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SITUATION OF WATER, SANITATION AND HEALTH OUTCOMES IN INDIA

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Abstract

A safe, reliable, affordable, and easily accessible water supply is essential for good health. A poor water supply impacts health by causing acute infectious diarrhoea, repeat or chronic diarrhoea episodes, and non-diarrheal disease. This paper want to explore the information about the accessibility of water and sanitation at household level in India and the health related impacts of water and sanitation in India.

In all over India only 29.4 percent households having source of pipe water. The use of drinking water like well, spring, bottle water, rain water collection, surface and tanker is 15 percent in India. Across all over India there are about 42 percent households doing exclusive use of household for toilet facility. In India about 20 percent households caused the stomach problem.

Introduction

A safe, reliable, affordable, and easily accessible water supply is essential for good health. Yet, for several decades, about a billion people in developing countries have not had a safe and sustainable water supply. A poor water supply impacts health by causing acute infectious diarrhoea, repeat or chronic diarrhoea episodes, and non-diarrheal disease, which can arise from chemical species such as arsenic and fluoride. It can also affect health by limiting productivity and the maintenance of personal hygiene. Reasons for the limited progress towards universal access to an adequate water supply include high population growth rates in developing countries, insufficient rates of capital investment, difficulties in appropriately developing local water resources, and ineffectiveness of institutions mandated to manage water supplies (in urban areas) or to support community management (in rural areas). Strenuous efforts must be made to improve access to safe and sustainable water supplies in developing countries, and given the health burden on the public and the costs to the health system, health professionals should join with others in demanding accelerated progress towards global access to safe water (Hunter et al., 2010).

Water supply and sanitation are essential for human health and survival, for food security and the empowerment of women as well as the education of girls, for reduction in productivity losses due to morbidity and malnutrition, for the management and protection of natural

resources. Although the crucial importance has been widely recognized, the right to safe water and adequate sanitation remains a promise unfulfilled for the world's poorest citizens. The lack of access to safe drinking water and to basic sanitation impedes economic development, thwarts progress towards gender equality and puts the health in danger. The unsustainable exploitation of natural resources is often due to insufficient or inadequate water supply and sanitation. The arguments in support of expanding the access to water supply and sanitation services and promote environmental sustainability can be expressed in terms of human values, human rights as well as in health and economic terms (Susanne, 2015).

Drinking water supply and sanitation in India continue to be inadequate, despite longstanding efforts by the various levels of government and communities at improving coverage. The level of investment in water and sanitation, albeit low by international standards, has increased in size during the 2000s. Access has also increased significantly. For example, in 1980 rural sanitation coverage was estimated at 1percent and reached 21percent in 2008. Also, the share of Indians with access to improved sources of water has increased significantly from 72 percent in 1990 to 88 percent in 2008(http://www.nationalskillindiamission.in/updates/197/, n.d.).

Most of the research on the health impacts of water and sanitation projects has focused on the incidences of diarrhoea diseases, malnutrition, and mortality of young children, and evidence accumulated during the decade indicates that these rates have been reduced (Esrey & Habicht, 1986).

Literature review

Water, sanitation and hygiene (WASH) are fundamental to health. Despite progress on child mortality, infectious diseases still pose the largest threat to the health of young children. An infection such as diarrhoea is the third biggest killer of children under five in Sub-Saharan Africa (C & L, 2002) and almost 90percent of cases of diarrhoea are caused by poor WASH (Prüss-Üstün, Bos, Gore, & Bartram, 2008). 50percent of under-nutrition is due to lack of WASH (Prüss-Üstün et al., 2008), and under-nutrition is an underlying risk factor for around 30percent of under-five deaths (WHO, 2015). Repeated episodes of diarrhoea can make under-nourished children predisposed to pneumonia(Schlaudecker, Steinhoff, & Moore, 2011). A lack of hygiene and sanitation and the associated diarrhoea also contributes to stunting and inhibited cognitive development in millions of children worldwide. Globally, 2.5 billion people still lack access to sanitation6, causing water sources, homes and surrounding environments to

become contaminated and contributing to poor health and preventable child deaths(World Health Organization., 2015).

Water, sanitation and hygiene (WASH) saves lives in both routine and emergency situations. Multi-sectoral action reduces vulnerability; maintains water sources and waste systems, and ensures WASH is a priority action in the response to emergencies. Numerous diseases are spread by water, waste and inadequate hygiene including via vectors. The main objective of water, sanitation and hygiene programmes in disasters is to reduce faeco-oral transmission of disease and exposure to disease-bearing vectors. WASH involves the promotion of good hygiene practices, the provision of safe drinking water and the reduction of environmental health risks which allow people to live with good health, dignity, comfort and security. While both water quantity and quality are important for health, it is quantity which should be given priority. Women and children who must find their own water risk their health and take time away from school and other productive activities. Providing WASH services helps people return to their normal daily activities after a disaster. Medical waste often contains sharps, pharmaceuticals, chemicals and heavy metals (WHO, 2011).

The findings of an analysis of 144 studies on the impact of improved water supply and sanitation facilities on diarrheal diseases, ascariasis, guinea worm, hookworm, schistosomiasis and trachoma are reported. Sanitation and water supply interventions included: excreta disposal facilities, personal hygiene, domestic hygiene, and drinking water quality. It is shown that improvements in one or more components of water supply and sanitation can substantially reduce rates of disease morbidity and severity for all diseases under study except hookworm (Esrey, Potash, Roberts, & Shiff, 1990).

