Chapter 4
Drinking Water Supply in India: Context and Prospects

Aidan A. Cronin, Anjal Prakash, Praveena Sridhar, and Sue Coates

Abstract India has made significant progress in developing its water resources and the supporting drinking water infrastructure. In fact, it has met the water target for its MDG commitment and in doing so has contributed significantly to the global achievement of this target. However, rapid development, increasing population and variable resource distribution has led to the current demand for water outweighing supply.

Large budgetary outlays since independence and a high political focus on drinking water have resulted in the country supplying water through improved sources to 92 % of its citizens. Improved sources, as per Joint Monitoring Program definitions, do not reflect the safety of the water supplied. Also improved sources do not result necessarily in improved health and nutrition outcomes due to other factors; the principal being poor sanitation and hygiene. This chapter will, therefore, deal with water along with sanitation and hygiene.

Like any other basic service, to be delivered efficiently the institutions responsible for them play a crucial role. Clear delegation of responsibilities is essential for this. This is not the case in India today with numerous institutions with duplicate roles and also significant gaps. In addition, inadequate institutional performance, lack of appetite for reforms and ineffective implementation of existing provisions have affected the performance levels for water supply, in both the rural and urban contexts. Besides the institutional challenges, other factors affecting water supply in India include political will, environmental sustainability (including climate change), social dynamics, technological appropriateness and economics.

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In spite of a sizeable water resource base and vast land resource, India continues to struggle to meet its drinking water requirements. This paper examines the landscape challenges and opportunities for improved drinking water supply in India. Positive developments can be seen in the recommendations for the 12th Five Year plan but will require systematic implementation of reforms and a strong political will.

Keywords Drinking water • Policy • Supply • India

4.1 Introduction

India has lost more than 600,000 children under 5 years in 2010 due to diarrhea and pneumonia (UNICEF 2012a); almost 30 % of the global total. Water, sanitation and hygiene (WASH) plays a critical role in combating these killers. Eighty-eight percent of diarrhea deaths are linked to incomplete water and sanitation service provision (Fewtrell et al. 2007). Stunting is thought to contribute to over a third of under five deaths globally (UNICEF 2012b). India has the largest number of stunted children in the world with over 40 % moderately or severely underweight (NFHS-3 2006). Stunting depends on food intake, the general health status of the child and the physical environment; WASH cross-cuts all these aspects and it has been estimated that 50 % of malnutrition is attributable to water, sanitation and hygiene (Fewtrell et al. 2007). A recent study (WSP 2010) estimates that inadequate sanitation causes India 'considerable economic losses', equivalent to 6.4 % of India's gross domestic product (GDP) in 2006 (US$53.8 billion). These are all unacceptably high figures for a country of India's standing and ambition.

India has about 16 % of the world's population as compared to only 4 % of its water resources. With the present population of more than 1.2 billion, the per capita water availability is down to around 1,170 cu m/person/year (NIH 2010). Despite these constraints, it is to India's credit that the provision of safe drinking water has taken great strides. India has contributed more than any other country to those gaining access to improved drinking water sources in the world, 522 million between 1990 and 2010 and has met the Millennium Development Goal for water (WHO/UNICEF 2012). These numbers are commendable but when the data is looked at in more detail, it is clear not all have benefitted equally. This is a key issue that has to be addressed as equity has been highlighted in the 12th Five Year by the Planning Commission of India (Planning Commission 2010, 2011).

Drinking water fits into the broader water sector. This sector is complex, interlinked and requires a holistic systems approach to develop a full understanding ranging from political, environmental, social, institutional and economical (UNICEF, FAO and SaciWATERs. 2013). This is true in all countries, but especially with the competing interests and priorities at play in developing countries and middle income countries like India.

Given this need for a holistic approach, this chapter unpacks the challenges and then develops the future possibilities. The chapter is divided into five sections. After

the introduction, Sect. 4.2 traces the history and institutional setting of drinking water in India so that a clear picture of how the sector has evolved is conveyed. Section 4.3 discusses the present institutional and service delivery structure of water supply in India while Sect. 4.4 focuses on the present status of water supply and sanitation. Section 4.5 maps the challenges of the sector in supplying water for all.

4.2 History of Indian Water Supply Policy and Implementation

The journey of planned efforts in water supply and sanitation in India began in 1949 when the Environmental Sanitation Committee, Govt. of India, recommended a goal of supplying safe water to 90 % of the country's population over the next 40 years. In 1950 the Constitution of India listed water as a State subject. Article 47 of the Constitution conferred the duty of providing clean drinking water and improving public health standards to the State Governments. This set the background for governing and managing water in the successive Five Year Plans. This evolution of thinking and planning is grouped into four groups, called First to Fourth generation programs (Sridhar 2012) and the corresponding milestones are illustrated in Fig. 4.1.

These generations of programs focus on rural water supply and sanitation. Urban water supply scenario has been different from the rural in a way that the progression of planning efforts as well as institutional structures shows a distinct trajectory. Figure 4.2 illustrates developments in urban water supply over the years. The timeline of developments in both – rural and urban – water sectors is provided to suggest a comprehensive way of looking at the developments in these areas rather than examining separate programs in isolation. A wider temporal perspective offers context and insight into why a particular program was launched.

4.2.1 Rural Water Supply and Sanitation

First Generation Programs The first Five Year Plan (1951–1956) allocated approximately 1.5 % of the total budget to water and sanitation. The allocation remained roughly the same until 1969 when the National Rural Drinking Water Supply Program (NRDWP), was launched, with technical support from UNICEF. The effort mainly comprised drilling bore wells and building piped water infrastructure. The fourth Five Year Plan (1969–1974) saw a near doubling of budgetary allocation. During this plan the Accelerated Rural Water Supply Program (ARWSP) was launched in 1972. This goal of this program was to increase the pace of drinking water supply coverage which had grown at a sluggish pace until this time. ARWSP made significant progress in the next decade, during which the budgetary allocation to water and sanitation also peaked at 4.15 % under the Sixth Five Year Plan (Fig. 4.1).

