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Frame work for the sustainable development toward improvement of sanitation and water supply.

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INTRODUCTION:

This study is figure out the framework for the sanitation and water supply on the rural state of sanitation and hygiene and the various programs that is run by the government of India to uplift the living condition and standard of the villages and rural sectors. The study pivot s around the water, its conservation, usage and overall impact on the inhabitants in rural areas. The impacts of various missions towards the sustainable development of water supply and sanitation.

ABSTRACT:

Jal Jeevan Mission in India is one of the mission to deal with water and other problems related to water in rural areas of India. This study aims to analyze sanitation facilities in the implementation of water sanitation in rural areas. This study applied a qualitative approach. Data collection through observation and depth study of present and past of village personal hygiene and sanitation facilities, Results depicted that personal hygiene and sanitation facilities in the implementation of water facilities appropriate with the standard. The residents do not have latrines approximately 50% . To sum up, the sanitation alternate to the module presented by jal jeevan mission.

Development and aatmanirbhar (self-reliant) is directly connected to water security and connectivity. The government is taking mission to accomplish the need for water in all sectors including rural areas. Water governance had taken initiatives to easy access to water for entire India for which various schemes are launched such as:

PMKSY(Pradhan Mantri Krishi Sichai Yojna) har khet ko Pani : objective is to achieve convergence of investments in irrigation at the field level, expand cultivable land , efficiency to reduce wastage of water, enhance the adoption of precision irrigation and other water saving technologies (More Crop per Drop).it is conceived amalgamating ongoing schemes viz. Accelerated Irrigation Benefits Program (AIBP), River Development and Ganga Rejuvenation(RD&GR), Integrated Watershed Management Program (IWMP), On Farm Water Management (OFWM).

Namami Gange Mission: Objective of effective abatement of pollution, conservation and rejuvenation of National River Ganga. It deals with River front development, Bio diversity conservation. Sewerage Treatment, River Surface cleaning, afforestation, Industrial Effluent Monitoring

Jal Jeevan Mission: community approach to water for education information and communication with an Objective to provide safe and adequate drinking water to individual household tap connection by 2024 to all household in rural india.

The program will also implement source sustainability measures, such as recharge, reuse through grey water management, water conservation, rain water harvesting.

Atal Bhu Jal Yogna: Objective of this scheme is to improve the management of Ground water resources in the water stressed area of selected states.

National Water Missions –harvesting, integrated water resource management helping to conserve water , minimize wastage and ensure more equitable distribution both across and states.

Jal Shakti Abhiyan- (Catch the rain water) reduce water gushing and loosing water in vain .(2019) #Catch the rain where it fall and when it falls. Water harvesting through check dams, water harvesting pits, roof top RWHS etc. removal of encroachments and de- silting of tanks, repair step-wells

The entire missions are under single ministry Jal Mantralaya.

Water Monitoring is resulted with cooperation and coordination with government Bodies for conservation of water and recharging of water can only help in monitoring; this is central government granted projects with the bifurcation of 30% in water management and 30% in sanitation. The government is providing tap water to each house hold in rural areas under the mission Har Ghar Jal yojna.

Sanitation is word that is concerned and related to heath and cleanliness to the society and well being. The word itself leads to living standards and is a critical issue linked to health. Poor sanitation consist of both the elements related to Liquid and solid waste that are not properly addressed to the environment. s. Poor sanitation directly results in not only decline in the quality of life, but also quantity of available water resources and the problem is now fully being treated with greater degree of seriousness than ever before. This was highlighted during World Summit on Sustainable Development in Johannesburg in 2002, where the existing Millennium Development Goals (MDGs adopted by the U. N. in New York in September 2000) were expanded to include the sanitation target of halving the proportion of people without access to sanitation in 1990 by the year 2015. Low access to sanitation, whilst having disastrous effects on public health is also causing very adverse impact on environment.

Water being the pivot point of life without it no Habitat could survive in biosphere. It is evident the the civilization is originated, developed and thrived near the places around the water resources. Water is needed by every living organism weather mobile or immobile living beings

The water sanitation is most important of all contamination/Pollution as it directly affects the immune system of the Human beings.). In the past ten years, diarrhoea has killed more children than all those killed in wars and armed conflicts in almost sixty years, since the end of Second World War. A child dies every 15 seconds from diarrhoea caused largely by poor sanitation and unsafe water provisions (WSSCC 2000).

