Decentralized Sanitation Planning Strategies for Ramdas City, India

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Abstract

The research article primarily focuses on the insufficient provision of sanitation services to the rapidly growing urban population, as well as the management of faecal sludge and septage in urban areas. The disposal of over 80% of wastewater directly into ponds without undergoing any form of treatment is a significant concern that warrants attention. In this particular context, the acronym FSSM refers to a decentralised approach for managing sludge and septage. This method encompasses five key components that collectively form a value chain for handling faecal sludge. When considering the relative merits of centralised sewerage systems and FSSM, it becomes evident that the latter is a cost-effective and environmentally sound approach that can be swiftly adopted to enhance urban cleanliness and public health. Ramdas, a town classified as fourth-class, was selected as the site for this project, although no comprehensive drainage infrastructure was implemented. Presently, the majority of residential dwellings inside the town are dependent on decentralised sanitation systems, namely septic tanks and pits, for the containment and partial treatment of black water generated on-site. Consequently, this locality has been selected to enhance the prevailing sanitation conditions. The theoretical framework plays a crucial role in the project as it is essential for advancing the project and gaining a comprehensive understanding of fundamental theoretical concepts and terminology. In response to these challenges, the implementation of decentralised sanitation planning has emerged as a feasible approach. This study presents a comprehensive examination of decentralised sanitation planning solutions for Ramdas city, focusing on their potential advantages and important factors to consider.

Keywords: Sanitation, Faecal Sludge Management, FSSM, Sewerage system, Septage Management Process

Introduction

The increasing urbanization and population growth in cities like Ramdas have placed immense pressure on conventional centralized sanitation systems, leading to challenges such as inadequate waste management, pollution and public health risks. Decentralized sanitation planning entails the distribution of waste management and sanitation responsibilities across multiple smaller scale systems rather than relying solely on a central infrastructure. This

approach offers several advantages including improved resource efficiency, reduced environment impact and enhanced resilience to natural disasters which can be tailored to suit the specific needs and constraints of Ramdas City. The phrase, Faecal Sludge Management (FSM), has become a highly essential strategy to providing enhanced sanitation. Previously, onsite sanitation sludge management was not a top priority for anyone, including municipalities. However, due to rising health concerns and water-borne diseases, many engineers believe that sewer-based systems are the best long-term solution for meeting sanitation needs. Onsite technologies were thought to be merely temporary solutions until a sewer system could be established, which is not an easy or quick operation. The management of faecal sludge and septage is concerned with on-site sanitation systems. It consists mostly of five components that work together to generate a faecal sludge value chain. In comparison to centralised sewerage systems, faecal sludge and septage management is the only affordable and sustainable technique that can be implemented quickly to make cities clean and healthy. The value chain has five main steps: user interface, collection and storage, desludging of septic tanks, conveyance, treatment, and finally disposal and reuse of the treated septage. According to the Detailed Project Report on Faecal Sludge and Septage Management Solutions (Faecal sludge management solutions for Unnao city, Uttar Pradesh, 2017) cities are rapidly expanding, but the scope of public sector funding remains unchanged, and the plan to connect all households to a sewer network remains a distant goal to achieve. It is the cost and effort needed in creating sewerage networks and treatment facilities in cities, as well as a significant amount of time, which results in the mainstreaming of FSM.

India's Sanitation Scenario

According to the Census of India, 2001 and 2011, 53.1% (63.6% in 2001) of Indian homes do not have a toilet, with the percentage reaching 69.3% (78.1% in 2001) in rural areas and 18.6% (26.3% in 2001) in urban areas. Furthermore, field studies show that even in rural and urban areas, the use of existing toilets is very low. These findings were also corroborated by a report released on March 6, 2012 by the WHO/UNICEF Joint Monitoring Programme on sanitation for the Millennium Development Goals, (UN Members, 2018) which revealed that 59% (626 million) Indians still lack access to toilets.

Sanitation in Punjab

Punjab has taken numerous initiatives to ensure that its citizens have access to safe drinking water. However, the availability of safe drinking water remains a major concern. Surface and ground water pollution is caused by the discharge of industrial waste water and the untreated discharge of municipal waste water. Punjab has faced numerous issues in wastewater management. (State Annual Action Plan ,2017)

Punjab is one of India's 29 states, located in North-West India. The state has experienced rapid urbanization. Punjab is India's fifth most populous state. According to the 2011 Census of India, the urban population of Punjab is 37.48%, which is significantly higher than the national average of 31.16%, and approximately 93.36% of households have individual toilets within the premises, with 63.74% connected to sewer networks, 20% to septic tanks, and approximately 7% to pits and other systems. (State Annual Action Plan ,2017).