The study titled "Interactions of diarrhoea, pneumonia, and malnutrition in childhood: recent evidence from developing countries" has found that under nutrition is the underlying cause of about half the deaths of children under five from infectious diseases in conditions like rural India (Schlaudecker et al., 2011). Despite widespread recognition of the human and social handicaps that poor sanitation places on developing countries, the considerable economic losses arising from inadequate sanitation are not well recognized, since they are not counted properly. This study attempts to estimate impacts in economic terms. It looks at the impacts of sanitation and associated hygiene practices separately, in a departure from the conventional approach of conjoint statements about water-and-sanitation or the effects of "water-borne diseases"(WSP, 2010).

It is not only developing countries that are at risk, as illustrated by a large Escherichia coli O157:H7 outbreak in a small rural township in Missouri, in the USA, that had an un-chlorinated water supply. There were 243 patients, of whom 86 had bloody stools, 32 were hospitalised, 4 died and 2 had haemolytic uremic syndrome. In a case–control study, no food was associated with illness, but ill persons had drunk more municipal water than had the controls. The study showed that, during the peak of the outbreak, bloody diarrhoea was 18.2 times more likely to occur in persons living inside the city and using municipal water than in persons living outside the city and using private well water (Swerdlow et al., 1992). People affected by disasters are more likely to become ill and to die from diarrhoea and other diseases related to inadequate sanitation and water supplies than from any other single cause (Sphere Project., 1998). Could toilets help children grow tall, while disease externalities from poor sanitation keep children from reaching their height potentials? Sanitation has received little attention in economists' recent investigations of the puzzle of Indian malnutrition (Deaton, 2007; Jayachandran, 2012; Jensen, 2012; Panagariya, 2013; Shah & Steinberg, 2017; Tarozzi, 2008).

Many children in India, particularly girls drop out of school and are denied their right to education because they are busy fetching water or are deterred by the lack of separate and decent sanitation facilities in schools. Women often suffer from lack of privacy, harassment and need to walk large distances to find a suitable place for defecation in the absence of household/ appropriate neighbourhood toilet facilities. Poor farmers and wage earners are less productive due to illness, and national economies suffer. Without safe water and sanitation, sustainable development is impossible (http://www.nationalskillindiamission.in/updates/197/, n.d.).

Magnitude of the problem situation

Sanitation and water supply interventions included: excreta disposal facilities, personal hygiene, domestic hygiene, and drinking water quality (Esrey et al., 1990). According to joint estimates of UNICEF and WHO (2012) for 2010, 15 percent of people in the world, and 19 percent of people in developing countries, openly defecate without using any toilet or latrine. Of these 1.1 billion people, nearly 60 percent live in India, which means they make up more than half of the population of India. These large numbers correspond with the estimates in the Indian government's 2011 census, which found that 53.1 percent of all Indian households – and 69.3 percent of rural households – "usually" do not use any kind of toilet or latrine. In the 2005-06, National Family Health Survey, 55.3 percent of all Indian households and 74 percent

rural households reported defecating openly (Hammer & Spears, 2013). Considering that 53percent of India's population defecates in the open, in consequence (GoI, 2012).

As per details released by UNICEF, one gram of faeces can contain 10,000,000 viruses, 1,000,000 bacteria, 1,000 parasite cysts and 100 parasite eggs(UNICEF, 2006). As a result, bacteria, viruses and parasites are communicated through the water, soil, food and unwashed hands and contaminate everything in their path, causing diarrhoeal disease (including dysentery and cholera), parasitic infections, worm infestations and trachoma. Diarrhoeal disease occupies a leading position among diseases as a cause of death and illness, killing 1.8 million people every year (UNICEF, 2006).

An analysis of data of 140 demographic and health surveys (DHS) has found that the height of Indian children correlates with their and their neighbours' access to toilets, and that open defecation (OD) accounts for much of the excess stunting in India(Spears, 2012). Considering that 53 percent of India's population defecates in the open, of in consequence, children are widely exposed to faecal-transmitted infections (FTIs) (GoI, 2012). In India, diarrhoeas caused the deaths of 2, 12,000 children younger than five years in 2010, accounting directly for 12.6 percent of child deaths (Liu et al., 2012). Diarrhoeas cause under nutrition and diarrhoeal episodes reduce resistance to infections and impair growth and development when repeated and prolonged (Ejemot-Nwadiaro, Ehiri, Meremikwu, & Critchley, 2009).

Problem formulation

To improve the quantitative and qualitative access to drinking-water and sanitation facilities is part of the millennium development goals (Target 10), because it is crucial to human developments. By 2010, still 2.5 billion people do not have access to improved sanitation facilities and 780 million people do not have access to improved source of drinking water. The practice of open defecation is declining, but still many people have no access to any kind of sanitation facilities (Who & Unicef, 2012).

Only 63 percent of the global population use improved sanitation facilities. Assessments of progress in sanitation indicate that the world has missed the Millennium Development Goals target of halving the proportion of people without access to basic sanitation. In 2010, 44 percent of the populations in the developing regions were without improved sanitation facilities. The two regions facing the greatest challenges are sub-Saharan Africa and Southern Asia, where 70 percent and 59 percent of the population, respectively, lack access to improved sanitation (Who & Unicef, 2012).

The Government of India study has found that "No-latrine households are characterised by poverty as compared to Have latrine households" (GoI, 2011).