In government records the land composition of village are:

1. Government Land:
    a. Grass land—Pastures generally used as grazing land for cattles
    Belonging to all of the inhabitants of villages
    b. Road and Undulating land –Barren land used for fairs and other recreational activities.
    c. Underwater Land—wetland generally all the grey water is collected to wet land and used for oxidation
    d. Sava Bhumi—good land but not in agri use, cultivable land belonging to government.
    e. Ground – Play ground
    f. Public Purpose—temples and premises
    g. Graveyard – Cremation Ground
    h. Abadi—residential area from ages the inhabitants lives there.

i. Amarai—Bagicha, orchards
j. Parati—Govt. land left over for multipurpose use
k. KabilKast—Farm Land with good farming soil
l. Dharsa-- Farm with loose soil may be used for kharif farming

2. Forest:
   a. Bade Jhar Ke Jungle
   b. Chhote Jhar ke Jungle
   c. Purview of Forest Conservation ACT
3. Private Land
   a. Adivasi
   b. Gair Adivasi

Today the Govt. Land is acquired by government and the land use is not defined. Initially there were under water lands were demarked for the grey water collection and was used as oxidation tank. In the present scenario the government is proposing the sewage tank and sludge refusal through Sewage disposal to evaporation tank and oxidation tank via trucks under jal jeewan mission.

The village traditionally has oxidation tank at a low lying area for the entire village and was under government land and known as sava bhumi. The entire drain was directed to the tank. The idea of sanitation is to retain that tank as wetland that will rejuvenate the ground water level and the proper disposal of grey water could be done.

The nalli/ channels from household to the wetland would be through open drain system where the inlet of the drain should be through proper oil & greases chamber and at regular intervals the dosing tank is to be prepared and further on all the drains leads to oxidation and evaporation tank so that water could be easily treated.

The Drains would be so constructed with vegetation so having cleaning capacity of pollutants and would restrict the growth of pathogens and malarial parasites so to reduce health risk of the inhabitants nearby.

Where ever the road meets the junction of drains can be formed and the dosing tank can be prepared so that the chemical treatment can be done to the water so that the water shall be free from other coagulants before reaching to wetland.

The idea of the study is to increase the health and sanitation of inhabitants of village and waste and other byproducts can be treated in village so to benefit the village environment so the septic tank , oxidation tank, soak pits and evaporation tank should be so constructed to maximize the health of village not into urban context.

In the view of above the government has figured out Two decentralized systems developed and used in Maharashtra are outlined below.

DOSIWAM (Decentralised On Site Integrated Waste Management) System : This system which was developed by (Late) Dr. S. V. Mapuskar has been categorised as a ‘promising best practice’ by UN HABITAT. In the DOSIWAM system, all waste is treated hygienically in eco-friendly non-polluting way by bio-digestive processes and end products are returned to the soil in an ecologically sustainable manner, simultaneously recovering some energy. Many projects based on this system were established at various places in the state of Maharashtra and outside. Under this system, night soil is collected without mixing it with sullage. It is anaerobically digested adequately, so that the effluent becomes safe and biogas from digestion can be used as fuel. It is ensured that there is no overflow of wastewater leading to pollution. Biogas plant effluent and sullage are recycled in kitchen gardens. Garbage is utilised to produce manure for kitchen gardens. Only low cost technologies which are appropriate to the given situation are used. The flow pattern in the DOSIWAM system is presented in Figure 7.6 and also is mentioned below:

- All the latrines are connected to biogas plant
- Effluent from biogas plant is combined with all the grey water from various places
- This water is taken to stabilization tank via intercepting tank Stabilized water is stored in water storage tank and used for irrigation
- Solid waste is segregated.

- Wet waste is vermi-composted and returned to soil as manure.

