SUSTAINABLE OPTIONS FOR ON-SITE SANITATION

IN RURAL MAHARASHTRA

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INTRODUCTION

1. The State of Maharashtra has embarked on a major programme of sanitation coverage in its rural areas. Over last 5 years it has evolved an innovative scheme of community mobilisation and participation by leveraging the mass appeal of *Sant Ghadge Baba*, a Saint who lived in the early part of 20th century and who emphasised cleanliness and environmental sanitation among his disciples and followers. Coupled to this, the approach of competitive appraisal, recognition and offering performance based incentives to the village communities has helped in bringing about a transformation. Several villages across the State have acquired the distinction of being 'open defecation free' settlements. Motivated village leaders have also integrated other community development issues and attempted to make 'ideal villages'. This campaign mode of coverage offers several lessons for providing rapid access to sanitation in other parts of the country.

2. However, with regard to the on-site sanitation system for containment and treatment of human excreta, the *Sant Ghadge Baba Sanitation Campaign* and the previous programmes in the State have focused exclusively on one technology option i.e., 'pour flush pit latrine'. Given the wide variations in the geographical, climatic, soil and groundwater conditions this single option does not appear to suit different regions of the State. Past experience has shown that a number of dissatisfied users have reverted to the old practice of open defecation, undermining efforts made in awareness creation and community mobilisation.

3. In this context, at the behest of the Water and Sanitation Program – South Asia and the Government of Maharashtra, a field investigation was undertaken in 2003 with the objective of developing a technology options manual targeted at the Field Engineers of Zilla Parishad, NGOs, CBOs and Masons; and District Officials involved in planning and implementation of the Total Sanitation Campaign. The objective of the manual is to facilitate the target groups in identifying and recommending appropriate technology options for on-site sanitation considering (1):

- affordability and acceptability by the end users
- soil, groundwater and climatic conditions of a location

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- associated environmental, ecological and health aspects, and
- availability of water and long term sustainability of the system

4. The manual brings out salient aspects involved in planning for an appropriate on-site sanitation facility at a particular location and enables at the field level in selection of functionally effective and suitable options. The planning considerations highlight essential elements that need to be built in the basic design of a sub-structure and differentiate from a 'low cost' facility whose functional life otherwise gets reduced significantly. In the context of 'ECOSAN', the subject of the conference, this paper attempts to bring out variations in regional conditions which entail a paradigm shift in planning and ensuring long term functional sustainability of the sub-structure of an individual household latrine.

ON-SITE SANITATION

5. On-site sanitation refers to that form of sanitation where human excreta is retained at the site of defecation in a manner which is safe from the point of view of hygiene and environment and provides privacy. Any storage structure that can meet the above requirements will prima facie be suitable to serve as an on-site sanitation facility. General criteria to define a satisfactory form of an on-site sanitation facility is that it should:

- Not lead to surface soil contamination
- Not contaminate springs or wells
- Not contaminate surface waters
- Not give access to flies or animals
- Involve minimum handling of fresh excreta
- Offer freedom from smells and unsightly conditions
- Be simple and inexpensive in construction and operation

and finally a latrine should be liked by intended users, then only it will be accepted and maintained clean and hygienic (2).

6. A basic form of an on-site sanitation latrine involves following three building blocks :

- A platform with either a hole or a squatting pan
- A sub-structure for containing, decomposing and disposing excreta, and
- A superstructure for privacy and protection from weather factors

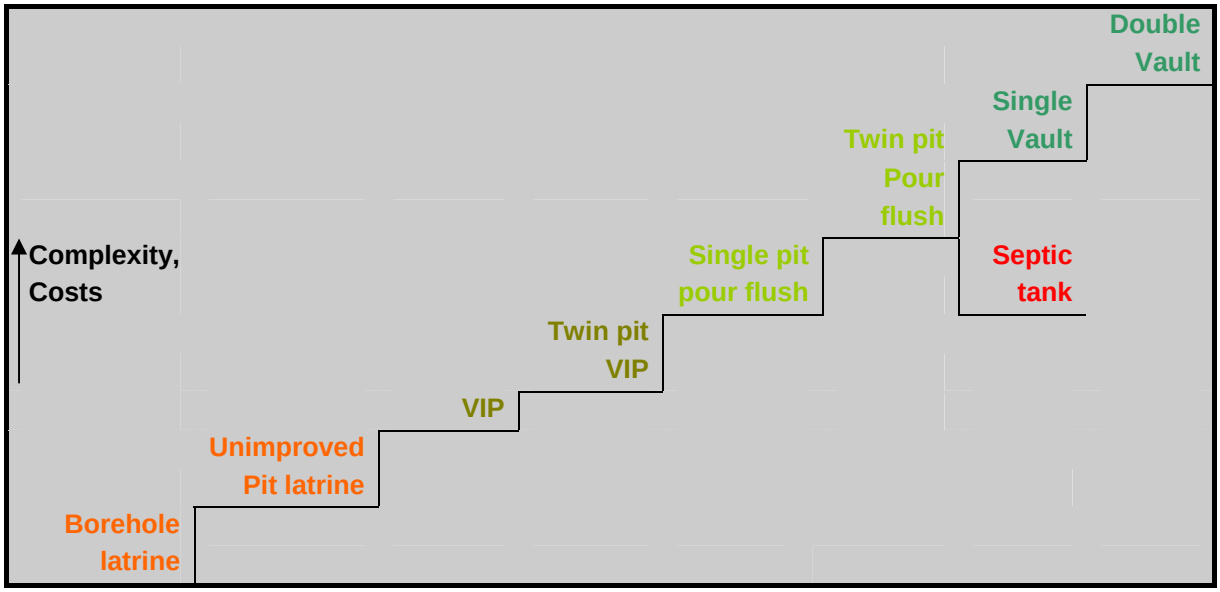
7. Further improvements can be made in this form by introducing additional features or components from the point of view of aesthetics, safety, hygiene and ease in operation and maintenance. For instance a screened vent pipe can be installed for controlling smell and flies, a

