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CHALLENGES OF SEWERAGE AND SEPTAGE MANAGEMENT IN UTTAR PRADESH

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In India, sanitation is the responsibility of the government. State-level steering committees and urban departments have the responsibility of providing guidance and support to Urban Local Bodies, which are in charge of the final implementation of sanitation on a local level in their jurisdiction. The Urban Local Bodies (ULBs) are tasked with the planning, design, implementation, operation, and maintenance of water supply and sanitation services in urban and suburban areas. It is a difficult task to provide people with sanitation that is safe for the environment. The challenges that the urban sanitation sector faces are primarily related to the low level of priority that municipal governments have assigned to it. In India, inadequate sanitation has significant negative environmental, economic, and health consequences. The current paper examines the current state of sewerage and septage management in Uttar Pradesh, as well as the challenges that are emerging in the state.

INTRODUCTION

According to the 2011 Census, nearly two-thirds of Indian households are reliant on onsite sanitation systems, the most common of which are septic tanks, followed by various types of pit latrines. Despite the fact that on-site systems are the most common, the majority of policy attention has been focused on sewerage systems, with on-site systems being overlooked. The majority of on-site sanitation systems are built by households, which may or may not have the necessary knowledge or resources to construct them in accordance with industry standards and regulations. On-site systems are frequently plagued by poor design and substandard workmanship. Even though there are significant differences between cities and states in general, there are few facilities for the safe emptying of pits or the de-sludging of septic tanks in the United States. While some urban local governments provide these services, the vast majority of households hire sweepers to manually empty their pits and tanks or hire private mechanical emptiers to do so for them (WSP, 2008). There are very few treatment facilities for faecal sludge, and the majority of those that do exist are co-treatment facilities at conventional sewage treatment plants (STPs). The majority of the time, the waste that has been collected is dumped in the open without any treatment (Aecom & Sandec, 2010; WSP-Taru, 2008). In general, there is little information available about the performance of on-site systems, and it is impossible to predict the amount of faecal sludge that will be transported and treated safely. The area has also had poor regulatory oversight, with neither the utilities nor the private players being properly monitored.

A broad division can be made between the sanitation systems in India: network-based systems, which refer to piped sewerage, and on-site systems, which include all other types of sanitation systems. It is clear that only a third of the city's population is served by network-based systems, as all other categories of systems, with the exception of piped sewerage, are provided by on-site systems. Only 100 out of 300 cities were found to have sewer systems, according to a survey conducted among the participants (NIUA, 2005). According to Census 2011, the number of cities with sewerage has increased by a small percentage. Even now, only 792 cities, or 10% of all cities, have more than 50% of their households connected to sewer systems, and this figure is almost certainly an underestimate. It is estimated that only one-third of total wastewater generated is collected, based on various estimates (CPCB, 2009). National sanitation ratings were conducted for 423 cities, and the results revealed that 274 cities (65 percent) have inadequate arrangements for the safe collection of human excreta. It is estimated that only about 27 percent of cities collect more than 80 percent of their waste (MoUD, 2010). Multiple issues plague the sewerage systems that do exist in places where they are installed. Sewers in most Indian cities are in poor condition, with frequent blockages, siltation, missing manhole covers, and gulley pits among other issues. There is little in the way of preventive maintenance, and repairs are only carried out in the event of a crisis (WSP-Taru, 2008). Solid waste that is not properly disposed of has a tendency to clog sewer lines. Storm water can infiltrate the sewerage system, resulting in an overflow of water that exceeds the capacity of the system, and as a result, sewer lines become unable to function (Wankhade et al., 2014).

Often, only a portion of the sanitation systems is taken into consideration. Excreta and faecal sludge emptying, transport, and treatment services and facilities are frequently not included in on-site sanitation solutions (such as latrines or septic tanks). Additional considerations include local business opportunities, demand for and potential uses of waste resources, such as water, nitrogen, and bio-solids, which receive little attention. Municipalities bear a significant financial burden as a result of failures or unsustainable solutions. Septic tanks, public latrines, and other on-site sanitation facilities, such as private or public latrines, are common in developing-country cities. Excreta and faeces accumulate in large quantities in these facilities. Comparatively, in industrialized countries, excreta is disposed of through cistern-water flush toilets, city-wide sewerage systems, and central wastewater treatment plants, all of which are commonplace technologies in industrialised countries but are either unaffordable or inappropriate in developing countries. In the event that faecal sludge is collected from on-site sanitation technologies at all, it is most often disposed of in an uncontrolled manner without prior treatment, posing serious health risks and polluting the environment (SCBP, 2017).