Dry waste goes for recycling Improving the Performance of Rural Water Supply and Sanitation Sector in Maharashtra

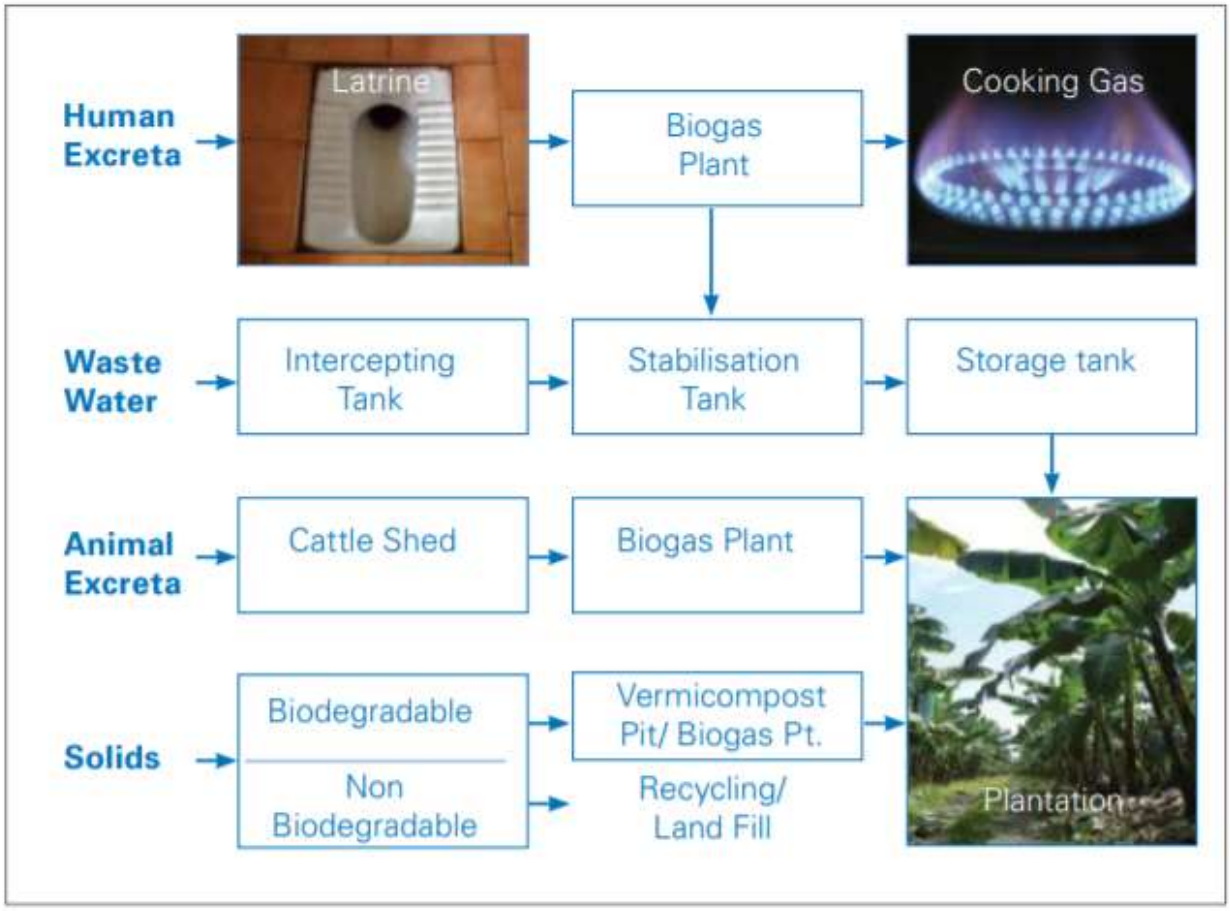

Figure 1: DOSIWAM Source: https://www.ctara.iitb.ac.in/en/system/files/uma-unicef-iitb-irap-rws.pdf

Tiger bio filter: The Tiger Bio Filter technology is based on vermi-filtration and uses a filtration arrangement consisting of bio media to trap and treat impurities in wastewater. The filtration medium is arranged in stacked manner with bio media on top which serves as active habitat for bacteria and earth worms specifically bred for the purpose. The bottom layers provide structural support and free drainage for clear water. The trapped impurities (mainly organic matter) are then consumed by the bacteria and earth worms as an energy source for metabolism and reproduction resulting in reduction in organic matter (measured as Bio-chemical Oxygen Demand).

