CHAPTER – II

REVIEW OF LITERATURE
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Present chapter is intended to present the review of the existing literature on health hazards and sanitation, so as to understand the concept and methodological issues. This chapter is divided into four sections in which Section I deals with studies on sanitation and open defecation, while Section II reviews studies on health and sanitation. Studies on sanitation and solid waste management are reviewed in Section III, while Section IV is intended to present summary of review.

SECTION-I

2.1 Studies on Sanitation and Open Defecation

The United Nations Report (2010) highlighted a crude fact that far more Indians have access to cell phones than to a toilet and basic sanitation. It is a tragic irony to think in India, a country now wealthy enough that roughly 70 per cent of the people own phones; about half cannot afford even the basic necessity and dignity of a toilet. For a rising economic power like India, such statistics reveals misplaced priorities and unequal distribution of the fruits of liberalization and globalization of Indian economy. The report further adds “popular education about the health dangers of poor sanitation is also needed. But this simple measure could do more to save lives, especially those of young children and old people. Improve health and help pull India and other countries in similar circumstances out of poverty than any other alternative investment. It can also serve as a very significant boost to the local economy”. The report is produced by experts who prescribe ways to meet the Millennium Development Goal (MDG) on sanitation by 2015.

The states are expected to prepare their own strategies within the next two years; cities are to prepare their model city sanitation plans, and a multi-stake holder city sanitation task force will be responsible for achieving the targets set. Significantly, it directs that 20 percent of the funds must be set aside for the urban poor and on the lines of the TSC’s Nirmal Gram Puraskar (award for clean village),
cities with the best performance will receive awards (Nirmal Sahar Puraskar). As usual, it is the implementation and commitment of the implementing agencies which will be the crucial factors. A huge percentage of urban slums are not connected to any sewerage system. ‘Illegal’ settlements do not have even rudimentary facilities. Sewerage and drainage facilities in most parts of unplanned and haphazardly developed urban areas are woefully inadequate. All this, plus the high population density, make urban sanitation, a nightmarish challenge. Sewerage connected toilets need adequate amounts of running water and a regular practice of waste disposal: the costs of maintenance too are prohibitive.

Besides, public toilets in Indian cities and towns, run by municipal bodies, are given very low official priority in terms of maintenance. Conventional sewerage systems require a prohibitive amount of continuous water supply and are costly to maintain. Mumbai had experimented with mobile toilets but, though this was a good idea, activists say that poor scheduling, poor maintenance and lack of access to sewer lines have made them ineffective. In this regard, the Sulabh Shauchalaya toilet-cum-bath facilities are making a noteworthy contribution, but they do not seem to be enough.

At least ten African countries have expressed their desire to adopt indigenous Sulabh techniques to improve sanitation in African countries, their officials have spent ten days in India to get first-hand experience about the low-cost Indian toilet construction. UN – HABITAT has organized the International Capacity Building Workshop on “Sanitation Technologies” in coordination with International Academy of Sanitation in 2006 to provide a platform for sharing knowledge about the low-cost toilet system which was designed by Sulabh International.

As a part of the implementation of the Habitat Agenda through collaboration with all partners included for sustainable development in water, sanitation and hygiene, this capacity building programme was accepted with great satisfaction over the techniques and expressed their desire to implement in their countries. The capacity building process was carried out in three phases where in the professionals were trained followed by the implementation of the sanitation projects by the participants in their own countries. This programme was an initiative of UN-HABITAT to promote
closer cooperation in developing appropriate technologies and there by strengthening the South-South Cooperation as the countries in this region resolved to cooperate in many sectors including sanitation.

**Government of Haryana (2008)** declares that access to sanitation facility is a basic necessity of each human being in a civilized society. According to Census 2001, only 21.9 percent rural population had access to toilet facilities in India. However, rural sanitation coverage in Haryana was reported to be 28.66 percent, on an average basis, with a range of 14.5 percent to 69.9 percent in different districts. National rural sanitation coverage has gone up to 57.5 percent in 2008. As compared to this the state of Haryana has achieved 70.5 percent on an average basis. Districts have shown considerable variation in their level of improvement resulting there by a range of 26.07 percent to 100 percent. Access to toilets is not less than 25 percent in any district. As per 2001 Census, access to sanitation facility was below 25 percent in four districts, while 11 districts have coverage of above 75 percent. The coverage has increased significantly during the last two years. Total Sanitation Campaign (TSC) has been an important intervention strategy to bring in this silent revolution in the state.

There is a paradigm shift in strategy that was implemented: they are from thrust on construction to change in behaviour, from government driven to community driven, routine training to capacity building, emphasis on individual to emphasis on communities, emphasis on creation of facility to awareness generation and creation of demand. The mantra of success has been a concerted strategy that included, capacity building of different stake holders, and identification of right kind of people, net working and community involvement. First step was, a district level workshop was conducted with the support of WSP and CLTS approach. The second step was, to reach to the heart of village and change the very basics of the daily routine of villagers; a proper channel network was formed. A strong net working was done to liaise with the districts from blocks, blocks to clusters and clusters to villages.

Frequent experience sharing workshops were organized by DRDA to share success stories among the villagers associated with the Total Sanitation Campaign (TSC) and others who were showing resistance. This helped DRDA to motivate and inspire the people of other villages also who thought initially that making their village
open defecation free would be very difficult task, if not impossible. A district level workshop was conducted with the support of WSP and CLTS (community led total sanitation) approach. A team of trainers and dedicated motivators was prepared.

As a second step, to penetrate the remotest of the village communities a networking of District to Block to Cluster to Village was created. Block level monitoring teams of 30-40 motivators prepared and put at the Block for triggering and supporting the village level Nigrani Samitis (vigilance committees) for day and night vigilance to stop open defecation. The Nigrani Samitis also took up the task of toilet construction as per requirements. The women and children played a key role in spreading the message of Sanitation.