Rational for the study

The unsafe practices relating to water and sanitation are linked to communicable diseases which are more likely to cause morbidity in adults and mortality in young infants due to serious infection. About half of the population in India practice open defecation, which leads to contamination of food resulting in infections. Child mortality is higher due to diarrhoea as compared to other infections in India. The information about access to water, sanitation and the quality of water is very important in the context of the health, wellbeing and environment of the citizens at rural and urban India. The data used for evaluating the practices relating water and sanitation is used from National Sample Survey Office (NSSO) 69th round which provides information about water, sanitation, and its health impact in urban and rural India. Goal six of sustainable development goals set by United Nations General Assembly in 2015 states that ensure water and sanitation to all. Due to poor economic infrastructure many people die from diseases associated with inadequate water supply, sanitation and hygiene. Water scarcity, poor quality of water and inadequate sanitation negatively impacts food security, livelihood choices and educational opportunities for poor people all over the globe. The drought prone areas are more likely to be affected by inadequate availability of water. To understand the current infrastructure and what we need to do to achieve this goal, the required policy prescription this paper would be helpful. The inequality within different social groups affects the access to water across different sections of the society. So, there is a need to address this issue extensively.

Data source and Methodology

The National Sample Survey Office (NSSO) is the major data source and representative of India, which provides unit level information on availability and source of drinking water, sanitation, hygiene, housing condition. For these instances, the present study used NSSO, Socio-Economic Survey, 69th Round: July 2012- December 2012, Sample Size N = 95548.

A stratified multi-stage design had been adopted for the 69th round survey. The first stage units (FSU) were the census villages (Panchayat wards in case of Kerala) in the rural sector and Urban Frame Survey (UFS) blocks in the urban sector. The ultimate stage units (USU) were households in both the sectors. In case of large FSUs, one intermediate stage of sampling was the selection of two hamlet-groups (hgs)/ sub-blocks (sbs) from each rural/ urban FSU.The two stage multi-stage stratified sampling technique is used for this study. Bi-variate technique has

been used to fulfill the objectives and cross tabulation between the state, religion, caste, source of drinking water, quality of water, treatment of water, access to latrine and drainage facility. For the rural sector, the list of 2001 census villages updated by excluding the villages urbanised and including the towns de-urbanised after 2001 census (henceforth the term 'village' would include Panchayat wards for Kerala) constituted the sampling frame. For the urban sector, the latest updated list of UFS blocks (2007-12) was used as the sampling frame.

Within each district of a State/ UT, generally speaking, two basic strata were formed: i) rural stratum comprising all rural areas of the district and (ii) urban stratum comprising all the urban areas of the district. However, within the urban areas of a district, if there were one or more towns with population 10 lakhs or more as per population census 2011 in a district, each of them formed a separate basic stratum and the remaining urban areas of the district were considered as another basic stratum. In case of rural sectors of Nagaland and Andaman & Nicobar Islands, the coverage was extended to the entire State/UT from this round. In these two State/UTs, one separate special stratum was formed within the State/UT consisting of all the interior and inaccessible villages which were not covered in any of previous rounds.

Objectives of the study

- To study the accessibility of water and sanitation at household level in India.
- To explore the health related impacts of water and sanitation in India

Findings and Discussion

The access to source and quality of drinking water in India.

In all over India only 29.4 percent households having source of pipe water. The component of the pipe water is 89 percent in the state of Goa and 10 percent in the state of Bihar, Assam, Jharkhand and Uttar Pradesh respectively. In the context of public water across India it is 56 percent and in the state of Bihar it is 96 percent and 3 percent in the state of Goa, Sikkim and Kerala. Drinking water supply in India remained a serious problem. In Urban India nearly 70.6 percent households use tap water as major drinking water source (SINHA, 2013). The quality of the water from the numerous sources was excellent, but the existing pipeline system was only rudimentary. The majority of the population had to fetch water from open furrows and ditches. Women spend long hours per day in order to secure the daily water supply needed by their families (Who & Unicef, 2012, Susanne, 2015). The use of drinking water like well, spring, bottle water, rain water collection, surface and tanker is 15 percent in India and about 78 percent in Lakshadweep, whereas it is 10 percent in the state of Haryana, West Bengal,

Chhattisgarh, Dadra and Nagar Haveli, Arunachal Pradesh, Uttar Pradesh and Punjab respectively. The result shows that in India 88 percent household getting good quality of water and 100 percent household in the state of Mizoram getting good quality of drinking water except in Assam 59 percent. A comparison of progress in rural and urban areas since 1990 shows that greater progress has been made in expanding water and sanitation services to urban areas. Of the 783 million people still using unimproved drinking-water sources, 83% (653 million) live in rural areas. Of the 2.5 billion people still not served with improved sanitation facilities, 72% (1.8 billion) live in rural areas (Hutton, 2013).

In the context of quality of drinking water it was ascertained whether the water was 'bad in taste', 'bad in smell', 'bad in taste and smell', 'bad due to other reasons' or had 'no defect'. The proportion of households reporting 'no defect' of drinking water from respective principal source can be interpreted as the proportion of households that were satisfied with the quality of the drinking water they got (Susanne, 2015). The treatment of drinking water is an important indicator of quality of drinking water and hygienic living as many households treat water by one or more methods before drinking. Treatment of water can be done through boiling, filtering, by using chemicals, by using electronic purifier or by any other method(Dangour et al., 2011). The study finds that use of treated water is 39 percent in India and 99 percent in the state of Nagaland and about 6 percent in the state of Bihar and Uttar Pradesh.

The access to source and quality of drinking water in India among social groups and religion.