The system is designed with sufficient surface area and worm quantity. The worms consume the organic matter load within 24 hours, making the bed available for the next day loading. As the process involves transfer of natural oxygen, there is no need for artificial supply of air through blowers, resulting in less consumption of energy and other consumables. Thus, the system is cost effective and environment friendly. Tertiary treatment in the form of Pressure Sand Filter and Activated Carbon Filter can be used as an option for polishing the effluent (Figure 2).

The advantages of using the Tiger Bio Filter are as follow. First: it requires small land area as compared to other technologies. Second: it is environment friendly as no odor and harmful by-products (sludge) are generated. Third: the O&M cost is low.

Figure 7.6: Schematic diagram showing flow pattern of the DOSIWAM system Human Excreta Biogas Plant Intercepting Tank Cattle Shed Biodegradable Non Biodegradable Recycling/ Land Fill Biogas Plant Vermicompost Pit/ Biogas Pt. Stabilisation Tank Waste Storage tank Water Animal Excreta Solids Plantation Latrine Cooking Gas. Improving the Performance of Rural Water Supply and Sanitation Sector in Maharashtra Bio Media Filter Effluent as per CPCB Norms

(Optional Tertiary Treatment) Filter (PSF and ACF) Reuse Screen Sewage Sump Chamber Filter Feed Tank Chlorine Contact Tank

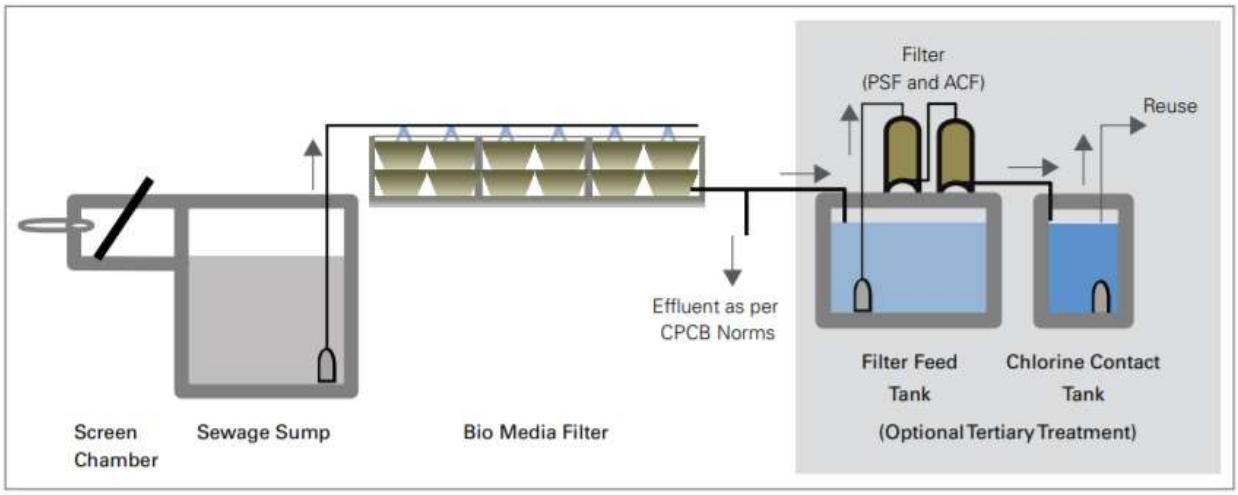

Figure 2: Schematic diagram showing process flow of the Tiger Bio Filter (Source: PriMove Infrastructure Development Consultants Pvt. Ltd., Pune)

Design of Rural Sanitation Systems for Different Physical Environments The Swachh Bharat Mission (Gramin) encourages cost effective and appropriate technologies for ecologically safe and sustainable sanitation, sustainable sanitation being defined as safe disposal or use of human excreta. The guidelines of the MDWS clearly state that a duly completed household sanitary latrine shall comprise of a toilet unit including a sub-structure which is sanitary (that safely confines human faeces and eliminates the need for handling by humans before it is fully decomposed), a super structure, with water facilities and a hand-wash unit (MDWS, 2016). Affordability, protection of drinking water sources from contamination and avoiding design and construction of sanitation facilities beyond requirements are the main factors that are considered in rural sanitation system design. Open defecation is highly prevalent in rural areas in India even among people who can afford to build toilets. The link between sanitation and health is unknown to many rural people which is one of the reasons for the low adoption. Affordability is another factor. Hence there is a need to design affordable sanitation facilities and at the same time to create awareness about the link between sanitation and health. Centralised sewage treatment systems are seldom used in rural areas. Given the dispersed and unplanned development in rural areas and the technical expertise required to operate them, it is not practical to provide centralized sewage treatment systems in rural areas. Also, capital costs as well and operation and maintenance costs are low for decentralized systems. However, combined sanitation systems can be undertaken for small communities or for a few households. Continued and proper use of a toilet depends upon the availability of water, proper technical functioning as well as ease of operation and maintenance without recurring expenditure. In India ablution with water is most prevalent and water borne toilets find easy acceptance. According to MDWS, even in water scarce areas dry toilets or composting toilets are not preferred.