Block-wise teams of teachers were constituted to educate school children, who became “Swachhtha Sainiks” (soldiers of cleanliness) and organized awareness rallies. Sarpanches (elected village official), grassroots workers like, SHGs, Anganwadi workers, Mahila Mandals (women’s cooperative union), School teachers, and ASHA workers contributed their might to achieve the status of open defecation free village. The note says, in order to improve women sanitation and hygiene, steps are being taken to increase production of affordable ‘clean sanitary pads’ for menstrual hygiene. Measures are taken for Solid and Liquid waste Management (SLWM) by popularising segregation of bio-degradable and bio non-degradable solid waste.

Shova Adhikari and Namaste Lal Shrestha (2006), points out that insufficient funds to develop sanitation and hygiene and resultant low coverage level have left Nepal in a condition, where reaching millennium goal target of 100 percent coverage by 2015 looks very difficult. The report reveals that children can act as change agents allied with the success of school sanitation and hygiene education made UNICEF Nepal to develop School Led Total Sanitation (SLTS), where open defecation free areas are achieved with school children in a leading promotional role. The paper shows how SLTS has shown very impressive results to date and paves the way to speed up the process of intensive latrine coverage in school catchment areas. Inaccessibility to latrine has led to increased dropout rates among girls and issues like menstruation problems, open defecation, bad state of health and hygiene situation have not yet received attention from the policy makers. It is recognized that, there exists
close relationship between excreta and disease. After the SLTS programme has been implemented, the enrolment of girls in schools and regular attendance in schools has increased. The open defecation decreased and the sickness has decreased significantly. Multiple hand washing tables helped students to stay clean and healthy. After the implementation of SLTS, the reported cases of diarrhea have declined drastically.

Ganguly Sumita C (2006) has evaluated the National Rural Sanitation Programme of the Indian Government which has begun in 1986. It has evolved into the Total Sanitation Campaign (TSC), which now operates in 578 districts of 30 states/union territories and is resourced with over US $ 1 billion, to reach India's rural population of 71 percent. This has boosted the supply chain, promotes sanitation and hygiene and caters to 138 million rural households of which around 55 percent are still without toilets. Lessons from three decades of a government-driven programme suggest that forward looking policies, combined resources, a strong institutional setting and decentralized delivery are key to reaching at least half of these by 2012, the end of India's 11th Five Year Plan. TSC provides a platform for innovation and creative solutions. The state of Tamil Nadu, one of the leaders in school sanitation, hygiene education and gender concerns is now joined by states including Gujarat and Uttar Pradesh to infuse the much needed qualitative aspects. TSC will now have to embrace far more than the basics to make water and sanitation goals achievable, sustainable and equitable.

Dayanand B. Panse (2006) portrayed a depressing picture of India’s state of affairs in sanitation. The author emphasizes that, for the poor people living in urban slums and rural areas without adequate sanitation and water supply, to achieve a better economic growth rate and higher productivity, priority has to be given to health of these people. For this, improved sanitation and safe water supply is necessary. A massive effort is needed to reduce this daunting backlog of sanitation with sustainability as a part of the programme. He points out about closing the loop between agriculture and sanitation to address issues of depletion of soil quality, food security, sustained soil fertility, soil carrying capacities, discharge of nutrients and organic material into drinking water. He emphasizes that, India urgently needs to develop innovative, decentralized solutions that are less costly and which can save water. The author also suggests that, ecological sanitation which can be termed as a
holistic approach to sanitation and water management is the most significant and viable solution.

Sekher T.V and Nazrul Islam Md (2006), in a pioneering paper on sanitation in India, attempted to explore the importance of sanitation and its linkage with health status, availability and utilization of sanitation facilities in India, programmes to improve its coverage and experiences in this direction and highlighting the challenges ahead for India by mainly utilizing all the available secondary data on sanitation. The authors observed a strong inverse correlation between access to urban water and sewerage connection on the one hand, and child mortality, on the other. Thus, increase in the amount of water used and wide coverage of sewerage connection contribute to better hygiene and in the elimination of bacteriological contamination. Diarrhoea is significantly less common among children living in households that boil water or use a filter for purification of drinking water than among other children without these facilities.

Marieke Slob (2005), points out that, excreta transport activities are very limited. In urban areas reuse on-site is not always possible, because of space restrictions. With experience in urban areas still being quite limited, there is a knowledge gap concerning the logistics of getting the matter from households to central treatment facilities and reuse locations. The study has therefore worked out a transport system for the collection and transport of excreta from the households in a specific urban community to farmers outside that specific city. The research question of this research was: What is an effective and efficient system to transport excreta from households to central treatment locations in a low-income area (Saboli) in Delhi, India? Saboli is quite similar to many densely populated urban areas in Delhi and other cities in developing countries.

According to the study, The Integrated Sustainable Waste Management concept served as the framework for the development of the criteria for a good transport system. The relevant aspects were applied and adjusted to the specific characteristics of excreta removal and Ecological Sanitation (EcoSan) and to the context of India, mostly through literature study and semi-structured interviews. This resulted in a set of criteria that was used to compare and assess different formulated
collection and transport options. Possible options were identified by studying the current waste removal methods in Delhi and by formulating main logistic systems. The situational conditions of the specific area in which the transport system had to be fitted were studied through a field study, which comprised observations and interviews with inhabitants, NGOs, responsible authorities, users and salespersons of relevant equipment. The concerns and criteria of the community and farmers on storage, collection, transfer and toilet and water use were gathered through several semi-structured group interviews with community members and nearby farmers. Appropriate options were further analyzed on financial implications.

The study concludes that for urine collection, collection with a tractor trolley combination equipped with a pump is the most effective and efficient system for large-scale collection. For faeces collection, the use of a household double vault system and collection with a simple tricycle is advised: the tricycles transport the faeces to a transfer trolley located nearby the collection area and secondary transport takes place with a tractor. Advice is also given how initial investments for a limited participation level of 100 households can be kept small. For urine transport, the initial investments required for purchasing equipment are projected at ` 47,000. For faeces transport the work can be done within two days at that participation level and it is advised to hire a tractor with trolley and driver and a few daily labourers operating simple tricycles or wheelbarrows instead of buying the necessary equipment.

