



RECENT DEVELOPMENTS IN RURAL CLEANLINESS METHODOLOGIES – SWACHH GRAMEEN

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Abstract - Open defecation, poor individual cleanliness habits, as well as an inadequate system for solid and liquid garbage disposal, have all had a negative effect on general populace health, child fatalities, gender justice, ecology, and the rural sector. In particular, improper solid and liquid trash management has led to the spread of water-borne illnesses like dysentery, dengue, malaria, pneumonia, and typhoid. It is predicted that an absence of potable water and sanitation, including efficient solid and liquid trash disposal accounts for 88% of the overall illness prevalence in rural areas. The medical and well-being consequences are disproportionately felt by vulnerable and underrepresented people, notably kids, particularly children below the age of 5 years, teenage girls, and women. This article will highlight current advancements in the areas of Solid and Liquid Trash handling that have occurred through the nation.

Index Terms – Open Defecation Free, Rural Cleanliness Swachh Grameen, Waste Management.

I. INTRODUCTION

"Sanitation takes precedence over political freedom." Gandhi, Mahatma. The Swachh Bharat Campaign was started on October 2, 2014, with the objective of achieving Swachh Bharat until October 2, 2019, the 150th birth ceremony of Mahatma Gandhi. Swachh Bharat Mission (Gramin) ("SBM(G)") is handled by the Department of Drinking Water & Sanitation, and Swachh Bharat Mission (Urban) is managed by the Ministry of Housing & Urban Affairs (MoHUA). Figure 1 depicts the primary strategic priorities of SBM (G) 2022.



Figure 1: Main focus areas of SBM (G) 2022

SWM (G)-phase II intends to preserve the ODF designation of rural communities and to increase the sanitation standards in poor villages via solid and liquid trash disposal operations, creating towns ODF Plus. An ODF Plus community is defined as "a rural area that maintains its Open Defecation Free (ODF) designation, manages sludge, and is visibly clean."

1.1 Goals and Objectives of SBM(G)

- Drinking water that is both clean and economical
- Put a stop to open defecation & increase the availability of hygiene and sanitation services.
- Promote sewage treatment in village regions to accomplish the Clean India goal.
- Encourage populations and Panchayati Raj organizations and Institutions to implement appropriate hygienic conditions and services by raising consciousness and providing healthcare awareness.
- Promote the use of cost-effective and viable and durable sanitation solutions.
- Create community-managed sanitary facilities in village regions, concentrating on modern solid and liquid trash disposal methods for overall hygiene.
- Improve sanitation, particularly in vulnerable groups, to have a largely beneficial influence on women and to encourage social integration.

II. LITERATURE SURVEY

The Ministry of Environment, Forestry, and Climate Change released the Solid Waste Management Guidelines, 2016 as well as the Plastic Waste Management Guidelines, in 2016, which outlined the government's particular rights and responsibilities regarding solid garbage management, along with plastic waste produced in poor villages. Furthermore, water and cleanliness are important duties of the Gram Panchayat ("GP") in village regions, according to the 73rd amendment to the Indian Constitution and the Karnataka Panchayat Raj Act. As a result, the SBM (G) regulations, together with the Karnataka Panchayat Raj Act, SWM Regulations, and PWM Regulations, create the legislative regime for village cleanliness and solid and liquid garbage disposal.

As an initial measure, the government of Karnataka has concentrated on eliminating open defecation in GPs. At the preliminary assessment in 2012-13, 45,42,655 families did not have access to toilets. Karnataka region was designated ODF in November 2018 after constructing the needed 45,42,655 bathrooms. Following the ODF proclamation, ODF plus practices like the neatness of sources of water and municipal water sources, distributed solid and liquid garbage management, drainages, upkeep of the school and Anganwadi bathrooms, hand-washing as well as individual personal care, knowledge and understanding, and education on pit unloading and fecal sludge management, and etc must be initiated, according to the SBM(G) rules. Considering that Karnataka has announced 100% ODF, it recommends transitioning to ODF plus exercises which concentrate on overall sanitary conditions, including secure dumping of fecal sewage, individual cleanliness practices, wastewater treatment, and systematic solid garbage disposal, such that villages can reap the complete benefits of hygienic practices.

