with concerted efforts by sector agencies, India has been able to eradicate guineaworm disease.

While today, there is virtually no point of institutional interface between the departments dealing with water supply and sanitation and the Departments of Health and Family Welfare, the new National Health Policy 2002 advocates some steps towards developing such linkages.

While no comprehensive study on equity issues relating to water supply, sanitation, and health has been conducted for the country as a whole, common equity issues that plague the sector in most developing countries also hold true for India. In addition, comprehensive studies on the economic value of the water and sanitation sector in India also do not exist.

The water resources, RWSS, UWSS and health sectors have several strengths but also several critical factors influencing their performance. Considering the sheer scale of the country's sectoral demands, it is important to recognise these, enhance the strengths, and work on the critical factors.

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. The currently on-going reform processes in the RWSS and UWSS sectors and the new National Water and Health Policies are important steps in the right direction. These should be sustained, and where necessary, augmented by further reform measures. It is also important to continue to build the capacities of states to better appreciate and better implement the reform programmes and the devolution of powers, including financial to PRIs in line with the 73rd and 74th Constitutional Amendments.

It is important to reiterate the need for RWSS and UWSS agencies to operate hand-in-hand with their health and education counterparts to jointly monitor indicators of RWSS, UWSS, health, education, poverty, and equity in order to make significant headway in the respective sectors. Existing health promotion and education programmes should be made more effective and geared towards achieving behaviour changes needed to improve hygiene. With the new policy agendas in these sectors, such intersectoral collaboration is now possible, more than ever before.

In sum, considering the sheer size of the country, the sheer numbers in terms of population, and the complex nature of its plural society and regional variations, India has made significant strides in the water and sanitation arena. While the task is far from complete, and much needs to be done, India is taking the right steps in the right direction.

Introduction

About This Report

This report on the assessment of drinking water supply and sanitation in India is the result of a collaborative exercise between the Planning Commission of India, the World Health Organization (WHO), and the United Nations Children's Fund (UNICEF) as part of a joint monitoring programme (JMP) for the sector. This country-level report in India comes in the wake of the four global assessments (reports published in 1991, 1993, 1996, and 2000) completed through the JMP process.

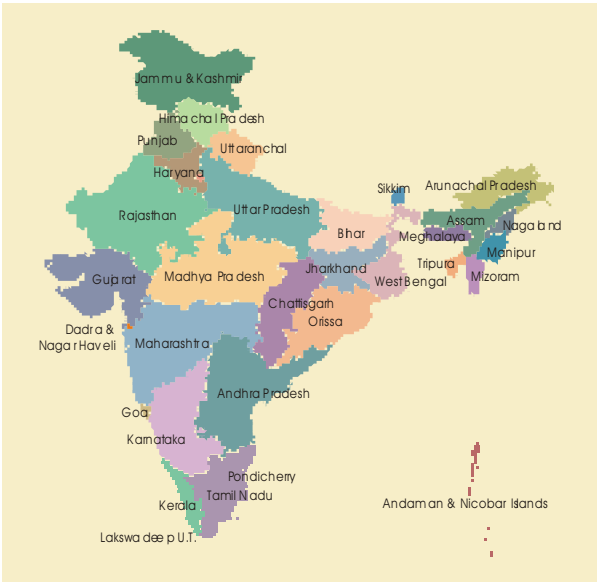
The report seeks to (a) analyse the data and information collected at the national level for the global assessment report in order to review priorities, analyse problems and make recommendations that support the development objectives of the country (b) to clarify any ambiguities that may exist in the data and information collected at country level and to provide information on any relevant national issue that may not have been covered by the global assessment report; and (c) to support ongoing policy reform initiatives, to guide technical assistance programmes, and to stimulate investment in the sector. In addition, in a regional meeting held at Colombo, Sir Lanka, between 18th to 19th September 2002 to take stock of the assessment process of sector progress in India, Sri Lanka, and the Maldives, it was agreed that each country report, once completed, would be used as a broad base document, to monitor and assess progress of the sector in the years to come.

The Assessment Process

The assessment was done using both primary and secondary sources of information. Primary information collection was done by a series of discussions held with personnel from various government institutions including the Planning Commission, the Rajiv Gandhi National Drinking Water Mission (RGNDWM), and the Ministry of Urban Development and Poverty Alleviation (MoUD). A significant amount of information for the assessment came from a variety of secondary sources. Governmental sources included data and documents from the Planning Commission, RGNDWM, MoUD, Ministry of Rural Development (MoRD), and the Department of Statistics. The websites of these and other governmental organisations such as the Central Pollution Control Board (CPCB) proved invaluable. Non-governmental sources for secondary information included various reports and documents from UNICEF, WHO, the World Bank, the Water and Sanitation Program South Asia (WSP-SA), United Nations Development Program (UNDP), and the Department for International Development (DFID). Detailed references and bibliography are presented at the end of this report.

The report went through iterative processes of soliciting inputs. A first draft was generated and circulated to sector agencies and key personnel in late August 2002, and a meeting was held at the Planning Commission on 6th September 2002 to receive feedback. This was followed by the regional meeting at Sri Lanka between 18th-19th September, and another meeting at New Delhi on 23rd September to appraise various sector agencies and personnel about the meeting in Sri Lanka. The inputs from these various meetings as well as inputs received from other sources were incorporated to create a penultimate draft, which was circulated to select sector agencies for comment. The comments received were incorporated to form the final report.

POLITICAL MAP OF INDIA



India Overview

India is the world's largest democracy. The seventh largest country in the world with a landmass of 3.29 million square kilometres (slightly larger than a third of the United States) and a population of just over a billion (during the last decade, India's population has grown by over 21 per cent), India is a mosaic of pluralistic diversity in terms of culture, religion and language.

The country is endowed with enormous natural and mineral resources (including the fourth-largest reserves of coal in the world, iron ore, manganese, mica, bauxite, titanium ore, chromite, natural gas, diamonds, petroleum and limestone) as well as the second largest pool of technical and scientific personnel in the world. India's climate varies from tropical in the south to temperate in the northern reaches. The enormous variations in altitudinal and agro-climatic zones also mean that India is a mega-biodiversity country.

The Indian economy has grown at an average of 4.5 to 5 per cent each year for the past 10 years. A series of economic reforms have deregulated the economy and stimulated domestic and foreign investment. This liberalization programme has unleashed the vast potential of the Indian economy. The private sector is the backbone of the economy, accounting for 75 per cent of Gross Domestic Product (GDP). The opening up of the economy together with the increasingly global focus of Indian industry has resulted in the dynamic growth and increased competitiveness of Indian firms.

Human Development

Overall, human development as reflected in the Human Development Index (HDI) has improved significantly between 1980 and 2001. At the national level, during the eighties the index has improved by nearly 26 per cent and by another 24 per cent during the nineties. There has been an improvement both in rural, as well as in urban areas. Though the rural-urban gap in the level of human development continues to be significant, it has declined during the period. Inequalities across States on the HDI are less than the income inequality as reflected in the per capita State Domestic Product (SDP).

At the State level, there are wide disparities in the level of human development. In the early eighties, States like Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan and

INTER-STATE VARIATIONS IN HDI

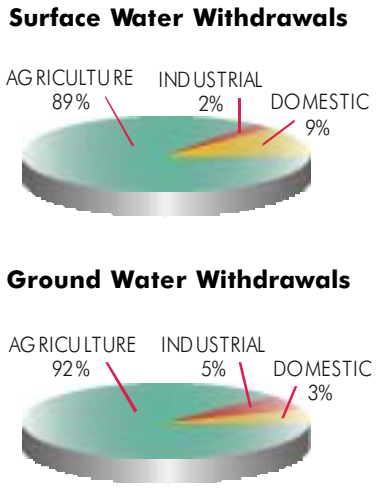
In general, HDI is better in smaller States and Union Territories. The economically less developed States are also the States with low HDI. Similarly, the economically better off States are also the ones with relatively better performance on HDI. However, the relation between the HDI and the level of development does not show any correspondence among the middle-income States in the country. In this category of States, some States like Kerala have high attainments on HDI, at the same time, there are States like Andhra Pradesh or even West Bengal where HDI values are not as high.

Orissa had HDI close to just half that of Kerala's. The situation has improved since then. Besides Kerala, among the major States, Punjab, Tamil Nadu, Maharashtra and Haryana have done well on the HDI.

Water and Sanitation in India's Development Context

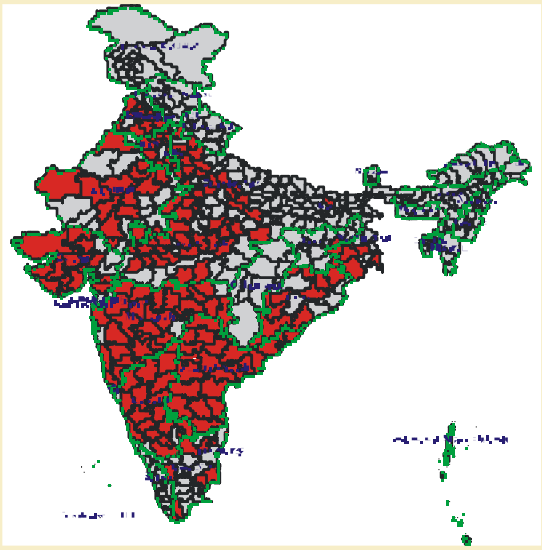
Historically, civilisations in India, as around the world, have largely evolved and developed around water bodies as most human activities, including agriculture and industry depend on water. In the five decades since independence, India has witnessed phenomenal development of water resources and has largely successfully met the demand of water for many of the diverse uses in the country. Consequently, the country has achieved self-sufficiency in food grains. Investments made during the last fifty years in water related infrastructure in the country have resulted in rapid expansion in the urban, energy and industrial sectors. Infrastructure for safe drinking water has been provided to about 85 per cent of India's urban and rural population. However, there remain significant challenges in providing sustainable services, especially for the poorest and hard to reach.

FIG 1: WATER USAGE BY SECTOR – A BIRD'S EYE VIEW



Source: Earth Trends 2001, World Resources Institute.

GROUNDWATER DEPLETION



The blocks shown in red are areas where, due to extraction of groundwater, especially for irrigation, the groundwater levels have fallen by more than 4 metres (@ > 20 cm/year) during 1981-2000.

Source: CGWB

India's irrigated agriculture sector has been fundamental in its economic development and poverty alleviation. The rapid expansion of irrigation and drainage infrastructure has been one of India's major achievements. From 1951 to 1997, gross irrigated areas expanded four-fold, from 23 million ha to over 90 million ha and irrigation continues to be the single largest use of freshwater in India.

However, this achievement has been at the cost of groundwater depletion, water logging and increasing salinity levels affecting large areas.

India's finite and fragile water resources are stressed and depleting, while sectoral demands (including drinking water, industry, agriculture, and others) are growing rapidly in line with urbanisation, population increases, rising incomes and industrial growth. At the same time,

TABLE 1
INCREASING URBANISATION

	1951	1991	2001	2021 (projected)
No. of Urban Agglomerations/ Towns	2795	3768	4378	—
Urban Population (In million)	62.0	217.0	285.00	550
As Percentage of Total Population	17.3%	25.72%	27.8%	41%

Source: CPHEEO

TABLE 2
GROWTH OF METRO CITIES

	1981	1991	2001
No. of Metro Cities (Population: 1 million +)	12	23	35
Population (million)	42	70	108
% of Urban Population	26	32	37.8

Source: CPHEEO

urban India is in the midst of transformation. In an era of economic reform, liberalisation and globalisation, cities and towns are fast emerging as centres of growth. In fact, estimates reveal that Urban India contributes more than 50 per cent of the country's GDP at present, although it accounts for less than one-third of its population. It is estimated that by 2025, more than 50 per cent of the country's population will live in cities and towns.

These figures are indicative of the likely demand for infrastructural facilities, notably water supply and sanitation that could arise due to urbanisation.

More importantly, the first areas likely to be adversely affected in terms of water availability are the rural areas around major centres of urban growth. All this has resulted in declining per capita water availability and deteriorating quality. Intersectoral allocations, planning and management of increasingly fragile water resources have thus emerged as a major challenge before the nation.

Low levels of basic literacy and awareness combined with economic deprivation and hunger are closely related and contribute to infant mortality, under-5 mortality, high fertility rate and low life expectancy. Within this context, water, and more importantly, sanitation and improved hygiene behaviour are crucial to overall public health. Water-borne diseases are caused by viral or bacteriological contamination of water – contamination either at source owing to unsanitary conditions or in homes when it is not stored and used properly. The risk of water contamination resulting in water-borne diseases is higher when there is inadequate availability of water, poor quality of water at source, poorly maintained water and sewer lines, high degree of open-air defecation, lack of adequate means of disposal of human, animal and household wastes, and in general, lack of awareness of good sanitation and personal hygiene practices.

Water Resources – Quantity, Quality, and Management

India receives an average annual rainfall equivalent of about 4,000 billion cubic metres (BCM). This source of water is unevenly distributed both spatially as well as temporally. Most of the rainfall is confined to the monsoon season, from June to September, and levels of precipitation vary from 100 mm a year in western Rajasthan to over 9,000 mm a year in the northeastern state of Meghalaya. With 3,000 BCM of rainfall concentrated over the four monsoon months and the other 1,000 BCM spread over the remaining eight months, India's rivers carry 90 per cent of the water during the period from June-November. Thus, only 10 per cent of the river flow is available during the other six months.

National level statistics for water availability mask huge disparities from basin-to-basin and region to region. Spatially, the utilisable resource availability in the country varies from 18,417 cubic meters in the Brahmaputra valley to as low as 180 cubic metres in the Sabarmati basin. Rajasthan, for instance, with 8 per cent of the country's population has only 1 per cent of the country's water resources while Bihar with 10 per cent of population has just 5 per cent of the water resources. Thus, while India is considered rich in terms of annual rainfall and total water resources, its uneven geographical distribution causes severe regional and temporal shortages.

DEPLETING WATER AVAILABILITY

Of 4,000 BCM of available water from precipitation, the mean flow in the country's rivers is about 1,900 BCM. Out of this, only 690 BCM is utilisable. With 177 BCM of live storage created by the existing major and medium projects and another 75 BCM of storage from projects under construction, there is still a gap of 440 BCM of water.

Assessments of replenishable ground water resources have been made at 431.9 BCM by the Central Ground Water Board through a large volume of hydrologic and related data. This is the sum total of potential due to natural recharge from rainfall and due to recharge contributions from canal irrigation. The utilisable ground water resources have been assessed at 395.6 BCM (70.0 BCM for domestic and industrial uses and 325.6 BCM for irrigation). The CGWB has also assessed the quantum of static ground water resources (one time available) at 10,812 BCM.

Water availability from other sources and through desalinisation of sea and ground waters is considered negligible in view of the high cost. The assessed gross available and utilisable water resources of the country, based on conventional technology, are therefore 2,384 BCM (billion cubic metres) and 1,086 BCM, respectively. With an estimated population of just over one billion, the available and utilisable water resources per capita per year are 2,384 m3 and 1,086 m3 respectively against an estimated availability of 6008 m3 in 1947. This itself, gives a broad indication of the growing resource scarcity in India in the fifty three years since independence.

India faces an increasingly urgent situation; its finite and fragile water resources are stressed and depleting while different sectoral demands are growing rapidly. This situation has developed incrementally, but is nevertheless dramatic. At Independence, India's population was less that 400 million and per capita water availability over 5,000 cubic meters per year. Today, fifty years later, population has grown to over a billion and per capita water availability has fallen to hardly more than 2,000 cubic metres per year and the actual usable quantity is around 1,122 cubic metres per year.

Environmental problems include water quality degradation from agro-chemicals, industrial and domestic pollution, groundwater depletion, water logging, soil salinisation, 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 remain critically important to social welfare and resource sustainability. High extraction of ground water has given rise to compounded Arsenic and Fluoride contamination and Saline Ingress. Where intensive agriculture is practised, Nitric levels in ground water are high.

In the past, 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 realisation regarding the need to address these problems.

At the same time, 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.

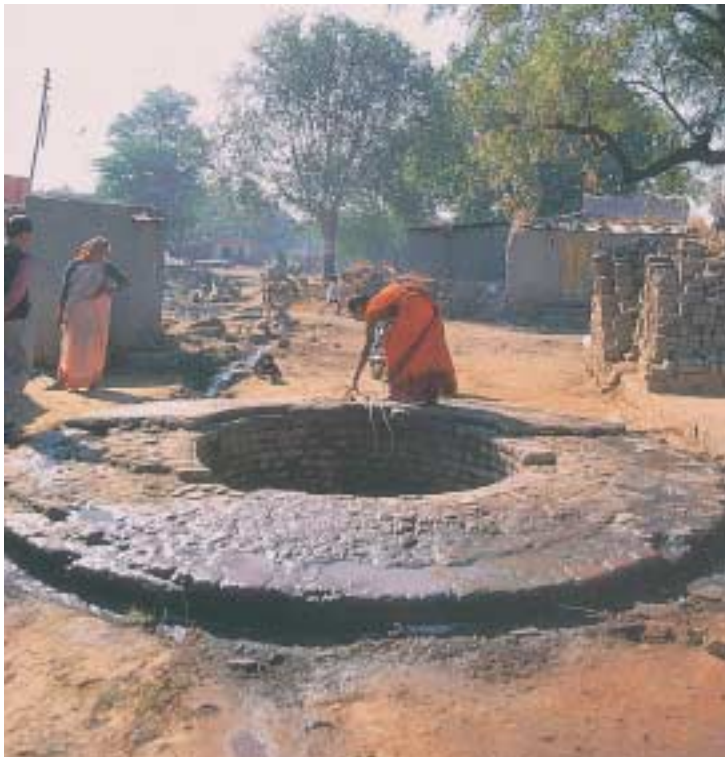
Water infrastructure investments have also enabled the rapid expansion of the urban and industrial sectors and the increased availability of safe drinking water in rural villages. Further, a variety of policies, legislation and institutional initiatives have been taken by India to better manage its water 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 generally more comprehensive than 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.

Evolution of Water and Sanitation Sector Programmes

Water supply and sanitation were added to the national agenda during the first five-year planning period (1951-1956). In 1954, the first national water supply programme was launched as part of the government's health plan (while sanitation is mentioned in the First Plan, it simply forms part of the section on water supply). Central and state administrations provided equal funding mainly for rural piped water supply schemes, with limited provision for point sources such as wells and boreholes. During the initial years, the programme realised only limited achievements mainly because the states lacked qualified work forces to plan and execute projects, and materials were in short supply. During each of the subsequent five-year plans, funding was allocated for the development and strengthening of state public health engineering departments. In recognition of the progress made, states were granted financial authority in 1968 to sanction rural water supply schemes (subject to defined limits). During this fifteen-year period, the programme sought to support local community development and improve the welfare of the backward classes.

The Ministry of Water Resources (MoWR) drafted a National Water Policy in 1987 to guide the planning and development of water resources throughout the country. The policy included several recommendations, which were subsequently adopted by the states. The recommendations focussed on the need for introducing (i) water resource management and according domestic water supply the highest priority (ii) design standards for groundwater structures to protect groundwater sources (iii) water quality monitoring and mapping, and (iv) data management and valuation. The 1987 policy has been



recently revised and the National Water Policy 2002 has now been adopted, once again according primacy to drinking water. While states have been asked to formulate state water polices based on this within the next two years, some states such as Karnataka, Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu have already drafted state policies based on the new national policy.

The national policy guiding the water and sanitation sector in India today is contained in the Eighth Five-Year Plan (1992-97), which states: "Safe drinking water and basic sanitation are vital human needs for health and efficiency [given that] death and disease, particularly of children,… and the drudgery of women are directly attributable to the lack of these essentials." High priority was given to serving villages that did not have adequate sources of safe water and to improving the level of service for villages classified as only partially covered. The Eighth Five-Year Plan also identified several points of emphasis including management of water as a commodity, delivery of water services based on principles of effective demand, standards of service corresponding to the level that users are willing to maintain, etc. The Ninth and Tenth Plan broadly follow the directions set by the Eighth Plan.