**Bijoyini and Mohanty (2005)**, in their paper examine the status and scenario of water supply and sanitation in rural and urban areas of Orissa as these two issues are in the domain of the state government. In general, rural sanitation and drinking water are serious and almost insurmountable problems in both urban as well as rural areas. Providing access to both these vital utilities for all the people is a real challenge to both state as well as central governments. To provide sustainable standard of living and decent quality of life for all people in urban as well as rural areas, it is essential to deliver adequate quantity and quality of safe drinking water and extend safe sanitation facilities. The district-wise data on population, water sources, toilet use and shares of funding of beneficiaries in respect of both state and central governments was collected from state statistical abstracts and district reports.
The study emphasizes that rural sanitation and water supply should become demand driven from people instead of being imposed from the governments. This requires sanitary awareness of rural people and their hygienic approach to generate demand for safe drinking water and perfect sanitation in villages. The natural drainages in the villages should be converted into permanent sewerage systems and public wells should be in the centre of village for all people to access. The study also suggests that to increase awareness and increase demand for sanitation, the NGOs must be involved in implementing these vital schemes because, without spreading awareness among masses, creation of safe water supply and sanitation will become soon unsustainable both in rural as well as urban areas.

**Sundar Burra, Sheela Patel and Thomas Kerr (2003),** analyzed the involvement of an alliance of three Indian organizations in community-designed, built and managed toilet blocks that now serve more than half a million low-income urban dwellers in eight cities in India. This programme has reached hundreds of thousands of poor urban dwellers with much improved sanitation, water and facilities for washing. The study observes that this programme has helped change the relationship between the residents of slums and local government agencies. Further, the study also explains why sanitation has been neglected and describes the inadequacies of government run sanitation Programmes. The study describes a serious human problem faced by slum dwellers in congested slum areas like Dharavi in Mumbai, where toilet blocks built by municipality get into serious disrepair within three months of construction, leaving people with little or no alternative but to defecate in the open. The place around the public toilet block is normally used for open defecation by large number of people due to shortage of space which in turn, produces a very serious health problem and contributes to high infant and child death rates. Toilet blocks are also used to dump household wastes since there is no arrangement for lifting garbage of the community.

The study also points out the pathetic and pitiful plight of women and young girls who have no access, what so ever, to safe and clean toilets. To protect their modesty, the women had to wait until the nightfall to go for open defecation, which was the only option left to them. This delay in defecation and the need to wait till darkness led to widespread gastric disorders and even gyneic problems for pregnant women. The paper also points out that, the number of toilet blocks built in any year
did not seem to be based on an assessment of need in relation to the population or on availability of budgetary resources. It says the need/number of toilets required is always far greater than what is planned for and the irony is that the resources allocated for sanitation often remain unspent which basically reflects the attitude of the bureaucracy, which lacks human touch towards the poor slum dwellers.

SECTION-II

2.2 Studies on Health and Sanitation

Veerashkharappa and Shashanka Bhide (2009) observed that the strategies adopted by NGOs are more effective than that are used by the government in promoting sanitation. Inadequate sanitation resulted in the spread of communicable diseases causing lot of deaths and disabilities to human resources. In the light of the emergency, the international community has included provision of sanitation as part of Millennium Development Goals (MDGs) with an objective to reduce the number of those without adequate sanitation facilities by half by the year 2015. The study examined the strategies to provide toilets, the constraints in generating demand for toilets, stake holder’s role and impact in providing sanitary services. Secondary data were used from Census and NSSO rounds. The factors influencing the adoption of toilets are lack of space, closely built clusters of houses, non-affordability amongst poor people, unsuitability of site due to rocky area and water-logging, reluctance of people to have toilet within the house and scarcity of water. The study concludes that the variation across the households in deriving benefits from the programme depends on the design of the project and awareness of the household. The study finds that the demand for sanitation is very insignificant whenever the provision of sanitation services were linked with community contributions and private household connection for water. The important observations of the study are:

- The current awareness campaigns have not led to a change in the mindset of the households to give high priority to latrine construction.
- Community contribution did not take place at the expected level due to lack of efficiency in the implementation process.
- Past experiences suggest that involvement of bureaucracy and politicians in the toilet construction programme be minimized.
As space or land is a major constraint in the construction of household latrines, community sanitary complexes need to be promoted based on the experience gained in Tamil Nadu.

- It is observed that the Rural Sanitary Mart (RSM) programme involving the replacement of subsidized programme by privatized one resulted in higher coverage of sanitation in rural areas.

To achieve a certain minimum level of sanitation at the household level a multi-pronged and sustained programme is needed. The study also highlights the role of education, leadership, finances and social mobilization as important factors in promoting sanitation practices by the households.

**Hutton G. Rodriguez U (2008)** have examined the issues viz., health, water, environmental, tourism and other welfare impacts associated with poor sanitation in Cambodia, Indonesia, the Philippines and Vietnam. The study was based on evidence from other investigations, surveys and databases. The impact measurement reported in the study focused mainly on a narrow definition of sanitation – human excreta management and related hygiene practices. The measurement of water resource impact also includes grey water and the measurement of environmental impact includes solid waste management. Many of these impacts are quantifiable in economic terms. Other impacts that are less tangible or less easy to evaluate are also potentially important for economic development, quality of life, and political decision making.

The focus in the study was on sanitation and not on water. This was justified due to the fact that water has historically received greater emphasis than sanitation, in terms of research, policy development, programmatic support and resource allocation. The study provides important evidence to support further investment in sanitation in these countries by examining the economic impacts of poor sanitation and the potential gains from improved sanitation. The specific goal of this sanitation impact study was to provide decision-makers at country and regional level with better evidence on the negative economic impacts of poor sanitation, and to provide tentative estimates of those negative impacts that can be mitigated by investing in improved sanitation. The results showed that the disaggregate impacts by provincial groupings for each country, as well as providing a rural-urban breakdown. Geographical disaggregation of results
is presented for some types of economic impact at the regional level in Cambodia, the Philippines and Vietnam, and at the provincial level in Indonesia. Rural/Urban breakdown is provided wherever it was feasible. Furthermore, health impacts are disaggregated by age group for selected diseases and descriptive gender analysis are also conducted.