Despite the fact that the plight of the urban poor and the provision of clean water have been brought to the public's attention for more than a decade, both the number of people without access to sanitation services and the percentage of people without access to sanitation services continue to rise. Despite the fact that overall urban sanitation coverage (63 percent) appears to be high and that significant progress has been made in the past two decades, coverage rates for the urban poor are significantly lower. The result is that developing country governments and city authorities are confronted with a sanitation crisis that is becoming more severe with each passing year. The consequences of unsanitary conditions are frequently not limited to the areas in which they occur. Human and domestic waste from any location has the potential to pollute not only the local environment, but also groundwater, lakes, and rivers, which are used by many people who rely on freshwater supplies for their daily needs. Many cities in India obtain their raw water from reservoirs that are more than 30-50 kilometres away from their locations. Environmental pollution not only poses a significant threat to the health of the urban population as a whole, but it also has the potential to become a significant financial burden on a city in the long run. Pollution of the urban environment is one of the most significant impediments to long-term economic development in developing countries.

Functional groups are made up of technologies that perform the same or similar types of functions. For example, sewerage and septage management technologies are grouped together. Sick building syndrome (BLS) is a condition in which different technologies from different functional groups are brought together to form a sanitation system. To ensure that the sanitation system is functional, it is necessary to make an informed decision about which technologies to use. Prior to being properly disposed of, a sanitation system should take into account all of the products generated as well as all of the functional groups to which these products are exposed. Domestic products are primarily distributed through five different functional groups, which work together to form a system of distribution. The User Interface is the starting point for all sanitation systems. From here, the product is either delivered to the collection and storage/treatment group or transported to the final destination. Whether or not there is sufficient supply of water available for a water-based system is a major factor to consider. Immediately following conveyance, the products are routed to the centralised treatment function group, where they are treated before being routed to the use and disposal group. The product passes through the functional groups of collection, storage, and treatment before ending up in the use/disposal functional group. Depending on the system, not all of the functional groups may be necessary. The type of toilet, pedestal, pan, or urinal with which the user comes into contact is referred to as the user interface. Because it is the point at which water is introduced into the system, the final composition of the product is also determined by the user interface. As a result, the availability of water has a significant impact on the choice of user interface. The following six technical and physical criteria influence the selection of a user interface: (1) availability of space; (2) ground condition; (3) groundwater level and contamination; (4) water availability; and (5) climate (IWA, 2014).

The technologies which are used for the collection and storage of the products are called the user interface. In the case of prolonged storage, some treatment may be provided, though it is usually minimal and varies depending on the length of time spent in storage. All of the units must be connected to either the conveyance or the use/ disposal function group for liquid effluent, or to the conveyance to solids function group. It is necessary to empty all of the units on a regular basis (depending on the design criteria) in order to remove solids. These solids, in turn, must be treated or processed before they can be used or disposed of. The following are the technical and physical criteria to be considered when selecting appropriate collection, storage, and treatment technology: (1) The condition of the ground (2) the level and contamination of groundwater

(3) the climate Transporting products from one process to another is referred to as conveyance in technical terms. Despite the fact that products may need to be transported in a variety of ways in order to reach the required process, the longest and most significant distance is that between on-site storage and (semi-) centralised processing. Consequently, for the sake of simplicity, conveyance will be limited to the movement of goods at this time. The following are the technical and physical criteria to consider when selecting an appropriate conveyance technology or system: (1) The availability of water (2.) The condition of the ground; (3) the level and contamination of ground water. In on-site sanitation facilities, the term "human-powered emptying and transport" refers to the various methods by which people can manually empty and/or transport the sludge and solid products generated. It can be done with buckets and shovels, or with manually operated pumps that are specifically designed for faecal sludge removal and disposal. In addition to the ability to generate income, manual emptying has several other advantages, including low costs and the availability of tools, as well as a low or non-existent requirement for electric energy. Manual emptying has several significant drawbacks, the most significant of which is the high health risk. faecal sludge septage and urine are emptying and transported using a vehicle equipped with a motorised pump and a holding tank for the purpose of motorised emptying and transport. It is necessary for humans to operate the pump and manoeuvre the hose, but sludge is not manually lifted or transported (see also human-powered and transport). Motorized emptying and transportation is both quick and efficient in most cases. Furthermore, it has the potential to create local jobs. However, large streets are required for the trucks to pass through, thick or dried material cannot be pumped, and garbage in pits may become entangled in the hose. Furthermore, capital costs are high, and it is possible that spare parts will not be available locally.