Overview of National Strategies

The primary responsibility for providing drinking water and sanitation facilities in the country rests with the State Governments, and, more specifically, the local bodies in the urban areas. The Centre provides allocates funds and also ensures that funds are provided in State budgets, and progressively larger allocations have been made for water supply and sanitation in the various Five Year Plans. National policy guiding India's approach to water supply and sanitation in the Eighth, Ninth and now the Tenth Plan broadly follow the guiding principles of the New Delhi declaration, adopted by the United Nations General Assembly in December 1990. These include (a) protection of the environment and safeguarding of health through the integrated management of water resources and liquid and solid waste; (b) organisation of reforms, promoting an integrated approach including changes in procedures, attitudes, and behaviour, and the full participation of women at all levels; (c) community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes; and (d) sound financial practices, achieved by better management of existing assets and extensive use of appropriate technologies.

The Tenth Plan envisages 100 per cent coverage of rural and urban population with safe drinking water as per the stipulated norms and standards (40 lpcd of safe drinking water within a walking distance of 1.6 Kms or elevation difference of 100 metres in hilly areas, to be relaxed as per field conditions; at least one hand pump/spot source for every 250 persons). The Plan also envisages establishment of a nationwide quality monitoring and surveillance system, evolution of cost effective and socially acceptable operation and maintenance (O & M) strategies, and reorienting the structure and functioning of rural water supply planning and implementing agencies to ensure sustainability. The Tenth Plan advocates management of water as an economic asset rather than a free commodity and places responsibility for source regeneration on all user agencies. The Plan also advocates comprehensive development of water resources, with the village as the focal unit.

Coverage remains an important agenda, and highest priority is being accorded to remaining 'not covered' and 'partially covered' habitations having a supply level of less than 10 litres per capita per day (lpcd) as also those affected severely with water quality problems. The Tenth Plan also advocates according highest priority to school sanitation, which is critical to the formation of proper habits for hygiene, sanitation and safe water use. Schools are being seen also as a powerful channel of communicating hygiene messages to homes and communities, and as critical to girls' education.

Effective interface and high degree of functional coordination between the development policy making and planning and implementation institutions is increasingly being stressed and intersectoral convergent programming is being advocated. Partnerships that go beyond traditional boundaries are increasingly being looked upon as an effective means of outreach. Thus, civil society groups such as non-governmental organisations (NGOs), other social organisations, women self-help groups, cooperative societies, civil societies, educational institutions, private institutions etc. are being increasingly involved.

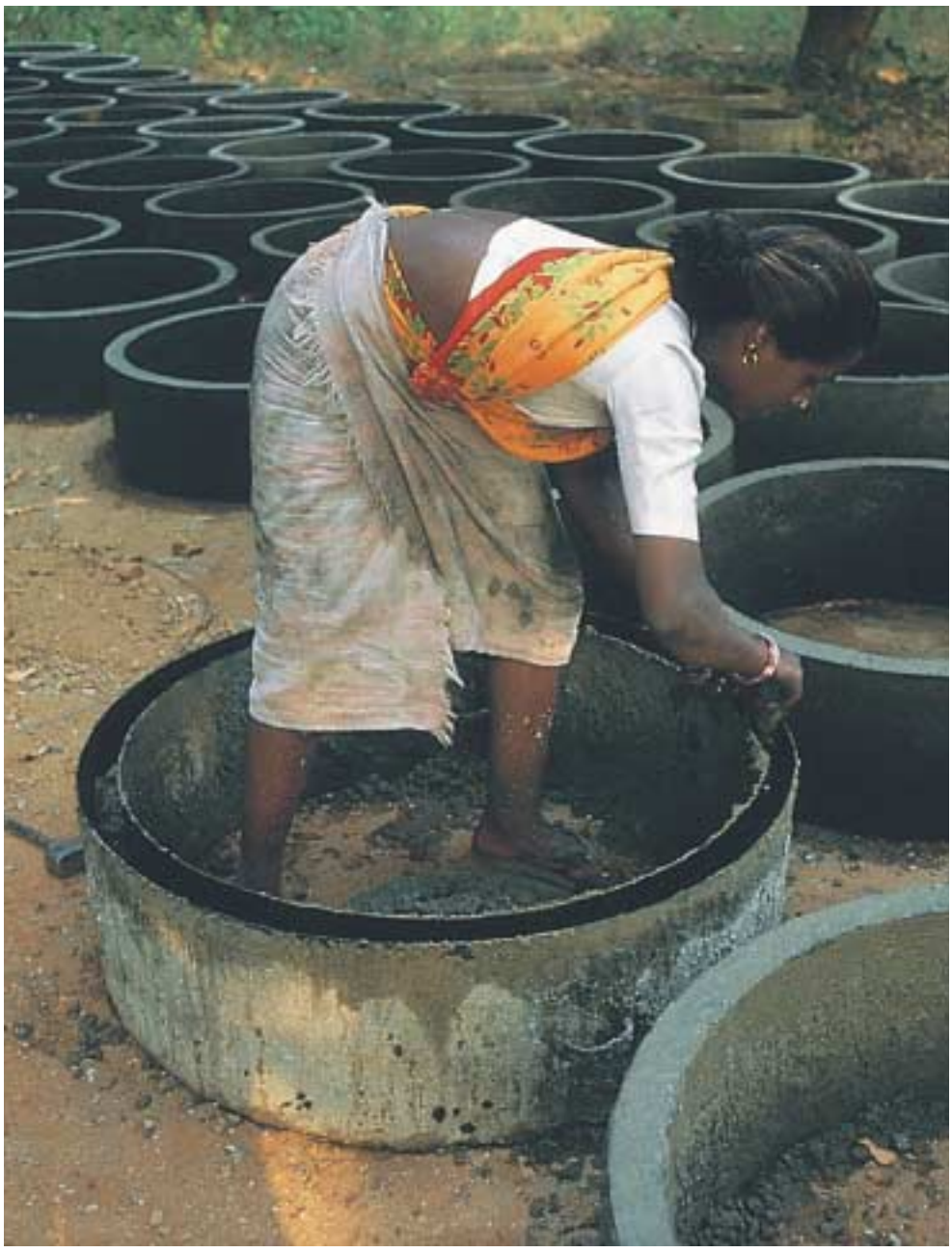
The rural sector has a strong water supply Sector Reform agenda, based on a paradigm shift towards decentralisation, demand responsiveness and people centred approach, increasingly taking the government from a direct service provider to a facilitator. Likewise, the Total Sanitation Campaign (TSC) approach of the Restructured Centrally Sponsored Rural Sanitation Programme (RCRSP – w.e.f.1.4.1999), which is based on the successful model of Midnapur (West Bengal), is also being adopted in other districts of the country with appropriate changes to suit the local conditions and perceptions.

The Tenth Plan places significant emphasis on Urban Water Supply and Sanitation (UWSS) as opposed to

previous Plans and emphasises strong reform agendas. As in the earlier plans, the objectives of universal coverage, adequacy in terms of minimum per capita consumption norms, regularity of supply, avoidance of excessive withdrawal leading to depletion and inaccessibility of water sources, and the need to conserve and make conjunctive use of water resources are highlighted. The Plan recognises that unsatisfactory service standards has lead to low tariff structures, which in turn results in poor resource positions, maintenance and service – a vicious circle – and that while surveys show consumer willingness to pay higher tariffs, such increases in tariff structures would have to be accompanied by substantial improvements in service quality. The Plan also recognises that given the above vicious circle, the main problem in financing of UWSS is the (un)sustainability of the current model, which is heavily dependent on state governments' willingness to provide guarantees for institutional finance and meeting the state share of project costs. Keeping in mind that innovative cost recovery mechanisms are exceptions rather than the rule, the Plan proposes several fiscal instruments.

INCREASING EMPHASIS ON BEHAVIOURAL CHANGE

Realisation that individual and group hygiene behavioural change is central to achieving success in the sanitation arena has meant that there is now strong emphasis on strategic planning in information, education and communication (IEC). Initiatives to inculcate safe hygiene behaviour in the formative years such as School Sanitation are being accorded the highest priority.



Institutional Structure

Role of Government of India

Water supply and sanitation is a State responsibility under the Constitution of India and following the 73rd and 74th Constitutional Amendments, the States may give the responsibility and powers to the Panchayati Raj institutions (PRIs) and Urban Local Bodies (ULBs). At present, States generally plan, design and execute water supply schemes (and often continue to operate) through their State Public Health Engineering Departments (or as in the case of some states, Panchayati Raj Engineering Departments or Rural Development Engineering Departments) and Water Boards. However, the Centre has seen the need over many years for coordination and harmonisation of standards. It has also been responsible, through the Five Year Plans, for guiding much of the investment in the sector as well as establishing other organisations to lend to the States. Similarly, it has taken a lead in recommending styles of water supply and sanitation organisations, in promoting the needs for training and research, and most recently in promoting water quality monitoring and human resources development programmes. In addition, a variety of different government institutions at the Centre have a role in the management of drinking water supply as government strives to fulfil its responsibilities for water resources coordination, pollution control and financing of infrastructure development.

India has had a series of Five Year Plans (with occasional variations) since 1951, reflecting the belief in central planning of a command economy. Preparation of the plans has been the responsibility of the Planning Commission, working under the Ministry of Finance (MoF) but agreement to the plans is the responsibility of the Prime Minister and the Chief Ministers of the States, meeting in committee. The Finance Commissions under the ministry's Department of Expenditure also provides funds for various activities to support the upgradation of standards of administration and special problems of States (In line with the national agenda for devolution of powers to local bodies, many states have set up State Finance Commissions to make recommendations on resource allocations to PRIs).

A variety of central institutions are involved with water supply and sanitation, either directly or indirectly. The Central Water Commission (CWC) in the MoWR has responsibilities for regulating the use of surface water for irrigation, industry and drinking water purposes. The CWC also mediates in inter-state water allocation disputes. The Central Groundwater Board (CGWB) of the same Ministry has an overseeing responsibility for the monitoring of groundwater levels and rates of depletion, as well as production of water resource inventories and maps. The Government of India (GoI) has circulated a comprehensive model bill for groundwater regulations.

The National Rivers Conservation Directorate (NRCD) under the Ministry of Environment and Forests (MoEF) oversees the implementation of Action Plans to improve the quality of the nation's rivers (previously their activities were confined to the Ganga Action Plan, but now extends to the polluted stretches of 27 major rivers with works spread over 149 towns in 16 states). The Central Pollution Control Board (CPCB) was set up in the Ministry to promote basin-wide pollution control strategies. The CPCB liaises with State Water Pollution Control Boards and lays down standards for treatment of sewage and effluents. The Board is also responsible for action in the case on non-compliance.

Other government agencies involved either directly or indirectly with water supply and sanitation in India include

the Ministry of Agriculture (MoA), which is involved in planning, formulation, monitoring and reviewing of various watershed based developmental project activities.

At national level, the RGNDWM (under the Department of Drinking Water Supply, MoRD) formulates guiding policy, sets standards, and provides funds and technical assistance to the states for rural water supply and sanitation (RWSS). It allocates funds under the Centrally Sponsored Accelerated Rural Water Supply Programme (ARWSP) and supervises the RCRSP. The RGNDWM has also a National Human Resource Development Programme (NHRDP – launched in 1994), which aims at training at least one grass root level worker in a village through district level trainers who in turn may be trained at selected institutions forming the Indian Training Network (ITN).

The HRD programme also aims at empowerment of PRIs/ Local Bodies with the objective of enabling them to take up operation and maintenance activities related to rural water supply systems. It also aims at capacity building of local communities by giving requisite training to mechanics/ health motivators/ masons etc. especially women to operate and maintain hand-pumps and the components of other water supply systems as well as to generate demand for adequate sanitation facilities. Under the NHRDP, several states have set up State level HRD cells for planning, designing, implementing, monitoring and evaluating an appropriate and need based HRD programme.

The MoUD is the nodal Ministry for policy formulation and guidance for the UWSS sector. The Ministry's responsibilities include broad policy formulation, institutional and legal frameworks, setting standards and norms, monitoring, promotion of new strategies, coordination and support to State Programmes through institutional expertise and finance. The Ministry is also responsible for managing international sources of finance. The Central Public Health and Environmental Engineering Organisation (CPHEEO), created in 1953, is the technical wing of the MoUD, which advises the Ministry in all technical matters and collaborates with the State Agencies about water supply and sanitation activities. CPHEEO plays a critical role in agreeing (giving technical sanction to) externally funded and special programmes and those parts funded by the Life Insurance Corporation of India (LIC). CPHEEO also plays a central role in setting design standards and norm setting for urban water supply and sanitation.

The Ministry also supports the States by sponsoring research relevant to the sector, largely through NEERI, the National Environmental Engineering Research Institute in Nagpur, Maharashtra. Areas of research include compost plants, urban water treatment plant evaluations, urban water supply tariffs, water distribution system performance evaluation, low cost methods of flocculation, optimisation of water treatment, drinking water in urban slums, leak detection equipment etc. MoUD launched the Accelerated Urban Water Supply Programme (AUWSP) in 1993/94 to implement water supply schemes in towns with population below 20,000 (as per 1991 census). Under this programme, 50 per cent of the estimated cost of the schemes is provided by the Ministry as a grant based on detailed project report and the remaining 50 per cent provided by the State government including a 5 per cent beneficiary/town contribution. In special cases, 100 per cent finance is available as the central share. The AUWSP is being administered through the CPHEEO at the Centre.

Another major area of Central Government assistance to the States is in human resources development. Concern with human resources development led to the Public Health Engineering (PHE) Training Programme starting in 1956. The programme is training 108 in-service engineers every year through 11 postgraduate courses in engineering. By 1996, a total of 1,950 had been trained on postgraduate courses. In addition, the CPHEEO arranges Short Term Courses. The Ministry has also jointly sponsored a Management Programme for Senior Public Health Officials with DFID funding for the past

five years. In addition to the countrywide Human Resources Development programmes, the Ministry is also supporting the establishment of HRD & Training Cells for the water sector in each State with a one-third grant for capital costs where proposals are approved. There has also been a centrally supported water quality monitoring programme again with substantial funding for water quality laboratories and monitoring staff in each state.

LIC (owned by the Government of India) has, as part of its statutory requirements, to invest 25 per cent of net accretion from its controlled funds in socially oriented schemes such as housing, education, water supply and road transportation. It has been advancing loans to local bodies and state level water supply and sewerage boards within the amount allocated by the Planning Commission for each state every year. The loans are advanced at concessional rates of interest on the security of the concerned state government guarantee.

HUDCO, the Housing and Urban Development Corporation is also very active in supporting the sector. It was set up by the GoI in a Bill passed in the Indian Parliament in 1970 with a mandate to assist the various government and semi-government organisations in implementing housing and urban development programmes in the country. In Orissa, for example, HUDCO finance is available to any organisation related with water supply and sanitation, either public or private, with a definite mandate for providing clean water and sanitation facilities. Realizing the importance of water supply needs HUDCO has accorded topmost priority to financing water supply schemes, especially in small and medium towns. As much as 37 per cent of the cumulative loan sanction for urban infrastructure schemes by HUDCO has gone to the water sector – for augmentation, rehabilitation extension as well as new schemes with development of sources for unserved areas.

The Ministry of Health and Family Welfare (MoHFW), and the Department of Health and Family Welfare have and continue to play important health related roles in India. The new National Health Policy 2002 adopted by the Ministry recognises that water supply and sanitation is part of an inter-connected set of factors that need to be addressed holistically and in coordination between various institutions. The All India Institute of Hygiene and Public Health (AIIH & PH), Kolkata, under the Ministry continues to be a leader in pursuit of its mandate for HRD in the field of public health and research, support services in urban (slum) and rural areas; and support and guide various programmes at the National level. Some of the important Research projects undertaken by this Institute include water toxicity-bioassay tests, water quality surveillance programmes in five districts in different states in India, and a comprehensive, capacity building, training and awareness generation programme to tackle the arsenic problem in West Bengal.

The Central Bureau of Health Intelligence (CBHI) is the Health Intelligence Wing of the Directorate General of Health Services. At the national level, it is the sole organisation, which deals with the collection, compilation, analysis and dissemination of the information on health conditions in the country covering various aspects of health including health status, health resources, utilisation of the health facilities etc. It also conducts the training programmes for various categories of statistical personnel dealing with health and medical records and arranges training for overseas fellows in the country on health statistics. The National Institute of Communicable Disease (NICD), under the Directorate General of Health Services provides training, services and operational research in the field of communicable diseases. The Institute acts as a centre for excellence in providing multi disciplinary and integrated expertise in the control of communicable disease.

Although not part of the formal management of the sector, the judiciary, especially the Supreme Court of India, have become involved (largely owing to public interest litigations) and have ordered the introduction of treatment schemes in a number of cases.

Role of the State

With the exception of some of the northeastern states and union territories, which have either public works departments or irrigation departments handling rural water supply, most states have separate public health engineering departments charged with planning, investigation and design. In some states (such as Gujarat, Kerala, Maharashtra and Tamil Nadu) the WSS Boards have been constituted to handle urban and rural water (and one state, Uttar Pradesh, formed a corporation), following the Third Five-Year Plan recommendation to form statutory water and sewerage boards.

With the recent move toward decentralisation, a mix of agencies have evolved, including state public health engineering departments, state boards and district engineering agencies. In some states, such as Maharashtra, the organisational matrix is complicated. The Groundwater Survey and Development Agency is responsible for hand pump programmes, the Maharashtra Water Supply and Sanitation Board is responsible for piped water supply, the district is responsible for operating and maintaining all drinking water installations and the Irrigation Department is responsible for drinking water sources downstream of command areas. Despite the apparent organisational complexity, the national trend is to decentralise capital investment responsibilities to Zilla Parishad engineering departments at district and block levels, and operations and maintenance activities to district and, in many cases, gram panchayat levels. Andhra Pradesh is the only state in which water supply and sanitation is the exclusive responsibility of the Panchayat Raj Engineering Department. At the local levels, gram panchayats are the lowest tier in the local administrative framework and may be responsible for one or more villages or habitations. The block is the intermediate tier in the local administration framework, serving, in the vast majority of states, a population ranging between 100,000 and 150,000. The district is the top tier of local government. Hygiene education is largely delivered via the Education Departments and the school sanitation programme, and via RGNDWM's programmes on IEC, especially in the TSC areas.

Sector Agencies Outside of Government

NGOs (both national and international) have played a significant role in the sector in India over the past three decades. They have exhibited comparative advantages that other organisations lack. These include the capacity to: (i) reach the rural poor and remote areas (ii) promote local participation (iii) operate at low costs, and (iv) adapt and be innovative when needed. The initial involvement of NGOs in the sector came in the sixties with the famines in Bihar (1964) and Maharashtra (1969). In this early period, NGOs functioned as drilling

URBAN WATSAN DEVOLUTION

Following the 74th Constitutional Amendment, states may give the responsibility and powers for UWSS to ULBs. This has resulted in a multiplicity of institutional arrangements, varying from state to state. Such institutions may be state level specialist agencies with various jurisdictions varying from entire states (Kerala for example), small cities, or large cities. Others include metropolitan level specialist agencies such as in Bangalore, Chennai and Hyderabad, specialist municipal undertakings (such as in New Delhi), public health engineering departments with various jurisdictions (entire state in Rajasthan, small cities in Andhra Pradesh), and municipal departments. In many cases, responsibilities for capital works and O & M are split between two agencies.

contractors to state governments and donor-financed programmes. The efforts of these NGOs convinced the donor community and the government to invest in hand pump programmes for drinking water, especially in the chronically drought-prone areas of the country. More recently, NGOs have operated successfully within donor-assisted projects where the institutional context is conducive, such as the World Bank funded project in Karnataka and the World Bank-assisted Uttar Pradesh RWSS project. In these projects, NGOs have been used mostly as an intermediary between the community and the water agency, facilitating project activities related to community mobilisation, cost sharing, health education, and other non-technical activities. Other noteworthy activities are in the area of watershed development, where NGOs have taken a holistic approach to water resources development in areas as far-flung as the Gangetic delta of West Bengal and the Himalayan foothills. Other success stories include for example, those in Gujarat and West Bengal (in Safai Vidyalay, Ahmedabad, and in Midnapur, under the Ramakrishna mission), SPARC in Pune, and Sulabh International across many urban cities and towns, and various projects funded by Water Aid in southern India.

