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Review on Sewerage Systems, Conditions & Awareness Measures

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Abstract

Sewerage systems in urban area is an important priority in Indian setting because of rapid urbanization, industrialization, and population growth, along with increase in slum population and migration. A recent study shows that urban sanitation can have an impact on diarrheal disease, even without measures to promote hygienic behaviour. In this regard, the presence of efficient drainage and sewerage system is a major factor in the prevention of spread of waterborne diseases in major cities. As per the census 2011, at country level, there is no drainage facility in 48.9% households, while 33% households have only open drainage system. In this review article we have tried to highlight the drainage and sewerage in India, the problems we face and their possible solutions.

Keywords: Sewage, drainage, sewerage, wastes, etc

Introduction

The primitive method of collecting and disposing of the society's wastes has now been modernised and replaced by a system in which these wastes are mixed with sufficient quantity of water and carried through closed conduits under the conditions of gravity flow. This mixture of water and waste products, popularly called sewage, thus automatically flows up to a place, from where it is disposed of after giving it suitable treatments, thus avoiding the carriage of wastes on heads or carts. The treated Sewage effluents may be Disposed of either in a running body of water, such as a stream, or may be used for irrigation of crops. The metropolitan cities and a few bigger towns of our country have generally been equipped with the facilities of this modern water carriage, sewerage system but In India being a developing country still uses the old conservancy system at various places, particularly in its villages and smaller towns. As per figure 1, the rural areas have still very high percentage of having no latrine facilities as compared to urban areas. Hence, urban areas have the demand of good sewage system more than rural areas for the safe disposals of sanitation wastes. The Sewage produced in houses and buildings has to be conveyed and connected to the Municipal Sewers by the owners of the houses. The provision and construction of an efficient plumbing system, for collection and movement of the sewage produced in the building, till it is carried and discharged into the nearest municipal sewer, is an important aspect of Building Construction. Many of us, who are living in areas provided with sewers, might have experienced the bad or improperly designed plumbing works, which everyday poses problems, in either the kitchen drain or the wash basin or the water closet getting choked, or the foul smells escaping from somewhere or the other. A properly designed and carefully constructed plumbing system in buildings, Is therefore, absolutely necessary to avoid such frequent troubles. Disposal of waste water generated from cities or from industrial areas is a big challenge at national level. Treated wastewater generated from existing wastewater treatment plants can be considered as an important component of water resources of the country. Due to the terrain and the concentration of the urban population, the majority of treated wastewater is discharged into various rivers nalahs or on open land and only a part of it is used for irrigation.

PERCENTAGE OF HOUSEHOLDS HAVING NO LATRINE INDIA, 2001-2011

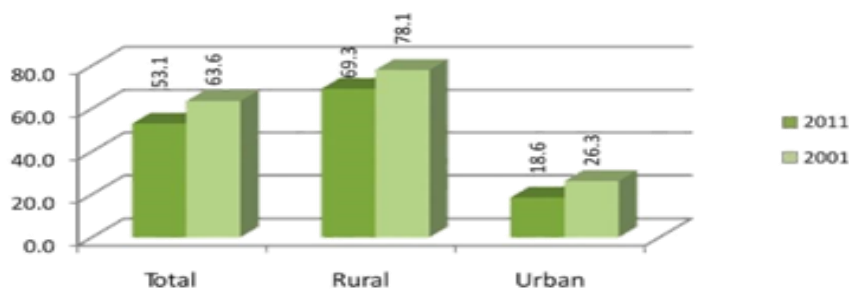


Fig. 1: Percentage of Households having no latrine

Requirements for Good Sewerage System

- Provision of adequate wastewater collection and treatment facilities for all the cities and towns.
- Protection of the environment and public health in the areas affected by the proposed systems, especially, surface water and ground water.
- Consideration of treated effluents as a source for reuse (irrigation/ industrial)
- Improvement of the socioeconomic conditions in the areas to be served by the proposed systems.

Safe water supply and hygienic sanitation facilities are the two basic essential amenities the community needs on top priority for healthy living.