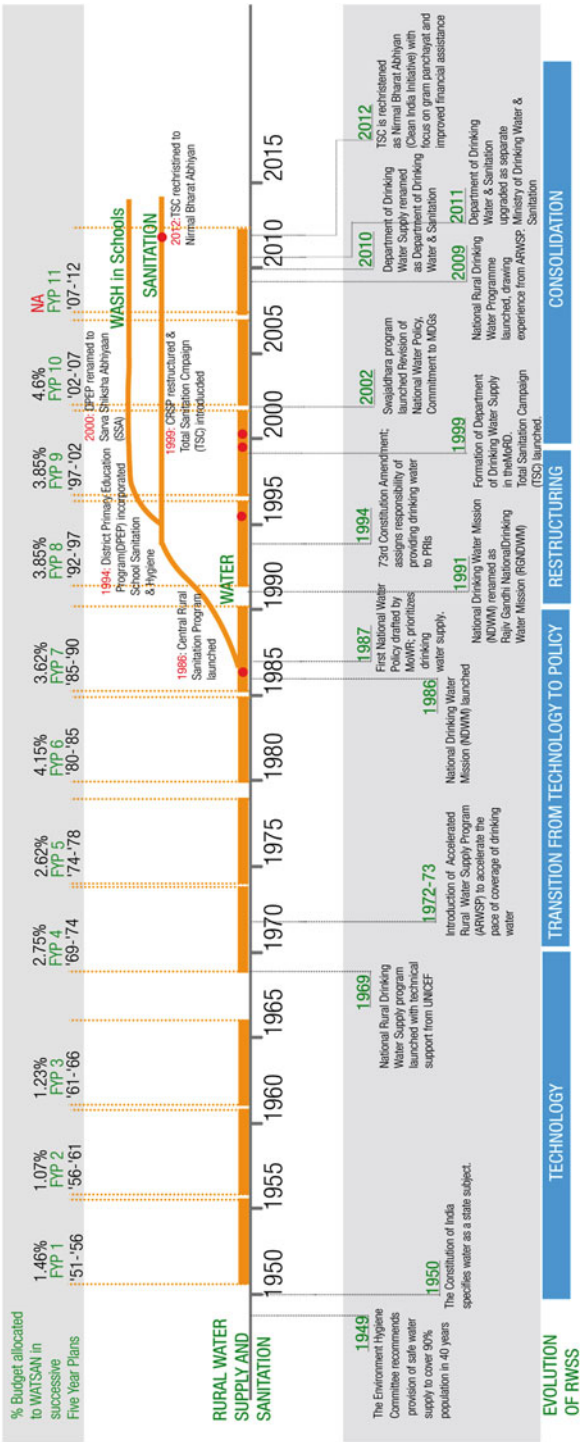

Fig. 4.1 Timeline of rural drinking water supply and sanitation in India (Sridhar 2012)

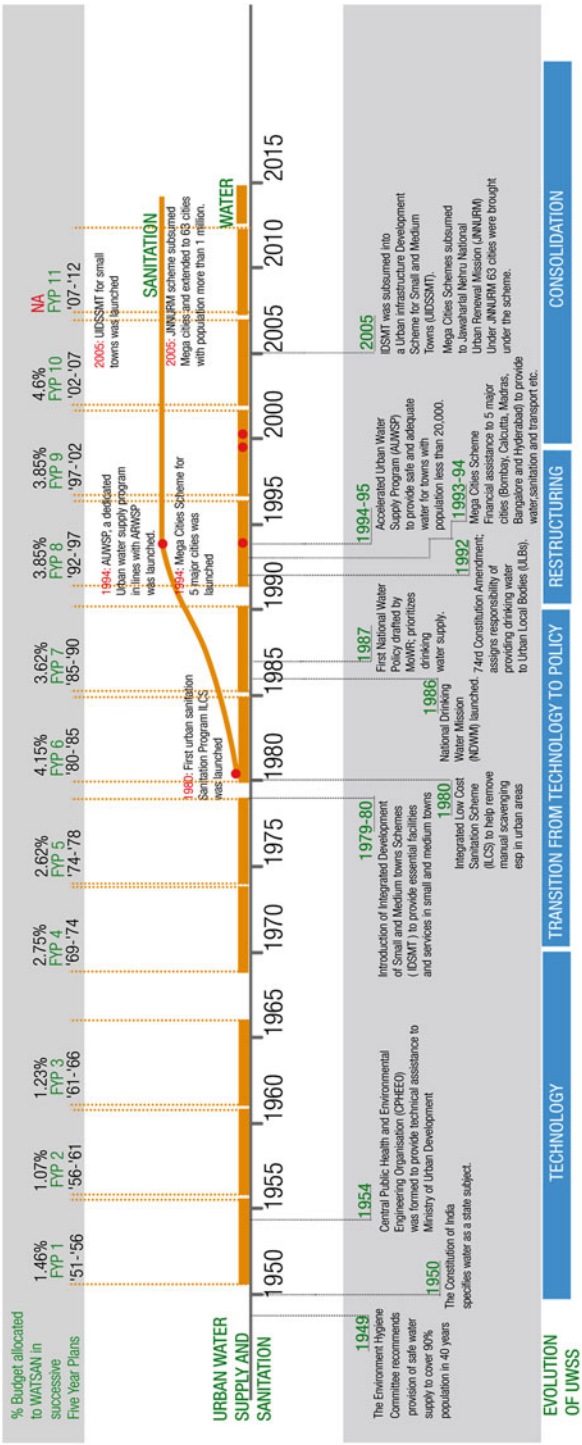

Fig. 4.2 Timeline of urban drinking water supply and sanitation in India (Sridhar 2012)

Second Generation Programs A national level apex committee was setup in 1981 to define policies to guide India to provide access to safe water in all its villages. This lead to formation of National Drinking Water Mission (NDWM) in 1986 followed by first National Water Policy in 1987 by the Ministry of Water Resources. Additionally, a Technology Mission was launched in 1986–1987 in which appropriate technology intervention, water quality, human resource development and support were introduced in Rural Water Supply sector. The Technology Mission was later renamed as Rajiv Gandhi National Drinking Water Mission (RGNDWM) in 1991 (Fig. 4.1).

Third Generation Programs The National Water Policy was revised in 2002. Villages that did not have adequate sources of safe water were prioritized and level of service in partially covered villages was planned to be improved, under this revision. In the same year India committed to UN Millennium Development Goals to halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation, from 1990 levels. The *Swajaldhara* program was launched in 2002 which changed the way in which water and sanitation services were supported in rural areas. *Swajaldhara* decentralized service delivery responsibility to *Panchayati Raj* Institutions (PRIs) and users. This new approach advocated for communities to be consulted and empowered in the planning process via a participatory approach; and from this to enter into a cost sharing agreement with the local authorities. For the first time users agreed to pay an upfront tariff for water use, that was significantly increased to cover the operation and maintenance costs. *Swajaldhara* continued till 2009 when the National Rural Drinking Water Program (NRDWP) was introduced. NRDWP drew on experiences from ARWSP and continues until now.

