Water and Sanitation Services Have a Profound Effect on the Life of Metropolis

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Abstract - The critical global issue of inadequate access to clean water, sanitation, and hygiene for a significant portion of the world's population, amounting to approximately 40%. In India, disparities exist in water and sanitation access between urban and rural areas. While 97% of urban regions have upgraded water supplies and 58% improved sanitation, rural areas show lower access rates at 90% for water and a mere 23% for sanitation. India's rivers suffer from severe water quality degradation due to untreated sewage, with inadequate sewage treatment infrastructure, particularly in swiftly growing urban areas like Delhi. Despite initiatives like the Ganga and Yamuna Action Plans, major rivers remain highly polluted. The flush toilet system further exacerbates the water crisis by consuming significant volumes of fresh water for waste disposal. This paper also underscores the link between water supplies, sanitation, and health, citing classifications of water-related infections and the pressing need to bridge the disparities in access. However, reports note progress in drinking water and sanitation coverage globally since 1990. The analysis concludes that India's cities struggle to meet basic living standards amidst rapid urbanization, emphasizing the profound impact of education, awareness, and service availability on residents' lives.

Water, Sanitation, Hygiene, Population, Access, Rural, Urban Rivers, Sewage, Pollution, Infrastructure, Health, Flush toilets, Disparities

*Key Words***:** Water, Sanitation, Hygiene, Population, Access, Rural, Urban Rivers, Sewage, Pollution, Infrastructure, Health, Flush toilets, Disparities

The essentials for health, survival, growth, and development are clean water to drink, proper sanitation, and decent hygiene. For many of the world's impoverished, these necessities remain a luxury. An estimated 2.5 billion people (roughly 40% of the world's population) lack access to safe sanitation facilities, and approximately 780 million people lack access to clean drinking water, according to a 2012 report jointly published by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). These two factors run the risk of being taken for granted since they are so obviously vital to health.[1]

In 2010, just 23% of India's population had improved sanitation access, while 97% had access to upgraded water supplies. Among rural inhabitants (constituting 72% of the population), 90% had improved water access, yet only 23% had access to better sanitation. Urban areas depicted higher access levels: 58% had improved sanitation, and 97% had enhanced water supplies. Notably, access rates have markedly improved since 1990, when water access stood at 72% and sanitation access at 18%.

In June 2012, Minister of Rural Development Jairam Ramesh characterized India as the largest "open air toilet" globally. He also observed that Pakistan, Bangladesh, and Afghanistan had superior sanitation records. [2]

Indian standards state that if a person has access to at least 40 liters of clean drinking water per day per capita within 1.6 km or an elevation difference of 100 m, they have improved water supply; however, these standards may be loosened depending on the situation. For every 250 people, there should be at least one pump. Accessibility by itself, however, won't guarantee a high-quality living. A few widely used metrics to gauge this are the Human Development Index (HDI), the Physical Quality of living Index (PQLI), the Happy Planet Index, and others.

This paper tries to understand a broad picture of Water and Sanitation situation in India and address the crux of the problem from its relation to each other and their influence in our day-to-day life.

Degradation of water quality in Indian rivers is mainly contributed by untreated or partially treated sewage, accordingly 33,000 million of sewage is generated everyday but the treatment capacities exist for only 21% or 7000 million liters per day including capacity created under the various National River Action Plans.[3]

If we try to understand the genesis for this problem, one doesn't have to travel long back in time. Most of our present cities came up on the banks of the rivers and capitalizing on the rich fertile land for many Land uses, never conceptualized or gave a serious thought to the problem of waste disposal, especially urban sewage that would be generated from the residential areas. The convenient way to dispose this waste was to channelize it to rivers without treating the wastewater or reducing the waste generation but can be justified by the time when the scale of Urbanization was in the infant compared to today's megalopolis.

Therefore, whatever little sewage treatment networks and plants that were designed and constructed, were based on conservative population estimates. As a result, only a small percentage of Indian towns and cities had sewage treatment plants and numerous other smaller cities/towns sprung up unplanned virtually with no sewerage system. This has highly polluted the rivers or even dead because of sewage overload, along with industrial pollutants and agricultural runoff.

To treat this river from endless pollution, government have taken up number of programmes like the Ganga and Yamuna Action Plan, but the bitter truth is that we have not been able to work on these rather straight forward solutions even after decades of their initiation. The evidence of the two most prominent river clean-up action plans namely, the Ganga Action Plan (GAP) and Yamuna Action Plan (YAP) lies in their present status. The highly revered Ganga still figures in the list of India's most polluted rivers, while Yamuna is often referred to as nothing more than a sewage drain.