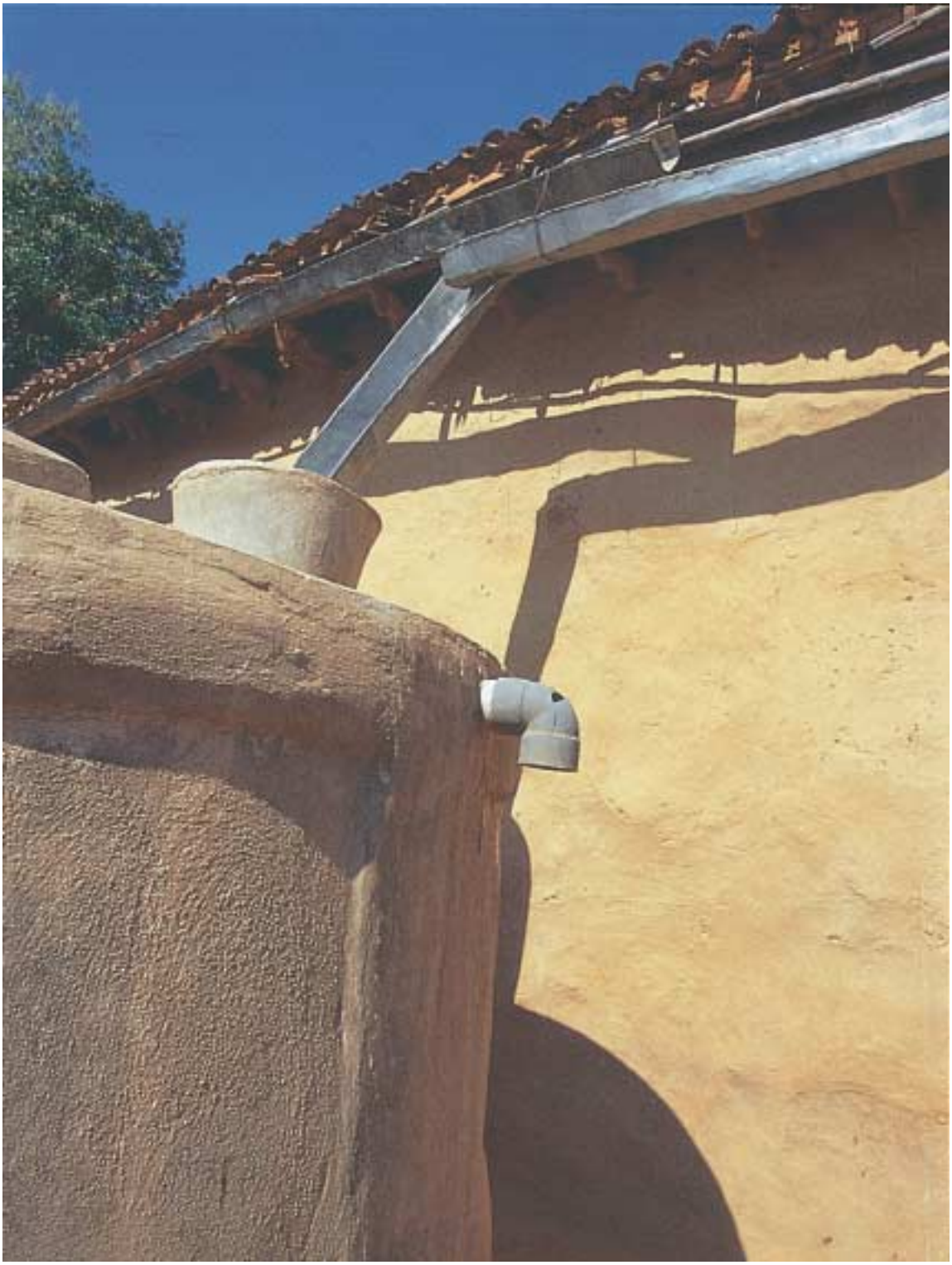
Private initiatives continue to drive the construction and maintenance of traditional open wells and household toilets. Nationwide, the number of privately constructed toilets is almost twice the number constructed through government programmes. The private sector is involved in the supply of materials and construction and, to a minor extent, maintenance. Private consulting firms (and NGOs) are also engaged on a very limited basis by state sector agencies. Although operations are performed almost exclusively by government agencies, private sector involvement in construction under government contracts constitutes a substantial part of capital investments. Procurement of materials and construction services from private firms amounts to more than two-thirds of annual investment in the sector. Bore well drilling and hand pump installation has been dominated by state water agencies. However, the private sector has been involved in groundwater development, and a huge network of private drilling contractors has been meeting the large demand for irrigation tube wells. Local private contractors are a viable O & M alternative to the public agencies and already have a presence in rural areas. Local private mechanics for instance, provide maintenance and repair services for farmers' irrigation tube wells.

LEVELS OF EXTERNAL DONOR ASSISTANCE

External donor assistance accelerated at the beginning of the International Drinking Water and Sanitation Decade, and during that period donor assistance accounted for almost 6 per cent of total sector investment. Today development assistance constitutes roughly only half that level.

Several external multilateral and bilateral agencies provide assistance to the sector in India. Some of the external support agencies (ESAs) include the bilateral agencies of Japan, the United Kingdom, the United States, Denmark, Sweden, Germany, Australia, Netherlands, etc and multilaterals such as the World Bank, WHO, UNICEF, Water and Sanitation Program – South Asia, UNDP, and the European Union.

While in percentage terms the levels of external donor assistance in relation to government investments have been falling, ESAs have made invaluable contributions to the sector in terms of supporting demonstration and experimentation at the project level, research, introduction of technological innovations, etc.
More recently, ESAs have supported reform agendas – most recent donor assisted projects have emphasised innovative features as conditions for lending, such as user participation, cost sharing and cost recovery. They have also adopted an integrated demand oriented approach to sector operations.



Situation Analysis

Water Resources

Since freshwater is essential for water supply and sanitation, an examination of the freshwater situation in India is required. As mentioned in the introduction, freshwater availability is uneven across India, and huge disparities exist, from basin to basin, region to region, state to state, and in many cases, even within states.

Declining availability

In terms of surface water, of 4,000 BCM of available water from precipitation, the mean flow in the country's rivers is about 1,900 BCM. Out of this, only 690 BCM is utilisable. Assessments of replenishable ground water resources have been made at 431.9 BCM by the CGWB through a large volume of hydrologic and related data. This is the sum total of potential due to natural recharge from rainfall and due to recharge contributions from canal irrigation. The utilisable ground water resources have been assessed at 395.6 BCM (70.0 BCM for domestic and industrial uses and 325.6 BCM for irrigation). The CGWB has also assessed the quantum of static ground water resources at 10,812 BCM.

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Increasing demand

The demand for fresh water has been identified, as the quantity of water required to be supplied for specific use and includes consumptive as well as necessary non-consumptive water requirements for the user sector. The total water withdrawal/utilisation for all uses in 1990 was about 518 BCM or 609 BCM per capita per year. The country's total water requirement by the year 2050 will become 1,422 BCM, which will be much in excess of the total utilisable average water resources of 1,086 BCM. At the national level, it would be a very difficult task to increase the availability of water for use from the 1990 level of approximately 520 BCM to the desired level of 1,422 BCM by the year 2050 as most of the undeveloped utilisable water resources are concentrated in a few river basins such as the Brahmaputra, Ganga, Godavari, and Mahanadi.

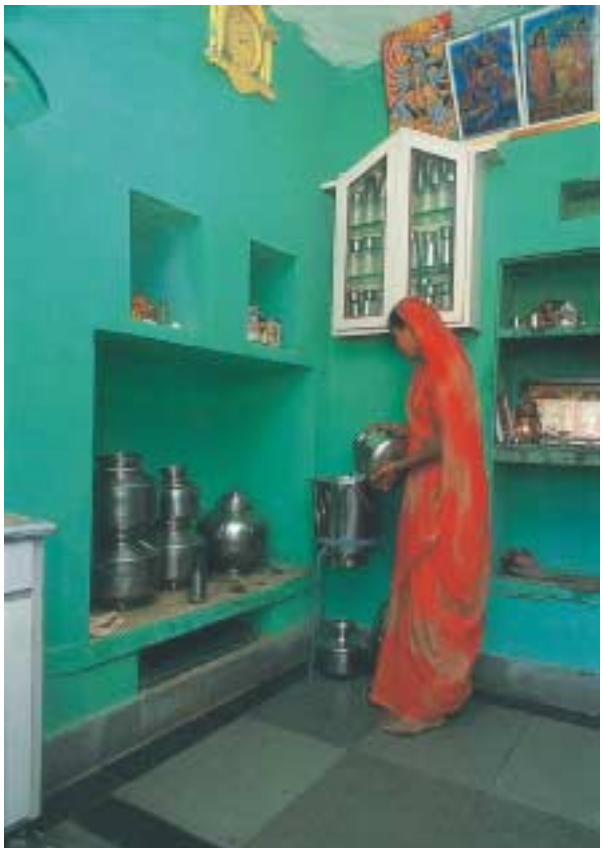
Resource degradation

There is enough evidence to indicate that the available freshwater resource base is degrading rapidly. The major rivers of the country have generally retained pristine water quality in the less densely populated upper stretches where the likelihood of getting affected by man's interference is minimal. As the rivers enter the plains, these start getting exploited for irrigation and receiving pollution discharges due to human activities such as intensive agriculture, use of fertilisers and insecticides, domestic sewage, industrial effluents etc. Thus in the middle stretches, the rivers are most affected both due to increased water requirement for various consumptive and non-consumptive uses, and degraded water quality. This makes the situation grave especially during the lean flow season when the amount of dilution water available is less.

The CPCB has been monitoring water quality of national aquatic resources in collaboration with concerned State Pollution Control Boards at 507 locations, of which 430 stations are under MINARS (Monitoring of Indian

National Aquatic Resources), 50 stations are under GEMS (Global Environmental Monitoring Systems) and 27 stations under the YAP (Yamuna Action Plan). The water quality monitoring results obtained during 1998 indicate that organic and bacterial contamination continue to be critical sources of pollution in Indian aquatic resources. The Yamuna River is the most polluted in the country having high biological oxygen demand (BOD) and coliform in the stretch between Delhi and Etawah. Other severely polluted rivers are the Sabarmati at Ahmedabad, Gomti at Lucknow, Kali, Adyar, Cooum (entire stretches), Vaigai at Madurai, and Musi of Hyderabad.

CPCB has also carried out limited water quality monitoring of the wells in different states and calculated percent violations over the desired levels of water quality in terms of pH, dissolved oxygen, BOD and total coliform. Certain locations in these states reported 100 per cent violation over the desired levels for dissolved oxygen and total coliform. CGWB's studies on chemical composition of groundwater in phreatic zones have revealed that in many cases anomalously high concentrations of nitrates, potassium and even phosphates are present in contrast to their virtual absence or low concentration (nitrate and potassium < 10 mg/l) in semi-confined and confined aquifers. The unsystematic use of synthetic fertilisers coupled with improper water management has affected the groundwater quality in many parts of the country. The state-wide brief account of the incidence of groundwater pollution also reflects the occurrence of high concentrations of heavy/toxic metals, fluoride and nitrates at different locations around the country. The presence of zinc in shallow aquifers of Delhi is reported at places located close to areas of intensive agricultural practices coupled with extensive use of chemical fertilisers.



Even with strong legislative provisions such as the Water (Prevention and Control of Pollution) Act and the Environment Protection Act, since 1974 and 1986 respectively, 851 defaulting industries were located along the rivers and lakes in 1997. The Water Cess Act, 1977 has also failed to act as a market-based instrument in reducing the quantity of polluted discharges.

Drinking Water

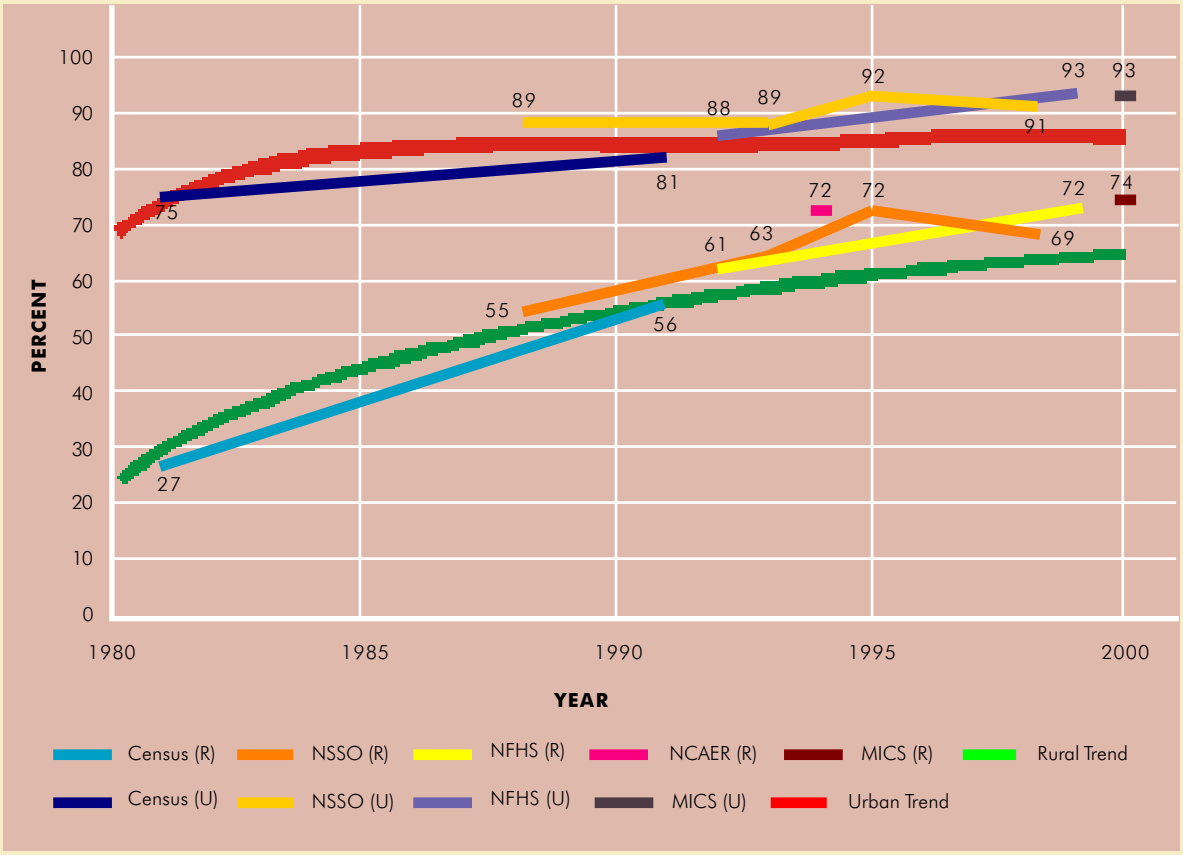
Rural and urban coverage

Analysis of data from a variety of sources shows that between 69 to 74 per cent of India's rural population take their drinking water from protected sources, leaving an unserved population of 26 to 31 per cent (see figure 2).

The same chart also shows that between 91 to 93 per cent of India's urban population take their drinking water from protected sources, leaving an unserved population of between seven to nine per cent. Data compiled by the WHO-UNICEF JMP process roughly coincide with these findings (primarily because many of the data sources are the same – see table 3).

Data available with the Department of Drinking Water Supply shows that of the 1.42 million rural habitations in the country, 1.27 million are fully covered (FC),

FIG 2: WATER SUPPLY COVERAGE AND USE
Households taking their drinking water from protected sources – India



Information regarding the quantity of water per capita per day is not reflected in the graph. Water sources considered protected are: Handpump and piped water. However, even these sources can at times be bacteriologically polluted.

Source: Census 1981, 1991; National Sample Survey Organisation (NSSO) 44R, 49R, 52R, 54R, NFHS I, II; National Council for Applied Economic Research (NCAER) 1994; Multiple Indicator Cluster Survey (MICS) 2000.

0.13 million are partially covered and 15,917 are not covered. While it is impossible to present state level data here owing to constraints of space, it is important to note that coverage is also not uniform across the country and varies widely from state to state. For example, of the 35 states in India, only seven have achieved full coverage of rural habitations (Bihar, Chhatisgarh, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Daman & Diu, Delhi, Lakshadweep, and Chandigarh) and the others to varying degrees. On the urban front, in class I cities and class II towns of the country, there is a huge disparity in quantity of water supplied. Of the 393 class I cities, only around 77 cities have cent percent water supply coverage.

The per capita water supply also ranges from as low as 9 litres per capita per day (lpcd) in Tuticorin to as high as 584 lpcd in Triuvannamalai. Similarly, around 203 of the 401 class II towns have low per capita supplies of less than 100 lpcd. Besides an inequitable distribution of water in a given city, the supplies are erratic with water quality degrading continuously over time.

TABLE 3:

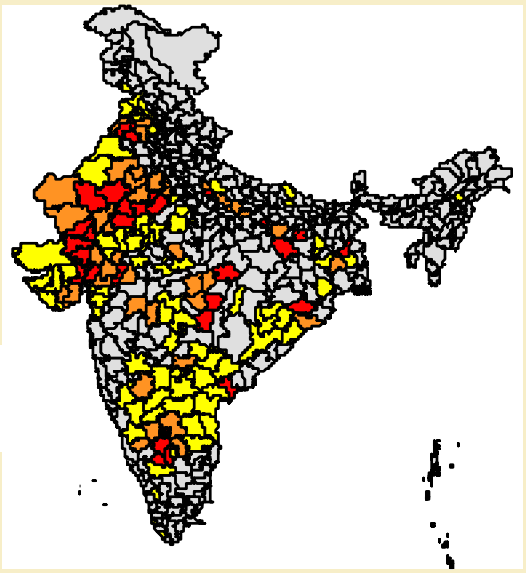
WHO-UNICEF JMP WATER SUPPLY DATA

			DRINKING WATER			
			URBAN		RURAL	
Source	Code	Year	data used for estimates	other data	data used for estimates	other data
The International Drinking Water Supply and Sanitation Decade. Review of National Baseline Data (as at December 1980). WHO 1984	WHO80	1980		77		31
Census 1981*(No breakdown available)*	CEN81	1981		75		27
The International Drinking Water Supply and Sanitation Decade. Review of National Progress (as at December 1983). WHO 1986.	WHO83	1983		80		47
The International Drinking Water Supply and Sanitation Decade. Review of National Progress (as at December 1988). WHO 1990.	WHO88	1988		79		73
National Sample Survey 1989 *(No breakdown available)*	NSS89	1989		89		55
The International Drinking Water Supply and Sanitation Decade. End of Decade Review (as at December 1990). WHO1992.	WHO90	1990		86		69
Water Supply and Sanitation Sector Monitoring Report 1993 (Sector Status as of 31 December 1991)	JMP93	1991		87		85
Census 1991 *(No breakdown available)*	CEN91	1991		81		56
India – Demographic & Health Survey - 1992/93	DHS93	1993	89		64	
India – National Sample Survey – 1993	NSS93	1993	90		67	
Water Supply and Sanitation Sector Monitoring Report – 1996. (Sector Status as of 31 December 1994). WHO/UNICEF 1996.	JMP96	1994		85		79
India – National Sample Survey – 1996	NSS96	1996	93		75	
Indian Institute of Mass Communication, Water and Sanitation Baseline Survey, 1997	IIMC97	1997				72
India, National Family Health Survey, 1998-1999, *Special tabulation*	DHS99	1999	94		75	
Global Water Supply and Sanitation Assessment 2000. Water Supply and Sanitation Sector Questionnaire – 1999. (Form 6 sent to WHO)	JMP99	1999		90		
Multiple Indicator Cluster Survey 2000	MICS00	2000		94		80
Estimates based on linear regression of the above data points		1990 2000	88 95		61 79	

Water quality

High fluoride concentration in ground water, beyond the permissible limit of 1.5 ppm, has come to stay as a major issue affecting a large segment of rural population to the tune of 25 million spread in over more than 200 districts in 17 states in the country. The population at risk is estimated at around 66 million.

