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### Waste Management in Rural Area case study of Vadaj village, Dabhoi, Vadodara, Gujarat, India

Dhaval Prajapati<sup>1</sup>, Megha Patel<sup>2</sup>,

<sup>1</sup>Student, Civil Engineering Department, Vadodara Institute of Engineering.

<sup>2</sup>Faculty, Civil Engineering Department, Vadodara Institute of Engineering.

**Abstract** - the paper points out rural regions need proper attention at the global level concerning solid waste management sector where bad practices and public health threats could be avoided through traditional and integrated waste management routes. Solid waste management in rural areas is a key issue for developing and transitioning countries like India, due to the lack of proper waste management facilities and services. In order to manage waste in a desirable way, there should be a functional waste management system in place. This paper shows solid waste management, liquid waste management and rainwater harvesting methods at Vadaj village, Dabhoi in India. Presently the wastes are disposed in an uncontrolled manner which may cause adverse impact on public health & environment. In Vadaj village solid and liquid wastes amount increasing day by day which may control by providing Vermicompost, bio gas plant for solid waste and aerobic toilet for liquid waste management. Also rainwater harvesting system is proposed to reduce scarcity of water.

**Keywords**-aerobic toilet, Vermi-compost bed, V-wire screen

#### I. INTRODUCTION

Water, sanitation, and hygiene (WASH) directly impact human health and have far reaching consequences when ignored. India is one of the fastest developing economies, but when it comes to WASH indicators, it continues to lag behind. Solid waste management and liquid waste management has become one of the major problem now days for environment. Though, solid waste generated in rural areas is predominantly organic and biodegradable, it is becoming a major problem as the waste generated is not segregated in-situ and is of the order of 0.3 to 0.4 million metric tons per day, as reported the Ministry of Drinking Water and Sanitation (MDWS), Government of India. The problem is not restricted to a single place rather it covers all parts of the environment which leads to toxic pollutants. A more serious risk is the transfer of pollution to ground water and land as well as the pollution of air from improper burning of waste. Waste comes in many different forms and may be categorized in a variety of ways. Table 1 shows various types of waste generated in % by weight.

**Table -1 Represent types of solid waste generated % by weight**

Types of waste generated	% by weight
Kitchen by reuse	69
Paper	20
Plastic, batteries	6
Glass	4
Metal	1

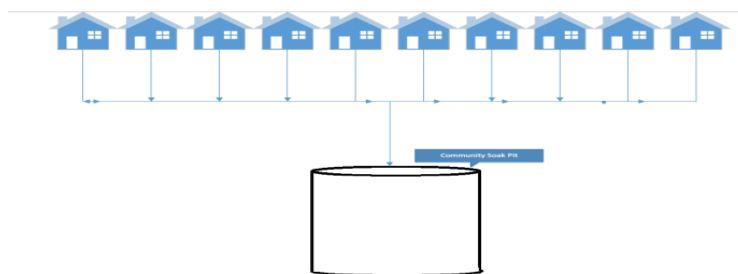
Solid waste can also be defined as the organic and inorganic waste materials produced by households, commercial & industrial establishments that have no economic value to the owner. As per biodegradability, solid waste can be classified as Biodegradable defined Waste that are completely decomposed by biological processes either in presence or in absence of air are called biodegradable. Non-Biodegradable defined Waste which cannot be decomposed by biological processes is called non-biodegradable waste. Which is further divided in two types, Recyclable defined Waste having economic values but destined for disposal can be recovered and reused along with their energy value and Non-Recyclable defined Waste which do not have economic value of recovery. Whereas used & unwanted water is called liquid waste water. Waste water generated in the kitchen, bathroom and laundry is called Grey water. It may contain pathogens.

Municipal Solid Waste (MSW) generation rate varies from season to season, place to place. It depends upon the affluence, season, education, living habits, traditions, etc. The goals of sanitation fail miserably when solid and liquid waste management aspect is not given proper attention to improve health and living environment of the community. In rural areas, this aspect is

mostly neglected due to lack of proper infrastructure, unavailability of sustainable technology at household or community level and moreover lack of adequate awareness of common people. In most of the rural areas it is not a felt-need problem. So we had decided to work on rural area nearby Vadodara, Gujarat, India.