Fourth Generation The Rural Water Supply sector today appears remarkably different in its approach and prioritization of issues, in comparison to the earlier generations. A significant difference lies in the shift from top-down and technology driven approaches to a decentralized one which lays greater emphasis on aspects like sustainability, equity and community participation. Ensuring sustainability of water, its availability in terms of pot ability, adequacy, convenience, affordability and equity are given priority in the latest programs. All this is to be achieved while ensuring decentralized approach which involves PRIs and community organizations.

As in other areas of governance the 73rd and 74th Constitutional Amendments were a landmark development in water sector. Now, with the amendments Panchayati Raj Institutions were given the responsibility of providing drinking water. The Department of Drinking Water Supply was renamed as Department of Drinking Water and Sanitation in 2010, which was later upgraded into the Ministry of Drinking Water and Sanitation (MDWS) in 2011. A dedicated Minster solely in charge of MDWS was appointed in 2012.

Meanwhile, sanitation developed separately from drinking water, with the launch of Central Rural Sanitation Program (CRSP) in 1986, though was planned and implemented in conjugation with drinking water programs. By the 1990s although

progress was being made in water, sanitation coverage remained abysmally low. To give increased impetus to progress and address known bottlenecks, in 1999 the Total Sanitation Campaign (TSC) was launched. This program is a restructured version of the CRS. TSC also included a component of building water and sanitation facilities in schools. TSC evolved into *Nirmal Bharat Abhiyan* (NBA) in 2012, with increased household subsidy and linkage with the rural employment guarantee scheme.

It can be said that in rural water supply and sanitation the focus was on technology until the lack of policy was felt. Policies affected a comprehensive approach to the sector but the gaps remained unaddressed. These gaps included sanitation, community engagement and increasing emphasis on demand over supply. Attempts to address these over the two decades have been through restructuring of departments, decentralization of local level planning as well as responsibilities from the centre to the lower levels of the democratic structure. More recently the importance of community engagement, gender, flexibility in central funding along with increased financial outlays have helped raise the profile and priority of the sector, especially sanitation.

4.2.2 Urban Water Supply and Sanitation

About 32 % of Indian population is urban spread across 474 urban agglomerations across the country, 31 of these have a population in excess of one million. Presently 97 % of population has access to improved water supply and 58 % has access to sanitation. Urban water supply was separated from rural water supply and given exclusive attention with the formation of Central Public Health and Environment Engineering Organization (CPHEEO). This organization was to assist Ministry of Urban Development in its functioning. CPHEEO began to conduct PHE trainings specifically to produce professionals trained in water supply and sanitation. Sanitation in urban context was seen in association with water but its introduction as a focus area happened much later in rural context. To remove the practice of open defecation and manual scavenging in urban areas Integrated Low Cost Sanitation (ILCS) was introduced in 1980. Improvement of infrastructure to address basic needs of smaller urban agglomerations and to avoid migration from smaller habitations to bigger habitations Integrated Development of Small and Medium Towns (IDSMT) was initiated in 1978. But in spite of these programs little progress was made in the state of urban water and sanitation. Part of the reason for this was allocation of funds. The rate of urbanization over years was not proportional to the funds allocated to deal with water and sanitation demand. The other reason was that the Urban Water Supply (UWSS) did not have exclusive and targeted programs to attend to the requirements of water and sanitation that emerged in the urban areas. The practice was to always club it with larger urban programs in infrastructure and planning. Accelerated Urban Water Supply and Sanitation Program (AUWSP) was an effort to give water and sanitation a focused attention and Mega Cities Scheme was initiated to address the overall basic needs of metros. Both IDSMT and AUWSP were subsumed into Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) and Jawaharlal

Nehru National Urban Renewal Mission (JNNURM) with improved budgetary allocation and increased scope to schemes. These programs have helped introduce wide ranging changes in planning, implementation as well as maintenance of water and sanitation services in urban areas. But this has yet to achieve the scale of results required; also due to the variety of structural challenges (administrative, political, and social) that are constantly at play and affect the state of water and sanitation in urban areas and which are further described below.

4.3 Water Supply Institutional Structure and Delivery Mechanisms

Governing water resources and their use, along with servicing basic needs (drinking water, sanitation and health) to over 1.2 billion people, requires an extensive system of institutions at various levels aided by numerous special purpose agencies (Fig. 4.3). The federal structure of India requires that there is clarity in responsibilities at Centre, State, and sub-State levels. It is important to understand the institutional structure and related responsibilities to fully comprehend the water landscape and in identifying the critical points in the decision making to implementation chain.

4.3.1 Rural Institutional Structure

The Central government is the facilitator of the entire process; its role is to set policy, guide investments in the sector, help States with funding, training, research, quality monitoring and human resource development. Under the aegis of MDWS, the National Scheme Sanctioning Committee (NSSC) sanctions funds to States. The sanctioning process is closely monitored and heavy emphasis is placed on financial expenditure. Impact of these funds is less closely scrutinized.

The States plan, design and execute water and sanitation programs. The State governments are supported by various departments including Public Health Engineering Department (PHED), Rural Development Department, Water Boards and PRIs. It should be noted that States may have different institutional setups in accordance with the local context. In some states water supply and sanitation programs are supported by PHED, whereas in some it is the Panchayat and Rural Development Department and in some it is the Rural Development Department. At a lower level PRIs play a crucial role in the process as most of the implementation and ground action takes place here. Going further, the PRIs are required to takeover planning of the programs at the village level.

The highest sanitation authority at the State level is the State Water and Sanitation Mission (SWSM) which is aided by a State Level Scheme Sanctioning Committee (SLSCC), Capacity and Community Development Unit (CCDU) and State Technical Agency (STA). The Water Supply and Sanitation Organization (WSSO) works