Improving the Performance of Rural Water Supply and Sanitation Sector in Maharashtra In areas where the water table is deep, the Twin Pit Water Seal Toilet can be used without fear of water pollution. This consists of the two pits used alternately, a pan, water seal / trap, squatting platform, junction chamber and a superstructure. Gases produced in the pit, mainly Carbon dioxide and Methane are diffused in the soil through honey comb structures. The system thus helps in reducing air pollution from such Green House Gases. Where households do not have enough space for individual leach pits or septic tanks, combined leach pit/ soak pit or other substructure can be constructed with required volume as the size for a combined pit is always less than for an individual one. In areas where the water table is shallow or where there is water logging, the pit must be raised and the space around the pits must be filled with earth and compacted. In areas where the soil is not porous as it black cotton soils appropriate design with vertical filling of coarse material around the pits must be provided. Safe distance of the leach pits from drinking water sources must be maintained. In coastal areas, flood prone regions and rocky areas pit latrines are not suitable (MDWS, 2016). Ecosan toilets are based on the philosophy of dealing with recovery of plant nutrients from human wastes for agricultural purposes and moving away from a linear to a circular /close-loop flow of such nutrients. Dry toilets, Urine-Diverting Dry Toilets (UDDT) and biogas from human waste toilets are examples. Ecosan toilets are suitable for high water table as well as rocky areas. However when water is used for ablution, the dry toilets are not feasible. Toilet linked biogas plants are suitable for hard rock areas. The biogas can be used for cooking or lighting. This type of sanitation system is not yet popular in the country.

Septic tanks are the most favoured type of on site sanitation system in India. Septic tanks are watertight, multi-chambered receptacles that receive black and/or grey water and separate the liquid from the solid waste, which it stores and partially digests. A septic tank is a combined sedimentation and digestion tank. The settleable solids in the sewage settle down to the bottom in one or two days accompanied by anaerobic digestion of settled solids (sludge) and liquid, resulting in reasonable reduction in the volume of sludge, reduction in biodegradable organic matter and release of gases like carbon dioxide, methane and hydrogen sulphide. The effluent although clarified to a large extent, will still contain appreciable amount of dissolved and suspended putrescible organic solids and pathogens, as the efficiency is only 30-50 % for BOD and 60-70 % for TSS removal. Septic tanks need to be de-sludged for their effective functioning. An anaerobic baffled reactor (ABR) is an improved septic tank, which, after a primary settling chamber, uses a series of baffles to force wastewater to flow under and over the baffles as it passes from the inlet to the outlet and is suitable for individual households, a group of households or at the community level. The Anaerobic Filter technology commonly known as BORDA Model of DEWATS (Decentralized Wastewater Treatment Solutions) in India provides suitable media for growth and retention of microbes in the chambers, which results in higher degradation of organic matter and thus greater lowering of BOD in the final effluent. The prefabricated Package Type Anaerobic Filter System can be installed easily in a short time and the BOD and SS removal is 50-70%. The Settling –Contact Aeration System is another system developed in India though the need for electricity and trained manpower for installation limit the adaptation of the technology. 213 Improving the Performance of Rural Water Supply and Sanitation Sector in Maharashtra Septic tanks are suitable for different physical environments, however the treatment efficiency is less and the septic and sludge need to be properly disposed. In India most towns and rural areas lack the facilities to treat and dispose the sludge from the septic tanks (MDWS, 2016).