**Pruss-Ustun A, Bos R and others (2008)** analysed the country data of disease burden attributable to unsafe water, inadequate sanitation, insufficient hygiene and inadequate management of water resources. It highlights how much disease could be prevented through increased access to safe water and better hygiene. The study provides epidemiological evidence and economic arguments for fully integrating water, sanitation and hygiene in countries' disease reduction strategies. It also provides the basis for preventive action by all relevant sectors managing critical water resources and services in support of public health efforts. The burden of certain water-related diseases viz., diarrhea, malnutrition, intestinal nematode infections, lymphatic filariasis, trachoma, scistosomiasis, malaria and other diseases (dengue, Japanese encephalitis and onchocerciasis) are described and quantified. The study suggests further investigation on various factors related to water, sanitation and hygiene which includes water hardness, lack of which has been associated with cardiovascular disease; fluoride in drinking-water, high concentrations of which are associated with dental and skeletal impairments; arsenic content of drinking-water, which is associated with various cancers; spinal injury, which is a risk related to recreational water environments; legionellosis, which is associated with poorly maintained artificial water systems. It also suggests that while some health impacts are small at a global level they could reach high local or national importance.

**The World Bank Field Note (2007)** highlights the urgent need of providing clean sanitation and drinking water for HIV - AIDS patients as their immunity levels being very low and is prone to catching infections very quickly. This note conducted by the Water and Sanitation Program (WSP) - South Asia is one of the pioneering efforts in the direction of exploring linkages between water, sanitation, hygiene, and HIV and AIDS. People living with the Human Immune deficiency Virus and Acquired Immune Deficiency Syndrome recognize the need for safe water, appropriate sanitation, and hygiene practices better than most people but there seem to be barriers
in converting knowledge into practice. Although non-governmental organizations and networks of people living with HIV and AIDS have started incorporating messages on safe water and hygiene practices into their efforts, the communication is inconsistent and not always comprehensive. According to the report, lack of availability and accessibility of safe water leads to usage of unsafe water, causing further health risks for people living with HIV and AIDS. It attempts to explore existing information on linkages between water, sanitation, hygiene and HIV and AIDS.

The study was conducted among people living with HIV and AIDS and a section of normal population in selected areas of Tamil Nadu and Andhra Pradesh as control group. The study compared the needs and practices of people living with HIV and AIDS in relation to safe water, sanitation, and hygiene. The study was followed by a national consultation for disseminating the findings of the study, building consensus on the need for mainstreaming water, sanitation, and hygiene safety messages in care and support programs for people living with HIV and AIDS, and identifying further strategies. This was followed by two state-level consultations in the two states.

The overall objective of the study was to analyze the role of water and sanitation services in mitigating the impact of HIV and AIDS in India. The study mainly involved a situational analysis of the availability and accessibility of safe water and sanitation for persons with HIV and AIDS and their families, and the dissemination of the results of the study and facilitation of a process to develop strategies to address the results of the study at the state level.

The study finds that barriers – such as limitation of time, economic constraints, lack of individual household toilets, lack of fuel for boiling water and water scarcity – were the obstacles in converting knowledge into practice. NGOs and networks of people living with HIV and AIDS have now started incorporating messages on safe water and hygiene practices into their efforts. And such communication is inconsistent and not always comprehensive. Further it finds that there is potential and interest among a number of stakeholders to incorporate better interventions and communication to improve water, sanitation, and hygiene practices among people living with HIV and AIDS.
This field note captures the importance of incorporating improved, consistent, and comprehensive water, sanitation, and hygiene-related information into HIV and AIDS care interventions. HIV and AIDS are no longer seen as medical or health issues but, as development issues pervading all sections of society. HIV and AIDS affect people in their most productive periods, depriving families, society, and nations of resources that could be generated by the productivity of the affected people. The Millennium Development Goals have an explicit objective to halt and reverse the spread of HIV and AIDS. The two are, however, capable of affecting the viability of the achievement of the other goals. The devastating and all pervading impacts of HIV and AIDS have forced policy makers and development partners not to limit HIV and AIDS to the health sector, but to mainstream efforts to all other sectors and stakeholders. However, as the people living with HIV and AIDS are often from the most marginalized groups with minimal inclusion and involvement in mainstream structures, limits their access to mainstream services. In the context of HIV and AIDS, it is especially important that, water supply points and toilets are easily accessible and close to where they are needed. The lack of availability and accessibility of safe water and clean toilets leads to usage of unsafe water, causing further health risks for people living with HIV and AIDS.

The study highlights the need for improved water, sanitation, and hygiene for infant feeding women who were affected by HIV - AIDS. Clean water is crucial for feeding infants. The chance of a child dying from diarrhoea increases when formula feeds (mother’s feed is prohibited for infants born to HIV-AIDS affected mothers) are not prepared with clean water, or when cleaning and water handling practices are not hygienic. The study also observes that, in spite of the clear links between water, sanitation, and hygiene, and HIV and AIDS, very few examples of interventions to address the impacts of the former on the later have been noted so far across the globe. This is especially the case in South Asia (which is estimated to be having the highest number of people living with HIV and AIDS after Sub-Saharan Africa), where significant initiatives to address the links between the two sectors are not known.
Key Findings of the Report are

- People living with HIV and AIDS reported higher levels of diarrhoea (25 percent for HIV+ people and 5 percent for general public) and vomiting (16 percent for HIV+ and 7 percent for general public) prior to the study period than the general public. They also reported economic and psychological impacts of HIV and AIDS.

- A very high proportion of people living with HIV and AIDS were found to be below poverty line (65.8 percent) compared with general public (41.5 percent).

- The proportion of people with HIV-AIDS with no income at all (15.7 percent) was significantly higher than that of general public (only 0.5 percent) – indicating that people living with HIV and AIDS belonged to the marginalized groups with very low financial resources.

- NGOs in the study area have helped people affected by HIV-AIDS to recognize the need for safe water, appropriate sanitation and safe hygiene practices better than most of the population. Nearly 70 percent of HIV affected people were aware of safe water, sanitation and hygiene issues compared to just 19 percent of general population.