On-site sanitation systems must be emptied of sludge and septage, which must be transported to (semi-)centralized infrastructures for further treatment. Faecal sludge and septage are dumped at transfer stations or underground holding tanks when they are unable to be transported to a (Semi-) Centralized Treatment facility due to transportation constraints. When transfer stations become overflowing, vacuum truck is required to empty them. Sewer discharge stations are similar to transfer stations, except that instead of simply acting as a holding tank, the stations are directly connected to the sewer system, which transports the sludge to a (semi-) centralised treatment facility for further treatment. In addition to reducing transportation distances, transfer stations may encourage more community-level emptying solutions and help to prevent illegal dumping. Access permits may be used to offset some of the moderate capital costs, and the construction and maintenance of the facility may generate local income. Expert design and construction supervision, on the other hand, are required. The following are the technical and physical criteria to consider when selecting appropriate technology for treatment: (1) The climate (2) the availability of space (3) the condition of the ground (4) the level and contamination of ground water The terms "use" and "disposal" refer to the various methods by which products are eventually returned to the environment, either as harmless substances or as valuable resources. Furthermore, products can be re-introduced into the system as new products if they were previously removed. A typical example is the use of partially treated grey water for toilet flushing, which is a common practise. Throughout the world, the conventional, centralised wastewater management concept, which consists of a water-borne wastewater collection system that leads to a central treatment plant, has been successfully implemented for many decades in densely populated areas of industrialised countries, and has made significant contributions to the improvement of hygienic conditions in these regions. However, given the urgent need for affordable and sustainable infrastructure in developing countries, the applicability of this model in the context of cities in developing countries must be questioned. In the event of a system failure, a centralised wastewater management system reduces the amount of wastewater that can be reused while also increasing the risk to humans and the surrounding environment. Centralized treatment systems are typically much more complex, necessitating the use of highly trained and experienced operators. The operation and maintenance of centralised systems must be funded by the local government, which is frequently unable or unwilling to ensure that the systems are operational on a consistent basis.

About 86 percent of the household toilets in the metropolitan centres of the state have on site sanitation system, and their distribution among ULBs is 78 percent in Nagar Nigams , 98 percent in Nagar Panchayats , and 90 percent in Nagar Palika Parshads . Septic tanks in the state total 72 million, assuming that each dwelling has a single tank. There are 30.2 lakhs Nagar Nigams (NNs,) 26.7 lakhs Nagar Palika Parshads (NPPs), and 15 lakhs Nagar Panchayats (NPs) in the various ULB categories. There are 99 STPs installed in 29 of the 652 ULBs, with a total capacity of 2646 MLD. The reported reception of sewage at STPs (71 percent) and areas not served by the sewerage network in sewered cities are two issues that need to be addressed. The cities with STPs have a chance to take use of septage control and co-treatment, subject to technological and economic feasibility. AMRUT and Namami Gange, two state-sponsored programmes, have added treatment capacity for 1948 MLD over 18 ULBs, thanks to the construction of new STPs. Upon completion, the urban areas of the state will have a total treatment capacity of 4594 MLD (Table 1).

Table 1: Category of ULB wise STPs and Their Treatment Capacity

Particulars		Nagar Nigam	Nagar Palika Parishad	Nagar Panchayat	Total
Existing	No. of ULBs	17	197	438	652
	STP Capacity (MLD)	3036.4	254.59	7.85	3298.84
	No. of STPs	75	26	3	104
Proposed	No. of ULBs	14	17	2	33
	STP Capacity (MLD)	875.38	393.55	12.4	1281.33
	No. of STPs	29	25	2	56
Total STP Capacity (MLD)	No. of ULBs	12	22	2	36
	STP Capacity	3911.78	648.14	20.25	4580.17

Source: U.P. Jal Nigam-2019

Effective scheduling systems need an accurate database of demand, an unrestricted and continuous supply of service providers, and an efficient management system for the whole process from start to finish (disposal at designated locations for treatment). The synergy of the data fields can only be tapped if the newly formed real-time database is paired with existing databases that were built for various purposes. It is hoped that this database would aid in the design of treatment systems by providing information on factors such as plant size, technology selection, and locations for safe disposal. When PPP models are considered, this evidence-based decision-making approach will assist ULBs in implementing reforms toward an accountable and transparent ecosystem of service supply. This will help the ULBs prepare for a variety of rating methods, as well. Table 2 summarizes the cleaning scale for several ULB kinds.