Existing Sanitation Scenario

In Ramdas, systematic drainage facilities have not been constructed Referring the sewage scenario. Ramdas town has a no systematic drainage facility. Currently, majority of the households in the town rely on on-site sanitation systems such as septic tanks and pits to contain and partially treat black-water that is generated.

According to the data by (Census of India , 2011), in the town only 58.83% of the households have toilets which are mostly connected to the septic tanks i.e. 35.19% and 64.80% have pit latrines

However, after the district Amritsar have been declared as ODF, this town have also been declared has the Open Defecation Free town (Bhatia, 2018). According to its Open

Defecation Free profile it has been revealed that it has availability of 5 public toilets and no community toilet in the town.

Importance of the Study

Ramdas does not have a City Sanitation Plan for its municipality. While the majority of the overall population is provided with decent onsite sanitation facilities, a well-maintained sewerage treatment plant is missing, producing serious sanitation difficulties. As a result, the majority of houses rely on on-site sanitation systems. Septic tanks and pits that overflow into open drains or artificial walkways are common. Furthermore, grey water from the household is discharged in the same drain that flows outside or nearby.

Surface drainage on both sides of the road has been built but has not been properly maintained. The surface drainage pattern is open and overflowing, as well as clogged with solid waste. The town has not made any investments in procuring desludging vehicles through a private contract to collect faecal sludge from septic tanks as they fill. However, the sludge transported by these vehicles is disposed of in open drains or existing ponds, thereby failing the entire sanitation value chain. Appropriate septage and sludge management aids in the reduction of diseases such as diarrhoea. In this respect, the presence of a good drainage system is the most essential component in preventing waterborne infections in major cities, as well as one of the most important measures in preventing underground water contamination. As a result, there is a pressing need for efficient wastewater management via improved water use efficiency and waste water recycling via decentralised treatment systems.

Previous Sanitation Theories

The theoretical importance of enhanced sanitation and sludge management must be understood. It will aid in the comprehension of the town's sanitation challenges, and as a remedy to these problems, theoretical sanitation possibilities and facilities will be arranged. The chapter provides information on septage, sewage, sludge management, faecal sludge and septage management in India, pertinent sanitation history and major reforms, FSSM and various procedures involved in managing faecal sludge, best practices/case studies. It also includes the identification of issues based on environmental physical, institutional, and social aspects, as well as the identification of key policies, acts, programmes, and stakeholders based on the sanitation value chain. The various treatments for treating sludge, such as decentralised and centralised, will be studied. It also covers all of the terminology that will be utilised in the future.

Historically, Indian society has placed a great value on sanitation. Excavations from the Indus Valley Civilization and Harappa demonstrate innovative waste water conveyance techniques via underground drainage systems. Sanitary engineering was advanced as far back as 5000 years. Such ideas of enhanced hygienic practises persisted throughout the reigns of many kingdoms that dominated the subcontinent, such as the Maurya’s, Guptas, and the southern kingdom of Vijayanagar. Even from an ideological standpoint, numerous Indian social reformers promoted the need of sanitation. The emphasis on sanitation was vital to India's cultural basis, from Patanjali's philosophy to Vivekananda's writings to the Gandhian concept of sanitation.

During the Indus Valley Civilization, the drainage system was equally advanced. Pottery pipes in the walls let water to drain, and in some cases, a cot was provided for sitting in toilets. The waste was subsequently discharged into drainage systems. There were large-scale sanitary sewer systems in place. The sewage was subsequently directed into cesspools, which were constructed at the intersection of two drains and had steps leading to them for periodic cleaning. Plumbing was completed using earthenware plumbing pipes with large flanges for simple connecting with asphalt to prevent leakage. Sanitation was an important aspect of Indian life.