The study reveals that, in social groups access to pipe water facility is 40 percent among other category and 15 percent in STs. About access to public water facility, it is 67 percent among SC category and 46 percent among other category. The access to other source of water is 24 percent among ST social group and 13 percent in other social group. The access to good quality of water is 85 percent among all social groups and about treated water it is 63 percent among STs and 29 percent among SC social groups. At current rates of progress in access to drinking-water, 8% (605 million) of the world's population will still be using unimproved sources of drinking-water in 2015. The remaining unnerved populations are generally the poorer and marginalized members of society, and thus are harder to reach with services. Hence there is increasing pressure for universal access to safe drinking-water and basic sanitation to be adopted as a global development goal(Hutton, 2013).

Among the religion, access to pipe water is 38 percent in other religious group and 26 percent in Muslim religion. About access to public water facility is 61 percent in Muslim religion, where as it is 39 percent in other religious group. In the context of access to other sources of water, the other religion is 23 percent and it is 13 percent in Muslim religion. In addition to quality of water, the access to not defected water is about 88 percent in all religion and use of treated water is 57 percent in other religion and 32 percent in Muslim religion. In low- and middle-income countries, it was found that in 31% of households use piped water to premises; 27% use a non-piped or community water source; 12% use only an unimproved water source and do not filter or boil their water; and on the sanitation side, 58% of households were estimated to use an improved sanitation facility(Prüss-Ustün et al., 2014). The water, sanitation and hygiene is important for improving the lives of slum dwellers, by reducing the risks of contracting water-related illnesses, relieving the burden on women and children (Susanne, 2015, Ainsworth, 2004).

The types of toilet and drainage facilities in India.

Across all over India there are about 42 percent households doing exclusive use of household for toilet facility. Among that the state of Mizoram is 97 percent and Union Territory (UT) Daman and Diu is 15 percent. In India about 12 percent households having common toilet facility in the building and it is 67 percent in the UT of Daman and Diu. The component of open defecation is 43 percent in India and it is 72-74 percent in the state of Jharkhand and Odisha respectively, whereas it is less than 4 percent in Lakshadweep, Kerala, Karnataka and Sikkim. In India 3 percent households using other toilet facility. It is estimated that, in 2010 about 15 percent of people in the world, and 19 percent of people in developing countries, openly defecate without using any toilet or latrine. Of these 1.1 billion people, nearly 60 percent live in India, which means they make up more than half of the population of India(WHO & Unicef, 2013). These large numbers correspond with the estimates in the Indian government's 2011 census, which found that 53.1 percent of all Indian households – and 69.3 percent of rural households – "usually" do not use any kind of toilet or latrine (Hammer & Spears, 2013). In the 2005-6 National Family Health Survey, India's version of the DHS, 55.3 percent of all Indian households reported defecating openly, a number which rose to 74 percent among rural households. . Based on the most recent estimates sanitation coverage must increase globally from 63% to 75% between 2010 and 2015. At the current rate of progress, sanitation coverage is predicted to be 67% in 2015(Hutton, 2013)

The access to drainage facility, in India about 29 percent household has underground and coverage drainage facility; among that Chandigarh is 84 percent and less than 5 percent in the state of Sikkim, Arunachal Pradesh, Manipur, Mizoram, Tripura, Meghalaya and Assam. In India 32 percent household have open drainage facility, among that 92 percent in the state of Nagaland, and 4 percent in Chandigarh. Across all India 38 percent households have not drainage facility and among that Odisha is 80 percent and 2 percent in Haryana and Delhi. The Census of India, 2011 revealed the availability of household amenities in India. Accordingly 51.7 percent of households do not have toilet facility within their premises. Wide disparities also found in the amenities. For instance, only 5.5 percent of households of Kerala do not have latrine facility within their premises. But 80.4 percent households of Odisha, 79.4 percent of Jharkhand, 78.2percent Chhattisgarh, 76.3 percent Bihar, 68.7 percent Madhya Pradesh do not possess toilet facility within their premises (GoI, 2012).

The access to different types of toilet and drainage facilities in social groups and religions.

In the context of social groups, the components of exclusive use of household for toilet facility, it is 62 percent in other social groups, whereas 20 percent in ST social groups. The common use of toilet facility in buildings is almost 12 percent in across all social and religion groups. About 67 percent ST social group's households facing the problem of open defecation and it is 20 percent in other social groups. The access to the coverage and underground drainage facilities is 41 percent among other social groups and almost 10 percent among SC social group. The access of open drainage facility is 35 percent in OBC social group, and 25 percent among ST social group. The problem of no drainage facility is 66 percent in ST social groups, whereas it is 28 percent in other social groups. At global level both water supply and sanitation, 25% of the world's population – 1.8 billion – would remain without access to improved sanitation in 2015. If current trends in sanitation continue, this figure will be closer to 2.4 billion. Majority of rural households 87.26 percent do not have connectivity to their drainage. It is alarming to notice that only 12.61 percent of urban households in Karnataka have closed drainage facility to their houses. And roughly same percentage of households manages without any drainage facility(Dr. Mohammad Akram, 2013).

In India 42 percent households doing exclusive use of toilet facility at household level and among these households the other religions are 65 percent and 40 percent in Hindu religion. The use of common toilet in building is more than 10 percent in all religion and not access to latrine facility is among Hindu religion about 47 percent and it is 20 percent in other religion.

In the additional study of drainage facilities, the access to underground and coverage drainage facilities is about 29 percent in India and it is around 35 percent in other religion, whereas it is 30 percent in Hindu religion. The access to open drainage facilities is more than 30 percent in across all religion. The problem of no drainage facilities is 39 percent in Hindu religion, whereas it is 29 percentages in other religion.

The types of illnesses caused in last month in India.