FLUORIDE AFFECTED AREAS IN INDIA



Sixteen States affected

66 million people at risk

Severly affected

Moderately affected

Affected: Severity not well known

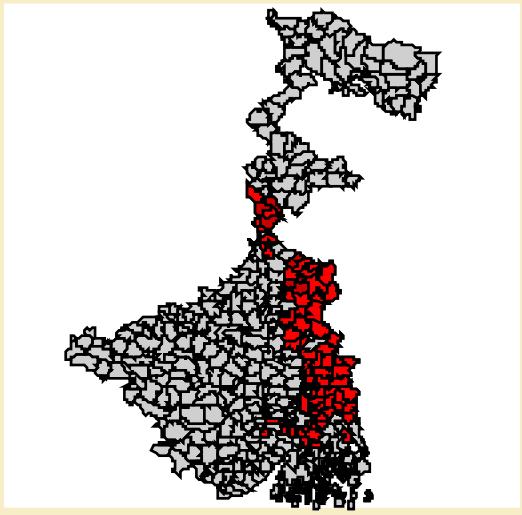
Data not available or not affected

Source: WHO

The presence of excess Arsenic in ground water has been reported from West Bengal. Nearly 13.8 million people in 75 blocks are reported at risk. It is also reported that around 0.2 million people in West Bengal have arsenic related skin manifestations.

Other water quality problems in India include varying iron levels in groundwater (which restricts water utility owing to colour, turbidity and taste), especially in northeastern India, heavy metals such as Chromium, Lead, Nickel, Zinc, Copper, and Manganese (especially around industrial towns – however, extensive surveys have yet to be carried out), nitrates, and bacteriological contamination (widespread owing to reasons including poorly maintained or non-existent hand pump platforms, inadequate or no drainage, and poor hygiene around drinking water sources).

ARSENIC AFFECTED AREAS OF WEST BENGAL



75 blocks in West Bengal affected

13.8 million people at risk

Source: WHO

Hand pump attached defluoridation and iron removal plants have failed due to inappropriate technology, unsuited to community perceptions and community involvement. Desalination plants have been a costly failure mainly due to lapses at different levels such as poor planning and implementation, inappropriate technology to the rural setting and high costs of O & M.

Over the last decade industrial waste and the municipal solid waste (MSW) have emerged as the leading causes of the pollution of surface and groundwater. In urban regions, river water is, to a large extent, treated before it is supplied by the municipal authorities to the people for drinking and other domestic purposes. However, most

Indian rivers today fall short of CPCB's standards, due to excessive pollution by untreated sewage, and domestic and industrial waste.

Sectoral issues

The National Agenda for Governance seeks to provide safe drinking water to all rural habitations within five years i.e., by March 2004. A large number of surveys have been done since 1996 to check the validity of government figures as also to measure the level of public satisfaction. In 1996-97, the Programme Evaluation Organisation (PEO – an independent organisation under the Planning Commission) studied 87 villages in 29 districts of 16 States. Although in the selected villages, the number of people who had access to drinking water from government sources had increased from 69 per cent to 81 per cent between 1986 and 1996, PEO came across serious problems even though the definition of 'providing' water was very liberal: source need to be within 1.6 km, one hand pump would suffice for 250 persons and 40 litres a day per adult in a habitation would be taken as fully covered (FC). Of the 29 districts studied, 19 reported the problem of frequent water scarcity. Of the 87 villages 40 per cent complained of shortage during summer months and 30 per cent people reported that water supply was not dependable. There was frequent breakdown of power in case of piped water supply and damage in pipelines led to leakages and contamination; for hand pumps, quality of construction was not satisfactory in 47 per cent cases and there was frequent mechanical failure.

Testing and maintenance of hand pumps, etc are responsibilities of different departments; only in 27.6 per cent cases routine maintenance activity of oiling etc. were undertaken. About 87 per cent of the districts reported breakdowns during the year, out of which only in 43 per cent cases repairs were undertaken. Often spares were not available and funds were inadequate. Local communities participated only in 20 out of 87 villages, mostly in identifying suitable sites and contributing their labour, involvement in O & M was hardly observed.

In 21 per cent cases Panchayats looked after O & M, in 9 per cent cases Panchayats supervised and regulated water supply, only in 3 out of 87 villages water committees were formed. Some states have not been able to get the full release of allocated fund of Central assistance under the ARWSP particularly due to non-provisioning of matching State Plan funds and thus have lost quite a substantial amount of Central assistance during the Eighth Plan and during first three years of the Ninth Plan. The biggest loser has been Bihar, which has lost about Rs.4000 million of Central assistance during the last five years.

On the urban water supply front, transmission and distribution networks are largely of very poor quality, in addition to being outdated and badly maintained, resulting in higher operating costs. Physical losses are typically high, ranging from 25 to over 50 per cent. Low pressures and intermittent supplies lead to back siphoning, resulting in contamination in the distribution network. Water is generally available for only two to eight hours a day in most Indian cities. As mentioned in the introduction, unsatisfactory service standards has led to low tariff structures, which in turn has resulted in poor

MIXED URBAN REVENUE RECOVERY

Areas of concern in operation and maintenance of water supply include paucity of funds, non-availability of adequate trained work force and over-centralisation and poor revenue recovery rates. Percentage of revenue generation to O & M cost in cities of Kolkata, Nagpur, Pune, Ludhiana, Lucknow and Kanpur (in March 1998) was 14, 48, 49, 40, 50 and 78 respectively. Even in Delhi, the national capital city, the revenue generation was only about 26 per cent of the production cost in 1997-98, though this has improved to 43 per cent in 1999-2000. At the same time, there are also good examples where revenue generation is more than 100 per cent, e.g. Hyderabad (230), Mumbai (268), and Chennai (184).

resource positions of ULBs, poor maintenance and service – a vicious circle. The problem is compounded by the rapid growth of urban centres and corresponding growth in the demand for services.

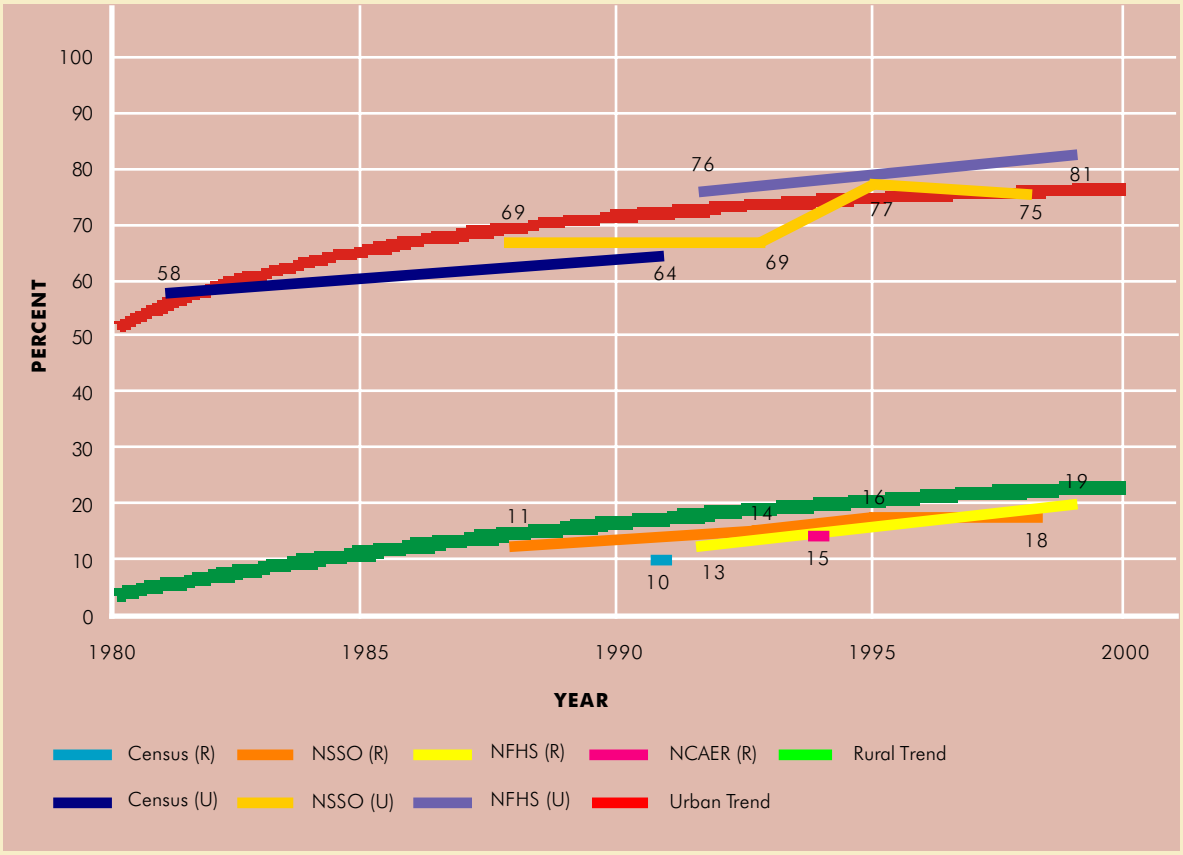
Persons employed per 1,000 connections rate from 17 to 33, indicating overstaffing compared to international best practices. While this is so, most personnel lack adequate training. Other major issues in the sector are the lack of adequate information/data, lack of performance evaluation and regular monitoring, overlap of functions between various local bodies and institutions leading to absence of or inadequate functional and financial powers, inefficient billing and collection practices.

Sanitation

Rural and urban coverage

Analysis of coverage data from various sources (see figure 3) shows that despite the acceleration of coverage under the Eighth Plan, only between 18 to 19 per cent of all rural households have a toilet. However,

FIG 3: SANITATION COVERAGE
Households having a toilet – India



Information regarding the type of latrine available to the household is not reflected in the graph.

Source: Census 1981, 1991; National Sample Survey Organisation (NSSO) 44R, 49R, 52R, 54R, NFHS I, II; National Council for Applied Economic Research (NCAER) 1994; Multiple Indicator Cluster Survey (MICS) 2000.

TABLE 4:

WHO-UNICEF JMP SANITATION DATA

			SANITATION			
			URBAN		RURAL	
Source	Code	Year	data used for estimates	other data	data used for estimates	other data
The International Drinking Water Supply and Sanitation Decade. Review of National Baseline Data (as at December 1980). WHO 1984	WHO80	1980		27		1
Census 1981*(No breakdown available)*	CEN81	1981		58		
The International Drinking Water Supply and Sanitation Decade. Review of National Progress (as at December 1983). WHO 1986.	WHO83	1983		30		1
The International Drinking Water Supply and Sanitation Decade. Review of National Progress (as at December 1988). WHO 1990.	WHO88	1988		38		4
National Sample Survey 1989 *(No breakdown available)*	NSS89	1989		69		11
The International Drinking Water Supply and Sanitation Decade. End of Decade Review (as at December 1990). WHO1992.	WHO90	1990		44		3
Water Supply and Sanitation Sector Monitoring Report 1993 (Sector Status as of 31 December 1991)	JMP93	1991		53		2
Census 1991 *(No breakdown available)*	CEN91	1991		64		10
India – Demographic & Health Survey – 1992/93	DHS93	1993	57		11	
India – National Sample Survey - 1993	NSS93	1993	43			
Water Supply and Sanitation Sector Monitoring Report – 1996. (Sector Status as of 31 December 1994). WHO/UNICEF 1996.	JMP96	1994		70		14
India – National Sample Survey – 1996	NSS96	1996	50		6	
Indian Institute of Mass Communication, Water and Sanitation Baseline Survey, 1997	IIMC97	1997				17
India, National Family Health Survey, 1998-1999, *Special tabulation*	DHS99	1999	61		17	
Global Water Supply and Sanitation Assessment 2000. Water Supply and Sanitation Sector Questionnaire – 1999. (Form 6 sent to WHO)	JMP99	1999		49		
Multiple Indicator Cluster Survey 2000	MICS00	2000		76		18
Estimates based on linear regression of the above data points		1990 2000	44 61		6 15	

the trend line shows that there has been increase in coverage, from around 10 per cent in 1990.

At the same time, between 75 to 81 per cent of all urban households in India have toilets, an increase from the 1990 figures of around 64 per cent. Once again, data compiled by the WHO-UNICEF JMP process (see table 4) roughly coincides with these findings.

The higher percentages for urban sanitation have largely been due to private initiatives at the household level and due to high concentrations of household toilets in the larger urban metropolitan cities. Coverage performance at the rural levels has obviously not been as successful. This has been due to a multiplicity of factors including low awareness of the potential health benefits (and therefore, economic benefits) of better hygiene practices, perception of the costs of having a household toilet as being very high and in most cases unaffordable, the sheer convenience (at least for men) of open defecation (vis-à-vis an enclosed space), high subsidies, and inadequate promotion of awareness.

As in the case of water supply, disparities across states exist. National Family Health Survey (NFHS-II) data on toilet facilities shows that the proportion of households having access to toilet facilities in larger, more populated and poorer States was much lower than the national average. These include Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu and Uttar Pradesh. Among the smaller States, only Himachal Pradesh followed this pattern. In case of Kerala, the proportion of households with access to household toilet facilities at 85 per cent was much above the national average of 36 per cent.

The coverage in terms of organised sewerage systems ranged from 35 per cent in class IV cities, to 75 per cent in class I cities. Studies conducted by the CPCB during 1994-95 showed that the total wastewater generated in 300 class I cities is around 15,800 million litres a day (MLD), while the treatment capacity is hardly 3,750 MLD. Twenty-three metro cities generate over 9,000 MLD of sewage, of which about 60 per cent is generated in the four mega cities (Mumbai, Delhi, Kolkata, and Chennai) alone. Of the total wastewater generated in the four metros, barely 30 per cent is treated before disposal. Thus, the untreated and partially treated wastewater eventually finds its way into freshwater resources such as rivers, lakes, and groundwater.

There has been a significant increase in MSW generation in India in the last few decades. This is largely because of rapid population growth and economic development in the country, and solid waste management has become a major environmental issue in India. The per capita of MSW generated daily, in India ranges from about 100 g in small towns to 500 g in large towns. Although, there is no national level data for MSW generation, collection and disposal, and increase in solid waste generation over the years, some estimates can be made. For example, the population of Mumbai grew from around 8.2 million in 1981 to 12.3 million in 1991, registering a growth of around 49 per cent. On the other hand, MSW generated in the city increased from 3,200 tonnes per day to 5,355 tonnes per day in the same period registering a growth of around 67 per cent. This clearly indicates that the growth in MSW in our urban centres has outpaced the population growth in recent years. This trend can be ascribed to changing lifestyles, food habits, and change in living standards. MSW in cities is collected by respective municipalities and transported to designated disposal sites, which are normally low-lying areas on the outskirts of the city. The limited revenues earmarked for the municipalities make them ill equipped to provide for high costs involved in the collection, storage, treatment, and proper disposal of MSW. As a result, a substantial part of the MSW generated remains unattended and grows in the heaps at poorly maintained collection centres and landfill sites. The poorly maintained landfill sites are prone to groundwater contamination because of leachate production. Open dumping of garbage facilitates the breeding for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests. Landfill sites also

generate gas emissions that are 50 to 60 per cent methane, which is a greenhouse gas contributing to global warming.

Sectoral issues

Some of the issues that have stood in the way of effective implementation of rural sanitation programmes include very low priority accorded to sanitation by the state governments and the people at large, lower emphasis on IEC, promotion of a single model i.e., twin-pit pour-flush toilets (which were costly to build, and therefore out of reach of many rural households), heavy reliance on subsidy, lack of motivation efforts, poor disposal of waste water from water points (creating un-hygienic conditions), sanitation services not corresponding to the local culture and habits, scarcity of water, and lack of community participation and NGO/Private Sector involvement.

Field studies show poor utilisation of existing sanitary toilets, largely due to lack of awareness, scarcity of water, poor construction standard, emphasis on standardised designs without attention to local specificities and general absence of involvement on the part of the beneficiaries. The Indira Awas Yojana also has a component of toilet, but the facility is often used as an extra room. A number of field studies, village level studies, evaluation reports and donor agency status papers have drawn attention to the serious problems in the programme design and implementation. Conversely, there is very strong evidence that in States where Centrally Sponsored Rural Sanitation Programme (CRSP) has not picked up to any significant extent, the gap has been to some extent filled by private initiative.

On the urban front, while access to household toilets in urban India is relatively high, sanitation beyond home toilets is a different story. Out of 300 Class-1 cities, about 70 have partial sewerage systems and sewage treatment facilities.

Thus, untreated water finds its way into water systems such as rivers, lakes, groundwater and coastal waters, causing serious water pollution.

Sector Approaches

Water resources

The National Water Policy, 2002, formulated by the GoI incorporates several changes from the 1987 Policy. It recognises the need for well-developed information systems at the national and state level, comprising of standardised networks of data banks and databases as a prerequisite for resource planning. The policy places strong emphasis on non-conventional methods for utilisation such as inter-basin transfers, artificial recharge, desalination of brackish or sea water, as well as traditional water conservation practices such as rainwater harvesting, etc to increase utilisable water resources. It also advocates watershed management through extensive soil conservation, catchment area treatment, preservation of forests and increasing forest cover and the construction of check dams. The policy also recognises the potential need to reorganise and reorient institutional arrangements for the sector and emphasises the need to maintain existing infrastructure. As in the 1987 policy, the new policy accords top priority to drinking water supply, followed by irrigation, hydropower, navigation and industrial and other uses. The policy also addresses issues such as planning of water resource development projects, maximising water availability, water pricing, water quality, water zoning for proper management of resources and other issues.

Under the National River Action Plan (NRAP), certain stretches of major rivers with high or intermediate levels of pollution have been identified by the CPCB. Sewage collection and treatment works being created to reduce the pollution load to these rivers include schemes for better sewage interception and diversion, construction of sewage treatment plants, provisions for low cost sanitation and other schemes. In the first phase, in the GAP (Ganga Action Plan), 29 towns were selected along the river and 261 schemes of pollution abatement sanctioned. At present, 156 towns are being considered under the NRAP, out of which about 74 towns are located on the river Ganga, 21 on the river Yamuna,

12 on the Damodar, 6 on the Godavari, 9 on the Cauvery, 4 each on Tungbhadra and Satlej, 3 each on the Subarnarekha, Betwa, Wainganga, Brahmini, Chambal, Gomti, 2 on the Krishna and one each on the Sabarmati, Khan, Kshipra, Narmada, and Mahanadi.

To focus on urban lakes subjected to anthropogenic pressures, the National Lake Conservation Plan (NLCP), 1993 was prepared. Bhoj Lake of Madhya Pradesh is already getting assistance under funds provided by the Overseas Economic Cooperation Fund (OECF), Japan. Under the World Bank aided Industrial Pollution Control project there is a provision of loan and grant assistance to proposals of construction of common effluent treatment plants for the treatment of effluents from a cluster of industries particularly of small scale.

The National Hydrology Project is being undertaken by the MoWR to set up and improve the Hydrological Information System (HIS) in nine peninsular states in India (Maharashtra, Tamil Nadu, Gujarat, Karnataka, Kerala, Madhya Pradesh, Orissa, Andhra Pradesh, and Chhatisgarh). The HIS will contain detailed, reliable and complete data on all water resources in these states and will enable the Central and State governments, industries and farmers to know the availability, to plan and to manage the water resources better and improve the hydraulic infrastructure to avoid disasters such as floods and droughts in peninsular India.