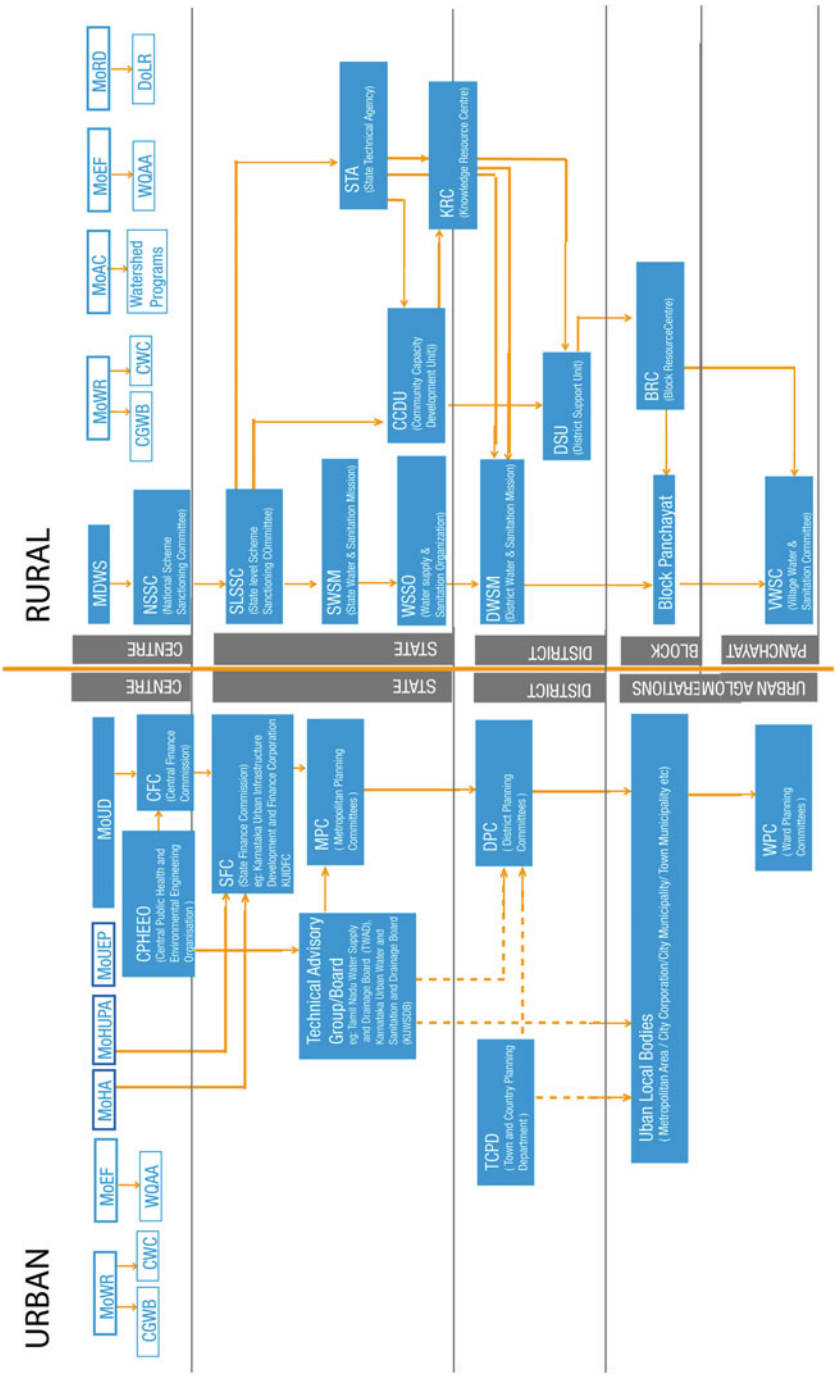

Fig. 4.3 Institutional setup in the water and sanitation sector (Sridhar 2012)

under the SWSM (Fig. 4.2). WSSO provides software support to district and blocks in areas like water quality monitoring, surveillance, evaluation, behavioral change and capacity building activities. At the district level the District Water and Sanitation Mission (DWSM) is constituted under the supervision and guidance of *Zilla Parishads*. DWSM's role is to facilitate communities (at the PRI level) to plan, implement, operate and manage schemes in their areas. Similar to the support units at state level, DWSM is also supported by District Support Unit (DSU) to fill in technical knowhow and capacity building (Fig. 4.2). Key Resource Centers (KRCs) provide capacity building on key technical areas from State to District level.

The Block Panchayats plays an intermediary role between DWSM and village. In 2010 Block Resource Centers (BRC) were introduced to augment support at the village level. BRCs provide continuous handholding to Gram Panchayats and village communities to achieve the goals that are set at the village level. Finally, at the lowest level Village Water and Sanitation Committees (VWSC) operate. As the entire system is decentralized, VWSCs should be independent units which make decisions and plans according to their local context and requirements. The resource and financial requirements are fed into the institutional system.

The system then works to meet these requirements and focus efforts towards meeting the goals set by the Centre, State, District and the Village, ideally in consultation with each other. Achieving adequate WASH coverage is not possible independently and requires convergence. This implies that the agencies responsible for planning, design and implementation must act in consultation with each other and ensure coordination at field level. As previously outlined, access to drinking water is determined by water availability and this issue spans several ministries. Water Resources (surface and ground water) is governed by Ministry of Water Resources (MoWR). In rural areas, monitoring of ground water is undertaken by the Central Ground Water Board (CGWB). Ground water is replenished by watershed development programs in some states and watershed development falls under Ministry of Agriculture and Cooperation's purview (MoAC). The Water Quality Assessment Authority (WQAA) is the responsibility of Ministry of Environment and Forest (MoEF). These links imply that all these ministries have to be involved in the sustainable provision of drinking water. Several ministries besides MDWS, including Ministry of Health and Family Affairs and Ministry of Women and Child Development, are required to achieve universal access to safe sanitation and ensure good health via adoption of best hygiene practices.

4.3.2 Urban Institutional Structure

Unlike rural water supply urban water supply does not have a clear organizational structure. At the highest level, the responsibility of provisioning urban water supply and sanitation services rests with the Ministry of Urban Development (MoUD). Ensuring these services for the urban poor is under the remit of the Ministry of Urban Employment and Poverty Alleviation. Other National Ministries that share

the responsibility and also contribute financially towards urban water and sanitation are Ministry of Housing and Urban Poverty Alleviation, and Ministry of Home Affairs. Two other ministries that have a role to play in urban water and sanitation are Ministry of Water Resources which allocates resources to meet urban demand and Ministry of Environment and Forests, which also influences the decision on utilization of the resources used to meet urban needs.

A coherent and comprehensive institutional structure to deliver water and sanitation services in urban areas is not evident, though the 74th Amendment of the Indian Constitution intended to empower Urban Local Bodies (ULBs) to deliver basic services required in their regions. As a part of this, Central Finance Commission was set up through which finances are allocated to States to renew their urban localities especially small and medium scale towns to contain migration to bigger cities.

Similarly, at the State level, State Finance Commission is advised by both CPHEEO and technical advisory boards in allocating funds to ULBs. Further down from this level to district and ULB, every state has its own structure to deliver services. In some states like Karnataka the State sets up engineering cells (Karnataka Urban Water and Sanitation and Drainage Board) to advise ULBS to plan their water and sanitation services. Likewise, Tamil Nadu has Tamil Nadu Water Supply and Drainage Board that advises ULBs and also executes the services for them. In municipalities like Rajkot, the municipality takes up the responsibility to plan and implement the water and sanitation services. With these examples it should be noted that overall there is no single, uniform structure that is followed by all urban agglomerations countrywide.