- A significantly higher percentage of people living with HIV and AIDS (71 percent) compared with the general population (55 per cent) found to be aware that boiling can make water safe for drinking.

- Majority of HIV affected people (83 percent) using boiled water for drinking, compared to 69 percent of general population.

- A significantly higher percentage of people living with HIV and AIDS (20 percent) compared with the general population (12 percent) were aware that safe water is good for health.

- Despite various barriers, people living with HIV and AIDS did adopt safer water and hygiene practices than did the general population.

- In total, 68 percent of HIV – AIDS affected people, compared with 59 percent general population reported to use purified water through some method.

- People living with HIV and AIDS spent significantly more money (₹ 50.20) than the general population (₹ 19.80) on purchasing water.

- A significantly higher percentage of people living with HIV and AIDS (61 percent) reported to wash hands with water and soap after defecation compared
with adult male (47 percent) and female (51 percent) members in the general population households.

- Nearly 66 percent HIV-AIDS affected people mentioned economic constraints for lack of individual toilets compared to 44 percent of general public.
- Out of the total, 40 percent of HIV affected people reported lack of adequate fuel as the reason for not boiling water compared to 27 percent of general public.
- People living with HIV and AIDS had less access to water and sanitation facilities than the general public.
- A higher percentage of HIV-positive persons (57 percent) compared with the general public (53 percent) practiced open defecation.
- Only 24 percent of HIV positive people have individual household sources of drinking water compared to 43 percent of general public.

**UNDP Report (2006)** reveals that, India loses most number of lives to diarrhoea in the world, yet its military spending is more than ten times that of sanitation. As per the Report it is pertinent to note that, while the country has made considerable progress on drinking water, it is lagging on the sanitation front as nearly two-third of India has no sanitation access. Moreover, of the 1.8 million diarrhoea deaths in the world, India has 450,000. At this pace India may quite likely to miss the Millennium Development Goals on sanitation which has two-third of population without sustainable access to safe drinking water and sanitation.

The Report quotes ‘Beyond Scarcity: power, poverty and the global water crisis’ is linked to the previous year had pointed out that despite its economic growth, India’s child mortality continued to remain high. Water and sanitation hold the key to saving lives of these children, the report states. Surprisingly, Bangladesh has overtaken India on this front too. “India may outperform Bangladesh as a high performing globalization success story, but tables are turned when the benchmark for success shifts to sanitation: despite per capita income some 60 percent higher, India has a lower rate of sanitation coverage,’ says the Report while pointing out, not long ago, the two countries faced similar problems. Since then, India has enjoyed far more rapid growth, widening income gap between the two countries. But in rural sanitation, it has fallen behind. The Report is peppered with numerous case studies from across the
countries that show how community mobilisation and good governance can make a difference. The National Slum Dwellers Federation in Mumbai galvanized people to construct toilets. The successful Total Sanitation Campaign in Bangladesh, later adopted by West Bengal has achieved impressive progress. In Hyderabad, the water utility has increased coverage and improved performance in revenue collection. Research in Maharashtra has shown that contracting out the billing work, repairs, water treatment and information updates can improve performance. The Report points to the importance of effective regulation to manage water supply better. Though Bangalore applies a rising block tariff – subsidies benefit non-poor more than poor people. The well off 10 per cent households receives 30 per cent of water subsidy and the poorest 20 per cent receive 10.5 per cent only.

India is just above Afghanistan and Pakistan in sanitation indices among developing countries in the world. Even Bangladesh is above India in this crucial social index, said Renu Gera, programme officer, UNICEF, Hyderabad. The child malnutrition rate of 50 per cent in India is much higher than Eritrea, a poor African nation, where it is only 35 per cent. While these figures may disappoint Indians, there is no need for despair, she said. “Although India was once a laughing stock for other nations, various government programmes, including total sanitation campaign undertaken by the Ministry of Rural Development aimed at ameliorating rural poverty and improving sanitary conditions, have resulted in considerable improvement in living conditions,” she added.

The sanitation index of Karnataka, which was a poor two per cent when the campaign was launched in 2004, is now a healthy 38 percent. Although, this is lower than the national average of 45 per cent, it is a positive achievement as per UNICEF Report. The jump from 2 to 45 per cent in sanitation index is very impressive; the index in literate Dakshina Kannada is 90 per cent. The Report says, “this is a clear indicator that when there is a right mixture of government policies and human initiative along with a government official to implement a mandate given to him/her, one can see the programmes end up in transforming human lives, especially in rural areas for better”.
Dileep Mavalankar and Manjunath Shankar (2004) have pointed out that the most vital sector of infrastructure for achieving the goal of health for all is provision of sanitation and drinking water. They explore the importance of sanitation and water supply in terms of health and other benefits. The study also attempted to bring out the woeful status of sanitation and water in India and the rate of progress in the sector. The study also analyzed the reasons for the poor status of sanitation and its slow progress. An attempt is made to explore the role of NGOs in promoting water and sanitation. Although water and sanitation are both important, they have stressed sanitation, since it is even more neglected than water. Epidemiological evidence suggests that sanitation is as effective in preventing disease as improved water supply. The study inferred that the role of the Panchayats in infrastructure development is limited. In rural areas, the Panchayat Samithi has some role through EAS and JRY. However, in rural water supply, the Panchayats’ role is worth mentioning, since they bear complete responsibility for drinking water, and have ensured good coverage. The only weak area is that in the process of selecting the spots, local women’s choices are mostly ignored. Unfortunately, despite sincere wishes of the state government to involve the people in all stages of the functioning of the Panchayats, the grassroots’ experiences reveal a different story. The decisions taken by the Panchayats tend to be adhoc as the participation of the people in the decision-making process is limited and infrequent.