Rural water supply and sanitation

As per information available, there are over 3.5 million hand pumps and over 0.1 million piped water supply schemes in India, installed under the rural water supply programme. The estimated costs for O & M of these at current prices would be around Rs. 20 billion (about US$ 0.4 billion) per year. At present, the available funds for O & M are around Rs. 2.3 billion (about US$ 0.05 billion). Hence, a very large gap exists. Combined with the 73rd Constitutional amendment and increasing recognition that centralised, government controlled, and supply driven approaches need to be changed to more decentralised, people centric and demand responsive approaches has led to the revamping of the ARWSP, and the inception of the Sector Reforms programme. This major paradigm shift in thinking and policy, launched in 1999, incorporates the following three principles:

- Adoption of demand responsive approaches based on empowerment, to ensure full participation in decision making, control, and management by communities
- Shifting the role of governments from direct service delivery to that of planning, policy formulation, monitoring and evaluation, and partial financial support to facilitate community action and planning
- Partial capital cost sharing, in either cash or kind or both, and 100 per cent responsibility of O & M by users.

Sector Reforms are currently being undertaken in 67 districts across the country, and is likely to increase to 75 soon.

Likewise, keeping in view the relatively poor sanitation coverage and the past experiences of the central government, the RCRSP that came into being from 1st April 1999 advocates a shift from a high subsidy to a low subsidy regime, advocates a greater household involvement and demand responsiveness, provides for the promotion of a range of toilet options to promote increased affordability, has strong emphasis on IEC and social marketing, provides for stronger back up systems such as trained masons and building materials through rural sanitary marts and production centres and includes a thrust on school sanitation as an entry point for encouraging

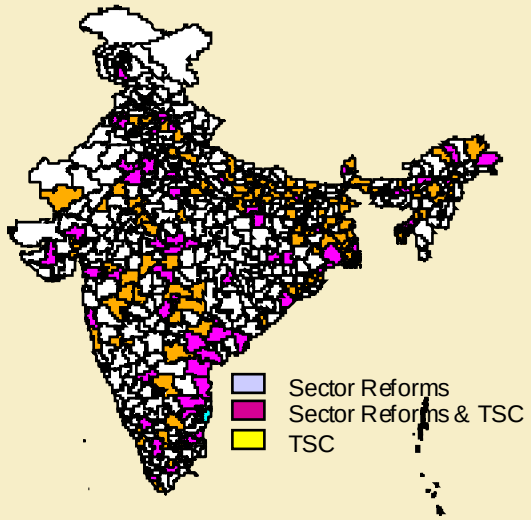
THE MIDNAPUR MODEL

In West Bengal, the successful "Midnapur Model" has become one of the most sustainable alternate delivery systems for sanitation. At its heart is a network of private production centres and retail outlets for sanitation products, coupled with extensive publicity and social marketing. The strategy is a major step towards shifting away from a subsidised government programme. The approach is to have the private sector create retail-marketing outlets that offer a wide range of sanitation products, including a package for the promotion of personal hygiene practices. The Midnapur project is based on the following key underlying assumptions: (i) resources for construction have to come from the users themselves (ii) the emphasis is placed on advocacy to create demand for services (iii) a focal point per village to serve as a s responsive repository of information and liaison, and (iv) substantial resources are to invested in training. Both technical and organisational training were envisaged, focusing on orientation for youth clubs, panchayat members, and village elders. Training was also provided to village masons, drilling *mistries*, and women caretakers of handpumps. The Midnapur experience successfully demonstrated that with sufficient promotion, even the poor can finance their own toilets and adopt better hygiene practices.

wider acceptance of sanitation by rural masses. The TSC also provides assistance for construction of individual household toilets, sanitary complexes for women, school sanitation, construction of drains and garbage pits and alternative delivery systems such as rural sanitary marts. The Total Sanitation Campaign is being carried out in 27 states/UTs. So far, under the TSC, 0.74 million household toilets, 542 sanitary complexes for women, 14,003 toilets for schools, 817 *anganwadis/balwadies*, and 85 rural sanitary marts/production centres have been set up.

Of the Rs. 5.7 billion that has been released to states (largely in 2000) under the Sector Reforms initiative, approximately Rs. 1.2 billion (around 24 per cent) has been utilised so far by the states. Likewise, of the Rs. 3.5 billion released under the TSC, about Rs. 0.8 billion (around 23 per cent) has been utilised so far. Recognising that water and sanitation in schools are critical to the formation of proper attitudes and habits for hygiene, sanitation and safe water use and that schools are powerful channels for communicating hygiene messages to households and communities, school sanitation programmes are being given high priority in the Tenth Plan and in RGNDWM's agenda. It is now also increasing understood and accepted that school WatSan is critical to girls' education. The task is however huge. Estimates suggest that there are at least 0.3 million rural primary and upper primary schools which do not have any drinking water supply or sanitation facilities.

SECTOR REFORMS AND TSC COVERAGE IN INDIA



Source: RGNDWM

TABLE 5:

UTILISATION OF FUNDS UNDER SECTOR REFORMS AND TSC

Programme	Funds Released (Rs. Billions)	Expenditure (Rs. Billions)
Sector Reforms	5.7	1.2
TSC	3.5	0.8

Source: RGNDWM

The NHRDP Programme has been launched by the RGNDWM from 1994, based on the HRD policy document evolved jointly by the centre and state governments. Under the NHRDP, many states have set up state level HRD cells for planning, designing, implementing, monitoring and evaluating need based HRD programmes. The NHRD Programme aims at empowering PRIs and local bodies, enabling them to take up RWSS programme activities.

The RGNDWM also has an IEC programme for the rural sector. During the Ninth Plan, 100 per cent financial assistance was provided to selected districts in the states, aimed at generating mass awareness regarding the need for safe drinking water, health issues, etc. The programme also focussed on the need for communities to participate in the decision-making processes.

The Department of Drinking Water Supply has constituted a Central Task Force to facilitate in setting up of a Centre of Excellence for Fluorosis Mitigation. Responses towards mitigation vary across the country. While community based drinking water defluoridation schemes exist, these have largely not been successful. As such, the use of activated alumina based domestic defluoridation units is increasing. ESAs have been providing extensive support to India's fluorosis mitigation programme by providing test kits, sophisticated instrumentation such as ion meters and training on their usage, as well as support for establishing pilot projects for fluorosis mitigation. Several research studies have also been conducted on fluoride and fluorosis mitigation.

To accelerate the arsenic mitigation efforts, the RGNDWM has established an arsenic mitigation centre in Kolkata. Several measures for testing and marking of water sources are underway in the arsenic affected areas. Development of alternative sources of drinking water such as piped water schemes, deep bore wells, domestic arsenic removal filters, rainwater harvesting, and exploitation of potential surface water sources are also underway. External agencies have been actively involved in a variety of activities and support programmes including research studies, support to pilot projects, technical training, development and dissemination of IEC materials on arsenic, arsenic toxicity, etc.

Mitigation measures for bacteriological contamination include regular testing and use of simple test kits such as the H_2S vials, and chlorination. ESAs have been providing equipment support and training to government water testing laboratories around the country in order to build up a network of water quality surveillance centres.

On requests from the states, the RGNDWM has taken up a national level management information system programme for effective planning, monitoring and implementation of various activities in the RWSS sector. Computerisation and connectivity of the sector, up to the level of the Division/Executive Engineer has been taken up, and the centre provides assistance to states to take up computerisation to plan, monitor and implement various activities.

Urban water supply and sanitation

Recognising the rapid rate of urbanisation and the poor conditions of UWSS as well as the vicious circle of low tariff, poor recovery rates and therefore poor quality of services, the UWSS sector is taking major policy reform steps. In this direction, the Tenth Plan has put forward several fiscal incentive measures to promote reforms such as the City Challenge Fund and the Pooled Finance

Development Fund to encourage reform measures and prompt ULBs to become viable, credit-worthy entities to access market funds. The Plan also proposes the Urban Reforms Incentive Fund to encourage ULBs to take up financial strengthening and reforms and better enforcement of user charges, taxes, etc. Improving efficiency of existing systems/schemes is being advocated by conducting diagnostic studies of operational status, reviews of practices in management and finance, assessments of investment needs in terms of restoration, renovation and augmentation. Once implementation of efficiency enhancement measures is underway and viability is established, innovative schemes such as those mentioned above could be availed of, to further enhance efficiency and credit-worthiness.

The Plan also calls for states to have benchmark rates for per capita expenditure and for proposed UWSS projects to be compared against the benchmark. The Plan also calls for any project to take into account the urban poor and marginalised. Once established or improved to become viable, the Plan advocates for projects to be run along commercial lines. The reforms agenda also calls for substantial institutional development linked to support for improved services covering measures such as decentralising, commercialising or corporatising of institutions, enhancement of technical and managerial capacity, unbundling/rebundling of functions, appropriate forms of public-private partnerships, use of information technology, and improved private sector participation, to achieve sustainability. Detailed guidelines for these have also been prepared by the MoUD.

Water conservation in urban areas also forms a major thrust area in the Tenth Plan, and several measures are proposed, including tariffs at appropriate levels to discourage excessive use, mandatory water efficient systems for flushing, reducing leakages and unaccounted for water, reuse and recycling of sewage, rainwater harvesting, etc.

Centrally sponsored low cost sanitation schemes continue to remain a key component of urban sanitation in the Tenth Plan and will continue to be propagated as not just a programme for urban poor or slum populations, but also as an appropriate intervention wherever the costly option of underground drainage is not feasible. In order to improve the programme, the Plan exhorts states to set up State Sanitation Councils to have supervisory roles. The Tenth Plan identifies urban MSW as a key area for action, especially the need for concerted action to improve flow of resources and the building up of systems.

INCREASING EMPHASIS ON WATER CONSERVATION AND SUSTAINABILITY

There is increasing emphasis on water conservation, rainwater harvesting and ground water recharge. Water supply links with watershed development programmes are also being advocated as critical to source sustainability, as are identification and strengthening of traditional water sources such as village tanks, etc. and recycling of wastewater. There is significant and increasing emphasis on sustainability of existing systems (there are more than three and half million hand pumps and over a hundred thousand piped water supply schemes installed in the country under the Rural Water Supply Programme) through decentralised operation and maintenance. There is also a significant thrust on the use of Central/State funding as a critical incentive to drive sector reform process at both the state and local government levels and at the same time, there is a significant emphasis on moving away from subsidies.

Water conservation in urban areas also forms a major thrust area in the Tenth Plan, and several measures are proposed, including tariffs at appropriate levels to discourage excessive use, mandatory water efficient systems for flushing, reducing leakages and unaccounted for water, reuse and recycling of sewage, rainwater harvesting, etc.

ENVIRONMENTAL HEALTH SUCCESSES IN SURAT

Environmental health problems in Surat, the oldest municipality in India, were at their worst in the early 1990s. This city of 2.2 million was incurring nearly half of all diarrheal cases in Gujarat, even though it represented only 5 percent of the state's population. Then, in 1994, it had an outbreak of the plague – making international headlines and costing the city both lives and an estimated $1.5 billion in disrupted commerce and trade. Considered one of the dirtiest cities in India, it was mobilised into action despite the tight fiscal constraints common to all Indian municipalities. By 1997, Surat was voted the second cleanest city in India. As a result of prudent actions over four years, water supply and sanitation coverage improved considerably, and the incidence of diarrheal disease dropped to only 10 percent of the state total. The plague disappeared. Incidents of malaria – correlated with stagnant surface water and poor drainage- dropped significantly. These health gains were achieved largely through decentralisation, improving efficiency, enhancing infrastructure performance standards, and strengthening health services.

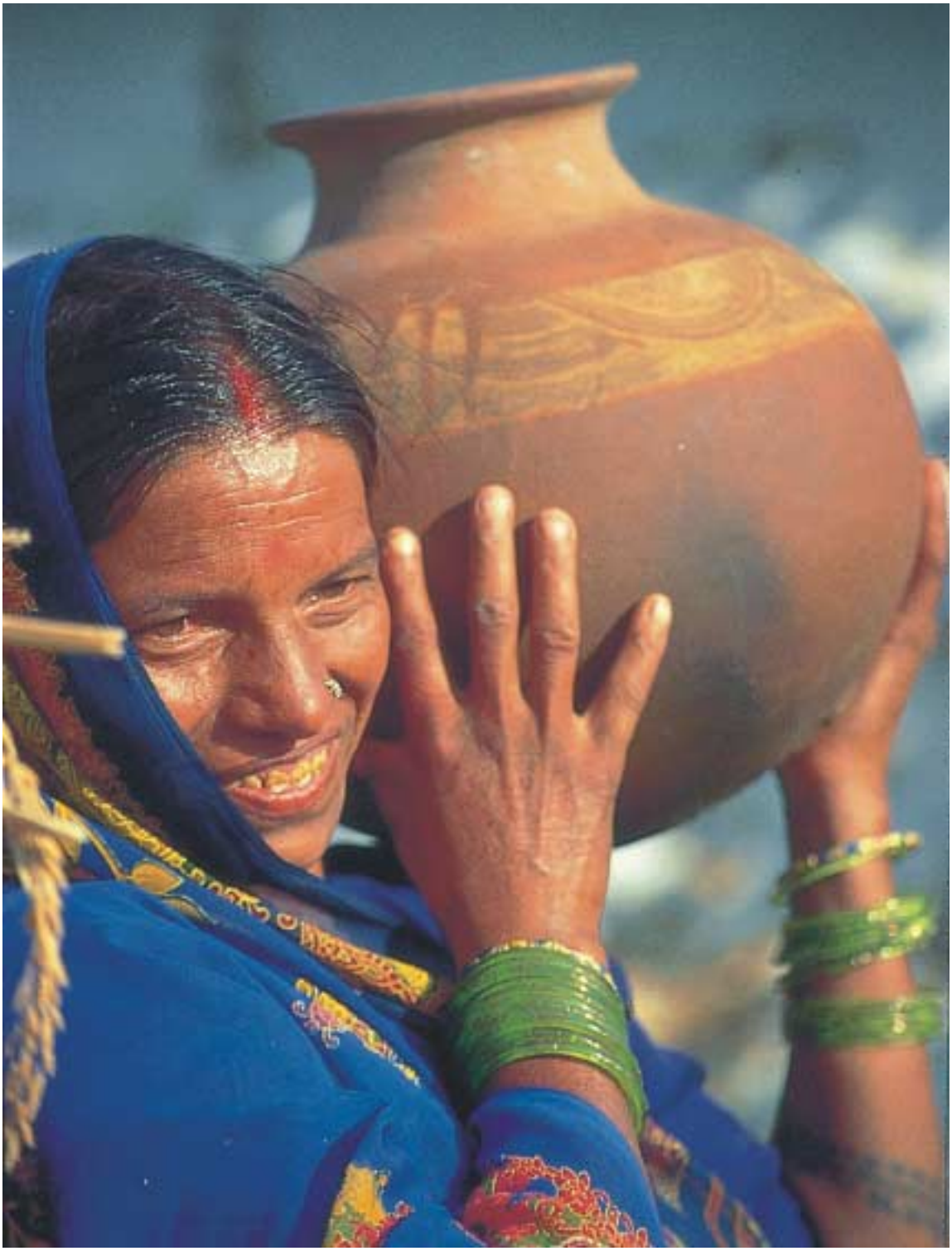
In addition, sanitation and drainage infrastructure in the city has been extended: 217 of the previously 253 unserviced slum communities have been provided with proper sanitation (including toilets) and drainage facilities. The city has upgraded two sewage treatment plants, which now meet discharge standards. Solid waste management has dramatically improved, to a collection efficiency of nearly 98 percent, and has been partly contracted out in order to make it financially viable. The city also operates a controlled landfill. To combat air pollution, traffic management has been streamlined with the intention of reducing congestion and hence vehicular emissions, but reductions in ambient levels are yet to be recorded. Unleaded gasoline will be introduced shortly.

The municipal corporation collects 85 percent of its property tax-the highest rate for any city in India – and has earned an investment grade credit rating. Its infrastructure policies and investment planning have met its urgent environmental needs in a way that is consistent with sound urban fiscal management. To continue making progress in badly needed infrastructure, the city has made ambitious plans to reach full coverage in the provision of piped water supply, expand the sewerage system to cover half the city's population, and introduce buses fuelled by natural gas.

Priority action areas being advocated in the plan include compulsory production of compost from urban solid waste, identification of less capital intensive and intermediate technologies, provision of fiscal concessions and subsidies, and strict implementation of rules pertaining to bio-medical, municipal and hazardous wastes. The MoEF has also recently enacted legislation on solid waste management by notifying the Municipal Solid Wastes (Management and Handling) Rules, 2000 with detailed guidelines and timeframes to be adopted.

The reform measures are already beginning to take effect. Significantly, improved performance in UWSS can be seen in cities such as Hyderabad, Chennai, Nasik, Surat, etc. and ULBs in Bangalore have adopted new technologies such as geographic information systems (GIS) for planning. In many cities such as Mumbai, freshwater is no longer supplied to industry – instead, recycled and treated municipal wastewater is provided.

Replicability of interventions, appropriate institutional arrangements for implementation and O & M of UWSS schemes are being considered. The GoI is also planning to establish a Water and Sanitation Mission for urban areas to support the reform process with technical, managerial and financial assistance.



Health, Equity and Economics

Health

Water-borne diseases are caused by contamination of water with virus (viral hepatitis, poliomyelitis), bacteria (cholera, typhoid fever, bacillary dysentery etc), parasites (amoebiasis, giardiasis, worm infestation, guinea worm etc.), or chemicals. Water gets contaminated either at source or while passing through water pipes which are poorly laid and maintained, or in the homes when it is not stored properly. The risk of water contamination resulting in water-borne diseases is higher under the following conditions: inadequate availability of water, poor quality of water at source, ill-maintained water pipelines and sewer lines, open air defecation is rampant, lack of disposal of human, animal and household wastes, and lack of awareness of good sanitation and personal hygienic practices.

Water-borne diseases are of immense public health importance in India because of (i) high morbidity and mortality (ii) potential for causing large and explosive epidemics (for example, cholera) which create panic in the community (iii) non-availability of specific treatment for some viral diseases such as Viral Hepatitis E, and (iv) increasingly difficult treatment due to anti-microbial drug resistance in bacterial diseases such as typhoid fever and bacillary dysentery.