The 74th Amendment mandates a structure where the State Finance Corporation provides funds to urban agglomerations through Metropolitan Planning Committee and eventually to ULBs though it has been observed that this process is often not followed by the states (Planning Commission 2001).

4.4 The Current Drinking Water Supply and Sanitation Scenario in India

4.4.1 Rural

The Joint Monitoring Programme or JMP (WHO/UNICEF 2012) estimates that 97 % of urban areas and 90 % of rural areas in India have access to an improved source of water (Fig. 4.4). JMP defines an improved drinking-water source is one that by the nature of its construction adequately protects the source from outside contamination, in particular with faecal matter. Indeed, the global MDG for drinking water has been met thanks to the considerable contribution of India.

However, access to improved drinking water quality does not take into account the safety of the water supplied (Bain et al. 2012). Hence, this value of 92 % of the population accessing improved water is impacted upon when the issue of water quality is considered. Microbiological (principal health threats from bacteriological

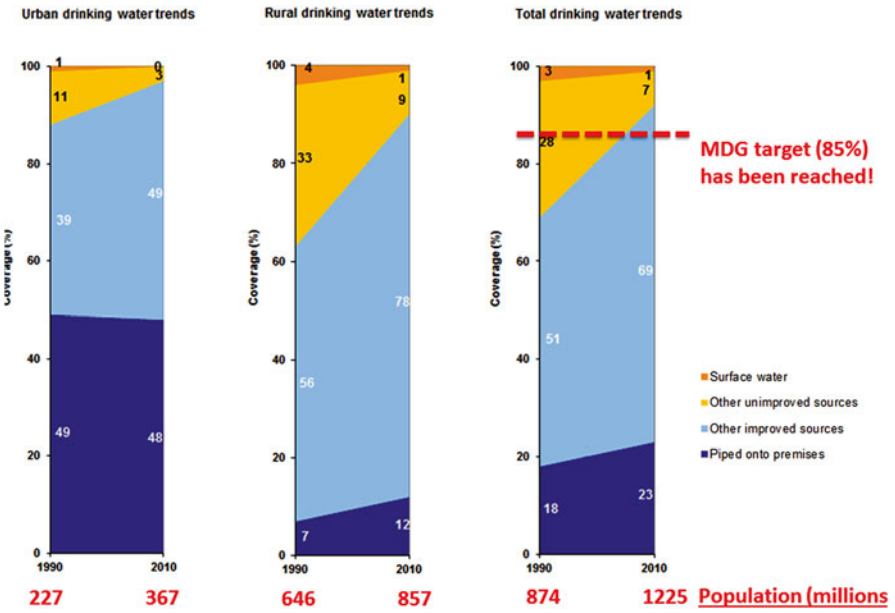

Fig. 4.4 Drinking water provision in India 1990–2010 (WHO/UNICEF 2012)

and viral pathogens) and chemical contamination (Arsenic and Fluoride are the main health concerns from geogenic pollution; anthropogenic pollution is also severely impacting on water quality) has resulted in water sources posing serious health problems, especially to the most vulnerable segments of the population.

Groundwater has traditionally been thought to be a safe source, especially from microbiological contamination. A UNICEF study conducted across 60 districts of India in 2007 found that from a total of 11,800 water sources tested 40 % were non-compliant for bacteria testing parameters respectively (MDWS 2011a). Sanitary surveillance, simple risk assessment forms filled out at water sources; indicate that this comes, not surprisingly, from the high levels of open defecation and poor operation and maintenance. Fluoride has been detected across 188 Districts in 19 States and Arsenic across 54 Districts in 8 States (MDWS 2011b). Needless to say, the at-risk populations in both cases are in the millions.

Another key issue behind these statistics is that of who is gaining access (Mudgerikar and Cronin 2012). Sixty-five percent of the richest quintile of India have piped water on premises while it is only 2 % of the poorest quintile; in rural areas 32 % of the richest quintile have piped water on premises while it is 1 % of the poorest quintile (NFHS-3 2006). Scheduled Tribe (ST) household access to piped water is lower than the India average (24 % as opposed to 44 %); the corresponding value for Scheduled Castes (SCs) is 41 %. STs and SCs are also disproportionally with lower access to sanitation than the Indian average (75 % and 63 % respectively as compared to the national average of 50 % from Census 2011). In terms of sanitation, though progress has been made India will miss the MDG target (Fig. 4.5).

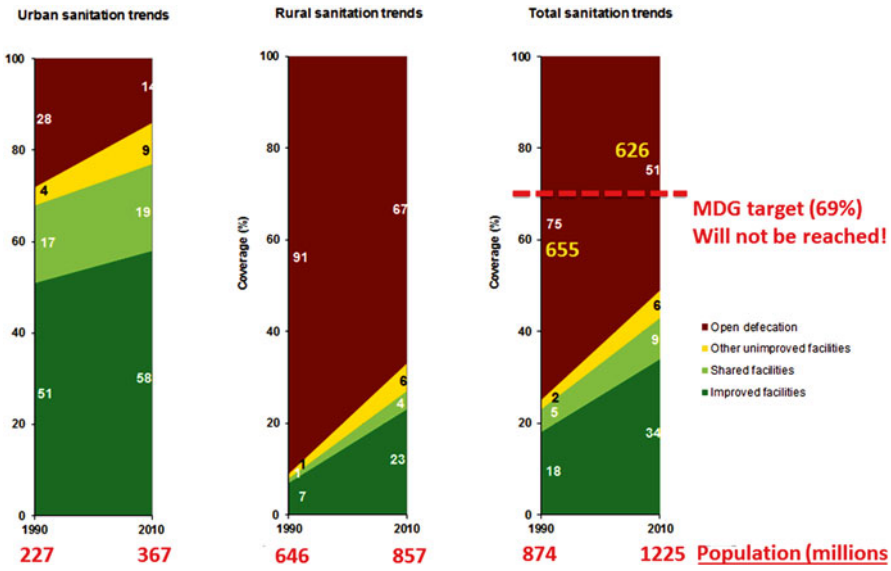

Fig. 4.5 Sanitation provision in India 1990–2010 (WHO/UNICEF 2012)

4.4.2 Urban

India is rapidly urbanizing and now almost one third of the population lives in urban areas. Associated with the rise in urbanization, WASH access for the urban poor is an issue of concern. Although the 11th Five Year Plan (2007–2012) considered the census slum population (42.6 million, 14.88 %), it is also mentioned in the document that 'almost 30–40 percent of India's urban population lives in slums' (Planning Commission 2008).