The Evolution of Sanitation in India Over Time

According to "The Technology of Sanitation in Colonial Delhi" (Prashad, 2001), sanitation ceased to be a national concern with the start of colonial rule. The steady increase in rural poverty as a result of colonial rule, as well as the growth of urban areas and population, were all important factors in why cleanliness fell out of favour. Even during colonial control, monarchs did not prioritise sanitation for their population. Only after the British Royal Commission reported a high mortality rate of 69 out of 1,000 troops due to diarrhoea in 1859 did each presidency form a Commission for Public Health. Under the Military Cantonments Act of 1865, a sanitation police were established, and for the first time, sanitary boards were established in each province to oversee civil sanitation conditions.

Unfortunately, colonial interest in public sanitation was limited to the needs of the military and the elite, rather than the entire population. Most municipal changes concentrated on epidemic eradication and estate creation, but no programme addressed Indian sanitation needs. By 1947, the Indian population of almost 30 crores had less than 1% sanitation coverage, a figure that did not improve for a long time.

The history of disease prevention in British India and the evolution of public health in that part of the world in the 19th and early 20th centuries provide a valuable insight into a period that saw the development of new trends in medical systems and a shift from surveys to microscopic studies in medicine. It houses early laboratory works as well as significant achievements in microbiology and immunology. The introduction of infectious diseases and tropical medicine was a direct result of colonialism. The epidemiology of infectious diseases, many of which are still widespread in third-world countries, may be traced back to the colonial era. It reveals the imperial government's response to diseases and the establishment of surveillance systems. It demonstrates how the colonial power's construction of health systems affected disease control in British India in order to promote the health of its inhabitants.

In Colonial India, the British Imperial government established and strengthened an organised medical system that supplanted indigenous Indian and Arabic medicinal systems. Slow development in the early years was owing to people's disinterest and the government's lack of cash and medical personnel. The people of India rejected British colonisation and were hesitant to support any services provided by a foreign administration. As natives were educated according to the British system, these trends gradually changed. They subsequently opted to join the Indian civil and military services in order to alleviate their problems by participating in government matters. That is why Indian Medical Services thrived in the late nineteenth and early twentieth centuries. In British India, medical and sanitary conditions improved dramatically.

Profile of the City

Ramdas is a Nagar Panchayat in the Amritsar district. Punjab. The town of Ramdas is divided into 11 wards. (See Fig. 1). It is a class 4^{th} town in the subdivision. Ajnala is the district. It is the smallest Nagar Panchayat. Ajnala sub-district covers an area of 9 km^2. Ramdas Nagar Panchayat was established. According to the District handbook dated 1 April 1998, Amritsar 2011, the town's nearest railway station is Ramdas, which is 3 kilometres from the city centre town. Ajnala is the sub-district headquarters. The distance from the town is 15 kilometres.

District administration Amritsar is 46 kilometers away from the city. Chandigarh, the state capital of the city, is 260 kilometers away. The city's annual average rainfall is 892 mm. The maximum temperature here can reach 40°C, while the minimum temperature drops to 4°C (Amritsar Master Plan, 2011). Ramdas is a Nagar Panchayat in the Amritsar district of Punjab. Ramdas is divided into 11 municipal wards, with elections occurring every five years. The town has a total of 1248 houses to whom it provides basic utilities such as water and electricity. The town has 53% residential area, 18% commercial area, 13% public & semi-public area, and 16% open spaces (see figure-2). Wards 9 through 11 are primarily residentially dominant. Wards 3, 4, 5, and 6 are freshly created residential colonies that are also residentially dominant wards. Ward 9 is the most densely located ward, with the most households and inhabitants, although

the area is small, measuring only 0.9 hectares. Ward 5 has the most people (1602) and the most land area (195 hectares) of any of the wards.