Beverly Young and John Briscoe (1979) have applied a case control design on the evaluation of improved environmental sanitation and diarrheal disease in rural Malawi. The study demonstrates the feasibility of using such an approach to evaluate two levels of water supply and sanitation services quickly and at a moderate cost. The paper says the sample size have to be increased substantially to evaluate multiple levels of service or to investigate interactions between water supply and sanitation. The results indicate that children living in families who use good quality water supplies and latrines experience 20 percent less diarrhea as reported to the health clinics during the warm rainy season. The study has covered 399 cases and 440 controls 95 per cent of those had follow-up interviews in the homes. The odds ratio estimated from the logistic regression analysis were used to adjust for confounding variables. The matched odds ratio estimate, using categorical matching on time of exposure is a consistent estimator of the Incidence Density Ratio (IDR). Regression
coefficients were fitted by maximum likelihood estimation and 95 percent confidence intervals around the IDR estimates were calculated using the method given by Kleinbaum, Kupper and Morgenstern. The study showed that, where changes in both water supply and sanitation conditions took place, there is substantial reduction in diarrheal disease and suggest that, the combination of software and hardware should be continued in Maliwi and extended it to water supply projects in other countries.

**Robert Stock (1988)** showed that massive public works in Europe significantly improved the health and life expectancy of the masses. In the colonies, the primary goal was to protect the health of the colonial officials and troupes from the alleged threat of diseases from native communities. Racial segregation achieved the same objective for the Europeans in the colonies and due to public works done in Europe. Meanwhile, the native population was kept in the same filthy environment. In India, the British officials and troupes were living in Military Cantonments were having good drainage facilities and very clean environment away from the native population.

The study arrives at an inverse relationship between the need for sanitation and allocation of state resources. Rural areas and smaller towns have been conspicuously ignored in the official sanitation campaigns. The richer section of the Nigerians rather than the common people was the main beneficiaries of sanitation efforts. The British colonialists protected themselves from unsanitary conditions by enforcing segregation ordinances to live away from broad masses. The sanitation problem has been exacerbated by rapidly growing population, rise in consumer wastes and failure to provide basic infrastructure. The Colonial British did not spend adequate resources on sanitation for broad masses primarily due to lack of serious commitment to social justice rather than due to shortage of funds. The environmental sanitation programmes were manipulated by the colonial masters to benefit them most rather than the poor masses who needed them the most.
SECTION-III

2.3 Studies on Sanitation and Solid Waste Management

According to the Report of Asian Development Bank (2009), providing environmentally safe sanitation to millions of people is a significant challenge. The task is very difficult in a country like India, where the introduction of new technologies can often challenge the traditions and beliefs of people. The Report examined the status of sanitation services in India and made recommendations that can help the key beneficiaries work towards the coverage of universal sanitation in India. The specific Recommendations are:
1. Scaling up pro-poor sanitation programmes
2. Customizing interventions
3. Exploring cost effective options
4. Applying proper planning and sequence
5. Adopting community based solutions and
6. Evolving innovative partnerships.

Radu Ban, Monica Das Gupta and Vijayendra Rao (2008), made an attempt to assess the role of sanitation on rural poor in four Southern States of Andhra Pradesh, Kerala, Karnataka and Tamil Nadu. The study observes that despite efforts to mandate and finance local governments provision of environmental sanitation services, outcomes remain poor in the villages surveyed in the four South Indian states. The analysis indicates some key issues that appear to hinder improvements in sanitation. Local politicians tend to capture sanitary infrastructure and cleaning services for themselves, while also keeping major village roads reasonably well served. The discussions suggest, however, that they neither understand the health benefits of sanitation, nor the negative externalities to their own health if surrounding areas are poorly served. Their findings suggest that improving sanitary outcomes requires disseminating information on the public goods nature and their health benefits, as well as on the local government responsibilities. It also requires putting public health regulations in place, along with measures to enable accountability in service provision.

Grail Singh and Swarm Singh (2007), focused on the integrated sustainable top-down approach followed for the purpose of modernization of villages and
observed to be very cost effective, replicable, participatory, pro-poor and inclusive model of village modernization. Completion of projects has led to better community relations and capacity building, substantial fall in water and sanitation borne diseases and reduction in flies, mosquitoes, and foul smell in the project villages.

This required modernization of civic facilities like good water supply, sewage treatment, cement roads, solar lights, village path, community center etc., which have been achieved due to active contribution of Punjabi Diaspora living outside India. The study observed the approach of Village Life Improvement Foundation (VLIF) in the village modernization and attempted to analyze the impact on health, socio economic and environmental aspects of people living in the project villages. The study used logit model to examine the impact of water supply and sanitation in the project villages. The study hypothesized that both household specific and environmental characters of individuals playing crucial role in determining the health status and reduction in incidence of water and sanitation related deaths.

The most significant aspect of the project is the universal usage of the sewage systems for the disposal of gray / waste water. According to the estimates of the logistic regression, the death rate due to diarrhea are determined by factors like age of a person, caste, availability of toilet facility, project status of the village, type of house etc., The variables that do not affect the diarrhea deaths are gender, source of drinking water, income of the household and ownership of television. The results showed that children aged between 0-4 years are most vulnerable to the risk of diarrheal diseases. Persons from weaker sections like SC and ST are more prone to the diarrheal deaths compared to others. Further the toilet facility within the house significantly reduced the risk of diarrhea. Further, the structure of the dwelling unit / house is also significant as more persons living in the katcha houses are more vulnerable to diarrheal diseases. Finally, the results show that provision of sanitary facilities in the project villages have resulted in the decline of diarrheal disease. The study recommends that the government should contribute its matching grants by pooling allocations made under various central and state governments’ welfare programmes. This should be added to the grants from the Diaspora instead of mobilizing additional resources. Further, the corpus fund should be created and must be large enough that the interest accrued from it should be sufficient to maintain the cleanliness of the
village. The information, education, awareness components must be integral part of the project itself. The negligible market cost in giving information would help create knowledge, aptitude and practice of better hygiene.