Water supply is not uniform across all cities or states. The average per capita water supply for Class I cities of Tamil Nadu is 79.9 l and for Maharashtra, it is 310.09 l, whereas the average per capita per day water supply for Class II cities of the state is 106.74 l. Among the Class II cities of Maharashtra, water supply ranges between 34.5 LCPD in Malkapur to 464.94 LCPD in Anjangaon. Such variations are common across all the cities and states of the country. One of the major reasons for wide variation in per capita water supply is the poor management of the water supply system. Levels of system losses through 'unaccounted-for water' or 'non-revenue water' are often as high as 50 % in Indian cities and represent large financial and environmental losses to cities and their economies. A study of four cities of Madhya Pradesh revealed that this Non-Revenue Water (NRW) ranged between 31 % and 49 % in Bhopal, between 37 % and 43 % in Jabalpur, and between 36 % and 66 % in Gwalior; based on the study, city-specific water demand management strategies were developed to minimize water losses and to increase revenue for municipal corporations (UN-HABITAT 2006).

Discharge of untreated sewage is the most critical water polluting source for surface and groundwater in India. Estimated sewage generation from Class I and Class II cities is about 38,000 million l per day (80 % of the water supply) and only 31.5 % of the generated sewage can be treated per day on the basis of the installed capacity. Estimated sewage generation by Class I cities is 35,558 MLD and sewage treatment capacity is only 32 % of the total sewage generated. Estimated sewage generation from Class II cities is about 2,697 MLD and the treatment capacity is only 8 % of the generation. Thus, 70 % of untreated sewage from Class I cities and 92 % from Class II cities contaminates surface and groundwater on a daily basis. Location is the deciding factor for source and availability of drinking water. It is reported that 50.7 % of urban households have access to piped water supply at home but access in non-slum and slum areas is 62.2 % and 18.5 % respectively.[1] Further, the disparity on the basis of tenure status is more severe and, generally, households of the non-notified slums are totally deprived from piped water supply in a dwelling unit (Fig. 4.6). The disparity in access to improved not shared (individual) toilet facility between slum and non-slum households is clearly visible. Also clear is the urban–rural sanitation divide, as well as social group disparities (Fig. 4.7).

In India, empirical observations indicate that there is a vicious cycle of relationship between the insecurity of housing tenure and access to basic services. Tenure security is defined by housing conditions and employment status. In general, those living in slums are considered as poor. But, among the slum dwellers, there is a hierarchy of tenure security. Basic services such as housing, water and sanitation, electricity, education, health and above all employment and access to credit also play a vital role in the overall development and enhancement of quality of life of the poor people living in slums. But, basic services, such as water and sanitation are not available to the slum dwellers living in 'illegal' housing or what is called 'slums with insecure land tenure'. Hence, land tenure has a very significant link with access to basic services and therefore poor and most needy are left out of the formal systems of water supply (Darshini and Shah 2009).

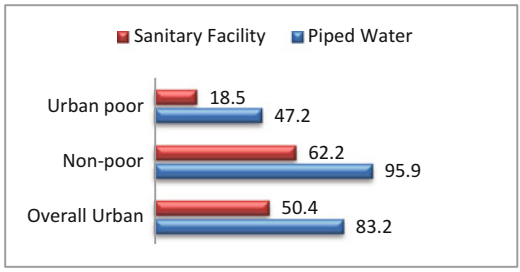

Fig. 4.6 Status of piped water supply and sanitary facility for urban poor and non-poor

[1] '*Key Indicators for Urban Poor in India*', available at http://www.uhrc.in/name-CmodsDownload-index-req-getit-lid-99.html (accessed 16 October 2011).

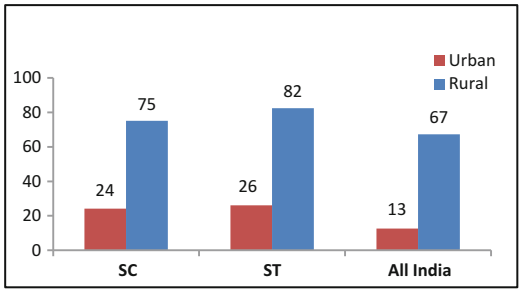

Fig. 4.7 Open defecation rates (%) across scheduled caste (SC), scheduled tribe (ST) and the all-India national average, analysed from Census (2011)

4.5 Challenges in Ensuring 'Water for All'

The previous section showed that the present framework for managing water has not yielded its desired policy outcomes in terms of supplying water to all and catering to the needs of the poor and marginalized. Approaches on water seem isolated and not integrated. Responsibilities for service delivery have been shifting to local bodies – urban local bodies (ULBs) and Panchayati Raj Institutions (PRIs). However, most of the time, these local bodies are unable to manage due to paucity of manpower, and lack of awareness and understanding of planning a water resource development and management activity. In most states, institutions created for water management at the community level are not accountable and therefore do not have any legal identity. They also lack capacity in merging multiple programs and schemes. The question therefore is this: What can be done to change the situation? In this section we outline some of the challenges that need to be addressed in a coordinated fashion to further the goal of supplying water for all.

4.5.1 Economic Challenges

It is also imperative to take into account that people cope with declining water availability in a variety of ways. A recent study of the costs of coping with inadequate water supply in Delhi found that the true total costs of water supply are already 'privatized'; on average, the private coping costs are Rs 262 per month (when capital costs are included) versus a monthly water bill of only Rs 141 per month (Misra 2005). Indeed, the provision of availing a consistent 24×7 supply to water at higher cost might not appeal to the elite group which already has ensured supplies by means of bore wells, water storage tanks or pumps. Managing this water scarcity situation is an immense challenge due to the socio-economic set-up of the country. Another study, a water balance study of municipal water supply conducted in four cities of Madhya Pradesh (UN-HABITAT 2006) suggests that the available water supplies theoretically translate into per capita availabilities ranging between 150 and 70 liters per capita per day (lpcd). But at the consumption end, the availability

remains low, due to substantial non-revenue water which is estimated to range among cities between 28 % and 45 %. The study reveals that the present water supply problems can be attributed to lack of governance and inadequate monitoring infrastructure rather than to scarcity of water resources. The financial and institutional assessments suggest that the reporting on revenue is inappropriate with poor estimates of collection efficiency, revenue and expenditure and over reliance on the government for financial support.

Competing uses also reflects in the economic domain. A key player with ever increasing water demands is industry. Industries are a large promoter of economic growth and as India strives to maintain and accelerate its impressive GDP growth, the demand for water in the industrial sector is also bound to increase. India is the tenth most industrialized country in the world with about 88 industrial clusters scattered across the country (CPCB 2009). Water is an integral component in industrial infrastructure and hence its importance in sustaining the GDP cannot be undermined. As mentioned before, the industrial sector accounts for only 2 % withdrawal of the total freshwater resources of the country. According to the projected water demand for 2030, the demand from industry will quadruple to 196 BCM (13 %), pushing overall demand growth close to 3 % per annum (Addams et al. 2009). An analysis on water use in industry, making a case for the underestimation of water use by the industries in India (CSE 2004) argues that water use efficiency in Indian industries is significantly lower in comparison with other developing countries in the world.