More importantly, young children bear a huge part of the burden of disease resulting from the lack of hygiene. India still loses between 0.4 to 0.5 million children under five years due to diarrhoea. While infant mortality and under five mortality rates have declined over the years for the country as a whole, in many states, these have stagnated in recent years. One of the reasons is the failure to make significant headway in improving personal and home

FIG 4

INFANT MORTALITY RATES BY SEX – ALL INDIA

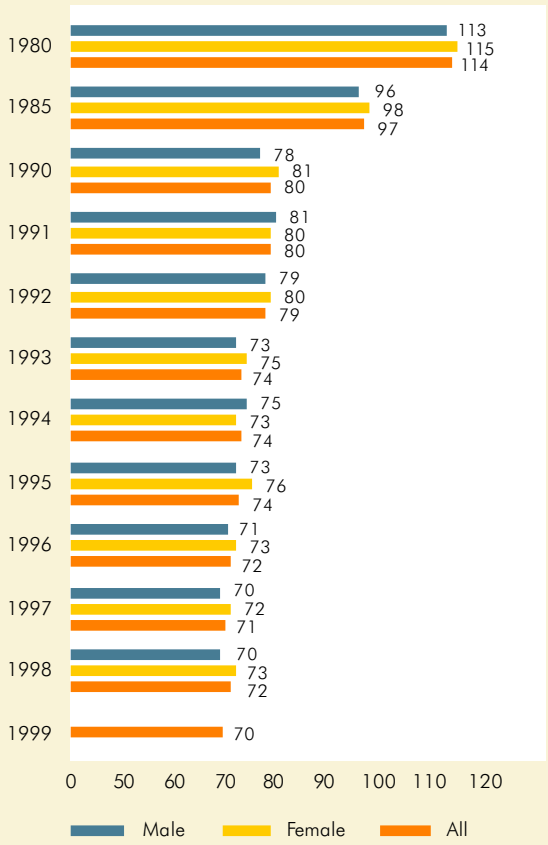
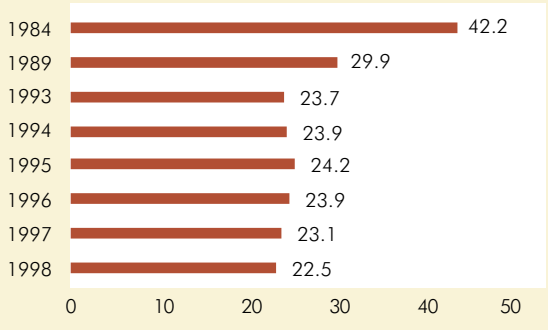


FIG 5

CHILD MORTALITY RATE



Source: SRS, Ministry of Health & Family Welfare

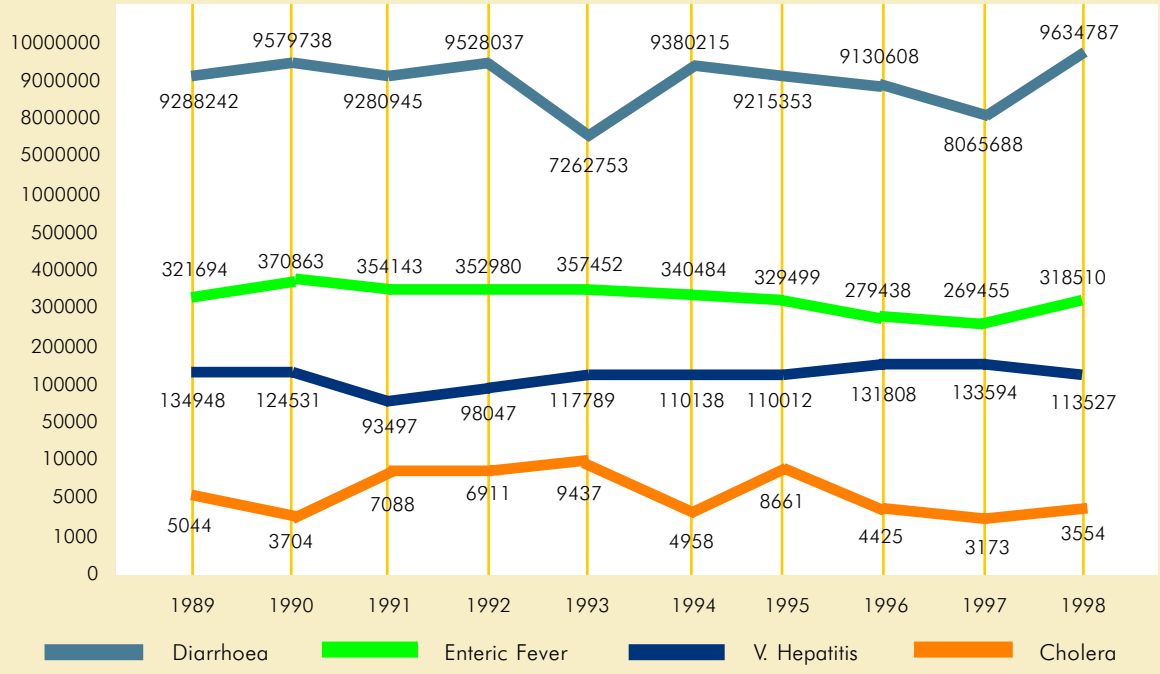
hygiene, especially in the care of young children and the conditions surrounding birth. Drinking water is but one of the several routes for transmission of diseases. Others such as poor hygiene behaviour, contaminated food and unclean toilets are equally important, yet receive far less attention. Hand washing practices are as important from a disease reduction perspective as are the use of toilets or drinking safe water or the use of hygienic toilets.

While massive inputs have been made by the Government to supply potable water in urban as well as rural areas and to promote sanitation, coverage, especially for RWSS is relatively low. Morbidity and mortality due to water-borne diseases have not declined commensurate with increase in availability of potable water supply, largely owing to the fact that quality of water is not maintained at consumer point and that safe water may become contaminated during storage due to poor handling practices and poor personal hygiene.

Disease burden due to water-borne diseases is enormous. The data grossly underestimates the true burden of water-borne diseases. For example, based on the reported data the incidence of viral hepatitis is around 12 per 100,000 population. In contrast, community studies from two urban communities have revealed that the incidence may be around 100 per 100,000 population. On the other hand, community studies indicate that every child below 5 years of age has 2-3 episodes of diarrhoea every year. It means many hundred millions cases of diarrhoea occur every year, and only a small percentage of diarrhoeal diseases are reported every year through routine surveillance systems.

Therefore, the availability of potable water alone may not result in significant decline in water-borne diseases, especially diarrhoea, unless the quality of water is also ensured at consumer point, and significant improvements in hygiene behaviour take place, which is not likely to

FIG 6: REPORTED MORBIDITY ON SELECT WATER BORNE DISEASES



Source: Central Bureau of Health Intelligence

SUCCESS! INDIA ERADICATES GUINEAWORM DISEASE

Guineaworm disease is one of the oldest parasitic infections known. In the early eighties, the disease was endemic in seven states in India and the population at risk was estimated to be almost six million. With concerted efforts by several agencies, India eliminated the disease in 1997 and achieved international certification in 2000.

happen unless the (currently poor) sanitation coverage improves dramatically. As such, interventions such as the TSC and school sanitation are vitally important to the water supply and sanitation programme in India.

One major, well-documented health related success of the water supply and sanitation programme in India has been the eradication of guineaworm.

The rather extensive presence of fluoride of varying concentrations in drinking water in India is of concern. Ill effects of ingestion of fluoride via drinking water range from skeletal fluorosis (bones and teeth) to dental fluorosis, depending upon concentration levels and period of exposure. The somewhat lower levels of distribution of arsenic in drinking water in terms of geographic area are of no less concern. Severe health effects have been observed in populations drinking arsenic-rich water over long periods, including cancer of the skin, lungs, urinary bladder, and kidney, as well as other skin changes such as pigmentation changes and thickening (hyperkeratosis). Absorption of arsenic through the skin is minimal and thus hand-washing, bathing, laundry, etc. with water containing arsenic do not pose human health risk.

While water supply and sanitation programmes in India began under the aegis of the health sector, starting with the First Five Year Plan, this subsequently changed. Today, there is virtually no point of institutional interface between the departments dealing with water supply and sanitation and the Departments of Health and Family Welfare. However, the new National Health Policy 2002 takes some steps towards developing such linkages. The policy document recognises that: "…it is to be acknowledged that public health indicators/disease-burden statistics are the outcome of several complementary initiatives under the wider umbrella of the developmental sector, covering Rural Development, Agriculture, Food Production, Sanitation, Drinking Water Supply, Education, etc."

The policy also acknowledges that despite the impressive public health gains, morbidity and mortality levels in the country are still unacceptably high and that these unsatisfactory health indices are, in turn, an indication of the limited success of the public health system in meeting the preventive and curative requirements of the general population. The policy also recognises that the common water-borne infections – Gastroenteritis, Cholera, and some forms of Hepatitis – continue to contribute to a high level of morbidity in the population, even though the mortality rate may have been somewhat moderated.

The policy also recognises the need for inter-sectoral coordination by stating: "the ambient environmental conditions are a significant determinant of the health risks to which a community is exposed. Unsafe drinking water, unhygienic sanitation and air pollution significantly contribute to the burden of disease, particularly in urban settings. The initiatives in respect of these environmental factors are conventionally undertaken by the participants, whether private or public, in the other development sectors. In this backdrop, the Policy initiatives, and the efficient implementation of the linked programmes in the health sector, would succeed only to the extent that they are complemented by appropriate policies and programmes in the other environment-related sectors" and that "it is well recognized that the overall well-being of the citizenry depends on the synergistic functioning of the various sectors in the socio-economy. The health

status of the citizenry would, inter alia, be dependent on adequate nutrition, safe drinking water, basic sanitation, a clean environment and primary education, especially for the girl child. The policies and the mode of functioning in these independent areas would necessarily overlap each other to contribute to the health status of the community. From the policy perspective, it is therefore imperative that the independent policies of each of these inter-connected sectors, be in tandem, and that the interface between the policies of the two connected sectors, be smooth." In addition, "the attainment of improved health levels would be significantly dependent on population stabilisation, as also on complementary efforts from other areas of the social sectors – like improved drinking water supply, basic sanitation, minimum nutrition, etc. – to ensure that the exposure of the populace to health risks is minimized."

The report of the Working Group on Communicable Diseases for the Tenth Five Year Plan also suggests that the Ministry of Health should take up a national programme of prevention and control of water borne diseases with the appropriate nodal agency which will establish a formal mechanism of collaboration with ministries in-charge of rural and UWSS with specific responsibilities for each being worked out during the Tenth Plan period. Thus, in policy terms, the stage is set for renewed inter-sectoral cooperation between health authorities and the water and sanitation sector.

Equity

No comprehensive study on equity issues relating to water supply, sanitation, and health has been conducted. However, common equity issues that plague the sector in most developing countries also hold true for India. Some of these issues are outlined below.

As elsewhere in the developing world, millions of India's poorest people are affected by preventable diseases caused by inadequate water supply and sanitation services. Many of them die due to the diseases and many more suffer from regular bouts of diarrhoea or parasitic worm infections. Of course, women and children are the main victims – burdened by the need (owing to traditional social structures and hierarchies) to carry water containers long distances every day, they must also endure the indignity, shame, and sickness that result from a lack of hygienic sanitation. Improved water supply and sanitation provides particular benefits for women and girls. Not only do they do the bulk of the carrying of water, they also often suffer harassment on the way to and from community defecation areas and water sources. School sanitation facilities have a major effect on the enrolment and attendance of teenage girls. In addition,

with their responsibilities for family health, women are often the strongest advocates in the community for change and improved facilities.

Social and economic discrimination – especially the caste system – is practised in many parts of India, restricting access to resources such as water stand posts and wells for lower castes.

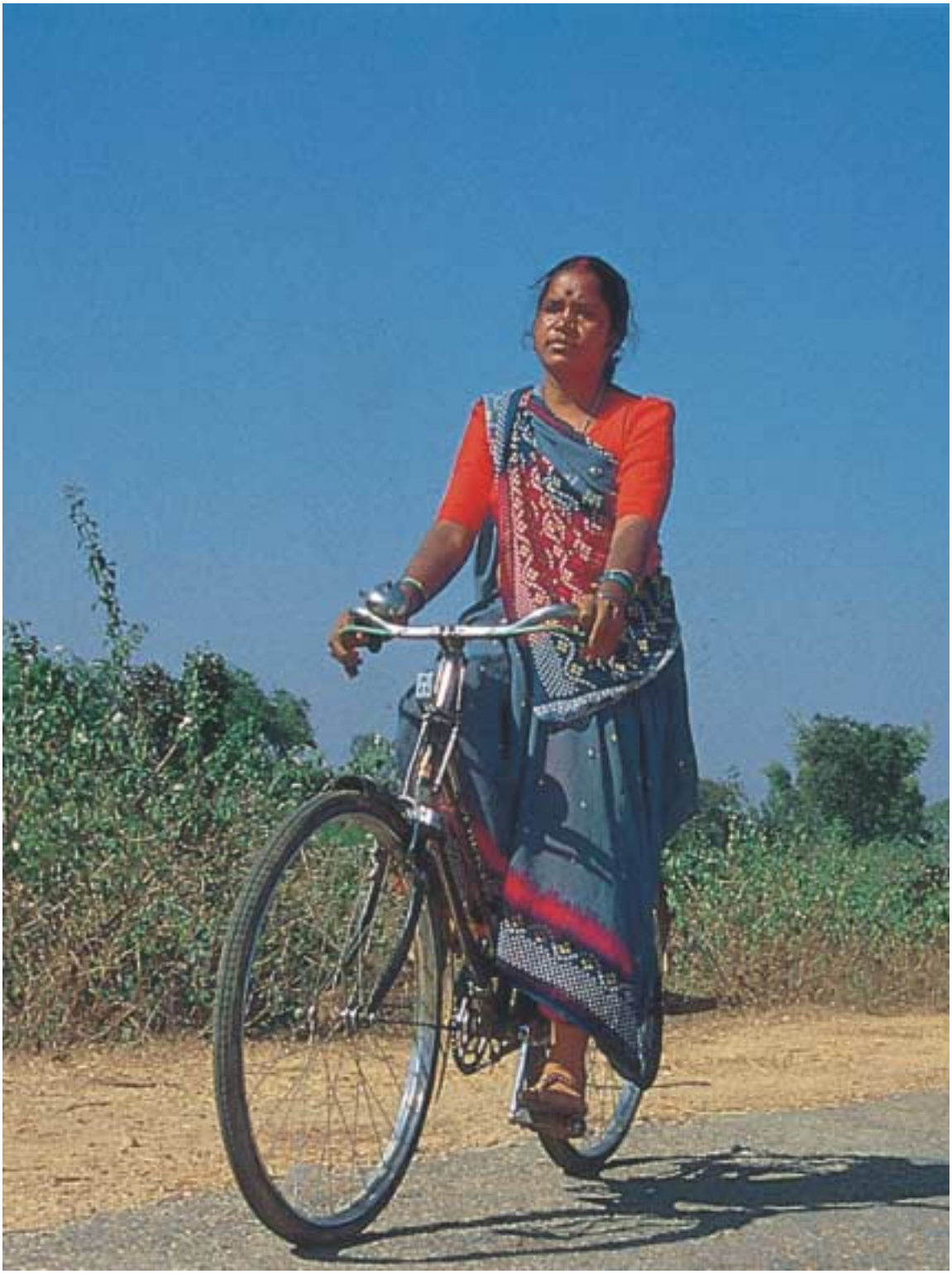
Again, as elsewhere, the impact of deficient water and sanitation services falls primarily on the poor. Unreached by public services, people in rural and peri-urban areas of developing countries make their own inadequate arrangements or pay excessively high prices to water vendors for meagre water supplies. Their poverty is aggravated and their productivity impaired, while their sickness puts severe strains on health services and hospitals. In rural areas, poor people have to work hard for their water, often fetching it from far-off sources and using it carefully and sparsely. The time spent collecting water is a double burden, as it means less time is available for the productive activities on which subsistence economies depend. In cities, the urban poor suffer the indignities of inadequate sanitation and frequently have to purchase water from private vendors.

Many cities and towns receive only a few hours of water supply each day. Frequent breakdowns, power cuts, etc compound the problem. Slum and squatter settlements often do not have direct connections to a piped water system and many depend solely on purchasing water from vendors at high prices, when at the same time, middle areas neighbourhoods connected to organised piped water systems pay extremely low user charges for water.
In India too, poor slums and informal settlements are commonly found on low-lying, flood-prone, or low-infiltration-capacity land with a high water table, leading to poor drainage and sanitation problems. Many poor people rely for bathing, laundering, and defecation on drainage channels, canals, and rivers, which become clogged by garbage and flood when solid waste management is inadequate.

Although improvements to water supply and sanitation are important for everybody, children are the most vulnerable to the preventable diseases, which result from lack of water, dirty water, and lack of sanitation. As mentioned earlier, in India 0.4 to 0.5 million children die every year from diarrhoeal disease and dehydration, and millions more experience more than fifteen attacks of serious diarrhoea before the age of five. A lack of water also means that children cannot wash often enough and so suffer from eye infections and skin diseases such as scabies.

Economics

No comprehensive studies, organised data sources, or even literature surveys exist on the economic value of the water and sanitation sector in India. As such, there was no readily usable data on values of existing infrastructure, generation of employment, exchange of goods and services, development of small industries, etc.



Sectoral Plans and Strategies

Plan Investments – Past and Current

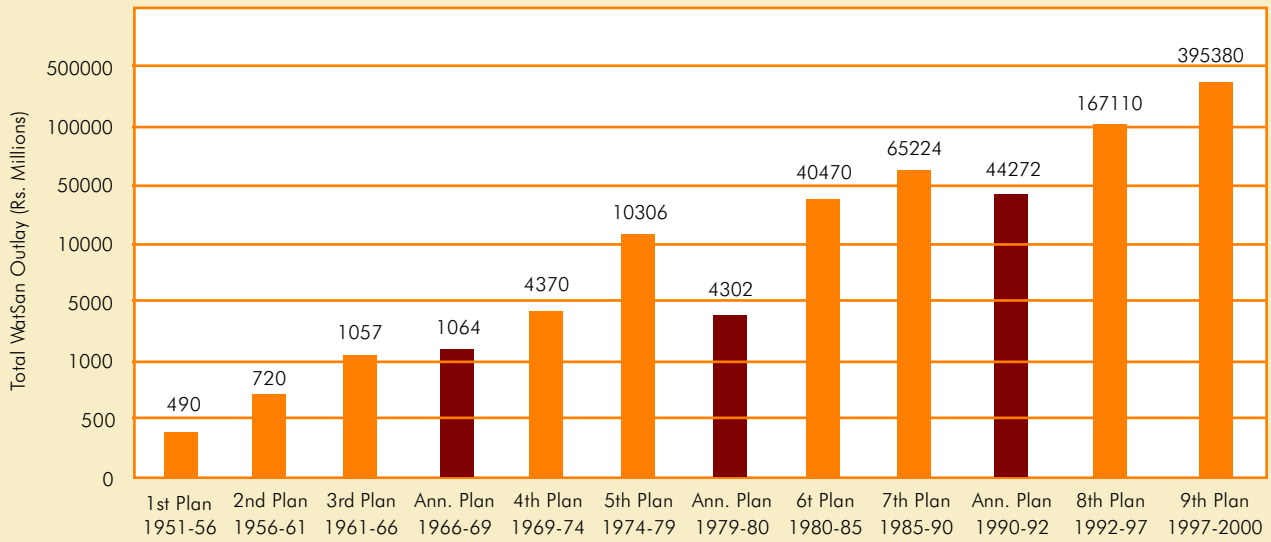
The first five Plan periods were characterised by relatively negligible investments in water supply and sanitation. Since the beginning of the Sixth Five-Year Plan (1980-85) and the launch of the International Drinking Water Supply and Sanitation Decade, India has substantially increased its commitment to the water supply and sanitation sector.

The Ninth Plan provides for Rs.395 billion (about US$ 8 billion) as outlay for the Water Supply and Sanitation Sector, which works out to about 4.6 per cent of the Ninth Plan Public Sector Outlay and is an all time high. Over the various Plan periods, there has however been a shift in the ratio of UWSS to RWSS. Up to the Fifth Plan (1974-1979), investments in UWSS were relatively higher. This changed since the Annual Plan of 1979-80, and the RWSS sector was the focus of increasing investments. However, during the Ninth Plan, the gap has narrowed.

Examination of Central Plan investments by sub-sector shows that Central Plan outlays for rural water supply far exceed those for rural sanitation, urban water supply and urban sanitation.