In India about 20 percent households caused the stomach problem, among that 42 percent in the state of Bihar and less than 7 percent in the state of Karnataka, Andhra Pradesh, Kerala, Lakshadweep, Tamilnadu and Pondicherry respectively. All over India 5 percent households caused by Malaria and it is 22 percent in the UT of Daman and Diu, whereas it is less than 1 percent in the state of Sikkim, Kerala, Lakshadweep, Tamilnadu, Pondicherry and Andaman and Nicobar. Consequently, the population suffered from numerous diseases caused by dirty water: diarrhea, worm diseases, skin and eye infections (Susanne, 2015). The improvement of the sewerage system, namely the construction of a treatment plant, the extension of the existing sewage network and the establishment of a system for the emptying of the on-site facilities, has had a very positive impact on the living condition of the population and in particular has reduced the health risks related to the insufficient water supply and sanitation situation. Between 2002 and 2004, the incidence of typhoid as well as hepatitis A decreased by over 50% each, dysentery was reduced by 48% during the same period and the number of diarrhoea cases dropped from 5.989 in 2002 by 38% to 3.736 in 2003 (Susanne, 2015, Padhi et al., 2015).

In India 7 percent households suffered by the skin diseases, among these households 14 percent suffered in the state of Punjab, whereas it is 1 percent in the UT of Delhi. The prevalence of illness like fever in India is about 36 percent and it is 51 percent in the state of Uttar Pradesh, whereas it is lowest around 6 percent in the UT of Pondicherry.

The types of illnesses faced by the Social groups and Religion.

The study finds that, about 23 percent people from SCs having stomach problem and 18 percent in other social groups. The problem of Malaria caused 7 percent in ST households and 3 percent in other social groups. The illness of skin disease is 8 percent among SCs and 6 percent in STs. The problem of fever faced by households is 41 percent in SC social group, whereas it is about 31 percent in other social groups. Exposure to unsafe water, unimproved sanitation, and poor waste management during pregnancy may increase the risk of infection, causing downstream effects such as low birth weight and preterm delivery (Padhi et al., 2015). The illnesses faced

by social groups like SCs and STs indicates the lack of improved source of drinking water, its quality and improved sanitation facilities especially in areas where these social groups reside. About the different types of illnesses among different religious groups, the stomach problem is 24 percent in the Muslim, whereas it is 16 percent in other religion. Across all religion 5 percent households has suffered by Malaria and 7 percent by skin diseases. About the illness of Fever, it is 40 percent in Muslim religion and 35 percent in Hindu religion. Across all religion about 19 percent households faced the stomach problem and 36 percent suffered by fever. Similar to the earlier results, the socially deprived communities like Muslims do face a problem of unimproved sources of drinking water and lack of proper sanitation facilities.

Implications and role of various stake holders

Drinking water supply and sanitation in India continue to be inadequate, despite longstanding efforts by the various levels of government, non-government and communities at improving coverage. While the international and national organisations ongoing efforts to address WASH bottlenecks in the enabling environment is much needed, it is critical to realise that this process will be lengthy. Ministries and departments of water and sanitation are very large organisations, which generally show much inertia and are slow to reform. Depending on individual states it might take five years as a best case scenario, or up to a decade or two, before the ecosystem is enabling. Designing appropriate policies, clarifying roles and responsibilities, devising strategies, addressing budget issues, agreeing on coordination mechanisms, etc. will all take time. Likewise, building stakeholder capacity so that they can fulfil their duties will be time consuming. And it will presumably take even longer to reach the point where the degree of policy enforcement and stakeholder accountability is satisfying. Even then, it is important to recognise that an enabling environment for WASH may not provide a full guarantee of success at local level. Therefore, a holistic approach should be used from micro to macro level in which individuals, as well as the stakeholders, do perform their duties which in turn will ensure the safe drinking water and sanitation for each person in a quicker way.

Recommendations

Ensuring poor people's access to safe drinking-water and adequate sanitation and encouraging personal, domestic and community hygiene will improve the quality of life of millions of individuals in India. Better managing water resources to reduce the transmission of vector-borne diseases such as viral diseases carried by mosquitoes and to make water bodies safe for recreational and other users can save many lives of urban as well as rural people and has

extensive direct and indirect economic benefits, from the micro-level of households to the macro-perspective of national economies.

This becomes increasingly important to identify who are being left behind and to focus on the challenges of addressing their needs. The recommendations which emerge reflect the need to address national water and sanitation bottlenecks both at the macro and micro levels. High-level commitment to ambitious targets can result in unbalanced approaches exclusively focused on hardware provision. Given the autonomy of state government in the field of water and sanitation, state-level policies and the quality of leadership at state (and district) level are very significant. The relevance of these policies and the extent to which this leadership permeates in the system, fostering the engagement of Department of water staff at district, block and cluster levels have a strong bearing on the community management for the WASH agenda. As noted, monitoring and planning processes are deficient and the training of Ministry of water and sanitation staff on WASH is yet much perfectible. These represent structural obstacles to an effective delivery of WASH at scale. Budgetary decisions made at national and state levels, and the timely disbursement of funds, also affect the development and maintenance of facilities across the country. Each District planning committee should inculcate provision of water in its plan. The planning outcomes needs to be audited by community workers and peoples representatives for ensuring accountability. Sustainable progress at scale requires the Government to devise appropriate WASH strategies and programmes, and consistent planning and budgeting informed by a more robust monitoring system. This implies building capacities of a range of stakeholders, and increasing their accountability. The improvement of the sewerage system among emerging urban and rural area's in India, namely the construction of a treatment plant, the extension of the existing sewage network and the establishment of a system for the emptying of the on-site facilities, has had a very positive impact on the living condition of the population and in particular has reduced the health risks related to the insufficient water supply and sanitation situation. The support provided by NGOs like UNICEF, Water Aid India and other international and national NGOs to the Government at national, state and district levels is instrumental in bringing gradual improvements to the system. Through their advocacy work, policies, norms, systems and practices have all improved.