Apart from occasional media attention and civil society focus, the only two components that have shown steady growth in these programs are financial allocations and sewage discharge in the rivers. Nearly fifteen years ago when the country's Supreme Court, suo-motu started monitoring the river quality

of Yamuna, it had to revise its deadline three times for the authorities to at least meet the lowest potable standards during time.[4]

The rate at which our cities are growing and expanding, it is virtually impossible for the authorities to cover the entire cities with sewage network and continue building Sewage Treatment Plants (STPs). The reality is that the cities are outgrowing and increasing in numbers at a much more rapid rate than the government's ability to build these systems both logistically and financially.

In Delhi for example, treatment capacity increased 7-fold (from 300 mld in 1960 to 2,330 mld in 2008) in the last 40 years, as compared to a twelve fold growth in wastewater generation. River Yamuna, enters Delhi at Wazirabad, from where the city draws its water supply to feed some 14 million people (according to 2001 census) and dumps in around 4,300 million litres of wastewater per day (mld), of which 65% is untreated. In fact, Delhi has the largest sewerage infrastructure in India, with about 6,000 kms of sewers and 2330 mld sewage treatment capacity. But even after this, just about 50% of the city is connected to the sewerage network which has come at a cost of whopping 1500 crores.

Even if Delhi builds all the STPs, it would still be short of sewage to treat since the drains carrying it are choked and silted thus preventing wastewater from reaching the treatment plants. As a result, sewage from these choked lines is diverted to functioning lines and subsequently ends of these lines are overloaded, leading to untreated sewage flowing into the river. Often the drains are so designed that treated sewage gets mixed up with untreated waste thereby diminishing the purpose of sewage treatment. So then what is the logical means to achieve the envisaged goal of cleaning up the polluted rivers?

The clue lies, the more water we use, more the investment is needed to clean it up. The modern flush toilet and the sewerage system have become symbolic of personal hygiene and sanitized environment, but they are in fact a part of the environmental problem and definitely not the resolution. A standard toilet installed in homes across India uses about 10-12 litres of treated fresh water to dispose a small quantity of excreta. Thus to keep our waste out of sight we require fresh water, for which we spend crores to build storage dams and pipelines. Then to carry the wastewater generated, we again construct large sewer systems and networks to dispose it in the very same river from where the water was sourced in the first place. Toilet water used for flushing constitutes about 40-45% of total water used in households, institutional and commercial units. A family of five who uses flush toilets contaminates 150 thousand litres of water to transport 250 litres of human waste in a year.

Urban Indians especially from the middle and upper class have developed a mindset of flush and forget! But, the real story starts after the lever on the cistern is pulled for flushing excreta. According to Sunita Narain, urban sewage system is a linear process, wherein, large amount of water in the cistern pushes excreta and dilutes urine down the commode into the wastewater pipe. This black water then mixes with the grey water from kitchen sinks, bathrooms to enter the pipeline leaving the house and then joins the pipes coming from other houses of buildings in the neighborhood. This then empties into a hierarchy of sewers starting from a municipal sewer and ending in the large trunk sewage drain.

During the process varying quantities of water is added to keep the sewage running in these lines as they enter the STPs for treatment before being disposed off as treated water in the rivers or seas. But, rarely this sequence of event is followed either because of limited STP connections, underperforming plants or chocked drains. As a result, the untreated sewage loaded with dangerous pathogens find its way into rivers, polluting them and creating enormous environmental and health threats. Every year, millions of people, especially children die or fall sick after consuming polluted water from these rivers. The real tragedy is that people dying and suffering from consuming polluted water are poor and often unserved with safe water and sanitation facilities.

The first effort to simplify the relationship between water supplies and health in developing countries was made by David Bradley (White, Bradley, and White 1972), who developed a classification of disease transmission routes in terms of whether they were Water borne, Water washed, Water based or Water related insect vector (Table1)
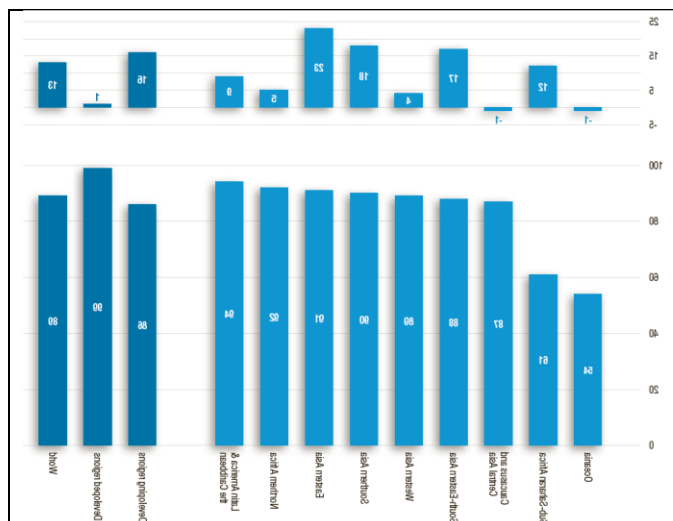
Transmission route	Description	Disease group	Examples
Waterborne	The pathogen is in water that is ingested	Feco-oral	Diarrheas, dysenteries, typhoid fever
Water-washed (or water-scarce)	Person-to-person transmission because of a lack of water for hygiene	Skin and eye infections	Scabies, trachoma
Water-based	Transmission via an aquatic intermediate host (for example, a snail)	Water-based	Schistosomiasis, guinea worm
Water-related insect vector	Transmission by insects that breed in water or bite near water	Water-related insect vector	Dengue, malaria, trypanosomiasis

Source: Cairncross and Feachem 1993.