While this is compensated for to a large extent by relatively higher state outlays, state outlay data disaggregated by sub-sector is not readily available, especially for UWSS. This is primarily due to issues relating to collection of information from the states, etc. India has witnessed rapid demographic changes in the

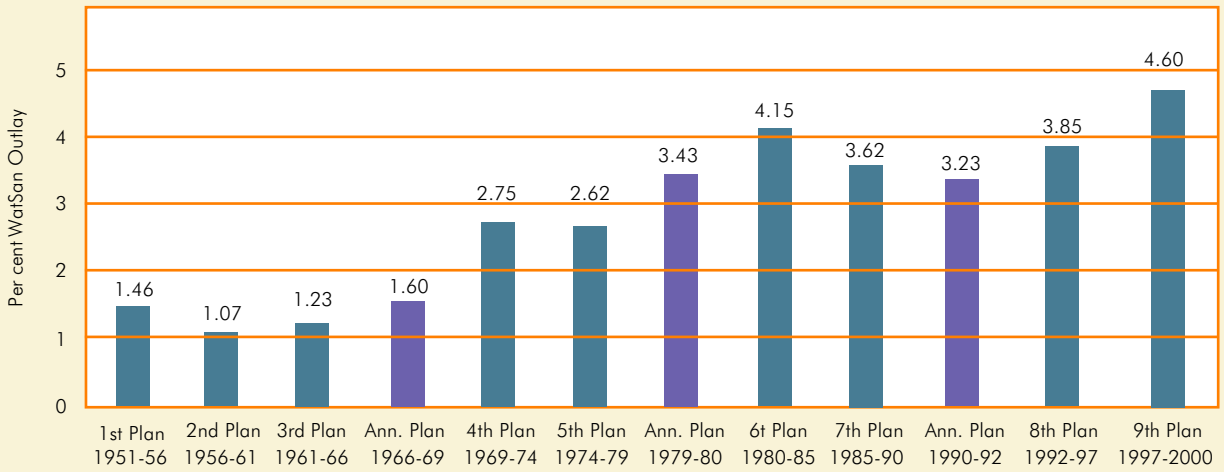
FIG 7: INCREASING PLAN INVESTMENTS IN WATER SUPPLY AND SANITATION



Source: Planning Commission

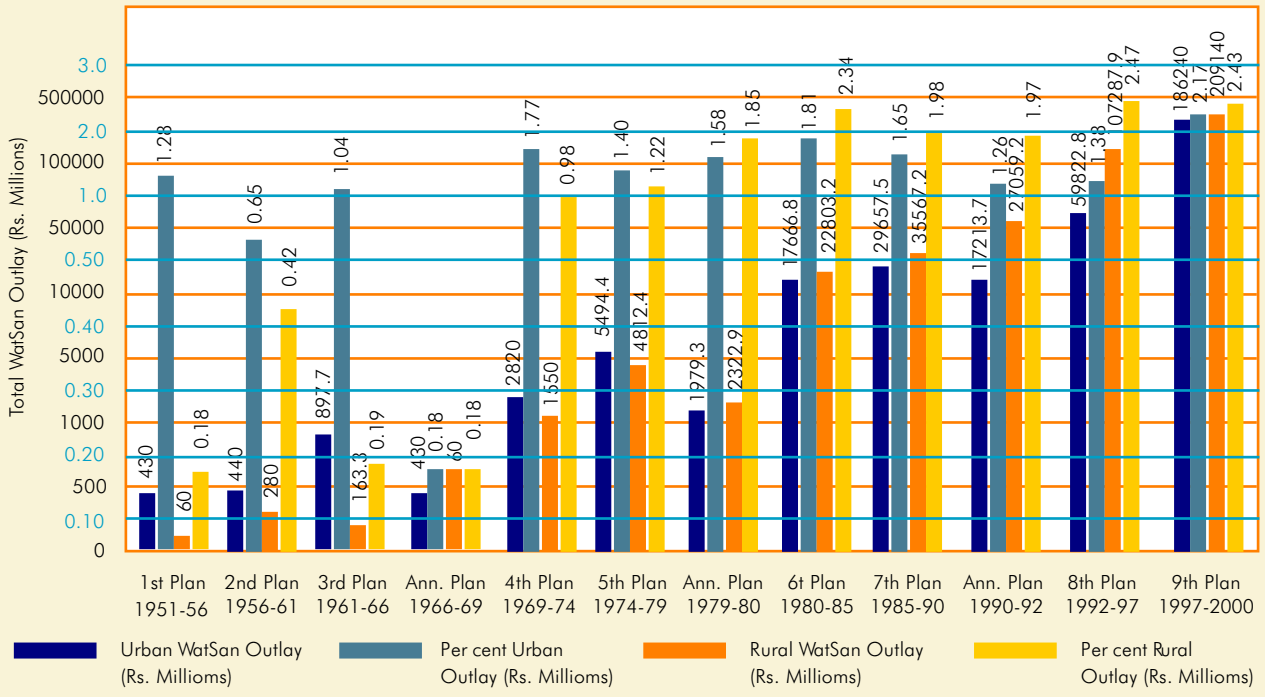
Note: Outlays shown are Central plus State investments at current prices.

FIG 8: INCREASING SECTOR INVESTMENTS (AS PERCENTAGES OF TOTAL PLAN OUTLAY)



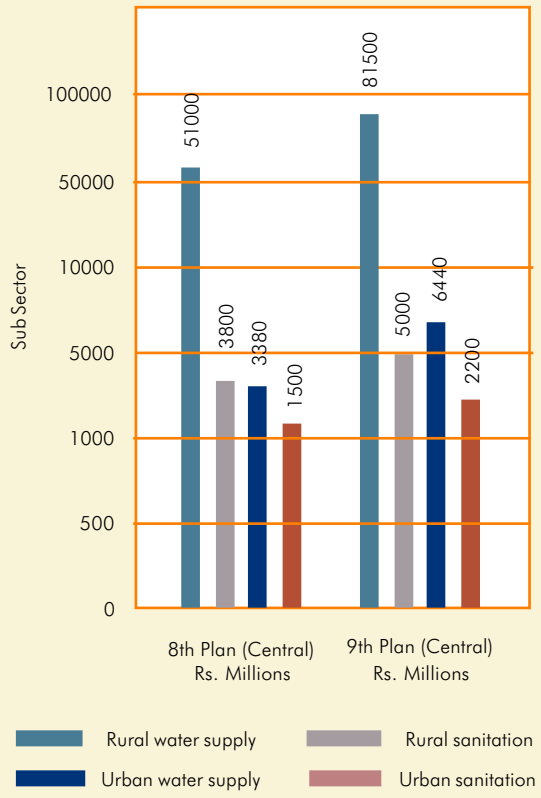
Source: Planning Commission
Note: Outlays shown are Central plus State investments at current prices.

FIG 9: SHIFTING PLAN INVESTMENTS IN UWSS AND RWSS



Source: Planning Commission
Note: Outlays shown are Central plus State investments at current prices.

FIG 10: PLAN OUTLAYS (CENTRAL SECTOR) BY SUB-SECTOR – EIGHTH AND NINTH PLANS



Source: Planning Commission

Note: Outlays shown are Central investments at current prices.

last decade. While the population grew by over 21 per cent, plan allocations to the water supply and sanitation sector during the same period increased by barely one and half per cent. This of course, shows the operational reality of resource constraints.

As in the earlier plans, coverage is one of the basic factors for allocation. This brings to the forefront a basic dilemma. If coverage is used as a basis for planning, then the planning is target driven. At the same time, the Eighth Five Year Plan and subsequent plans strongly advocate demand responsive approaches, which seek to move away from earlier top down, target driven approaches.

Investments – the Future Scenario

India's population over the coming years, based on projections (and taking into account the rapid urbanisation rate will be as follows:

India aims to reach 100 per cent coverage in terms of rural water supply by 2004, consolidation by 2007, and augmentation by 2015. If it is assumed that India will maintain 100 per cent coverage from 2004 onwards, projections based on current level of coverage and estimated population growth trends, this will mean that:

- by 2004, India will need to reach an additional (from the current level) 232 million people, a further 19 million people by 2007 (from the 2004 level) to maintain 100 per cent coverage, another 33 million (from the 2007 level) people by 2015. By 2025, rural populations would have stabilised (partially due to falling birth rates, and partially due to the increasing urbanisation), and it will be enough to maintain rural water supply coverage at the 2015 levels. If the Millennium and Johannesburg summit goals of halving uncovered populations by 2015 have to be met, the figure will be approximately 142 million additional people (from the current levels). If the global goal of water supply for all by 2025 has to be achieved, this will mean covering an additional 75 million people from the 2015 levels.

India plans to achieve 35 per cent coverage by 2007 in rural sanitation, and 50 per cent by 2015. This will mean:

- reaching 133 million additional additional people by 2007 (from the current level) and another 133 million by 2015 (from the 2007 level). If the Millennium and Johannesburg goal of covering at least half the unserved populations by 2015 has to be met, India will have to reach an additional 335 million people (from the current levels). If the global goal of sanitation for all by 2025 has to be met, 269 million people will have to be covered (from the 2015 levels).

Likewise, India aims to achieve 100 per cent coverage in urban water supply by 2007, and 75 per cent coverage in urban sanitation by the same year (under low cost sanitation and sewerage). This means that:

- approximately 43 million additional (from the current level) urban people will have to be covered by water supply and an additional (from the current level) 31 million people with sanitation by 2007. In order to meet the Millennium and Johannesburg summit goals, the figures will be approximately 88.5 million and 92.5 million additional (from the current levels) people for urban water supply and sanitation respectively. For the global 2025 goals to be met, the figures will be approximately 236.5 and 240 million people respectively (from the 2015 levels).

Projections of investment needs made by the RGNDWM for the Tenth Plan period for rural water supply and rural sanitation are Rs. 621 billion and Rs. 248 billion respectively (including state and central plan funds). Similar projections made by the MoUD for the Tenth Plan period for urban water supply and urban sanitation (including drainage, sewerage, and solid waste management) are Rs. 283 billion and Rs. 494 billion respectively.

Extrapolation (keeping in mind current coverage levels) of the above show that estimated investments to the tune of Rs. 380 billion and Rs. 200 billion respectively will be needed for rural water supply by 2015 and 2025 to meet millennium/Johannesburg and international goals. For rural sanitation, the figures will be Rs. 676 billion by 2015 and Rs. 503 billion by 2025. Likewise, the investments necessary for urban water supply by 2015 and 2025 will be Rs. 96 billion and Rs. 258 billion respectively and for urban sanitation, the figures will be Rs. 208 billion and Rs. 539 billion by 2015 and 2025 respectively.

Strategies

Rural water supply and sanitation

The National Agenda for Governance envisages provision of safe drinking water to all rural habitations by 2004. The RGNDWM's strategy to achieve this revolves around (a) accelerating coverage of remaining NC and PC habitations with improved drinking water systems (b) tackling the problems of water quality in affected habitations and to institutionalise water quality monitoring and surveillance systems, and (c) to promote sustainability, both of systems and sources to ensure continued supply of safe drinking water. To ensure coverage, a Comprehensive Action Plan has been prepared based on information furnished by the states.

As has been observed in the past, new non-covered habitation often emerge in "covered" areas or covered habitations cease to be so due to various factors. To address this, the 2004-2007 period is expected to be used for re-survey of all habitations and consolidation work, thereby dealing with slippage and covering new habitations.

For addressing water quality issues, exclusive Sub-Missions have been constituted for initiating preventive and remedial measures. Current sub-mission programmes include those on Arsenic, Fluoride, Brackishness, Iron, and another on sustainability.

In terms of sustainability, one strategic development has been the recognition and acknowledgement that the government alone will not be able provide necessary expansion of services to a growing population and that a shift of government role, from that of a service provider to that of a facilitator and that local communities need to be empowered to act as agents of social change. Coupled with the fact that while drinking water is a fundamental social right, exercising this right needs to be done keeping in mind that water is an economic good and the adoption of the 73rd Constitutional Amendment, the Sector Reforms Programme for rural drinking water supply was initiated, adopting a demand responsive and adaptable approach. The reforms strategy aims to ensure full participation of villagers by empowering them to make decisions in the choice of scheme design, control of finances and management, and by ensuring partial capital cost sharing and shifting responsibility of O & M completely to end-users. Strategies being adopted/ advocated for sustainability of water sources include rainwater harvesting, artificial recharge of aquifers, conjunct use of surface and groundwater, revival of traditional water harvesting and management systems such as ponds and tanks, johads, checkdams, etc.

A HRD programme is also in operation to support the reforms process, in terms of empowerment of PRIs and local bodies for O & M, capacity building of local communities including training to mechanics, masons, health workers, motivators, etc. Comprehensive IEC programmes for building awareness and motivation, setting up of MIS systems, data collection, and continuous monitoring and evaluation are also being adopted.

Likewise, strategic reforms are underway in the rural sanitation sector. The TSC under the RCRSP represents a shift from a high subsidy, low community involvement, supply driven programme to a low/zero subsidy, high community involvement, demand responsive approach.

The key strategic features of the TSC include lower subsidies, greater household involvement, range of technology choices, options for sanitary complexes for women, rural drainage systems, stress on IEC and awareness building, involvement of NGOs and local groups, availability of institutional finance, HRD, and most importantly, emphasis on school sanitation.

The Tenth Plan emphasis on UWSS and reforms in the sector are a step in the right direction, as the sector faces deep systemic problems. Rapid growth in population combined with rapid growth of urbanisation has meant that most urban environments in India are highly stressed and deteriorating rapidly. Plan outlays for the urban sector have been grossly inadequate compared to the basic requirements of basic urban infrastructure. Most local governments, responsible for urban governance and management lack the required capacity for planning and managing local development initiatives, capabilities for appropriate decision making and shoring up and managing financial resources.

Urban water supply and sanitation

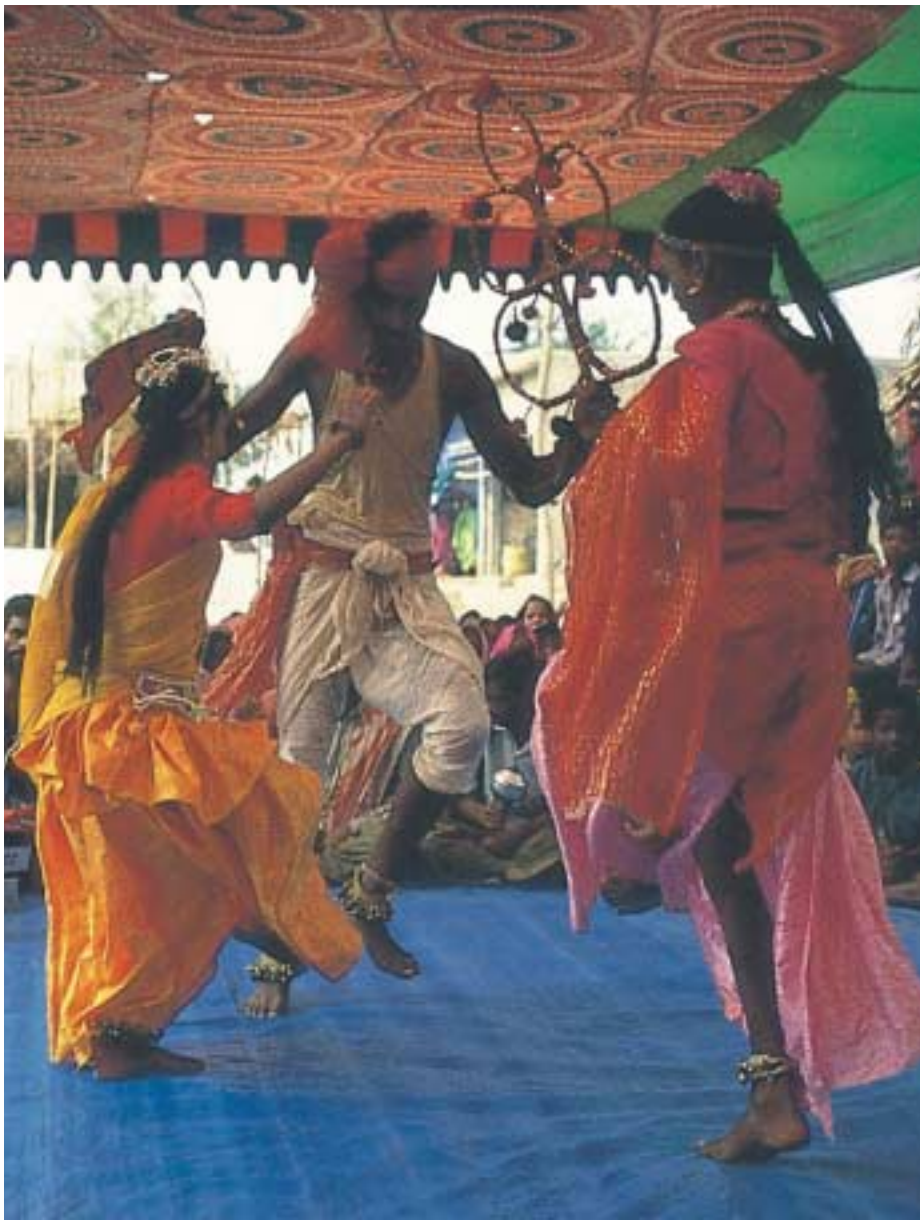
The primary objectives of the UWSS sector continue to include universal coverage, adequacy of water supply, regularity of supply, avoidance of excess drawal leading to depletion, and the need to conserve and make conjunctive use of water resources remain unchanged. At the same time, keeping in mind the 74th Constitutional Amendment, the growing urban population and the rate of urbanisation, and the current status of urban water supply and sanitation services, several reform processes are underway. Broadly, these reform strategies include (a) decentralisation (b) commercialisation or corporatisation of existing institutions (c) enhancement of technical and managerial capabilities (d) unbundling or rebundling of functions if ULBs (e) institutional restructuring (f) changing role of government from service provider to regulator and facilitator (g) appropriate forms of private participation and public-private partnerships, (h) benchmarking for performance (i) evolution of a sound sector policy, and (j) emphasis on low cost sanitation and solid waste management.

Reform strategies envisage shifting of responsibility for UWSS to municipal governments, which in turn could undertake the responsibity via a variety of arrangements including municipal department or enterprise, contracts with reformed state utilities or with private providers. Decentralisation strategies are also accompanied by reforms that include development of good practices in municipalities, especially in the areas of accounting, auditing and procurement, the professionalising of municipal management, removal of monopolies to state owned providers to encourage competetion, corporatisation of dis-aggregated entities (privatisation in some cases), full autonomy to ULBs, and adoption of institutional capacity building. Financial reform strategies will now increasingly include direct market access to service providers, better access to capital markets, credit enhancement facilities, and utilisation of public funds to further reform initiatives (thereby enabling ULBs to leverage market funds). Tariff reform strategies include rational water pricing on volumetric basis to encourage conservation and planned achievements of cost recovery via rationalised pricing (thereby generating internal funds for infrastructure improvements and enhancements). Improved accounting based on double entry based accrual systems are also being advocated.

Increasing emphasis on use of information technology applications in urban governance and management to ensure quick access to information, planning and decision support systems (such as GIS), public domain access to all relevant information (many ULBs are beginning to make extensive and effective use of the internet – some such as the Greater Mumbai Municipal Corporation, the Delhi Jal Board, the Kolkata Metropolitan Authority, Hyderabad Metropolitan Water Supply and Sewerage Board, and many others have comprehensive websites providing extensive access to information on services, tariffs, infrastructure, management, contracts, government orders, etc) is also being advocated.

Several options for private sector participation and public private partnerships such as service contracts, management contracts, leases and concessions, SOT/ BOO/BOOT, etc and divestiture are also being increasingly facilitated. Several water conservation measures are being advocated, such as leak detection and rectification works, rainwater harvesting (in some cities, mandatory for certain categories of buildings and projects), reuse and recycling of treated wastewater, and recharging of aquifers.

Solid waste management is also increasingly seen as an important area in UWSS. Legislation on municipal waste handling and management has been passed in October 2000. Some strategies on solid waste management include preparation of town-wise master plans, training of municipal staff, IEC and awareness generation, involvement of community based and non-governmental organisations, setting up and operation of compost plants via NGOs and the private sector, enhancement of the capacities of some state structures such as State Compost Development Corporations with emphasis on commercial operations and private sector involvement.



Strengths and Challenges

Critical Factors

Water resources

The major bottleneck in an effective policy formulation and implementation is the current institutional set-up involving various government agencies. Further, there is a separation of responsibilities based on water quality and quantity. As many as eight agencies are involved in collecting data on the following water-related parameters: quality of surface water, ground water quality, monitoring of drinking water quality, sanitation and drinking water supply. Such a fragmentary approach, both at the central and state levels, results in duplication and ambiguity of functions and discourages unitary analysis of this scarce resource. For instance, the CPCB monitors the water quality at 507 locations and the CWC separately measures water quality at another 300 locations. However, co-ordination between the two agencies in fixing the monitoring locations and defining monitoring protocols is missing.

Water being a state subject, the states are empowered to enact laws or frame policies related to water. Even then, only some of the states have set up organisations for planning and allocating water for various purposes. Though water policy for the country has been prepared by the MoWR, only few of the states have their own respective state water policies.