- Filtration at the generation and the treatment of 100% organic waste is completed in 20% of all GPs by March 2020, 50% of all GPs by March 2021, and 100% of all GPs in Karnataka by March 2022.
- In 20% of the overall count of GPs by March 2020, 50% of the GPs by March 2021, and 100% of the GPs by March-2022, 100% of the non-biodegradable trash will be recycled, reused, or treated, with an emphasis on avoiding conveyance to landfills.
- Unification of dry waste treatment at the regional or district level among villages & urban regions by March 2022.

III. SOLID AND LIQUID WASTE MANAGEMENT (SLWM)

SLWM is divided into four categories:

- Biodegradable waste management
- Plastic waste management
- Grey water management
- Fecal Sludge management

3.1 Biodegradable waste management: Solid garbage in rural regions is composed of 73% biodegradable waste & 27% non-biodegradable trash. Biodegradable waste, like bovine manure, kitchen trash, agricultural leftovers, and so on, can be entirely destroyed by biological processes in the presence or absence of air. By aerobic and anaerobic decomposition, organic waste may be transformed into organic fertilizer and biogas. Improper solid trash disposal can cause environmental degradation and water pollution, especially during the monsoon period. The essential processes in this garbage treatment system are source separation, gathering and conveyance, treatment, and dumping.

3.2 Plastic waste management: To effectively handle plastic trash, everybody must adhere to the 4Rs concept. The four Rs to remember are to refuse, reduce, reuse, and recycle.

- Refuse throwaway and one-time-use plastics such as disposable straws and plastic bags
- Reduce plastic pollution by adopting more environmentally conscious purchase selections.
- Instead of purchasing new plastics, reuse existing ones.
- Recycle and discard plastic in a responsible manner. Encourage the use of recycling bins.

Residents are responsible for the primary 3 R's: refuse, reduce, and reuse. The recyclable plastics will be given to scrapping dealers/cement sector or utilized for road building or for other means of recovery. The major processes to adopt in plastic waste disposal approach are separation at the source, gathering, storage unit at the village level, and Managing the Plastic Trash Unit at the block/district level.

3.3 Grey water Management: Grey water treatment approach comprises 3 stages: reduce, reuse, & recharge. Figure 2 depicts grey water, which is sewage flow collected from kitchens and bathrooms.

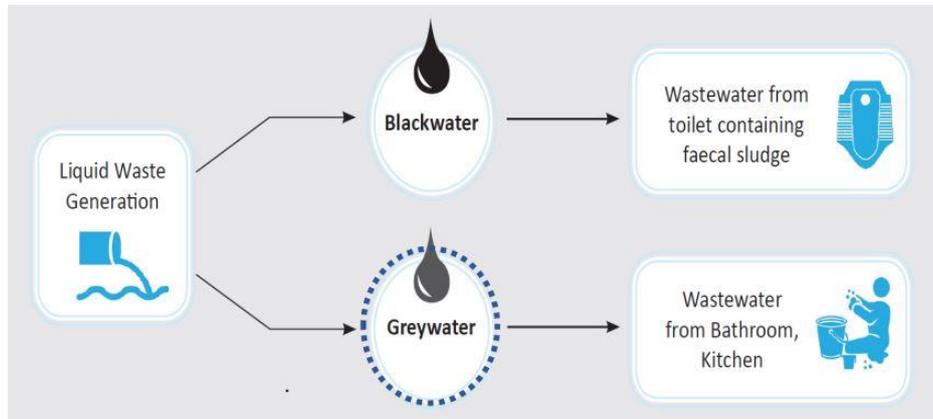


Figure 2: Liquid waste classification

- **Reduce:** Use clean water wisely, resulting in the formation of as little Grey water as possible.
- **Reuse:** To the greatest degree feasible, reuse grey water for activities like kitchen gardening, car cleaning, and flushing the toilet.
- **Recharge:** Recharge groundwater resources with grey water using methods like soakage pits and leach fields.

Grey water treatment in the home includes a kitchen garden, soaking pits, a leach pit, and a magic pit. Community-level remedies comprise a leach pit, a built pond, a phytoid, and a distributed wastewater treatment infrastructure.

3.4 Faecal sludge management: Faecal sludge treatment is the proper dumping of fecal waste produced by toilets. Septic systems and single-pit toilets are examples of toilets that don't permit in-situ cleaning.