4.5.2 Political Challenges in Ensuring Water as a Human Right

Water is an immensely political issue due to the nature of the resource. This resource interacts with a highly inequitable society marked with class, caste and gender differentiation. Techno-managerial reforms in the water sector have been unable to tackle the fundamental issues of inequity in water supply.[2] In this light, the right to water issue becomes important. India is now a signatory to the 2010 United Nations (UN) declaration of water as a right. A rights-based approach to water means that communities have the opportunity to participate in decision making on water-related projects and plans, and have access to information concerning water, such as safe hygiene practices and water quality data. Ensuring right to water means that the obligation to guarantee that everyone has access to safe clean water rests with governments.

[2] Prakash and Sama (2006) document one such experience from Gujarat where water access is intertwined with caste and gender relationships. The authors observed 'that power structure and social and economic hierarchy go hand in hand and unless the issue of resource inequity is tackled through policy and advocacy means, the real issue will not be solved'.

All stakeholders, especially the state, market, community and civil society, are critical to resolving the challenges faced in the water supply landscape in India today. The prime role of the state is to formulate people-centric policies thus ensuring parity. Also, to bring in strong directives for those violate the existing laws and regulations. The market is seen by many as a profit-making entity that may compromise on the issue of equity and sustainability. Under strong state regulations, markets do play a positive role in water service delivery, research and development, and also water-related technological solutions. There is no single entity known as 'the community' as it is divided by socio-economic class, caste, tribe, age, gender. Models exist for the community's self-regulation, which needs to be seen in an overall framework of people-centered development with more political and financial powers for the community to implement water-related projects. The role of civil society becomes important here as it helps community capacity building thus enabling community members to manage resources in a decentralized resource management framework. Their role in having a close watch on the water management process is also important for equitable water distribution and sustainable management of the resource.

Community involvement in a structured process is essential to achieve this, right from the planning to implementation level (for example Biswas 2012). However, the problem is twofold; on one side, the authorities lack planning, and the community, too, is not actively getting involved in water supply projects. Wherever the gaps from both ends have been met, the water supply projects have been successful. Other related issues are gaps in technical capacity at the level of the resource, delivery, distribution and O&M, lack of information about the policies and plans, and political interference.

4.5.3 Environmental Challenge of Dealing with Water Availability and Scarcity

With an estimated per capita availability of 1,588 cu m/capita/year (CWC 2010), India does not fall under the category of a water scarce country per se, rather it can be termed as a country under 'water stress'.[3] However, India faces a large gap between current supply and projected demand, amounting to 50 % of demand or 754 BCM (Addams et al. 2009). Any analysis pertaining to water resource management in India would be futile without incorporating the spatial and temporal variations in the distribution of the resource. Erratic distribution of rainfall, results in to floods and droughts in various areas of India. While theoretically it might be feasible to divert water resources from surplus to deficit regions, the ecological sustainability

[3] According to the UN an area experiences water stress when annual water supplies drop below 1,700 cubicmetres (cu m) per person. When annual water supplies drop below 1,000 cu m per person, the population faces water scarcity, and below 500 cu m 'absolute scarcity'.

and affordability of such an exercise puts constraints on its implementation. Even in the areas where water is made available it is important to revisit the sustainability of such supply by looking into service indicators and customer feedback rather than mere technical supply indicators. Further, climate change is now become one of the developmental challenges for nations across the world. Climate change has an altogether different connotation for a country like India due to its varied topography, consisting of diverse bio-geographical features including forests, coasts, mountains, mangroves, islands. Further, the dependence of people, especially the poor, on the natural resource base also makes them more vulnerable to such changes. The Lower Bhavani Project in Tamil Nadu, is a clear example, where the most significant uncertainty factor is rainfall variability (UNWATER 2012). This has led to water scarcity and a highly unpredictable situation for the farmers without canal supply to endure and adapt to seasonal fluctuations in water availability.

Water pollution is adding to India's water woes with almost 70 % of surface water and an increasing percentage of groundwater being contaminated by biological as well as chemical, organic, inorganic and toxic pollutants (MoWR 2000). The sources of such pollution include point sources such as industrial effluents and domestic waste, and non-point sources such as agriculture. The health implications of poor water quality are enormous, and water and sanitation related diseases are responsible for 60 % of the environmental health burden in India (Planning Commission 2008). Water quality is another major concern. The presence of pathogenic microorganisms in drinking water is an extremely important parameter of water quality given the crucial role water plays in healthy lives. The world over, unsafe drinking water, along with poor sanitation and hygiene, are the main contributors to an estimated four billion cases of diarrheal disease, causing more than 1.5 million deaths, primarily among children under 5 years of age (WHO 2011). Surveys have estimated that over one third of rural ground water sources in India may be microbiologically contaminated, much of this contamination is preventable and proper operation and maintenance of water sources coupled with safe sanitation practices (MDWS 2011a). Indeed, improving environmental sustainability of water and energy was been cited as one of the top ten interventions that India needs to accelerate growth, in order to reach its economic potential (Goldman Sachs 2008). As is evident from the gap between sewage generation and sewage treatment capacities of major cities, there is an immediate need to build appropriate infrastructure. There is legislation that addresses the prevention and control of pollution – for example, the Water Prevention and Control of Pollution Act of 1974, Water Cess Act of 1977 (amended in 1988 as the Water Prevention and Control of Pollution Cess Act), and the umbrella legislation, the Environment (Protection) Act or EPA (1986). Recently, the Right to Information (RTI) has also been used by activists and people as a potent legislation to deal with discrepancies in the water sector. Although the Indian government is working more proactively on the increasing threat of water pollution, it will take very significant political will for these actions to translate into concrete measures resulting in improved water quality.

4.5.4 The Challenges of Equity and Distribution in Water Supply

One of the major constraints often cited for India in achieving developmental goals is the pressure of an ever-increasing population; it has now reached over 1.21 billion (Census 2011). The per capita water availability during this period has decreased from 2,309 cu m in 1991 (Sharma and Bharat 2009) to 1,588 cu m in 2001 (CWC 2010). Considering the projected population growth in 2025, the per capita water availability can further decrease to under 1,000 cu m. Despite the National Water Policy (NWP) assigning the highest priority to drinking water, providing adequate and safe drinking water to every household in the country remains an onerous task.