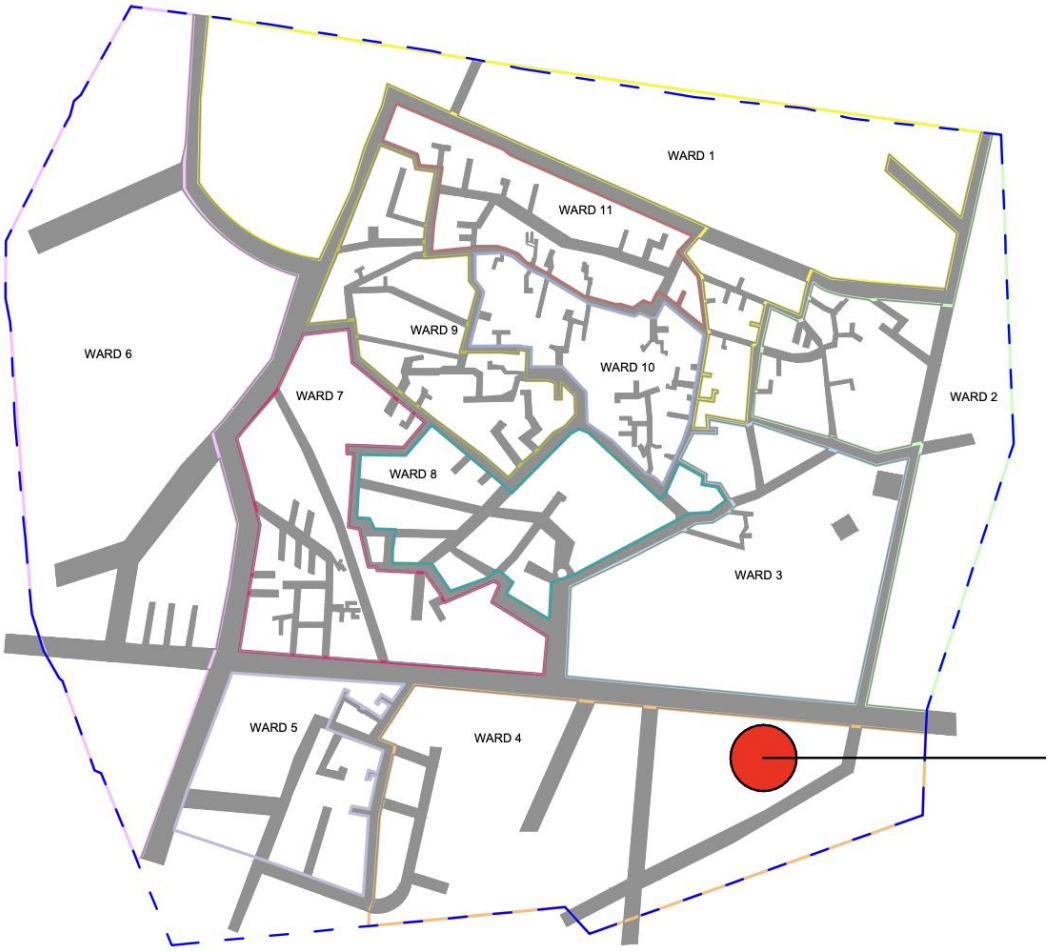

Fig. 1: Ward Wise Map of Ramdas
Source: Author

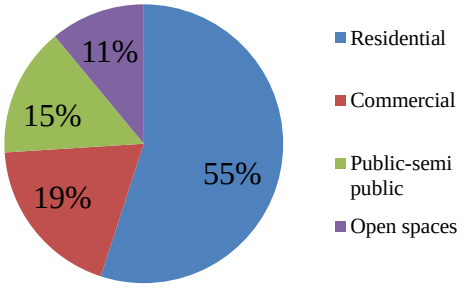

Fig. 2: Land use distribution in Ramdas
Source: MC, Ramdas

Land use is widely connected to sanitation management demand by informing the way land is impacted the demand for sanitation infrastructure sand services. The overall area covered by commercial land use is 18%, which includes the major market of Ramdas town as

well as wards 7 and 8. These primarily apply to retail commercial establishments. They are not equipped with adequate parking. The cars are parked on the street. Confectionaries, cosmetics, toys, utensil shops, eatables and sweets shops, and daily necessities are all available. A showroom for electronic devices is also located on the main route. The overall area covered by the Public/Semi-Public category is 13%, which includes Ramdas' new bus stop on the main arterial road known as Ajnala Road. It will also include the cremation grounds and graveyards located in Wards 5 and 10. This area extensively required sophisticated sanitation infrastructure to accommodate larger visitors around the day.

Research Methodology

This section details the methods, tools and techniques used in collecting data, assessing the current sanitation situation and gaps in wastewater in Ramdas town. Data was collected by the methods below-

- Primary data survey
- Interviews and discussions with stakeholders linked to sanitation and water
- Primary survey data identified in the form of questionnaire in different wards (ward 01 – ward 11) of the city. The gaps were identified from the present household toilets whether they are as per standards or undersized and open defecation of the wards.