Table 2: A Comparison of Scheduled Empting Services

Particulars		Nagar Nigam	Nagar Palika Parishad	Nagar Panchayat	Total
Cleaning Once	ST/OSS Cleaning per Year	1006758	884128	499068	2389954
in 3 Years	Daily Septage to be Cleaned (KL/day)	3356	2947	1664	7967
	Average Septage per ST/OSS (KL/day)	1.63	1.77	1.82	
Cleaning Once	ST/OSS Cleaning per Year	604055	530477	299441	1433973
in 3 Years	Daily Septage to be Cleaned (KL/day)	2014	1768	998	4780
	Average Septage per ST/OSS (KL/day)	2072	2.95	3.04	

Source: U.P. Jal Nigam-2019

It is recommended that ULBs plan for the septage management which includes a mandatory 5-year septic tank cleaning cycle. 72 million septic tanks / OSS in the State 1750-3000 MLD of septage treated annually 14 to 24 lakh emptying annually 600 vacuum trucks running everyday (Table 3).

Table 3: Septage Cleaning Mandate in Uttar Pradesh

Particulars	Nagar Nigam	Nagar Palika Parishad	Nagar Panchayat	Total
No. of ULBs	17	197	438	652
Septage Generation 2018 (KL/Year)	2000970	1900917	1107219	5009106
Septage Generation - 2018 (KL/day)	5482	5208	3033	13724
Septic Tank Cleaning per Year	1006758	884128	499068	2389954
No. of STs Empting in One day	914	868	506	2287
No. of 6 cum Trucks required	228	217	126	572

Source: U.P. Jal Nigam-2019

The present need for emptying trucks necessitates a total of 572 vehicles. Before determining the demand for vacuum trucks, it is necessary to take into consideration the present stock of vehicles owned and used by the private sector. According to the size of the ULB, it is suggested that the minimum number of septage cleaning and transportation machines be in working order. This will guarantee that the ULB is prepared in the event of an emergency. This fundamental mechanization procedure is also acknowledged to be necessary to limit risks to private sector involvement, especially when periodic cleaning is imposed. The properties of the septum have a crucial role in treatment option selection. Wastewater and septage from the treatment facility might be used for a variety of public and commercial applications. This will help in the recovery of nutrients and costs, as well as the development of profit (Table 4).

Table 4: Septage Generation and Possibilities for Co-treatment

Particulars	Nagar Nigam	Nagar Palika Parishad	Nagar Panchayat	Total
No. of ULBs	17	197	438	652
Septage Generation 2018 (KL/Year)	2000970	1900917	1107219	5009106
Septage Generation - 2018 (KL/day)	5482	5208	3033	13724
No. of ULBs	14	28	6	48

Source: U.P. Jal Nigam-2019

In addition to the two FSTPs in Jhansi and Unnao, the state government has authorized and awarded contracts for a total of 57 FSTPS/Septage Management Projects, with only 17 of these projects currently under construction, according to the state government. Using existing sewage treatment plants to co-treat FSS is a more cost-effective solution than treating FSS produced in areas without an established sewage network or in partially covered cities. The cost and difficulty of constructing a citywide sewage network that provides 100 percent coverage are increased in densely populated areas, as is the time required. Before a faecal sludge treatment plant (FSTP) can be built, it is necessary to complete the following steps: land identification, permissions, and the bidding process. It also saves money by eliminating the need for a new operator as well as the additional costs associated with co-treatment site infrastructure. In many Indian cities, raw sewage is pumped directly into the STP or the nearest pumping station or manhole of the sewage network, with no prior treatment or treatment at all. In some countries, it has been demonstrated that co-treatment of FSS in a STP without pre-treatment has negative consequences for the patient. Because FSS contains significantly higher levels of solids, organics, and nutrients than sewage, solids deposition, obstruction, and corrosion of sewerage infrastructure, including STP, are all possible outcomes. As a result, the Center for Science and Environment in New Delhi has proposed that wastewater samples be collected from the influent and effluent of each STP module in order to assess how well each module is working.