A projected 40 % of the population will be living in the urban areas by 2030 with higher purchasing power. This will increase calorie intake putting greater pressure on existing water resources. There exists a huge disparity between the water consumption patterns of the rich and the poor.[4] Access to water is governed by power relations in society with the poor often being differentially excluded from this process. The efforts to augment water supply and 'manage the scarcity' often concentrate on the technical and managerial aspects thereby reinforcing existing inequalities. It is imperative to consider the relational aspect of water scarcity and the differential consumption patterns as the scarcity experienced by a poor person with reference to basic livelihood needs should not be clubbed with the luxury needs of the urban rich.

Provision of water supply and sanitation for increased population in urban areas and provision of infrastructure in peri-urban areas are some of the challenges faced by the government. At the moment, the policies are either geared towards urban or rural areas with different institutional setup for delivery of services. The peri-urban areas in this case face greater challenge as they face the brunt of urbanization and lose their water security to fulfill increasing urban demand for 24 × 7 water. In many areas, tankers fetch water from peri-urban areas and supply them to urban domestic and industrial use. Prakash (2012) documents the case of Hyderabad where tanker economy is thriving at the cost of peri-urban water security. Due to large influx of population mainly because of the expansion of the city as an Information Technology (IT) hub, the peri-urban areas have been losing out on water access to the more powerful urban population with high paying capacity. These areas are witnessing change in two ways. First, they cater to the rising urban economic class that is ready to pay for constant water supply through the sale of water fueled by an informal water tanker economy. Second, peri-urban areas and their citizens are at the receiving end of the waste water produced by cities, and suffer the consequences in the form of polluted rivers, industrial and domestic waste and a damaged urban ecosystem. This trend has led to immense water insecurities due to a combination of

[4] A study by Water Aid in Delhi reveals that in one particular locality, '92 per cent of water supplied goes to 20 per cent of population and the remaining 80 percent of population gets 8 per cent of the total piped water supply'. See Water Aid (2006: 58).

issues –urban growth induced water scarcity; myopic planning that is not based on available environmental resources; lack of recognition of community water rights and lack of regulation for the protection of diminishing surface water resources.

The final key issue to be considered under social challenges is gender. Rural and urban women of almost all age groups are engaged in collection of water for household needs, including water for livestock. Women balancing pots of water on their heads while travelling vast stretches is a common sight in rural India, as is the serpentine line of women standing in queues in urban slums to collect water from a single tap! Indeed, water collection is a responsibility that primarily rests on women. The average distance travelled by women every single day in rural and peri-urban India has been a subject of countless surveys, and the fact that this indeed affects their overall health and decreases productive work hours is established in many research studies.[5] The girl child's educational and overall self-development status suffers a serious setback in a society where they are considered inferior to the male child by getting involved in water collection and other household chores constrained by water supply. Although the policy discourse has recognised this role of women, it has not come without its own peril. Women's role in government water schemes has largely been reduced to water collectors while undermining their potential for involving them in the decision-making process. As per the NRDWP guidelines, the members in VWSC should be selected to represent various groups of society and 50 % of which should be women especially those belonging to SCs, STs and OBCs. The efforts were made to involve more and more women in the programmes at a policy level. However, in reality and on the ground, these provisions are hard to implement because of strong gender bias. The technological interventions which do not take into account the social, economic and familial constraints of a society with respect to women, may lead to unfair outcomes for them.

4.5.5 Institutional Issues

India has a significant governance deficit when dealing with changing water scenarios. Severe water shortages have led to a growing number of conflicts between users in the agricultural and industrial sectors, as also the domestic sector. The pressures and drivers that stem from demographic, socio-economic, industrialization and urbanization processes could have been better dealt with, if there as a sharp vision for governance of water. Governance of water is divided between the central and state authorities, with categorization of rules and responsibilities, yet it is seen that the overall sustainable vision for water development, conservation and management remains missing. There is a dire need for convergence of laws and legislations; there exist too many laws and this in turn dilutes the water issue. The coordination and synchronization between departments/implementers and regulators is fragmented leading to each department doing things without coordination with other

[5] See, for example, Seaforth (2001).

departments, and sometime at cross purposes. The regulatory bodies have not been strict in controlling, for example, appropriation of water bodies, industrial pollution. Also, there is lack of data disaggregation and aggregation in important decision making by the body involved in water planning. Data is generated by different bodies and is sometimes contradictory in nature. The importance of data and its input into management and regulation have been stressed for the 12th Five Year Plan (Shah 2013). Much stronger political will is equally essential in finding sustainable solutions to water problems and reducing the current governance deficit in water (UNICEF, FAO and SaciWATERs 2013).

4.6 Conclusions

Here we have traced the sector development in India, both in urban and rural areas, and have outlined the issues currently holding back progress. India has had significant challenges to date in managing water. Emerging challenges such as climate change are going to further transform the water management scenario rapidly. This chapter shows that the present framework for managing water has not yielded its desired policy outcomes in terms of supplying water to all and catering to the needs of the poor and marginalized. Approaches on water seem isolated and not integrated. Responsibilities for service delivery have been shifting to local bodies – urban local bodies or ULBs and PRIs. However, most of the time, these local bodies are unable to manage due to paucity of manpower, and lack of awareness and understanding of planning a water resource development and management activity. In most states, institutions created for water management at the community level are not accountable and therefore do not have any legal identity. They also lack capacity in merging multiple programmes and schemes. The question therefore is this: What can be done to change the situation? Would treating water as a basic human right change the way we look at water governance? While there is some recognition of right to water in international human rights, as well as in the Indian constitution, at the level of state legislation and policies in India, different dimensions of right to water do not get much support. This is true even of cases like Maharashtra, where a particular version of rights (for example, entitlement to water) has been put forward. In addition, there has to be stronger disincentive for polluting the water source which accentuates the scarcity situation while polluting freshwater resources. Thus, infrastructure for waste water management needs urgent intervention. The structure and mechanism for conflict resolution between the sector and states need urgent attention. Unless these concerns are met, the right to water, even if it is guaranteed, will not bring fundamental change in the way water is conserved, managed and delivered.

Given the multiple problems that the water sector faces, it is necessary to re-think the approach to planning and implementation of the water projects. Since water is used for multiple purposes, involving potential users from the start of a project should be made central to program implementation but it must be asked if the cur-

rent institutional set-up has the necessary manpower and skills to do this. The governance structure around water has undergone considerable change with a view to be more participative rather than techno-centric, though there is considerable scope for capitalizing still on this policy shift and this really is the key to sustainable services delivered with quality and equity.

Disclaimer The views expressed herein are those of the authors and do not necessarily reflect the views of UNICEF, or the United Nations

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