## **II. Existing Liquid Waste Management System**

At present, there is a very inconsistent drainage system in the Vadaj village. In Vadaj village from the baseline data discharge the waste water released from households passing in to soak pit. The system for liquid waste management is broadly based on the system of soak pits traditionally adopted for building toilets in rural areas but with certain modifications. The model envisages clusters of houses such that for every house, a soak pit is built to allow water only from the 1 house to flow into. The water from the houses flow in to these soak pits via underground channels. The water is gradually soaked into the sides of the pit and filter down to the ground water table. The soak pit being constructed is 2m in diameter and 10m in depth. After analysing the soil conditions around the village, it was found that the soil is porous and loamy. This kind of soil has a low soaking capacity due to which this soak pit will have a longer depth than traditional community soak pits. This method is good but adopted method is creating land pollution. Schematic diagram of process flow for community soak pit in below fig.1



**Fig. 1 Schematic diagram of process flow for community soak pit (sewage waste water)**

Whereas Sullage water is open in the atmosphere. Due to flow of waste water into public areas, it has become a major source of bad odour, disease in the Vadaj. Villagers are using this water for irrigation purpose. Figure 2 is showing existing condition of pond in Vadaj village.



**Fig.2 Vadaj lake**

## **III. Existing solid Waste Management System**

Presently in Vadaj village there is no collection and disposal mechanism for solid waste. The Vadaj Gram Panchayat does not have any facility to collect and transport the waste and there is no specified location for the waste disposal. Majority of the users dump their biodegradable waste (68.04%) and non-biodegradable (67.71%) waste in dustbins which is ultimately thrown in the open fields (figure 3). Few villagers are (1.48%) depositing bio-degradable waste in a safe manner. For that people are disposing bio-degradable waste in an identified place; composting, burying, re-using in the garden and having the Gram Panchayat collect the waste and feeding it to the cattle. But specific measured data is not available. The national waste generation average can be taken as a basis for designing a management solution for solid waste disposed from the area. Table number 2 shows the existing solid waste management system and method of deposition in Vadaj.

**Table 2.Existing solid waste management system in Vadaj gram Panchayat**

Waste Generation	Collection and Transportation	Disposal
Total generated estimated solid waste ➤ 1.5 to 2 tons per day (based on an estimate of 250g per person per day).	Currently there is no scientific system to daily collect and transport the solid waste generated.	Current disposal methods ➤ Vegetable & food waste is used as food for livestock.  ➤ Plastics is thrown outside in the open area, field, drain or burnt.
Types of solid waste ➤ Biodegradable-:animal waste, vegetable waste ➤ Non-biodegradable-:plastic bags ,paper ,glass.	Once in 2 to 3 months waste is collected from the roads /drain and throw to an open area outside the village.	
Solid waste sources ➤ Weekly market , school / anganwadis.	Collection is based on contract system by the Gram Panchayat.	