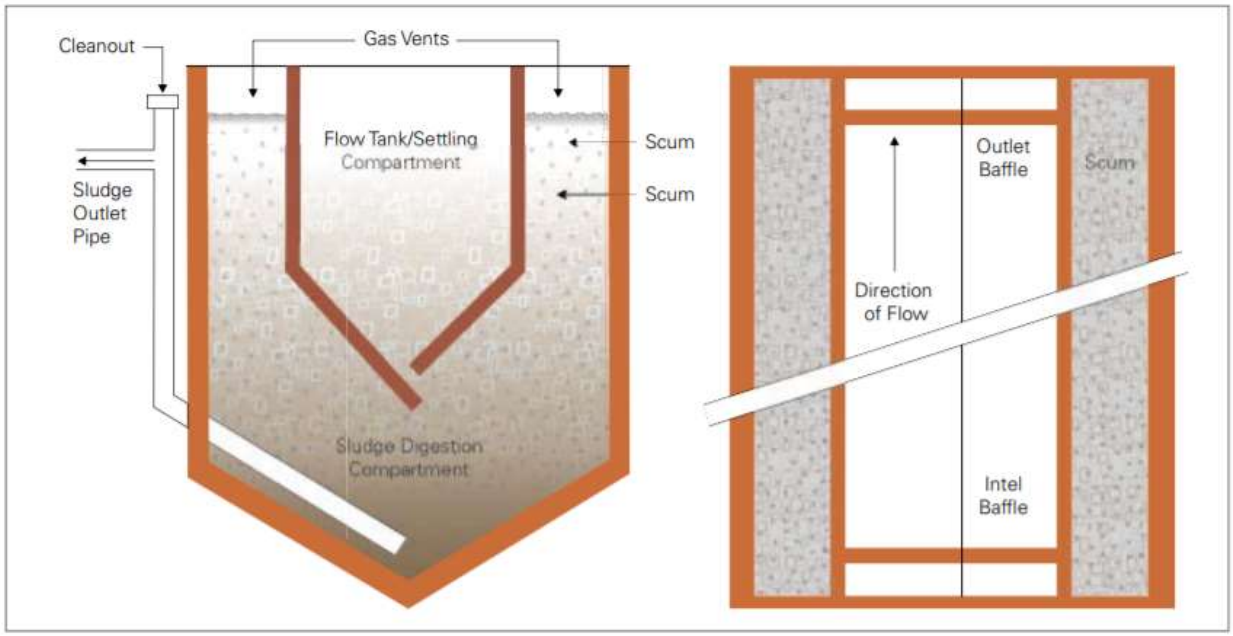

Figure 7.8: (https://www.ctara.iitb.ac.in/en/system/files/uma-unicef-iitb-irap-rws.pdf)

An Imhoff tank Septage has high values of total solids, suspended solids, Biochemical Oxygen Demand, Chemical Oxygen Demand, Nitrogen, Phosphorus and pathogens and almost no presence of heavy metals and toxic. Septage can be completely recycled and reused for agriculture purposes after proper treatment. It can be seen as an opportunity for resource recovery rather than a problem for disposal especially in rural areas where agricultural activities are very prevalent.

Design Issues in Rural Sanitation Systems:

The design of toilets for a rural area must be done keeping in mind the geographical, social and economic conditions. Type of soil, amount of rainfall, depth of water table, susceptibility to floods, temperature and availability of water for use in the toilet are factors that the design of the sanitation system depend on. It also depends on what the people want and are willing to pay for. Design of a sanitation system that works over a long period of time is a challenge in water scarce regions. When water is very scarce a dry toilet or composting toilet is very suitable. However, in India water is used for ablutions after visiting the toilet. As such a dry toilet is neither acceptable nor a suitable design option. There

is a big focus on the construction of toilets in rural India with the launch of the Swachh Bharat Mission. However mere construction of the toilet structure without ensuring that there is enough water for use in the toilet will not improve the situation in the villages; it will be a waste of resources. Even in places where enough water is available Cleanout Sludge Outlet Pipe Gas Vents Flow Tank/Settling Compartment Sludge Digestion Compartment Scum Scum Direction of Flow Outlet Baffle Intel Baffle Scum.