Challenges

Nutrients and organic compounds found in human excreta can be safely recycled in agriculture when handled with care and using sustainable sanitation techniques (Andersson et al., 2016; Esrey, 2001). They can use slurry and manure in a variety of ways, as well as a variety of sanitation methods and approaches, depending on the system (Sinha et al., 2017). Some socio-cultural value systems associated with human excreta reuse, on the other hand, can work against the adoption of ecological sanitation methods in other circumstances (Andersson, 2015; Nawab et al., 2006; Sinha et al., 2017). The nutrients found in human faeces and urine could be beneficial to farms, particularly as soil fertility declines and people increasingly rely on artificial fertilisers to compensate for and increase agricultural productivity in developing countries (Is et. al., 2003; Winker et. al., 2009). As a result of improvements in sanitary conditions over the last 25 years, India's population has gradually increased. Between 1990 and 2015, global adoption of improved sanitation increased from 53 to 67.5 percent, with India being the only country to see an increase from 19 to 40 percent during the same time period (WHO, 2013). Because of this, developing countries such as India, where sanitation levels must be improved, are in dire need of sanitation development.

Using ecological sanitation, which improves sanitation, water, and agriculture, as well as the concepts of ecological sanitation, this type of development activity can reap the benefits of sustainable development. When used as a sanitation technique, ecological sanitation has helped to promote circularity in the flow of manufactured (waste) resources back into the natural environment. An integrated system separates human waste at the point of generation (households) and distributes it to agricultural regions for use as crop fertiliser, following a closed-loop system (Ganesapillai et al., 2015). For example, urinary dissection toilets make it simple to distinguish between beneficial (nutrients) and undesirable substances in urine (pathogens, micro-pollutants, heavy metals). Improved soil quality and significant cost savings have resulted in similar outcomes in South India as they have elsewhere (Simha et al. 2017). Typically, only a portion of a sanitation system's performance is evaluated. It is common practise in site-based sanitation systems to exclude excreta and sewage sludge from the emission control, transportation, and treatment services and facilities (latrine or septic tank-based). Local business opportunities are also overlooked, as is the possibility of utilizing waste resources such as water, nitrogen, or bio-solids for a variety of commercial purposes. Communities have suffered significant financial losses as a result of their continued reliance on inadequate solutions. When it comes to solid waste management, on-site sanitation facilities such as private and public toilets, as well as septic tanks, collect significant amounts of waste and sewage sludge in developing countries. This includes things like toilets, city-wide sewerage systems, and central wastewater treatment facilities that are common in developed countries but are essentially non-existent in developing countries. However, despite the fact that there are methods for collecting sewage sludge, it is frequently dumped untreated, posing a serious health risk to the public and causing significant environmental damage (SCBP, 2017). The sanitation system is responsible for the management of human excrement from the time it is produced until it is disposed of. As part of the sanitation system, sludge from on-site sanitation systems must be safely emptied and then transferred for treatment or disposal to a central location. In the sanitation process, the emptying and transfer of human waste is a critical step. It is necessary to empty septic tanks on a regular basis, as well as to handle faecal sludge safely. The process of removing and transporting faecal sludge could be made more efficient and safe for sanitation service providers, homes, communities, and the environment as a result of this research. Several different types of faecal sludge removal and transportation service providers can be found, ranging from independent contractors to large, well-established corporations. Depending on the location, public utilities or non-governmental organisations may provide services; however, in Uttar Pradesh, ULBs and the Uttar Pradesh Jal Nigam are responsible for providing these services (UPJN). Many different service providers are located in the same location as one another. This is due to the large number of on-site sanitation options available to customers, as well as the financial resources available to them. Sludge removal from an on-site sanitation system can be accomplished through the use of manual and mechanical methods, such as a bucket or a hand pump (using a mechanized pump or vacuum truck).