Challenges of Sewerage System

In most cities and towns, only a minority of households are connected to a sewerage system and only a small fraction of the sewerage from these households is treated effectively at primary or secondary sewerage treatment plants. The rest of the urban population has either:

- Some form of on-site sanitation like septic tank/soakage well for disposal of human excreta
- Kitchen & bathroom waste disposing into road drains or directly on roads, thereby creating unhygienic conditions
- No sanitation facilities i.e. excrete in the open spaces around their homes.
- To ensure 100 percent sanitized cities.
- To improve water supply service focusing on customer satisfaction, coverage, frequency and reliability.
- Supply of potable water incurs large amount of money but is used in non-drinking purposes.
- Pure water is available in scarce quantity whether from ponds, tube wells etc and the shortage becomes acute during summer. Therefore, reuse of treated sewerage can provide incremental supply for non – potable applications and thus reduce need for augmenting supplies. In other words, water reuse promotes environmental sustainability by reducing burden on already stressed basin and aquifers and preventing their depletion.
- Sewerage is disposed of unscientifically which heads to health hazards and pollutes ground water as well. Therefore, water reuse results in lower volume of sewage discharge leading to reduction in environmental costs and health hazards.
- Water reuse ensures resource conservation & preservation of sensitive eco-system and reducing pollutant loading.

70% of Urban India's Sewage is Untreated

- In urban India alone, no more than 30% of sewage generated by 377 million people flows through treatment plants. The rest is randomly dumped in rivers, seas, lakes and wells, polluting three-fourths of the country's water bodies, according to an India Spend analysis of various data sources. An estimated 62,000 million litres per day (MLD) sewage is generated in urban areas, while the treatment capacity across India is only 23,277 MLD, or 37% of sewage generated, according to data released by the government in December 2015.
- Further parsing of this data reveals that of 816 municipal sewerage treatment plants (STPs) listed across India, 522 works. So, of 62,000 MLD, the listed capacity is 23,277 MLD but no more than 18,883 MLD of sewage is actually treated. That means 70% of sewage generated in urban India is not treated. While 79 STPs don't work, 145 are under construction and 70 are proposed, according to the Central Pollution Control Board's (CPCB) Inventorization Of Sewerage Treatment Plants report.
- India's towns and cities contaminate their own water, with no improvement over the years. Sewage generation in India from class-I cities (with a population more than 100,000) and class-II towns (population 50,000–100,000) is estimated at 38,255 MLD, of which only 11,787 MLD (30%) is treated, according to the Faecal Sludge Management report by Water Aid, a safe-water and sanitation advocacy, quoting a 2009 CPCB report. The untreated sewage is dumped directly into water bodies, polluting three-fourth of India's surface water resources, the FSM report said. Up to 80% of water bodies could be polluted, the report said.
- Uttar Pradesh has the most working STPs, 62, followed by Maharashtra (60) and Karnataka (44). About 17 million urban households lack adequate sanitation facilities in India, with 14.7 million households having no toilets, the FSM report said. If you consider five people per family, that means about 85 million people—or more than the population of Germany—are without adequate sanitation in urban India. In terms of rural households, only 48.4% (87.9 million) have toilet facilities as on December 7, 2015, according to a reply in the Lok Sabha, the lower house of parliament.
- Around five million (7.1%) urban households having pit latrines that have no slabs or are open pits, and about 900,000 toilets dispose of faeces directly into

drains. Only 32.7% of urban households that have sanitation facilities use toilets connected to an underground sewage network. As many as 30 million urban households (38.2%), of the 79 million households with septic tanks, have no clear method for sewage disposal.

Open defecation remains a major challenge

- About 12.6% of urban households defecate in the open. This number is higher for slums, with 18.9% of households defecating in the open. Around 1.7% of households across India defecate in the open despite having toilets; the government informed the Lok Sabha in a reply last month, based on the National Sample Survey report 2012.
- In Madhya Pradesh, around 22.5% urban households defecate in open spaces, followed by Tamil Nadu with 18.9%. In Odisha, 86.6% of rural households defecate in the open. In Kerala, no more than 3.9% of households defecate in the open.
- The proportion of people practising open defecation globally has fallen almost by half, from 24% in 1990 to 13% in 2015. About 68% of the world's population had access to improved sanitation facilities, including flush toilets and covered latrines, in 2015, according to the World Health Organisation (WHO).
- However, nearly 2.4 billion people across the world lack basic sanitation facilities, such as toilets or latrines. Of these, 946 million defecate in the open, according to the WHO. The Swachh Bharat Mission launched by the National Democratic Alliance government on October 2, 2014, aims to make India open-defecation-free by October 2, 2019.
- The government plans to construct 2.5 million individual household toilets in urban areas by 2015-16, of which 882,905 were constructed upto December, 2015, according to latest data available. As many as

32,014 out of 100,000 community and public toilets have been built under the Swachh Bharat Mission. The rural sanitation programme, in its first year, saw the construction of 8.8 million toilets, against the target of 6 million.