**Christine Poulos, Subhrendu K. Patnayak and Kelly Jones (2007),** have attempted to provide rigorous scientific impact evaluations which imply that water and sewerage policies are effective in delivering many important development goals. The purpose of the study is to serve as a guide for conducting impact evaluations in the water and sanitation sector. The impacts of such policies and programs range from greater efficiency in the utilities sector, improved access to higher quality services, health improvements, increased incomes and consumption, social and gender inclusion and education improvements. The analysis describes in detail various definitions of evaluation and types of economic evaluations (cost-benefit, cost effectiveness analysis). It focuses on impact evaluations done in various WB projects (e.g., Armenia, Bolivia, Brazil, India) with the goal to measure the impacts of programs on individuals or households and whether or not they are the result of the program.

**Hutton G, Haller L and Bartram J. (2006),** have studied the costs and benefits of selected improvements in water supply and sanitation at both global and regional levels and summarized in the Benefit-Cost Ratio (BCR). The cost-benefit analysis results of the selected water and sanitation coverage goals are highly favourable, standing at between US$ 3 and US$ 21 with an economic benefit per US$ 1 invested for all developing world regions. The benefit-cost ratio remains above US$ 1 even under less optimistic assumptions for some of the key variables in the analysis. The results provide evidence to support the further investment in value-for-money water supply and sanitation investments.

**Veerashekharappa (2006),** tries to investigate how and to what extent a paradigm shift has taken place in the sharing of costs by the community in the provision of potable water and environmental sanitation through user charges in Karnataka Integrated Rural Water Supply and Sanitation project (KIRWSSP). The analysis reveals that, reforms in water and sanitation sector intended to make stakeholders part of the implementation process. In the process, beneficiaries share
only partial capital cost and meet 100 per cent of operation and maintenance cost by generating own revenue through user charges, which will reduce burden on exchequer. But, the experience shows that in most of the villages this approach has become a futile exercise. Finally, the study suggests that the option left is to partially privatize the operation and maintenance activity for efficient delivery of service.

**Hutton, G and Haller, L (2004),** made an attempt to estimate the economic costs and benefits of a range of selected interventions to improve water and sanitation services. The study considered 17 WHO sub-regions and considered the global level. The methodology used for this study included a cost-benefit analysis, cost-effectiveness analysis and sensitivity analysis. The analysis was carried at the country level, and the results were aggregated (weighted by country population size) to give regional averages (17 WHO-sub-regions categorized according to epidemiological indicators). The analysis was based on changes in water and sanitation service levels. Services were categorized into improved and unimproved services and improvements were based on basic improvements where low technology improvements to water and sanitation services were used (e.g., stand post, borehole, septic tank, latrines), further improvements that make water and sanitation services safer or more convenient (e.g., water disinfection at the point of use and personal hygiene education) and high technology improvements (e.g., regulate water supply through household connection and household connection to the sewerage system). The study implied that all water and sanitation improvements were found to be cost beneficial, and this applied to all world regions. Further, the study points out that, transmission of diseases is most closely associated with poor water supply, poor sanitation and poor hygiene. Waterborne and water-washed diseases are responsible for the greatest proportion of the direct-effect water and sanitation related disease burden, which mainly consists of infectious diarrhea.

**Zacharia S. and Zhordt K. S (2004),** attempted to investigate whether a hygiene intervention within community-based sanitation and water projects has impact on behaviours that are measured many years (1 to 9 years) after the projects have ended. Further the study seeks to identify, which elements of the interventions appear to be most effective for creating sustained behavioural changes. An analysis is made of data from a cross-section study carried out in Kerala, Southern India in 10
communities. The overall results showed that 91.3 percent of households knew about the importance of hand washing after defecation, 81.2 percent of households had good hand washing skills as shown by the demonstration (washing both hands with soap and water at home) and 59.2 percent of household recorded consistent hand washing of both hands with soap and water while at home. The gender difference in hand washing was significant. This means that 71.2 percent of the women reported consistent hand washing practice versus 48.1 percent of the men. Consistent latrine use was reported by 78.1 percent of the men and women who voted. Latrine use report was 93.9 percent for women and only 58.9 percent for men. It was found that the difference between practices of men and women in latrine use when at home is also statistically significant. It is pertinent to note that the study arrived at no correlation between hygiene behaviour of households and improved access to water sources. It is interesting to note that in five other countries, where the study was conducted for sustainability of hygiene behaviours, improved access to water supply was also not associated with the key hygiene behaviours.

The study suggested that, for an effective hygiene promotion Programme, the men should have been targeted more than the women for improving hygiene behaviour. Further according to the study, hygiene interventions need to be formulated from a gender perspective with a focus on men as well as women and construction of latrines only is not sufficient to create or sustain new hygiene practices.

Annette Pruss David Key, Lovnaa Fewtrell and Janic Bilthear (2002) estimated the diseases burden from water, sanitation and hygiene at the global level taking into account various disease outcomes, mainly diarrheal diseases. The study calculated disability – adjusted life years (DALYS), an index that combines the burden from death and disability in simple index and permits the comparison of burden from water, sanitation and hygiene with the other risk factor diseases. The study divided the world population into typical exposure scenarios for fourteen geographical regions. The scenarios have been matched with relative risk information obtained mainly from earlier studies. The study also estimated the disease burden from water, sanitation and hygiene to be 4 percent of all the deaths and 5.7 percent of the total disease burden occurring worldwide, taking into account diarrheal disease, scistosomiasis, trachoma, ascariasis and hookworm disease. These estimates are based mainly on intervention
studies. Other water and sanitation related diseases remain to be evaluated. This preliminary estimation of the global disease burden caused by water, sanitation, and hygiene provides a basic model that could be further refined for national or regional assessments. This significant and avoidable burden suggests that, it should be a priority for public health policy. The results indicate that, the high potential for disease reduction by simple interventions like safe drinking water storage and disinfection in the home which is illustrated by the difference of the disease burden of minimal and realistic approaches. The study observes that, there is a need for additional research to understand the complex web of risk factors involved in faecal-oral transmission of diseases. Such information will allow policy makers to act on reducing faecal oral diseases in better targeted method.