Conclusion

Water, sanitation and hygiene are fundamental to health. Hence importance of good quality of water and sanitation practices as well as access to the needed quantity of water and its easy

availability help in elimination of various vector borne diseases. It also improves the quality of life led by the population. Despite the effect of the various sanitation programmes where it has happened, half of the Indian population defecates unsafely. In Indian context as observed from the findings we can come to the conclusion that the practice of sanitation is very low in prevailing development scenario. Access to piped water varies from very low level in Bihar to a moderate level in well developed states. The overall access to piped water in India is 29 percentages which is very low as compared to developed countries. The access to good quality of water in most of the states is poor which in turn contributes to higher morbidity and mortality. As per different social groups the situations worsens with vulnerable sections of the society. Only 41 percentage people have access to their own toilet facilities while the rest of the population practices open defecation. Access to toilet varies among different social groups. It is very low in Schedule tribe population as compared to other category population. If reducing open defecation indeed can improve life of our peoples. Improvements in the water and sanitation practices as well as delivery mechanism of good quality and easy access of water will benefit the population and reduce disease burden.

Table No. 1 - Source and quality of water in India

	Source of water						**Quality of water**			
State	**Pipe water**	**N**	**Public water**	**N**	**Well, Spring and Other**	**N**	**Not Defected**	**N**	**Treated Water**	**N**
Jammu and Kashmir	50.1	1117	24.6	450	25.3	377	75.1	1420	36.9	826
Himachal Pradesh	56.4	725	29.5	438	14.1	167	93.5	1247	22.0	254
Punjab	49.2	1015	50.3	1095	0.4	14	79.9	1724	19.9	410
Chandigarh	78.8	228	21.2	60	0.0	0	85.2	249	23.2	68
Uttaranchal	36.8	373	49.1	391	14.1	124	92.6	814	24.0	147
Haryana	65.1	1119	25.0	459	9.9	178	86.9	1509	19.1	374
Delhi	71.3	1373	22.5	388	6.2	93	90.5	1648	46.2	865
Rajasthan	39.4	1853	39.0	1566	21.7	804	82.3	3486	63.5	2722
Uttar Pradesh	9.4	1504	86.3	9604	4.3	455	91.0	10415	5.9	773
Bihar	1.1	108	96.2	4148	2.6	124	80.6	3542	3.2	219
Sikkim	84.1	645	0.8	20	15.1	103	94.7	732	91.4	653
Arunachal Pradesh	53.4	649	41.7	256	4.9	17	88.9	772	67.0	727
Nagaland	28.3	311	34.9	157	36.8	396	94.9	827	99.8	856
Manipur	12.5	316	33.8	665	53.7	1114	96.1	2038	92.2	1914
Mizoram	42.9	469	30.2	355	26.9	315	100.0	1138	77.5	891
Tripura	13.9	492	68.9	1344	17.2	276	80.3	1724	65.2	1479
Meghalaya	17.3	283	35.9	470	46.7	495	94.7	1204	75.1	1022
Assam	2.6	121	73.6	2267	23.8	696	59.2	1846	63.1	1972
West Bengal	12.7	1191	80.4	5663	7.0	434	84.1	6146	16.9	1459
Jharkhand	7.1	152	61.7	1359	31.3	575	88.5	1875	35.7	725

Odisha	10.6	447	71.2	2524	18.1	573	87.8	3120	26.5	965
Chhattisgarh	16.0	360	75.4	1286	8.6	130	90.4	1619	50.2	968
Madhya Pradesh	22.4	1382	61.3	3284	16.3	718	90.2	4906	56.4	3167
Gujarat	60.4	2385	27.9	1138	11.7	434	89.0	3534	86.6	3437
Daman Diu	34.1	93	55.2	77	10.7	22	98.9	186	34.0	130
Dadar and Nagar Haveli	22.5	25	71.2	137	6.4	18	97.1	176	47.3	97
Maharashtra	57.3	4443	28.7	2377	14.0	999	93.4	7315	73.3	5715
Andhra Pradesh	39.0	2285	39.8	2356	21.2	1178	89.8	5188	38.6	2207
Karnataka	42.8	1670	43.2	1823	14.0	587	93.0	3765	49.4	1933
Goa	86.8	237	3.1	10	10.1	41	80.7	241	83.2	212
Lakshadweep	0.0	0	21.9	53	78.1	127	91.7	165	76.9	116
Kerala	18.4	757	9.7	487	71.9	2593	93.3	3538	84.7	3308
Tamilnadu	33.5	1812	51.3	3154	15.2	818	87.4	5176	34.4	1885
Pondicherry	74.0	289	15.6	67	10.3	52	81.0	333	40.7	171
Adman and Nikhobar	69.9	228	17.3	51	12.8	67	84.4	294	65.7	220
India	29.4	30457	55.9	49979	14.7	15114	87.8	83912	39.3	42887

Note: 'Other' water source includes bottled water, rain water collection, surface water and tanker and category of treated water includes electronic purifier, boiling, chemically treated with alum and bleach/chlorine tablets, filtered with water filter and cloth and other.