**Fig.3(A) Biodegradable waste Fig.3(B) Biodegradable waste**



**Fig .3 (C) Non-biodegradable**

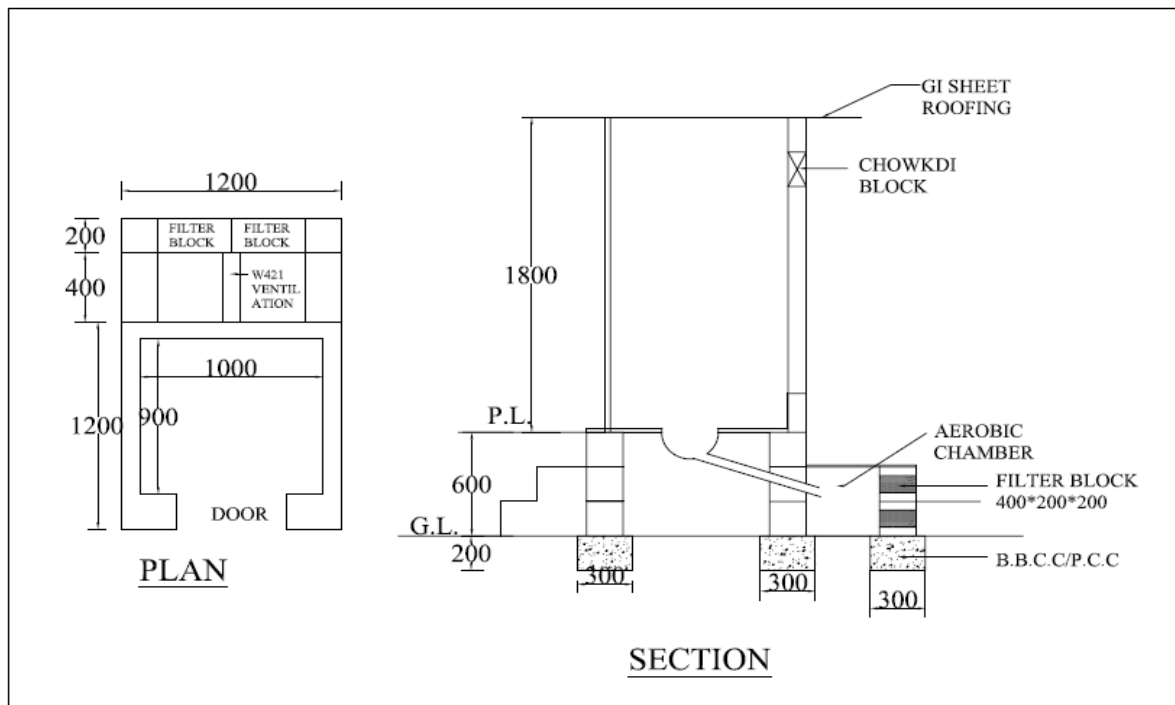
#### IV. Proposed Liquid Waste Management

Liquid waste management is proposed by very easy and simple method. Liquid waste (sullage) will be collected in artificial pond which can build. After collection of liquid waste, number of trees like morigacan be plant surrounding the pond which will absorb the impurities. When tress will absorb the impurities after that pond water can be used for irrigation purpose. The reason for tree plantation is to remove impurity and protect to crop disease. Figure 5 shows the proposed liquid waste management.



*Fig .5 Proposed to liquid (sullage) waste management*

For sewage management aerobic toilets and biogas plant are proposed. The proposed has demonstrated different technologies for processing the sewage. We have planned a toilet with 2 aerobic chambers with size 2 x 2 x 2 feet. The excreta will start process and within few hours it will convert into organic fertilizer. The beneficiaries can earn around 2000 Rs/year from this waste. Following figure shows section of aerobic toilet.



*Fig .6Aerobic toilet*

#### **V. Proposed solid waste management system (Vermicompost)**

For solid waste management we are proposing Vermicompost method. Vermicompost is one type of fertilizer. Fertilizer are generated by composting process in which use of various type of worms, like red wigglers ,white worms and other earthworms, to create a mixture of decomposing vegetable of food waste, bedding material, and Vermicompost. Vermicast(also called worm castings, worm humus, worm manure or worm faces)is the end product of the breakdownof organic matter by earthworms. These casting have been shown to contain reduced levels of contaminates and a higher saturation of nutrients then the organic material before vermicompost.Vermicompostcontains water soluble nutrients and is an excellent nutrient rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming. Figure 7 shows proposed Vermicompost bed.



*Fig.7Bio degradable waste Vermi-compost bed*

For non-biodegradable waste separate dustbin will be provide per house. Different color's may use for recyclable waste material and non-recyclable waste material which is shown in figure 8.



**Fig 8 Non-Biodegradable waste**

## VI. Rainwater harvesting

For Vadaj village we have proposed injection well to recharge bore wells through V wire technology for rainwater harvesting. In this technology we are proposing injected recharged well with filter. This technology can rise ground water level and it can also provide drinkable water. Design of system and filter size are show in figure 9.