Outcome of sewage problems

- Malfunctioning septic systems have resulted in contamination of well water, ground water, river water and causing threats to public health.
- Untreated and open drainages have produced conducive breeding for mosquitoes, flies, rodents, insects and other diseases carrying vectors.
- Untreated sewage has led to stinking and foul smell.
- Direct physical exposure to wastewater for people bathing and washing clothes and utensils.
- Toxic food farming has increased around the Yamuna River due to improper sewage treatment.
- Leading to various diseases like as vomiting, gastroenteritis, diarrhea, blood infection, dehydration, kidney dysfunction and urinary infection.
- The toxins have polluted the ground water and soil.

Solution and Discussion

Decentralized Sewerage System

Decentralized sewage treatment also known as “Onsite wastewater treatment system” is one that treats discharges, sewage, wastewater at the location itself where the sewage is generated as shown in Figure 2. For example, we still have the simple system of septic tanks and leach fields serving single homes in various towns and villages in India. Instead of sending the wastes into a huge STP in a particular location, the water is treated and returned to the ground on the same area. The system is designed to encourage the development of smaller, more affordable systems to treat wastewater closer to the point of generation, enabling more effective water reuse for toilet flushing and gardening.

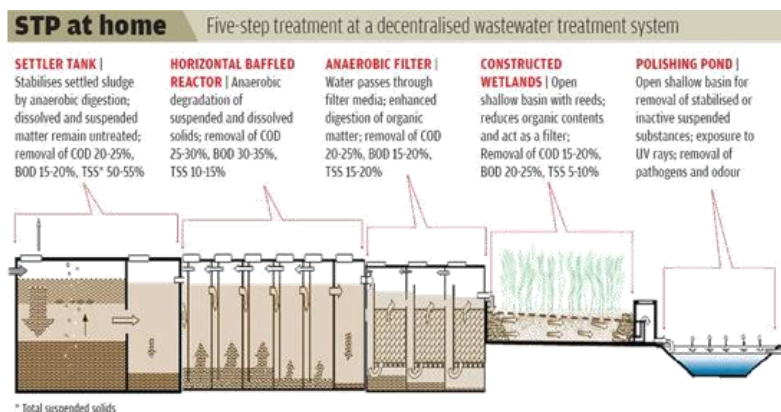


Fig.2: Five Step Treatment at a Decentralized Wastewater Treatment System

Regulation of Private Cleaners

The regulation of private cleaners is equally important. It can be done through a public-private partnership. Such a partnership would give houses access to improved service, the municipality can better monitor and regulate emptying activities and private cleaners get access to markets and formal employment, wherein they are also made aware of safe sites for disposal of faecal sludge.

Reuse of Faecal Sludge

- Dry sludge as fuel for combustion
Use of faecal sludge as a dry combustion fuel in industry has not yet been implemented, but seems very promising based on the use of wastewater treatment sludge (biosolids) as an alternative fuel in the cement industry in Europe and the US.
- Production of animal protein

Using faecal sludge as a medium for rearing insect larvae for protein in animal feed is a potential treatment and resource recovery option. There are no full scale implementations, however at the laboratory scale the use of faecal sludge as a feed source for black soldier fly (BSF) larvae, *Hermetia illucens*, has been successfully demonstrated.

c. Biogas

The Anaerobic Digestion Pasteurization Latrine (ADPL) is a self-contained and energy neutral on-site sanitation system using anaerobic digestion of fecal sludge to generate biogas and then uses the biogas to pasteurize the digester effluent at 65–75°C to produce a safe effluent that can be reused locally as a fertilizer.

Public Awareness on the Sewerage Projects

- a. The public shall be educated through various means about the risks associated with the exposure to untreated wastewater and the value of treated effluents for the different end uses.
- b. Programs for public and farmer's awareness shall be designed and conducted to promote the reuse of treated wastewater, methods of irrigation and handling of product. Such programs shall concentrate on methods of protection of farmer's health, animal and bird health and the environment.
- c. Public awareness campaigns shall also be waged to educate the public on the importance of domestic hygiene, wastewater collection, treatment and disposal.

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