Table No. 2 - Source and quality of water in social groups and religion of India

Background Characteristics	Pipe water	N	Public water	N	Well, spring and other	N	Not Defected	N	Treated Water	N
Social Groups										
ST	14.8	2751	61.0	6286	24.1	3487	91.23	11426	63.3	7922
SC	22.0	4280	67.3	11174	10.7	1966	87.62	15264	29.4	5129
OBC	28.3	11059	56.4	20251	15.3	5997	88.39	32974	42.6	15875
Other	40.1	12367	46.5	12268	13.4	3662	85.69	24248	49.3	13959
Religion										
Hindu	29.3	23172	56.2	39933	14.5	10676	88.33	64972	39.2	31520
Muslim	26.2	3842	61.0	7040	12.8	1867	83.79	10668	32.3	4983
Other	38.2	3443	39.1	3006	22.7	2571	89.05	8272	57.4	6384
Total	29.4	30457	55.9	49979	14.7	15114	87.83	83912	39.3	42887

Note: in other religion categories are included Christian, Buddhist, Jain, Zoroastrianism and other.

Table No. 3- Types of toilet and drainage facility in India

	Toilet facility								**Drainage facility**					
State	**Exclusive use of Household**	**N**	**Common use in building**	**N**	**No Latrine**	**N**	**Other**	**N**	**Underground and Coverage Drainage**	**N**	**Open Drainage**	**N**	**No Drainage**	**N**
Jammu and Kashmir	53.6	1082	10.4	282	35.2	537	0.8	43	32.6	619	30.5	684	37	641
Himachal Pradesh	61.3	782	14	180	22.1	328	2.7	40	18.7	188	35.9	483	45.4	659
Punjab	62.4	1252	21.3	407	15.6	433	0.7	32	44.4	919	44.8	923	10.8	282
Chandigarh	55	149	23.8	78	1.5	15	19.7	46	84.1	247	4.3	7	11.6	34
Uttaranchal	64.4	517	18.3	165	16.1	185	1.3	21	21.7	208	46.7	358	31.5	322
Haryana	70.4	1137	12	226	16.7	373	0.9	20	30.5	555	67.9	1138	1.6	63
Delhi	67.8	1362	28.9	419	0	3	3.3	70	68	1271	30	545	1.9	38
Rajasthan	32	1401	9.8	453	57.2	2305	0.9	64	23.6	977	28.7	1356	47.7	1890

		365		115		658				411		526		218
Uttar Pradesh	30	1	9.1	4	60.1	3	0.8	175	36	5	45.6	8	18.4	0
		105				284						215		162
Bihar	21.5	6	9.4	432	67.4	0	1.8	52	10.2	595	52	6	37.8	9
Sikkim	78.1	577	19.8	157	0.1	5	2	29	3.4	19	65.8	484	30.8	265
Arunachal Pradesh	51.1	569	15.9	217	10.4	45	22.6	91	3.9	49	50.4	563	45.7	310
Nagaland	93.7	754	5.5	89	0	1	0.9	20	5.7	56	92	772	2.3	36
		167										159		
Manipur	77.2	0	21.5	386	0.9	20	0.4	19	1.5	34	73	1	25.5	470
		111												
Mizoram	97.8	5	1.3	16	0.3	3	0.6	5	3.4	30	63.5	714	33.1	395
		140												140
Tripura	69.6	3	12.6	325	1.2	17	16.6	367	1.2	38	24.8	665	74	9
		109												
Meghalaya	89.3	6	6.8	109	3.6	41	0.2	2	3.5	49	50.3	674	46.1	525
		240										121		180
Assam	79	5	8.1	284	11.2	316	1.8	79	1.6	63	38.2	7	60.1	4
		342		141		201						237		420
West Bengal	45.2	0	20.2	7	29.4	5	5.2	436	7.9	708	27.6	4	64.5	6

						140								108
Jharkhand	18.8	512	6.7	159	73.9	2	0.6	13	9.4	228	34	772	56.6	6
						244								270
Odisha	18.2	778	9.5	281	71.6	9	0.6	36	8	361	11.9	477	80.1	6
						103								
Chhattisgarh	26.5	566	6.3	134	65.6	2	1.6	44	16.3	295	30.3	593	53.4	888
Madhya		183				298				159		178		201
Pradesh	29	3	9.5	505	60.7	9	0.8	57	26.7	3	33.7	1	39.6	0
		193				159				166				191
Gujarat	54.1	6	9.5	353	34.4	2	2	76	49.8	8	6.9	372	43.2	7
Daman Diu	14.8	59	67.1	63	3	40	15	30	57.7	104	35.9	31	6.4	57

Continue

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Dadara and														
Nagar Haveli	17.1	30	40.1	35	42.4	111	0.5	4	22.7	29	7	5	70.4	146
		327				288				277		256		248
Maharashtra	43.4	0	11.4	757	33.5	7	11.7	905	38.7	4	29.8	5	31.5	0
Andhra		262				240				191		189		200
Pradesh	45.9	7	14.7	729	38.7	8	0.8	55	35.6	5	30.4	6	34.1	8

		176				182				140		143		124
Karnataka	42.4	8	11.1	388	44.8	9	1.6	95	39.1	0	32.1	5	28.7	5
Goa	72.7	192	8.8	21	6.7	49	11.8	26	39.5	82	35.1	114	25.4	92
Lakshadweep	81.2	156	16.7	19	1.2	3	0.9	2	38.7	44	13.6	23	47.7	113
		336								142				170
Kerala	91.5	3	5.2	181	2.3	172	1	121	39	1	19.8	710	41.2	6
		222				275				191		134		252
Tamilnadu	42.9	4	10.5	455	41.1	9	5.5	346	38.9	5	20.4	5	40.8	4
Pondicherry	64.2	248	12.3	44	21.1	100	2.5	16	22.1	84	55.3	259	22.6	65
Andaman and Nicobar	66.6	230	11.9	27	19	80	2.5	9	18.3	43	35.6	115	46.1	188
		451		109		359		344		246		344		363
India	42.1	90	11.7	47	43.3	67	2.9	6	29.2	96	32.8	65	38	89

Note: 'Other' category includes paid and unpaid toilet facility.