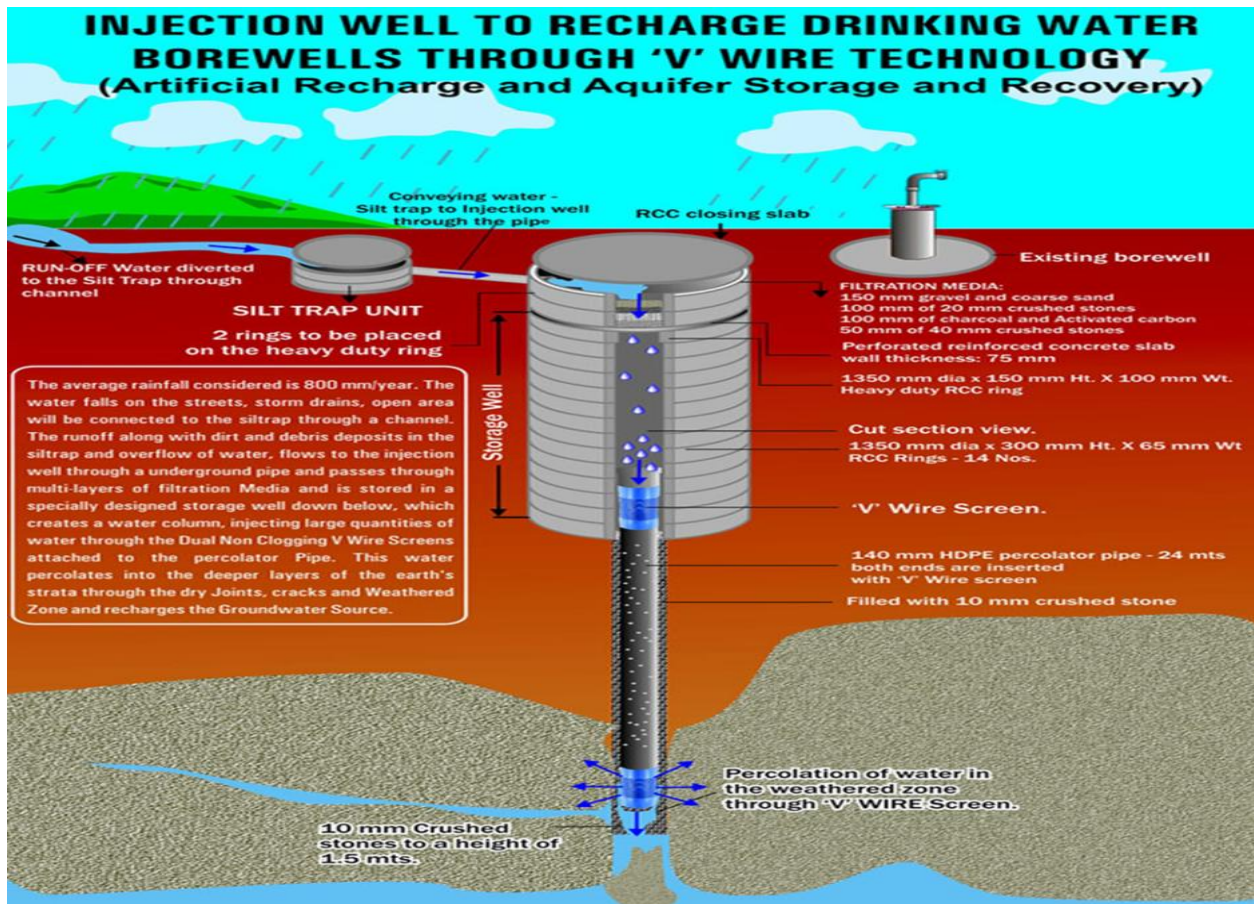


Fig.9 Rainwater harvesting

## VII. CONCLUSION

The waste management of rural area at Vadaj village, Dabhoi Vadodara city is carried out. Improper disposal of waste is leading to hygienic condition as well as polluting the surrounding water bodies and land of the area. Systematic waste management system is proposed. Liquid waste can be manageby aerobic toilet & irrigation pond. Solid waste can be manageby vermicomposting bed while non-biodegradable waste can be manage by providing seprate dustbins. Proposed waste management system can help people to earn out from waste. Rain water harvesting system is also provided with V wire screen technology. This way major problems of Vadaj village can be solved. We can encourage villagers to use and for that we can plan series of awareness campaigns, for personal hygiene and sanitation, safeguarding water source, HH level segregation, cleanliness and maintenance of drains, open spaces etc.

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