Vijay Prasad (2001), concluded that the sanitation system was not governed by machines, but by manual labour. The refuse was removed by sweepers as quickly as possible, using carts and Lorries. They then either buried the refuse in sanitary landfills or dumped the refuse in water courses. The sanitation system survived only through a greater intensification of labour and a creative use of the environment. The labour process, far from holding back development, enabled the system to survive. Without that creative flexibility there would be no sanitation system at all. The sanitation question in a capitalist state is framed by the nexus between technology and capital. The limit for the development of capitalist modern city (i.e. as bourgeois thought's self-image) is not something extraneous, something ancient or outside, but it is itself its limit. In other words, the limit of capitalist modernity is its constituents: the social nexus between technology and capital. Within this framework, one that relied upon the sweepers at the same time as it reviled them, the dalits will find no emancipation. Technology is not a neutral thing, since it is imbedded within the social relations that produce and use it. The emancipation of the dalits cannot come by technology alone, but also through the rearrangement of the social relations.

Satu Kokkonen (1999), summarized existing review and viewed that the empirical evidence indicates that, the community-based approach, which relies on cooperation of community members to manage the water system, can enhance the performance of rural drinking water systems. However, the success of collective action among community members is not automatic. How effectively, if at all, community
members’ work together to manage the system depends partly on existing social capital in the community. The empirical evidence indicates that the existence of other non-water related networks and associations in a community helps collective action for water delivery. In those instances, households are accustomed to working together and formal and informal ties among people constrain free-riding and provide incentives for households to participate in system management as designed. Existence of social capital may promote collective action and coordination within the community, but it does not ensure that the water system performs well. Social capital is only one of several factors that influence the effectiveness of community management and performance of water systems. Also, collective action is fruitless, if users do not possess the skills to operate and maintain the system. Finally, all actions may be perfectly coordinated and users possess the needed skills to manage the system, but without appropriate technology and access to spare parts, even the best-organized and trained community management efforts will fail.

**Brown and Pollard (1998)**, studied the sustainability of water systems in Indonesia and found that in several cases users had been ignored in the design of systems. Further, even when government officials had involved community members in system design, they had often ignored the expressed preferences of users, when the final decision about the type of the system was made.

**Nick Johnstone (1997)**, attempted to examine the relationship between economic inequality and urban environmental quality in developing countries with special reference to provision of water and sanitation services. The study analyses the consequences of dual systems in which the proportion of citizens served by subsidized sewer water and sanitation facilities, while at the same time, other section of the society has been forced to develop a variety of onsite strategies through their own efforts. The analysis concludes that i) the poorer households are generally more adversely affected by low level of provision and disease conformed due to standard project evaluation techniques. ii) the cost structure of providing service means that equal access to a standardized system is more efficient than the unequal level of access and treatment which exists today. iii) the access to water and sanitation, the means by which the system is financed are the most important and effective means of distribution of resources.
Balachandra Kurup.K (1991), has studied the impact of Kerala Water Authority (KWA) launched by both the governments of the Netherlands and Denmark in 1984 on water bodies in North, Central and Southern parts of Kerala State. The analysis reveals that, social and economic aspects should be given equal importance in the water and sanitation programme for getting the full support and commitment of the community at every stage of the programmes. This will help a great deal in solving problems connected to selection of sites for public taps or latrines, maintenance, misuse or water management at the local level. In hygiene education and sanitation programmes, the concurrent monitoring and evaluation of the involvement of the community is quite vital.

Price V. Fishback and Dieter Lauszus (1989), have made an attempt to study the sanitation and water conditions in American Coal towns. Coal company towns were infamous, being described as exploitive and charged with providing low-quality services like sanitation. Yet, the quality of sanitation in coal towns in 1922 appears similar to that in cities of similar size, although lagging behind that in major cities in US. Within the coal region, company and independent towns provided similar levels of sanitation. The quality of sanitation in company towns varied in response to cost-related factors including town age, population, and natural location. Meanwhile, workers were mobile and demanded compensating increases in wage rates in towns with lower-quality sanitation and higher rents.

R. G. Feachem (1980), analysed that during 1981-90 which is declared as the international drinking water supply and sanitation decade, massive international efforts were needed to accelerate the provision of domestic water supply and sanitation facilities for the rural population of developing countries. Creative concepts and approaches are being developed and promoted as guiding themes which will help to steer and coordinate the activities of the programme. Among them are appropriate technology, community participation and the village level user choice approach. The study discussed the validity and importance of these concepts. The analysis concludes that, the concepts are often applied in over simplified manner and are based on various factors such as direct attention from political, administrative and realities. These
factors primarily determine the success or failure of rural water and sanitation programmes.

**Saunders, R.J and Warford, J (1978),** have pointed out that, if the market is badly distorted and gives false price signals to government, commercial entrepreneurs and individuals, there can be little hope that appropriate technologies will be selected. No amount of urging and evangelizing will persuade a farmer to buy composted night soil in preference to cheaper chemical fertilizers made available through government subsidies to the chemical industry or by cheap agriculture credit available for fertilizer purchase, but not for compost purchase.

The economic approach to the selection of appropriate technology must not be overemphasized. Sound Engineering judgment will always play a crucial role. There is an urgent need to make available well prepared text books and teaching materials covering technologies suitable for water supply and sanitation in villages and urban slums. There is need for re-orientation of courses for the Engineers and Engineering teachers. The selection of appropriate technology must involve the users of the technology by having community participation in the designing process.

**References**


Marieke Slob (2005), “Logistic Aspects of Ecological Sanitation in Urban Areas: Case study in Low-Income Community in Delhi, India” issue case study, University of Twente, the Netherlands, October, 2005, pp 1-38.


The World Bank Field Note (2007) on “Water, Sanitation, and Hygiene for People Living with HIV and AIDS”, June 2007, the Water and Sanitation Programme (WSP), South Asia, the World Bank, New Delhi.


United Nations Report-2010

The Sanitation Challenge – a sense of mission and urgency is needed if urban sanitation is to advance, Editorial, Economic & Political Weekly, January 24, 2009. Accessed at www.indiaenvironmentportal.org.in

Ten African Countries to adopt Indian toilet system, UN Habitat (press release), New Delhi, November 25, 2006.