During the survey semi structured interview are done with the slum population, various councillors and members of the Nagar Panchayat of Ramdas. Semi-structured interviews are one of the ways to create discussions and the main aim of these discussions is to collect information from the various stakeholders. Such interviews was conducted during the reconnaissance survey or even during the actual survey. Such interviews can give us the informal details like sanitation facility in household, types of sanitation facility, age and shape of septic tank, agency responsible for de-sludging and other problems which can be used for further analysis and recommendations.

The sampling method used for the research is Stratified Random Sampling Technique which is sub-part of the Probability Sampling. Stratification is the dividing up of the whole population of town into sub populations called “strata”, and from each stratum, random sample is drawn.

Town Sanitation Problem Evaluation

In Ramdas, 74% of all households have toilets within their premises, whereas 26% do not have any household toilets due to a lack of land availability, funding, and land title concerns. The other 26% of the population uses community/public toilets or practises open defecation, which causes odours in the environment (see figure 3). In the town, 26% of the population still practises open defecation, particularly in Wards 7, 8, which are close the pond. Wards 3, 4, have 100% household toilets because they are newly constructed and do not have any septage related difficulties.

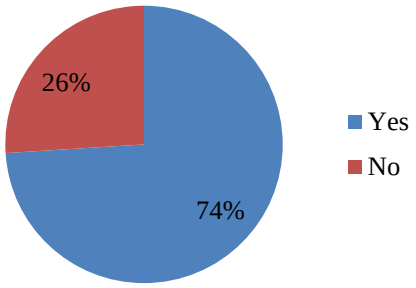

Fig. 3: Availability of toilet at household
Source: Author (primary survey data)

Public Defecation

Out of the 26% of households without toilets, 65% practise open defecation because community toilets are inaccessible; thus, people prefer to defecate in the open rather than travel so far. Because of a lack of proper water supply, electricity, street lighting, and accessibility, only 35% of HHs utilise community/public toilets. Wards 1, 2, 7, 8, and 9 are all old wards with about 20% of the population lacking access to toilets. Because they are not easily accessible, people prefer to defecate in the open.

Public/Community Restrooms

Because there are no separate male and female toilets, women are hesitant to use these community toilets. The user group for the community toilet is huge in the morning, making it inconvenient for all users, who prefer open defecation.

According to the Ramdas Nagar Panchayat, 5 public/community toilets are available for public use (see figure 4). According to a survey conducted at the household and local levels, these toilets are just on paper; there are only 6 public/community toilets on site, with no sufficient water supply or electricity. MC built the toilets but failed to maintain them, so people do not use them. Instead of utilising public/community toilets, they choose open defecation, which harms the environment and creates unsanitary circumstances, and many health issues arise that directly affect them.

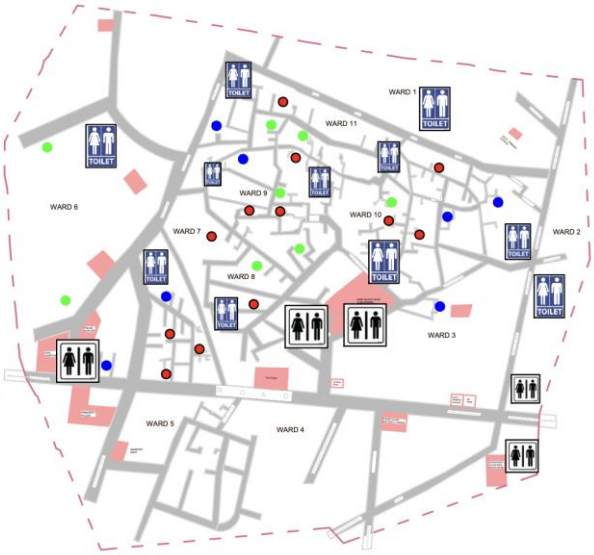

Fig. 4: Public/ Community Restroom location in Ramdas.
Source: Author

Collection and Storage

In the town Ramdas, the sewage generated from the houses is collected in the septic tanks. The septic tanks are with and without soak pits. Data on the types of faecal sludge collection systems in household across town indicates that use of septic tanks is most prevalent, followed by soak pits. However, many households which do have constructed septic tanks have their direct outlets to open drains along the road in which the grey water and black water is disposed of. Out of the total households only 72 percent of the households have the septic tanks and the rest 28 percent dispose of the sewage from the houses directly to open drains. Such a situation in the town creates many issue related to health, environment and it also affects the aesthetics of the town