Table No. 4 -Access to different types of toilet and drainage facility in social groups and religion

Background Characteristics	Exclusive use of Household	N	Common use in building	N	No Latrine	N	Other	N	Underground and Coverage drainage	N	Open drainage	N	No drainage	N
social Groups														
ST	23	6084	7.8	1011	67.2	5100	1.9	329	9.6	905	24.8	4890	65.6	6729
SC	26.4	5141	10.8	1711	58.6	9618	4.2	950	19.7	3131	35.1	6387	45.2	7902
OBC	39.2	16114	10.9	4024	47.5	16050	2.4	1119	29.1	9955	35.2	13753	35.8	13599
Other	61.9	17851	14.5	4201	20.3	5199	3.2	1046	41.5	10705	30.1	9435	28.4	8157
Religion														
Hindu	39.7	31691	11.1	7978	46.5	31476	2.8	2636	28.9	19137	32.2	25165	39	29479
Muslim	48.5	6780	15.8	2051	31.3	3367	4.4	551	29	3758	35.4	4706	35.6	4285
Other	65.5	6719	11.3	918	20.5	1124	2.6	259	35.1	1801	36.4	4594	28.6	2625
Total	42.1	45190	11.7	10947	43.3	35967	2.9	3446	29.2	24696	32.8	34465	38	36387

Table No. 5 -Types of Illnesses caused in last month in India

State	Stomach Problem	N	Malaria	N	Skin disease	N	Fever	N
Jammu and Kashmir	24.4	531	0.3	9	11.1	269	32.5	637
Himachal Pradesh	14.3	201	1.1	15	6.8	92	31.4	405
Punjab	26.5	533	3.1	58	13.5	299	47.1	964
Chandigarh	22.6	56	2.0	1	5.0	14	26.8	82
Uttaranchal	26.6	239	1.3	20	10.8	107	32.3	346
Haryana	18.6	368	8.1	114	5.4	105	35.1	665
Delhi	7.8	138	0.5	18	1.1	28	20.9	389
Rajasthan	18.5	850	10.8	454	9.3	410	43.4	1842
Uttar Pradesh	33.7	3929	8.6	1047	12.1	1386	51.0	5914
Bihar	42.3	1723	3.8	164	9.7	470	49.1	2089
Sikkim	8.7	92	0.0	0	3.8	20	14.7	123
Arunachal Pradesh	30.9	274	17.2	130	8.8	58	42.6	379
Nagaland	22.6	195	1.0	7	3.1	59	21.6	279
Manipur	14.7	310	1.2	31	7.3	178	23.5	511
Mizoram	20.1	217	9.3	97	6.5	63	20.4	208
Tripura	13.2	277	4.0	55	3.7	71	30.4	643
Meghalaya	28.2	323	10.3	118	7.9	80	33.8	429
Assam	39.5	1200	2.8	63	11.4	372	44.7	1332
West Bengal	24.9	1751	1.1	61	10.7	736	36.9	2615
Jharkhand	31.1	668	14.2	267	9.3	218	41.9	839
Odisha	14.8	536	11.4	396	4.8	178	40.4	1424
Chhattisgarh	15.9	298	8.1	154	4.8	73	35.9	630
Madhya Pradesh	25.0	1324	13.5	687	8.8	457	39.8	2186
Gujarat	7.4	228	3.5	163	2.5	106	23.1	991
Daman Diu	11.7	7	21.7	8	1.5	3	14.2	45
Dadara and Nagar Haveli	5.8	13	1.1	3	0.7	2	29.5	62

Maharashtra	12.6	969	3.3	289	3.2	244	30.8	2402
Andhra Pradesh	6.2	419	2.0	130	3.2	181	28.8	1715
Karnataka	6.9	280	0.4	20	2.1	113	27.6	1235
Goa	8.2	34	2.9	7	3.7	11	19.4	73
Lakshadweep	4.7	9	0.0	0	4.5	11	30.2	51
Kerala	5.9	213	0.1	5	6.9	220	28.8	1127
Tamilnadu	4.8	265	0.7	51	3.7	204	18.9	1093
Pondicherry	0.6	9	0.2	2	1.5	11	6.1	31
Andaman and Nicobar	19.8	46	0.3	1	6.4	13	43.2	104
India	19.5	18525	4.9	4645	7.0	6862	36.1	33860

Table No. 6- Types of Illnesses caused in last month among social groups and religion.

Social groups	Stomach Problem	N	Malaria	N	Skin disease	N	Fever	N
ST	17.7	2513	7.3	889	6.3	842	37.3	4322
SC	22.8	3841	5.7	914	8.4	1446	41.0	7067
OBC	19.1	6899	5.2	1941	6.9	2600	37.1	13486
Other	18.3	5272	3.3	901	6.5	1974	31.2	8985
Religion								
Hindu	19.1	13693	5.1	3584	6.7	4972	35.7	25985
Muslim	23.6	3047	4.2	592	8.8	1212	39.8	5038
Other	16.5	1785	4.2	469	8.5	678	33.8	2837
Total	19.5	18525	4.9	4645	7.0	6862	36.1	33860

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