A proper legal framework for regulating withdrawals of groundwater is not in place. Though efforts have been made to check the overexploitation of groundwater through licensing, credit or electricity restrictions, these restrictions are directed only at the creation of wells. Even the licenses do not monitor or regulate the quantum of water extracted. While in the water supply and sanitation sector the primary concern may be about rapidly falling ground water levels and pollution of aquifers and surface water, the problems go way beyond mere excess withdrawal of groundwater for agriculture. For example, one of the reasons for excess withdrawal of ground water is the extreme subsidisation of energy for irrigation pump sets. Other reasons that directly affect water balance include an alarming rate of deforestation and loss of tree cover, loss of common lands, and complete disregard for traditional management systems such as tanks in southern India. This is but a small part of a large list.

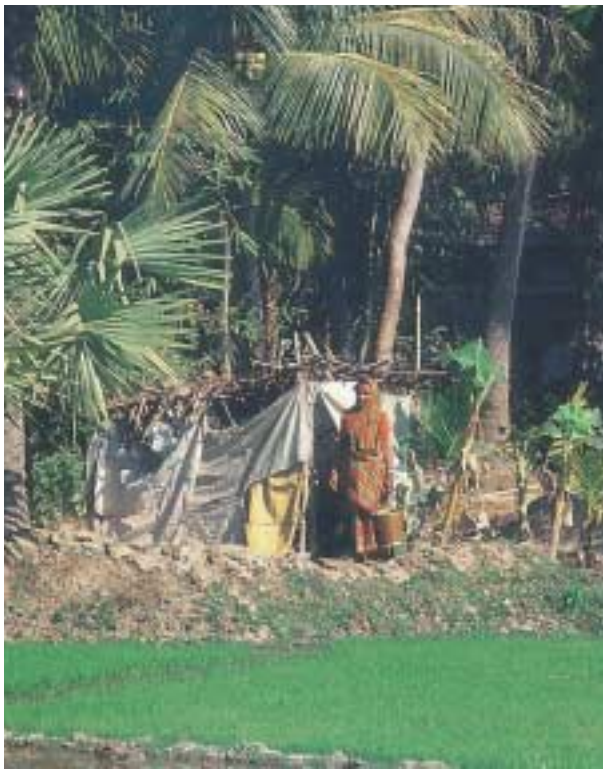
Market-based instruments to encourage resource conservation mainly in the agriculture and domestic sector have not been really tried. This accompanied with the subsidy regime in these sectors has resulted in poor resource usage efficiency.

Knowledge/information/data gaps also plague the sector. Published data is not readily available. Though groundwater availability maps have been prepared for certain locations, extraction rates have not been defined. Information gaps on water consumption and effluent discharge patterns for industries also exist.

Other critical factors include water pollution, intersectoral imbalances, groundwater depletion, very inadequate price incentives for water conservation and efficient allocation between sectors (and conversely, not much disincentives for inefficiency, waste, etc).

Rural water supply and sanitation

One of the most critical factors and the reason for the centre to adopt sectoral reforms is the overwhelming perception that water supply and sanitation is the responsibility of government, not of communities, households, and individuals. This holds true for the population at large, and also for most of the leadership in



the state agencies responsible for RWSS. Another highly critical issue is that water and sanitation programmes operate in isolation from programmes in health and education. This is a reflection of the fact that water and sanitation is not pursued with the aim of reducing disease, improving hygiene, improving educational levels or reducing poverty.

The rapidly growing population in India is a major area of concern. The increasing numbers mean available resources will be that much more stretched, and continue to do so if current trends continue. The deteriorating ground water situation is of critical importance to the sector, as much of RWS is ground water dependent. Water quality problems, especially fluoride and arsenic too are critical issues. Low levels of literacy and awareness of the health benefits of improved hygiene behaviour are a potential hindrance to the success of the restructured programming. Sustained professional advocacy, IEC and social marketing inputs are definitely needed to begin to turn the tide.

Social and economic inequities have been briefly covered in an earlier section, and these will continue to remain major factors hindering effective and equitous implementation of programmes.

While the ongoing Sector Reform programme places the responsibility of O & M on local institutions and communities, the pace of change has been slow in state government agencies. This is also reflected in the relatively low levels of expenditure under Sector Reforms and the TSC by states. More importantly, the reform initiatives need to be seen as a means of encouraging state governments to move ahead with decentralization to PRIs in line with the 73rd Constitutional amendment.

While the current approaches of Sector Reforms and TSC and the ARWSP and RCRSP draw on the inherent strength of community management, it must also be recognised that community management also has inherent weaknesses and these need to catered for. Community management requires significant capacity building which requires substantial human resources. This is particularly so where technology is complex or the size of 'project' is large. Communities also need regular support. As projects grow, new institutional inputs will be needed based on the changing scenario. How can that be put in place and who finances it? NGOs or local government? Community management is highly reliant on external facilitation and support, both during and after implementation. Community management is vulnerable to local and external events and shocks and needs a strong supportive policy environment. It is therefore the role of the government to provide policies, regulations and a legal framework in which the water supply and sanitation sector, private sector, training sector, etc. can operate and which regulates the relations between the owners, implementers and financiers.

Community management is heavily reliant on a supportive framework. Many communities lack the capacity to provide necessary support for technical design and supervision, facilitation and management, long-term training, legal issues, auditing, monitoring and evaluation.

Communities also largely do not have the capacity to manage an increased amount of capital (for major repairs, replacement, or extension) over a long period. They need capacity building and support on managing of financial resources. A number of 'internal' community dynamics can threaten community management; e.g. conflicts, poor leadership, lack of transparency, equity issues, theft. Countering this threat again often calls for the presence of external support. A number of threats to community management, and in particular to scaling up community management, have been identified around donor and NGOs perceptions of government and the tendency to create unsustainable parallel structures in the name of 'efficiency'. Donors in particular can pose a significant threat to long-term sustainability due to their largely short-term project focus and need to 'spend' programme funds.

Urban water supply and sanitation

As in the case of RWSS, one of the most critical issues in UWSS is that water and sanitation programmes operate in isolation from programmes in health and education and reflect the fact that water and sanitation is not pursued with the aim of reducing disease, improving hygiene, improving educational levels or reducing poverty.

The rapid pace of urbanisation is another critical issues for UWSS. The bulk of already low sector investments go to the 4 mega-cities – Mumbai, New Delhi, Chennai and Kolkata. The pace of urbanisation also means that increasing numbers of urban poor will lack access to water and sanitation services or will have to pay high prices to commercial vendors for water.

The lack of substantial new investments mean that existing infrastructure is outdated, inefficient and highly stresses, leading to high degrees of unaccounted for water. Limited metering and efficiency incentives, unviable pricing (does not even cover O & M costs), poor revenue recovery rates, high unfulfilled investment needs lead to inadequate service coverage; unreliable and poor quality service provision. Commercially unviable urban local bodies mean that fresh investments by external agencies and the private sector will not be forthcoming.

The lack of reliable and dependable information on UWS and databases at local, state, and central level mean that there is very little actual basis for planning improvements.

For each major city in the developing world, there is the city 'proper' where roads, piped water, and electricity are relatively accessible. But either on its fringes or in slums and tenements at its centre, informal settlements spring up, populated mostly by migrants. Peri-urban incomes are usually low, because of the lack of job opportunities and the low skills of many rural migrants. The haphazard build-up of the settlements, the lack of funding for infrastructure, and high population densities combine to make these places water-stressed and unsanitary. In addition, traditional community-oriented solutions are difficult among recent migrants who are not a 'community'. And because peri-urban sector services are a relatively new area of concern, municipal water agencies are often particularly unaware of how to implement and how to finance decentralized solutions in these areas.

Health

Available data tells us that morbidity and mortality due to water borne diseases have not declined commensurate with increase in availability of potable water supply. However, accurate data is simply not available owing to inadequate surveillance mechanisms.

The limited collaboration between health authorities and the water and sanitation sector only accentuates this situation.

(Potential) Strengths

Water resources

The institutions that are primarily responsible for water resources management such as the MoWR (and its constituents such as the CWC, CGWB) and the MoEF (and its constituents such as the NRCD and CPCB) have substantial resources in terms of trained personnel, information, data, research capability, etc. Pooled together, they have the potential to influence change. The National Water Policy 2002 complements this potential by advocating strongly for institutional restructuring and inter-sectoral planning and implementation.

Rural water supply and sanitation

One of the greatest strengths of the RWSS sector has been the will to implement sweeping changes in terms of the Sector Reforms and TSC initiatives. The current approaches of Sector Reforms and TSC and the ARWSP and RCRSP, though slow to take off are a vital step in the right direction and draw on the inherent strength of community management. This is primarily because of the following reasons:

- Community management is often small scale and therefore facilitates transparency.
- Community management is flexible and can easily be adapted to the local circumstances including poverty. Equally, it can adapt to local supporting mechanisms and make best use of potential capacity of all stakeholders.
- Local concerns drive the local agendas, leading to greater demand responsiveness.
- Community management allows for self-monitoring and self-regulation, which leads to improved accountability and quicker feedback and learning.
- Community management has the potential to be more sustainable in part due to improved revenue collection and hence cost recovery. It also has the potential to be more cost effective (although there is not yet much strong evidence)
- Community management also has several opportunities which can be tapped:
- Communities can take decisions on strategic issues, like service level and tariff system and level, based on local knowledge.
- Communities can make strategic decisions about the system. They can manage local conflict and deal with equity issues.
- Communities can more effectively mobilise resources to pay for operation and maintenance costs, and possibly for capital investments.

Another significant potential strength the sector has is the relatively strong and vibrant non-governmental sector and civil society. While more recently this group's potential and phenomenal outreach to communities and user groups has been recognised and is beginning to be tapped in the delivery of government programmes, there is much scope to do more in this direction. Existing NGO and civil society networks can be tapped and the formation of sector-dedicated networks supported.

Urban water supply and sanitation

As in the case of RWSS, the urban sector too has taken the vital decisions to bring in change in terms of reforms agendas. This shift, when seen with the vibrant private sector in India too is a strength, with potential (along with NGOs and civil society groups) for increased involvement in supply of water and sanitation goods and services, potential for substantially increased (and much needed) investments, increased involvement in planning, implementation and O & M, potential for institutional strengthening and training support, etc.

Signs of change are already evident in few cases such as Hyderabad, Chennai, Bangalore, etc. With the initiatives under the Tenth Plan to make the sector more viable and credit worthy, more and more urban centres are likely to adopt similar reform initiatives.

Health

With the primary responsibility of protecting human health, the health sector, with its strong health infrastructure is uniquely positioned to support the water and sanitation sector by integrating efforts to reduce the burden of disease related to water, sanitation and hygiene. As discussed in an earlier section, the National Health Policy 2002 too echoes this potential.

Sector Prospects

Water Resources

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.

With water being a subject under the state list, the present approach to water-related matters restricts the issue only to political boundaries, involving a number of agencies and ministries with overlapping responsibilities. Instead a river basin or sub-basin-based approach to water management is called for. This would ensure that aspects such as water allocation, pollution control, protection of water resources, and mobilisation of financial resources are not dealt in isolation and decisions on the overall development process and land-use planning flow from this. The administrative mechanisms necessary to do this need to be defined and operationalised in coordination with relevant state government departments, the central government, and representatives from the community, ensuring that the delegation of authority from the existing departments is consistent and avoids any overlapping. This could perhaps be done by an apex level body operating under the MoWR.

Groundwater legislation aiming at equity and sustainability in access to groundwater and its development needs to be enacted in all states.

The concept of watershed development has also to be adopted more rigorously, which will effectively contribute to the revival of local level traditional water control works. Micro-watershed development provides a medium for revival and integration of traditional water control measures.

Obviously a major effort in public education and training of local people to impart the basic understanding and skills necessary for eliciting such participation is imperative. The government should also consider providing technical and financial support for harvesting rainwater, especially in the rural areas.

Water being a state subject, pricing is done by the state governments and water prices vary from state to state. With water demand in the agricultural sector as high as 95 per cent of total demand and no proportions between the water rates and consumption patterns, water usage efficiency is only 30-35 per cent. Such poorly targeted subsidies send the wrong signals to users causing a wasteful use of resources and suboptimal choices by consumers. An appropriate tariff structure for water services will encourage wise usage of the resource and generate additional support for the fund-starved service providers as well.

Together with the measures towards pollution abatement it is imperative to further intensify efforts for conservation of water to prevent overexploitation of existing resources and reduce the quantity of wastewater generated. As water tariffs are very low, the consumer has little incentive to conserve water. As such, systems of incentives and disincentives will have to be worked, tried, revised, and strengthened.

In order to enhance effective treatment of wastewater, there is a need for better collection and interception of sewage. The existing large number of scattered sources of pollution from high-density low-income communities need to be converted into concentrated point sources that are easier to monitor and intercept for any further treatment. Many low cost and effective technologies for waste water treatment, e.g., duckweed ponds, and horizontal filters have been developed in other parts of the world but are applied to a limited extent in India.

There is a need to explore the associated advantages in terms of the negligible amount of energy required, beneficial uses of by-products (sludge as manure and biogas), lower operation and maintenance costs, etc.

Rural Water Supply and Sanitation

The currently on-going reform processes in the RWSS sector are important policy steps in the right direction. These should be sustained, and where necessary, augmented by more reform measures. It is also important to continue to build the capacities of states to better appreciate and better implement the reform programmes and the devolution of powers, including financial to PRIs in line with the 73rd Constitutional Amendment.

While the importance of and need for intersectoral collaboration has already been stressed upon in earlier sections, it is important to reiterate the need for RWSS agencies to operate hand-in-hand with their health and education counterparts to jointly monitor indicators of RWSS, health, education, poverty, and equity in order to make significant headway in the respective sectors. With the new policy agendas in these sectors, such intersectoral collaboration is now possible, more than ever before.

Terminology such as NC, PC and FC need to re-examined and redefined to take into account the issues discussed in earlier sections as also the rapid demographic changes that we are witnessing. Use of other 'norms' such as 'poverty line' also needs to be seriously re-examined. These are more often than not rather flawed, one sided, and do not reflect reality. There needs to be a rethinking of poverty norms based on access to and control of resources.

The high degrees of systemic and non-economic inequities that exist in India present a problem to widespread and sharing of benefits from many changes that the current approaches may bring. Careful consideration and incorporating these concerns into planning must be done to ensure equitous distribution of benefits. Considering the increasing importance to water quality, there is a need to invest in modernising the network of government water testing laboratories at all levels and by providing additional support in terms of training and capacity building in order to establish an effective water quality surveillance network. Along with the reforms agenda, it is important to start developing and using frameworks for minimum standards and benchmarking for all levels of RWSS work.

Urban Water Supply and Sanitation

As in the case of RWSS, the UWSS sector has begun to take important measures towards sectoral reforms. These need to strengthened and sustained so that ULBs become efficient and viable entities and in turn are able to offer better levels of services. In addition to the transfer of powers to ULBs under the 74th Constitutional Amendment, there is a need to undertake substantial training of personnel to implement and sustain reform agendas.

There is an urgent need for a comprehensive, reliable, cross-sectoral, continually updated system for collection and analysis of water supply and sanitation metadata, including on financial information. Such a metadata

system should be complemented by use of dedicated GIS based planning tools and decision support systems.
There is an urgent need to increase investments into the UWSS sector. While fiscal reforms in the sector are underway, the disparity in terms of plan allocations for sanitation also needs to be corrected. There also needs to be increased investments in civic awareness generation and social marketing, such as the need to reduce the quantum of solid waste generated, separation of organic and inorganic wastes, etc. Such programmes can be complemented by ULBs by reinforcing their available infrastructure for efficient MSW management and ensuring the scientific disposal of MSW by generating enough revenues either from the generators or by identifying activities that generate resources from waste management (composting, recycling, energy generation, etc). Promotion of private sector participation and public – private partnerships in UWSS to augment the reform initiatives should also be encouraged.

There is a need for a better understanding of water supply and sanitation needs and systems of peri-urban areas. This is especially important, as peri-urban areas are populated by large numbers of migrants from rural areas, community approaches are unlikely to work.

Health

Successful advocacy depends on strong evidence.
To advocate the development of water supply and sanitation infrastructure and increased efficiency within the sector, health authorities will need to improve their information base. Health authorities' capacity as advocates of improved water supply and sanitation services and increased sector efficiency can be strengthened by linking disease surveillance with environmental surveillance programmes, by strengthening research capacities on epidemiology of water related disease and economic analyses, and by improving information management and communications capabilities.
Improving access to water supply and sanitation services is necessary, but not sufficient to reduce disease prevalence without also improving practices. Existing health promotion and education programmes should be made more effective and geared towards achieving behaviour changes needed to improve hygiene. To do this, health promotion and education programmes will need to be strengthened to achieve behaviour changes needed to improve hygiene practices. Water supply and sanitation authorities need to make significant investments over several decades to correct deficiencies in coverage and meet the needs of growing populations. Meanwhile, families and communities can protect their health through simple, affordable measures. These include rainwater harvesting and household level water treatment. Health authorities should play a leading role in promoting measures to alleviate morbidity and mortality. This can

be achieved by strengthening the capacity of health authorities to promote simple, affordable water supply and sanitation technologies at community level. In addition to employing strategies of advocacy and partnerships, health authorities in particular must take action to ensure inter-programme collaboration, where water supply and sanitation concerns intersect with programmes for disease prevention and control, primary health care and healthy settings, infants' and children's health, and women's health and gender equity.

Recommendations Common to Water Resources, RWSS and UWSS

There is a wealth of experience in the country in the areas of water resources management, RWSS, UWSS, and health. This experience, spanning decades, is however 'scattered' both geographically and between diverse institutions including government ministries and departments and other bodies, development aid agencies, private sector, and civil society groups such as NGOs. The institutional experience is also diverse, ranging from policy to grassroots implementation. Recognizing the connectedness of these sectors, there is ample scope to bring together these experiences and document best practices and what works and what does not, to use this as a planning and implementation tool, and also to promote cross-sectoral learning.

It will be extremely useful to set-up a state-of-art centralised resource centre for collection, compiling, and disseminating information on water resources, RWSS, UWSS and health. Such a centre could become an important hub promoting inter-sectoral coordination and dialogue. The centre could also form a hub to promote networking among the sector agencies (and especially including the vibrant NGO/INGO and private sectors).

A REMINDER FOR PERSPECTIVE

India aims to reach 100 per cent coverage in terms of rural water supply by 2004, consolidation by 2007, and augmentation by 2015. If it is assumed that India will maintain 100 per cent coverage from 2004 onwards, projections based on current level of coverage and estimated population growth trends, this will mean that by 2004, India will need to reach an additional (from the current level) 232 million people, a further 19 million people by 2007 (from the 2004 level) to maintain 100 per cent coverage, another 33 million (from the 2007 level) people by 2015. By 2025, rural populations would have stabilised (partially due to falling birth rates, and partially due to the increasing urbanisation), and it will be enough to maintain rural water supply coverage at the 2015 levels. If the Millennium and Johannesburg summit goals of halving uncovered populations by 2015 have to be met, the figure will be approximately 142 million additional people (from the current levels). If the global goal of water supply for all by 2025 has to be achieved, this will mean covering an additional 75 million people from the 2015 levels.

India plans to achieve 35 per cent coverage by 2007 in rural sanitation, and 50 per cent by 2015. This will mean reaching 133 million additional additional people by 2007 (from the current level) and another 133 million by 2015 (from the 2007 level). If the Millennium and Johannesburg goal of covering at least half the unserved populations by 2015 has to be met, India will have to reach an additional 335 million people (from the current levels). If the global goal of sanitation for all by 2025 has to be met, 269 million people will have to be covered (from the 2015 levels). Likewise, India aims to achieve 100 per cent coverage in urban water supply by 2007, and 75 per cent coverage in urban sanitation by the same year (under low cost sanitation and sewerage). This means that approximately 43 million additional (from the current level) urban people will have to be covered by water supply and an additional (from the current level) 31 million people with sanitation by 2007. In order to meet the Millennium and Johannesburg summit goals, the figures will be approximately 88.5 million and 92.5 million additional (from the current levels) people for urban water supply and sanitation respectively. For the global 2025 goals to be met, the figures will be approximately 236.5 and 240 million people respectively (from the 2015 levels).

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