Septic Tank Availability

It was discovered that 26% of the total household does not have access to the septic tanks and 74% of other households are the state of the septic tanks is deplorable. Tanks are leaking and are not being adequately maintained. maintained. 64% of households (74% of the total) Toilets are linked directly to septic tanks. The remaining 10% have pit latrines. Such deplorable conditions The main cause of the unsanitary conditions in town is conditions in the town. The toilets that are directly adjacent The bad odour is caused by being connected to open drains. because the drains are not covered and also the mosquitoes' nesting grounds, which becomes the reason for many health concerns in town. (see figure-5).

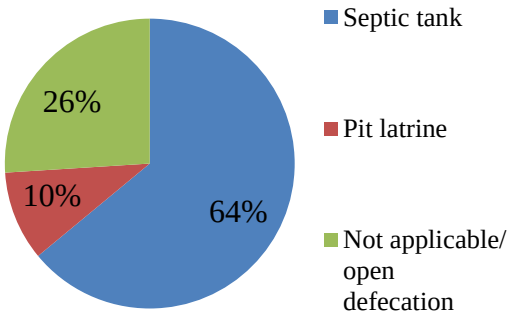

Fig. 5: Availability of Septic tank
Source: Author (primary survey data)

Accessibility of Septic Tank

There are numerous access issues linked with septic tanks throughout the municipality. Septic tank repair must be undertaken on a regular basis as part of any management programme To thoroughly clean a septic tank, entry must be gained through a manhole or manholes that give access to all corners or compartments of the tank. This requires an opening at least 20 inches in diameter, allowing the ability to clean and inspect the tank as part of regular maintenance in the town the 19% of the septic tank which is constructed under the toilet which is not accessible to de-sludge and in ward no 7, 8, 9 and 10 narrow street which is also the reason for manual desludging. Most tanks in town had manhole access for inspection or desludging. However, these remained closed during the survey; they were plastered in the edges with cement mortar and had to be opened by breaking open.

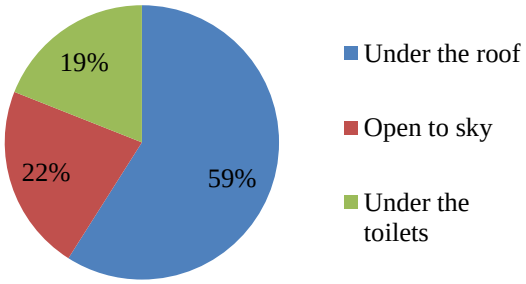

Fig. 6: Accessibility of Septic Tank
Source: Author (primary survey data)

Desludging and Conveyance of Septic Tanks

In the town Ramdas, the desludging is not done frequently. The desludging frequency is observed to be invariably low (once every 8-10 years). The low desludging frequency can be attributed to either the unlined nature of the pits or in case of septic tanks, their large size and the provision for the supernatant to flow out of the tank direct into the open drains along the roads. The first desludging can take as long as 10-20 years and, in some cases, even more. Once desludged, the desludging interval decreases as the soil around the pit becomes saturated with liquids and clogged with sludge particles. Desludging is primarily done by the private operators.

The town is served by one or more private operators. For the desludging of septic tanks in the town the Ramdas, the Nagar Panchayat has signed a contract with the private operator of time period 6 months, which has now been terminated. Most of these trucks have a Faecal sludge storage capacity of around 3500 L to 4500 L. However, the inaccessible areas of all these towns continue to depend on non-mechanical desludging. The desludging user charges also vary greatly from mechanical to non-mechanical.

Mode of Desludging

In the town, the main mode of the desludging is non mechanical i.e., 95% of the desludging is done manually (refer figure-7) which is against the law of Manual Scavenging Act, 1993. The reasons for illegal manual scavenging are that the easy availability of the labor form the ward no- 7,8,10. However, the private trucks for cleaning the septic tanks are coming from a distance of 15 km and they are sometimes even not available. Therefore, people prefer to get cleaned their septic tanks manually by the easily available labor in the town. Labor only use gloves and boots only and no other protective measures are taken while desludging activity. There are no guidelines given by the Nagar Panchayat of the town and there is no check on the desludging activity. The ward wise scenario of the town is also detailed out based on the primary survey. In the ward no – 8,9, 10 and 11 desludging of the septic tanks is done 100% manually.