Vacuum trucks are available in a wide range of sizes and configurations to accommodate a wide range of applications. They can hold anywhere from 200 to 16,000 litres of liquid on average. Vacuum trucks are capable of transporting up to 55,000 litres. Large tanks of on-site sanitary equipment can be quickly emptied using a mechanized emptying system, which saves time and money. When compared to manual emptying, this procedure is far safer and more healthful. Despite the fact that pump and hose operation are required, there is no requirement to enter the technology or come into close contact with faecal sludge. There are a few mechanical issues with vacuum vehicles, on the other hand. Conventional vacuum trucks have a depth capability of two to three metres. A 25-yard radius around the sanitation equipment on site is reserved for emergency vehicles and emergency personnel. In some cases, large vehicles are unable to navigate through narrow streets or bad roads due to the lack of clearance. Sewage treatment plants, wastewater treatment plants, and wastewater collection systems are all capable of receiving and processing sludge. In most cases, sludge is dumped, buried, or discharged into a nearby sewer system because it is difficult to handle and dispose of. As a result, simply moving waste away from the collection point does not constitute a long-term waste management strategy. Workers who empty on-site sanitation systems and deal with faecal sludge are exposed to significant dangers. Using protective clothing and masks while emptying the pit, as well as thoroughly washing your hands and body afterward, is required for the job. It is necessary to remove slabs or coverings in order to provide access and improve air circulation. Allow sufficient time for the on-site sanitation technology to become acclimated. The venting of gases such as sulphur dioxide and methane allows them to escape. Never enter a pit without first securing yourself with a rope and a safety harness. In the event that the worker is overcome by gases or the pit walls collapse, the rope should be carried by two people. A portable, manually controlled pump was developed to increase the efficiency of manual emptying while also protecting the public. Electricity, fuel, or pneumatics are used to power machines that empty faecal sludge (using pressurized air or gas). Septic tanks and latrines are frequently emptied using vacuum pumps, which are also known as vacuum cleaners. A hose is lowered through a lid in order to gain access to the technology. It is possible to transport faecal sludge to a tank using a heavy-duty truck, lighter carts, or even by human power. Faecal sludge, on the other hand, must be handled with caution. Both manual and motorized emptying operations are available, with the former requiring the use of human or animal power, and the latter requiring the use of a fuel-powered engine. Manual service providers are frequently transported by cart, wheelbarrow, wagon, or rickshaw, among other modes of transportation. Water-based devices such as flush latrines and septic tanks may also be cleaned out by vacuum trucks. Sludge may thicken and become difficult to pump depending on the method used to prepare it for disposal. Adding water to the faecal sludge makes it easier to pass through the body in this situation. However, there are some disadvantages. Manual drainage may be the only option available if water supplies are limited.

Wastewater management that is decentralised reduces the risk of system failure and the associated costs. The likelihood of a large number of small systems failing at the same time is significantly lower than the likelihood of a single system serving an entire community failing. When decentralised treatment processes are used, they can be tailored to the quality of the wastewater stream generated by each individual subsystem as well as the effluent quality that is required. The amount of treatment required will vary significantly depending on where the treated wastewater will be used after treatment (e. g. agricultural reuse, discharge into water bodies, infiltration). Decentralised wastewater management increases the likelihood of wastewater reuse by bringing the wastewater as close as possible to the source community where it is generated. In developing countries, demand for treated liquid waste is frequently driven by urban centres, which want to use it in public parks and urban agriculture. The collection of wastewater flows in one location for treatment and the subsequent distribution of the treated effluent where it is needed are both ineffective when wastewater is used for irrigation. Decentralised management may make use of a combination of cost-effective solutions and technologies that are tailored to the specific conditions that exist in different sections of the community, rather than a single solution or technology. For example, a sewerage system and treatment facilities can be installed in a community's commercial and residential centres that are highly developed and densely populated, as an example. When soil and groundwater conditions allow for it, sparsely populated housing neighbourhoods can be served by a settled sewerage system or dry sanitation systems, depending on their population density. It is possible to make incremental improvements and investments in community wastewater systems because of decentralised management. Settled sewers can be used to upgrade decentralised systems such as septic tanks that are already in place if this is necessary. In order to serve new and well defined residential, industrial, and commercial developments, it is possible to add new, independent, and properly sized systems. Investments in centralised systems, on the other hand, must be completed in a short period of time, placing a strain on the local economy. Typically, centralised systems are designed to handle wastewater flows that are expected to occur in the next 30 to 50 years. In many cases, centralised systems are initially overbuilt, but they eventually become undersized (SCBP, 2017).

CONCLUSION

The management of faecal sludge from an on-site sanitation technology includes the emptying, transportation, treatment, and use or disposal of faecal sludge generated by the technology (like a pit latrine or septic tank). Specifically, it addresses the final three components of a sanitary system. According to the findings of the study, sludge operators are engaged in the emergency emptying of septic tanks and pit latrines; however, there is no regular practise of cleaning septic tanks by the general public. Additionally, the fees for desludging vary from city to city, and sludge operators frequently encounter difficulties in desludging their tanks. Sludge operators are overseen by both municipal governments and private companies. Operators of sludge from urban local bodies (ULBs) provide services within their jurisdictional areas, whereas private operators provide services outside of their jurisdictional areas. After decontaminating septic tanks and pit latrines, government sludge operators dispose of the waste at suggested points along the sewer line / STP if one exists, or into open drains in some cases, whereas private operators dispose of the waste into open drains in some cases as well. The vast majority of sludge operators and workers do not have adequate safety measures in place and are not aware of the importance of issues such as health, hygiene, and safety.

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