In the recent times, the adoption of the Millennium Development Goals, the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation has reported on progress towards achieving Target 7c: reducing by half the proportion of people without sustainable access to safe drinking water and basic sanitation. Even the report talks about the three main issues, which are very relevant to the context, those are:
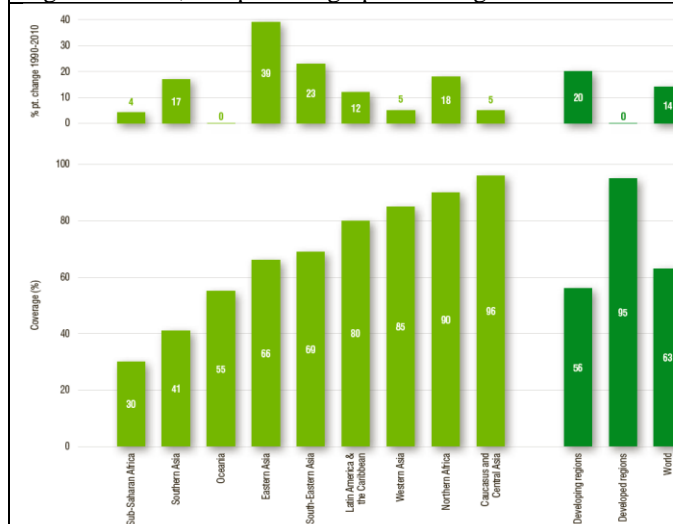
1. Huge disparities exist.
2. Complete information about drinking water safety is not available for global monitoring
3. More than 780 million people remain unserved.[5]

Figure2: Use of improved drinking water sources by MDG region in 2010, and percentage-point change 1990-2010

Since 1990, drinking water coverage in the developing world has increased by 16 percentage points
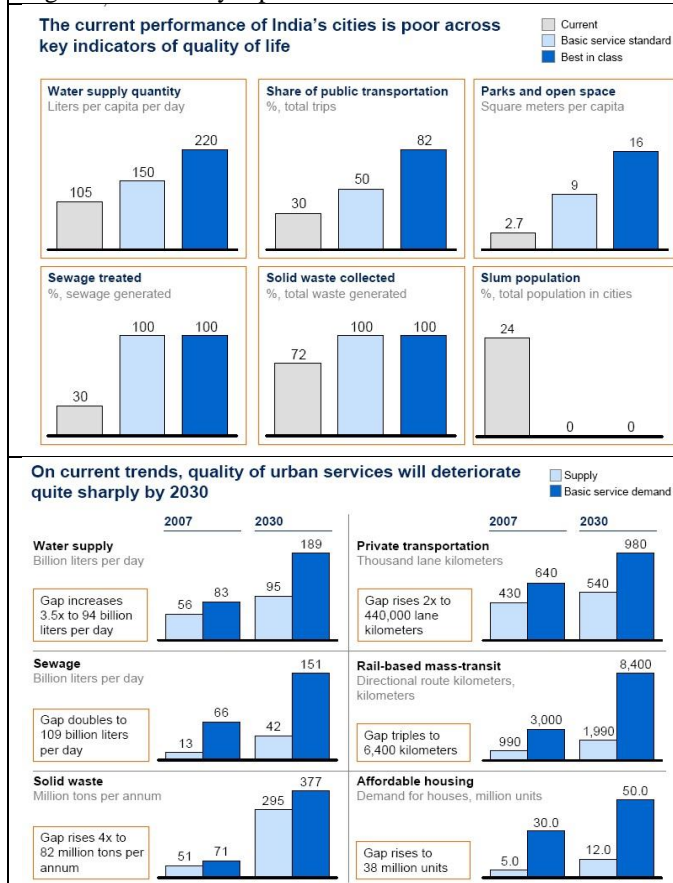
Figure3: Use of improved sanitation facilities by MDG region in 2010, and percentage-point change 1990-2010

Since 1990, sanitation coverage has increased by 20 percentage points in developing regions

McKinsey report [6] tried to bring out the present trends of services provided in cities across India and compared with key indicator for the Quality of Life and projected for next 20 years (Figure 4). The delivering basic standards of living are in deficit and Indian cities are failing to match the rate of Urbanization and its service delivery. So, from the above discussion and conclusion, it is observed that nationally/internationally the education, awareness and availability of water and sanitation services have a profound effect on the life of metropolis, small town, or rural residents.

Figure5: McKinsey report

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