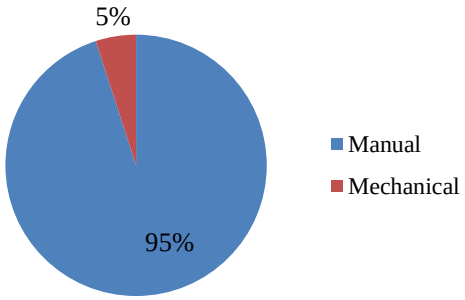

Fig. 7: Mode of Desludging in Town
Source: Author (primary survey data)

Desludging of septic tanks

No staff has been appointed for desludging of the septic tanks in the town. For desludging process, the team appointed for the cleaning of the sewers or the workers appointed for the municipal waste collection are called on random basis after no fixed time periods. (see Fig-8)

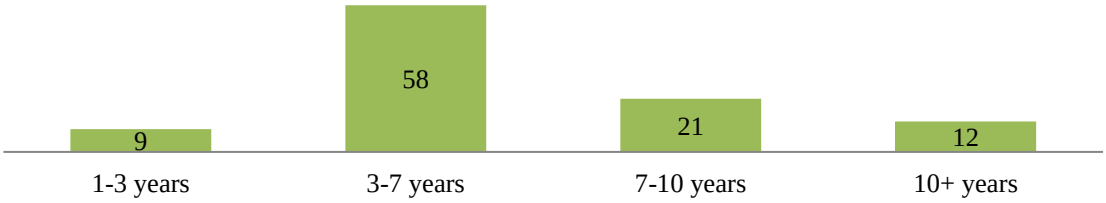

Fig. 8: Frequency of Desludging in Town
Source: Author (primary survey data)

Physical concerns

There are no individual bathrooms in wards 1,2,5,6,7,8,10,11. Individual toilets are not available in 312 houses (15%). Because there are no individual toilets in the aforementioned wards, people resort to open defecation. Lack of access to the community toilet in ward-1 constructed by Nagar Panchayat Ramdas leaves residents with no other choice but to resort to open defecation. Issues In Wards 10, 2, 3, 4, there has been little attention paid to poor people's access to safe sanitation, and sanitation solutions have been determined to be supply driven rather than demand responsive.

The town has 1248 households having their own septic tanks. Interviewing the officer in nagar palika, it appeared that 761 HH have twin pit septic tanks whereas 113 HH had single pit septic tanks. 32 % of the septic tanks were unlined. This means underground seepage of waste water existed in the town. This, therefore, can be one of the main reasons for the ground water quality depletion. Collecting 3 water samples from ward number4, 6 and 12, the water samples failed the turbidity test making it unsuitable for human consumption.

- **Cleaning the sewerage system** - There is no fixed periodic cleaning process reported. Septic tanks and pits in the town are not de-sludge regularly to keep them functional. 70% of the households get cleaned their septic tanks after 3 years. These are occasionally emptied manually and dumped into the nearby municipal drain, low lands, ponds and into open environment.
- **De-sludging the septic tanks -** As mentioned above that no specific safety measures are taken for the manual cleaners and de-sludgers, same implies here as well.

Socio-Economic Concerns

The government's provision of half of the cash for toilet construction at the household level resulted in poorly constructed toilets. Households receive only 6000 rupees for the construction of toilets. Ramdas Nagar Panchayat does not provide separate bathrooms for women. People also use this location for drugs at night in public restrooms because they are afraid to go out in the open fields at night. Access to toilets is hampered by financial constraints and a lack of room for the construction of individual toilets. As a result, members of families without toilets resort to open defecation. In Ramdas, where there are no toilet facilities, 65% of the population practises open defecation, which exacerbates environmental issues, public health, and safety.

The availability of septic tanks covers the hygienic propaganda of the population thus, giving population some major hygiene goals and making them aware of the healthy environment. The availability of septic tanks in the households reduces the risk of unhealthy environment and also reduces the gender biasness as the availability of public toilets for the female is poor in number thus encouraging open defecation.

Whatever the grounds are, be it inaccessible road widths refraining heavy duty/mechanical motor loaded vehicles to clean the sewers door to door, or be it inadequate staff member for the cleaning/desludging process, manual cleaning directly violates the Manual scavenging act in the town. No specific caste distinction systems have been noticed, but when the background details of the person plunging into a deep manhole or desludging a septic tank are looked upon, they are the ones belonging to the below poverty line distinction.