- Containment: Proper storage of fecal wastes from toilets in septic tanks, individual pits, and so on.
- Draining and transit: Automated unloading of fecal matter via suction equipment and delivery to a neighboring sewage plant.
- Treatment: All gathered garbage is treated.
- Reuse/Disposal: Reusing leftovers or safely disposing of them.

IV. KARNATAKA STATE RURAL SANITATION POLICY

States are obligated under SBM (G) recommendations to establish an operational strategy to facilitate the adoption of the rules while keeping state-specific problems, needs, and trends in consideration. The government of Karnataka recommends adopting this governmental policy for waste disposal and cleanliness in village regions ("Karnataka State Rural Sanitation Policy") as the core component of this integrated model and in compliance with the prerequisites of SWM Regulations and PWM Guidelines, which includes core fundamentals and method, vision for the future, targets, and timelines to meet the objectives. In parallel with the policy, Karnataka wants to develop and execute a statewide strategy for administering the "Karnataka State Rural Sanitation Policy".

The state strategic approach would provide, among many other things, advice on washroom retrofitting innovations, solid and liquid garbage control, funding, duties, and accountability of various public officials, information education and communication and behavior modification interaction, institutional capacity, tracking, and assessment of systems for managing waste. Additionally, the Village Panchayat's prototype bye-laws would serve as an accountability tool for the concepts outlined throughout this policy as well as the state approach.

As a result, the Karnataka State Rural Sanitation Policy, alongside the state program and prototype bye-laws, will serve as a judgment structure to enhance garbage and cleanliness disposal approach and procedures throughout the state's rural districts.

Whereas the primary duty for waste treatment and cleanliness will continue to stay only with GP at a distributed point, the government of Karnataka, in collaboration with suitable public officials, might very well play a positive part in the manner of policy and regulatory development, viability chasm financing, mentoring, technical advice, as well as other capacity gaining support to the GPs.

It is explained that toxic material, bio-medical disposal, e-waste, building as well as demolition garbage, and industrial pollution (solid & liquid elements) are still not addressed by the Karnataka State Rural Sanitation Policy as they are ruled by separate regulatory requirements and managed by officials separate from the Regional Development & Panchayat Raj Unit. If, as a result of modifications in relevant legislation, the treatment of these kinds of trash comes under the jurisdiction of the Gram Panchayat, this Strategy would be broadened to cover the aforementioned byproducts.

4.1 Aims and Objectives relating to Solid Waste Management

- Efficient execution of the Forestry, Ecological, and Conservation Dept's prohibition on plastic items across all village regions throughout Karnataka.
- To guarantee that no garbage is deposited or burned in open areas, therefore protecting the natural ecology of village regions.
- Via rigorous informational training and awareness, and behavioral modification communication initiatives, the 4R strategy to trash will be established.
- Reducing the negative impacts of incorrect solid garbage disposal on the ecosystem and the welfare of local communities through enhanced cleanliness in village regions.

4.2 Aims and Objectives for Sanitation and Liquid Waste Management

- Through societal interaction and education, open defecation will be eradicated via accessibility to restrooms and continued use of the utilities. This would be accomplished by retaining a 100-percentage ODF rating in rural Karnataka by constructing additional restrooms for every residential dwelling and/or communal restroom with sufficient control.
- Improving community healthcare & sewage employees' safety by promoting appropriate individual as well as communal sanitation behaviors (such as the supply of individual safety equipment) by strictly adhering to the Banning of Recruitment as Manual Foragers & their Amendment Act of 2013.
- To prevent sewage pollution of soil and freshwater supplies by establishing adequate and low-cost, low-maintenance treatment centers.

V. OVERALL APPROACH TOWARDS WASTE MANAGEMENT

5.1 Management Of Different Types Of Solid And Liquid Wastes

- Although grey water accounts for around 80-85% of sewage by quantity, black water is much more harmful to individuals & the ecosystem in respect of the effect of non-treatment. As a result, with state assistance, local GPs will handle the containment, storage, transport, processing, and dumping of black water.
- In terms of solid trash, GPs must concentrate mainly on the disposal and treatment of non-biodegradable (dry) waste because it includes a greater issue than biowaste in most rural communities, whereas biodegradable trash might be properly disposed of and/or fed to animals by the waste generation system itself.