Improving the Performance of Rural Water Supply and Sanitation Sector in Maharashtra for drinking and other household uses, there is not enough water for use in toilets for flushing and cleaning. Most rural sanitation systems do not take into consideration the treatment and management of septage. Mechanised removal of the septage and safe disposal must be given priority. In fact in rural areas it can be completely reused in agriculture. However it is usually dumped in open fields or ends up in water bodies. Enough funds are also not allotted at the panchayat level for the safe management of septage. It is also found that local masons or users change the design parameters, affecting the performance of the system. For example it has been found that instead of providing two pits for the pit latrine to be used alternately, people build a single bigger pit without understanding the principle behind constructing two pits. Also it is seen that a vent pipe is provided for the pits which is not necessary and which also produces bad odour. The gases are to diffuse into the surrounding soil keeping the area odour free. The toilets should be at least 10m away from any drinking water source. Lack of awareness or lack of space around a house may cause toilets or soak pits to be located near drinking water sources which can lead to the spread of diseases. If ground water supplies are drawn from deep and confined aquifers, on site sanitation does not cause ground water pollution (Kumar, 2014). Not having enough funds is an issue which prevents many people in rural areas from building toilets. If lack of space is a concern, community toilets or common toilets catering to a few households may be considered. Whatever the type of toilet that is designed, it should be undertaken with help from technically qualified or trained personnel. A faulty design will be expensive to correct. If people give up using the facility, the money spent will be completely wasted too. Standard designs can be made for a region or village based on the geographical particulars of the area under consideration. 7.7 Maintenance of Rural Sanitation Systems Maintenance of a rural sanitation system is as difficult and important as designing and constructing it. Often toilets that are built with much fanfare are abandoned for many reasons like lack of water or improper use leading to blockage or foul odour. If the design of the sanitation system has been done properly with attention to local conditions, proper maintenance of the system can be achieved by the following. Users must be made aware of how to use the system properly. Some of the information that users should possess include:

01. In case of double pit latrines, only one pit is to be used at a time and pouring too much of water into the pit is to be avoided. De sludging of the pit is to be done after two years. Chemicals and detergents must not be poured in the toilet as well as lighted cigarettes. Waste material like cloth, sanitary napkins and the like are not to be dumped in the toilet.

02. Ensure that there is enough water for use in the toilet. Improving the Performance of Rural Water Supply and Sanitation Sector in Maharashtra

03. Make sure that the soak pits/leach pits are not clogged. If clogged clean the pi n the pit so that the function is restored.

04. Ensure that de-sludging of septic tanks is done at regular intervals.

05. Ensure proper treatment of the septage and reuse it in agriculture.

06. If a sewage waste treatment plant is part of the system employ technically knowledgeable personnel for its smooth operation.

07. Allocation of funds for the operation of the system by the local government is to be ensured and officials appointed to oversee the system accountable for its proper functioning.

Conclusion:

Supply of good quality water in adequate quantities, safe sanitation practices, health and economic prosperity are inter-related. Water is needed not only for drinking and cooking but also to maintain hygiene and for flushing and cleaning in toilets. Use of poor quality water for washing and bathing too can lead to diseases like infections of the skin. The ministry of drinking water and sanitation aims at providing rural areas with 70 litres of water per capita per day by 2022. At present habitations getting 40 litres per capita per day are considered fully covered. However, providing rural areas with

40 lpcd without slippage and maintaining water quality is itself proving to be a daunting task. Proper waste water treatment and reuse is important for preventing the spread of water related diseases as well as to protect water sources from pollution. Unlike in urban areas the waste water generated in rural areas is relatively free from inorganic components. As such the reuse after treatment of waste water as well as the solid residue for agriculture is possible. This will also ensure the return of minerals back to the soil. Presently the percentage of people in rural India practicing open defecation is high. The Swachh Bharat Mission is giving a big thrust to sustainable sanitation in rural areas. However mere construction of toilets will not bring good results. Scientific design of rural sanitation systems by technically qualified personnel taking into consideration local geological, hydrological, social and economic conditions is necessary. Continued use of the toilets in a proper way and proper handling and reuse of waste water and septage with timely de-sludging of pits/septic tanks are needed for a sanitation system to be a success. It is also necessary to create awareness among the rural people on the interrelationship between hygiene and health and what each person should do to maintain the system well. Above all the local government should ensure that enough funds are allocated and officials appointed for the successful operation and maintenance of the sanitation system.

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