Environmental Issues

Open defecation in the city produces unsanitary circumstances and harms the ecosystem. The primary dumping points are in Ward No. 11, which exacerbates the water quality issues. Households without septic tanks have their toilets discharge directly into open drains, where they mingle with the water supply pipe and contaminate the drinking water. Wards 1,2,7,8, and 11 of Ramdas town have homes that do not own separate toilets and do not utilise public restrooms due to insecure and unsanitary conditions. Almost all houses used to defecate in the open, which was a major cause of the spread of unsanitary and hazardous environments, as well as the transmission of undesired diseases. Diseases spreading in the town as a result of open defecation are hampering growth.

The foul smell of sludge affects the lives of surrounding people as a direct impact. Poor construction of septic tanks is leading to the overflow in rainy season, water pollution and a high cost of cleaning. Cleaning of septic tanks at household level is not frequent. The breakdown or leakage in the vacuum trucks during conveying of sludge results in foul smells on the way.

Any recessive aspect, be it physical or institutional, would lead to the improper handling of the waste water and the septage, which at last would degrade the environment in any form. In September, 2018, 26 dengue cases were reported to the dispensary. The manual scavengers dispose of the septage along the open drains along the roads which also creates the unhygienic conditions in the town.

Conclusions

DEWATS (Decentralized waste water treatment system) is a wastewater treatment system that is reliable and low-cost in operation. It can treat organic wastewater from both domestic and industrial source with flows from 1 to 1000 m3 per day. The DEWATS system is an effective and efficient wastewater treatment solution that minimizes water and soil pollution in housing complex/settlements. DEWATS helps in improving sanitation, protecting the environment and promoting sustainable water management in the wards with limited access to centralized infrastructure by providing Biogas plants, Wetlands, Septic tanks, Aerated Lagoons, Sand Filters, Reed beds, Anaerobic filters etc. by raising awareness of the importance of Sanitation and Hygiene. (Mohmmed Hasan and Abdul Ghafoor, 2023)

In the town 26 % of the household do not have septic tanks which are a main issue and 26% of the households are still practicing the open defecation. Even the houses which have septic tanks, but the septic tanks are not well maintained and cleaned on time. The engineers, masons and the community need to be trained in proper construction, detailing and use of toilets and their maintenance. All households with toilets, either with single pit or twin pits with bottom lined with cement concrete, and toilets should be connected to septic tanks so that they function effectively The outlet of the existing septic tanks is directly connected to the open drains which create a lot of problems. The city should consider implementing a comprehensive and organised system for managing septage, which involves the collection of waste from septic tanks and other sources of faecal matter in unconnected households and public toilets. This institutionalised approach aims to promote sufficient and safe sanitation practises.

The proposals are given as per the increased requirement over the next ten years. To the households which do not have the spaces at their houses, the community toilets will be proposed. In the town, total 849 septic tanks will be proposed, out of which 1248 will be the proposed individual septic tanks and 25 will be the shared septic tanks which will cover 39 houses. The shared septic tanks will be provided in those wards, where the roads are very narrow and have no provision for the construction of the septic tanks. The shared septic tanks which will share 5 houses will be 10, and which will share 3 houses will be 8 and which will share 2 houses will be proposed. Small scale vacuum trucks called vacutug (From 200 up to 2,000 liters capacity) are recommended for use in areas inaccessible to large desludging vehicles. In the ward no-1,2,6,7 and 9, some roads are having width even less than 1 meter, which even small desludging trucks cannot access such roads, in such cases solutions such as using a gulper may be a solution. The proposed solution should demonstrate compatibility with the prevailing traditional and rural characteristics. (Sahu, Paliwal and Kalwar, 2020)

Bringing out sludge will be preferred to be done during the morning as falling temperatures in the evening can result in hardening of sludge, making the suction pumps unusable. The five to six months of summer will be time when majority of the cleaning and treatment will be done. In the presence of only pits and septic tanks as a collection and treatment module for Faecal sludge management and the absence of further treatment modules, the collected Faecal sludge is disposed without treatment. The Faecal sludge collected by the trucks is either disposed in the Ramdas Drain or the ponds. Treatment of Faecal sludge is required before it can be safely disposed or used.

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