5.2 Management Of Solid And Liquid Wastes In Rural Areas

- The Gram Panchayat would retain main accountability for sanitation and garbage disposal facilities as well as service delivery on a distributed level.
- Residential trash producers are responsible for limiting the trash (fluid & granular) and processing this locally to the greatest degree practicable.
- The state of Karnataka will take the preceding approaches to garbage treatment/processing alternatives:
 - Distributed alternatives must be favored over centralized solutions wherever feasible.
 - Simple-to-use technology with minimal operating and upkeep expenses should be used.
 - Treatment solutions with greater reuse/recyclability will be chosen.
- It is vital for garbage treatment solutions to be self-sustaining throughout time. GPs would be forced to set a minimum of 25% of their total expenditures for cleanliness and domestic trash disposal facilities. Furthermore, in accordance with the recognized concept of "carbon emitters pay," all trash producers must be billed reasonable customer charges for trash disposal services that may be utilized to fund the operating costs of the SLWM networks.
- Waste disposal strategy must take into account local variables like population density, geo-climatic factors, and the capacity to execute and run the solutions.

VI. ROBOTIC WASTE MANAGEMENT FRAMEWORK

The suggested system's primary intention is to discover a method to accumulate and successfully dispose of garbage. As seen in Fig.3, the presented Smart Trash Collection Framework is composed of two components: Smart Garbage Bin with Waste Level Sensor as well as Automated Trash Collection Vehicle.

An integrated ultrasonic detector will be utilized to constantly monitor and update the waste level on the Cloud Data center. When the extent nears a certain level, a quantity in the context of the smart garbage bin number is modified in a different channel field.

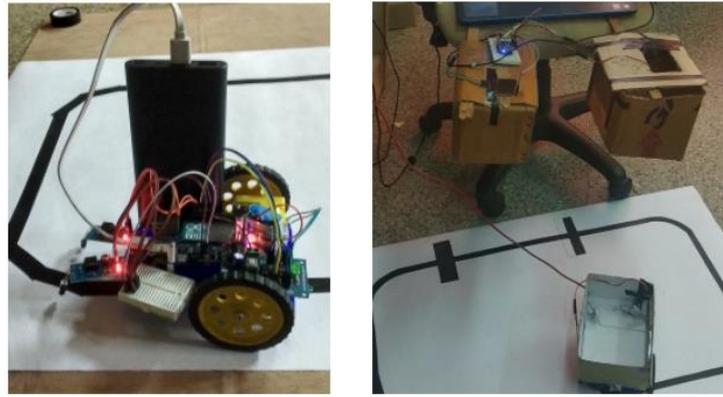


Figure 3: Automatic waste management system

The Automated garbage collection vehicle will sign up to this link field, so as quickly as the value is modified, the AGCV would then recognize the target intelligent garbage bin number. The vehicle will begin to move utilizing attached locomotives and will be steered constantly by IR detectors attached to an Arduino board. The vehicle will determine the number of crosses in the path must be avoided depending on the garbage receptacle number.

When the automated vehicle arrives at its destination, it will allow access to the Collection Block by opening the Lid and also the garbage bin will allow access by removing the Disposal Lid, accomplishing the trash collection. To complete this task, time duration is given. Soon as the trash bin is emptied, the result in the corresponding cloud fields is upgraded, and the machine returns to its original location by using IR directed line tracking device. As a result, the suggested process is complete.

VII. CONCLUSION AND FUTUREWORK

To deliver safe, economical, durable, and accessible trash and cleanliness treatment solutions to all people in rural Karnataka, leading to a better healthcare system, a greener ecosystem, and increased resource recovery. Solid and liquid garbage disposal actions must be designed with regional considerations and circumstances in mind. SLWM actions must be included in the GPDP. For integrated execution, states must proactively interact and include the Public Health Engineering Dept, Panchayat Raj Dept, and Rural Development Unit. Government agencies should train and assist their district organizations to ensure adequate strategy, execution, and finance. Local Safe Water Campaign will create a year-long budget plan through combining all resources available, such as such as the National Budget, Public Fund, 15th FC subsidies to RLBs, MGNREGS, and so on.

FUTURE SCOPE

Human excrement should be prevented from entering the surroundings. And this can be accomplished by ensuring safe isolation, collection, conveyance, treatment, and dumping. In this context, the state of Karnataka must guarantee that all single-pit restrooms are converted to twin-pit or some other approved safe manner of the enclosure by 2025. Furthermore, by 2025, all GPs will have 100% containment and processing of domestic sewage and grey water.

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