water seal can be provided for improved aesthetics and odour control, an additional pit can be provided for alternate usage and long life etc. With regard to the superstructure, it is entirely up to the preference of the owner and any amount of refinement is possible. For instance in Maharashtra, provision of glazed ceramic tiles on the platform and on the side walls seems to have become a norm as it was observed widely across various districts and social strata. Obviously as more features are added, the cost of the latrine goes up. However, what is important is to look at how effectively does this facility help an individual and a community in breaking the faecal-oral transmission routes of diarrhoeal diseases and eliminate the potential hazards to environment and public health.

LADDER OF TECHNOLOGY OPTIONS

8. It is the platform and the sub-structure which define a technology option and its environmental foot print. Essentially the difference lies in how the excreta is transferred through the hole in the platform and retained in the pit underneath. As against the conventional approach in the State in particular and the country in general of focusing on only the 'pour flush pit latrine', the manual suggested following set of options as shown in Exhibit 1. This set represents a ladder of on-site sanitation technology options varying in complexity, water requirement, ease in construction and use, safety in excreta disposal, and finally the cost (1).

EXHIBIT 1: THE SANITATION LADDER



Notes :

1. VIP - Ventilated improved pit latrine
2. Vault latrine : Also known as Vietnam latrine (with urine diversion)

9. For instance a 'borehole latrine' is the simplest and least-cost option which could be suitable in remote isolated locations. A pit latrine is cheaper but has limitations of odour and aesthetics. VIP latrine is complex in operation but requires no water for excreta disposal. A pour

flush water seal latrine overcomes the limitations of odour and aesthetics associated with pit latrines, but is more complex, requires large quantity of water and costs higher. It also has associated problems of seepage and/or groundwater pollution. Urine separating 'vault latrine' is positioned on the high end of the ladder due to complexity in construction and operation and higher cost, however its water requirement is nil and has least environmental impact. It represents the conventional ECOSAN option which has been in use in Vietnam and in several communities in India as well. On the other hand while a septic tank is as complex and costs more, it is positioned lower than the 'vault latrine' due to its higher water consumption and associated effluent and septage disposal problems.

WHY OPTIONS ARE REQUIRED?

10. The approach of offering a ladder of options stems from the realisation of the fact that once a beneficiary develops the habit of 'fixed point defecation' he/she will move up the ladder as per his/her convenience, means and preferences. The advantage of this non-prescriptive approach is that it can enable people to choose suitable options according to the following factors (1) and help in faster sanitation coverage of a community:

- Affordability
- Desired level of aesthetics
- Social customs and practices
- Personal hygiene practices
- Preparedness for emptying a pit and recovery of compost
- Preparedness for constructing additional pit

WHY TO ACCOUNT FOR THE BOUNDARY CONDITIONS

11. In comparison to the above personal and subjective preferences, more critical ones are the technical factors i.e., the boundary conditions under which a sub-structure has to function. Among others, these factors are:

- Rainfall and flooding pattern
- Availability of water
- Soil conditions, and
- Groundwater conditions

12. During the course of preparation of the manual, a field visit to three districts of Maharashtra representing the coastal belt (Raigarh), the central part (Ahmednagar) and the eastern part (Nanded) brought out wide differences in these factors. For instance while the coastal belt receives abundance of rainfall, the eastern part is prone to drought; the coastal belt

has porous alluvial soil while the central part is characterised by impervious black cotton soil and the eastern part has hard and fractured rock strata; water table is shallow along the coast while it is more than 40-60 m deep in central and eastern parts. These conditions are summarised in Exhibit 2.

EXHIBIT 2: REGIONAL VARIATIONS IN BOUNDARY CONDITIONS

Region	**Rainfall and flooding pattern**	**Water availability**	**Soil conditions**	**Groundwater conditions**
Coastal	Heavy	High	Alluvial	Shallow
Central	Medium	Moderate to low	Black cotton/ deep and shallow black	Shallow-deep
Eastern	Low / Drought prone	Low	Mixed red and black soil/ Hard and/or fractured rock	Deep

13. With such a wide variation in the boundary conditions, it is not possible for a single technology option of 'pour flush pit latrine' to function satisfactorily across the length and breadth of the State. However, this is what was found to have been implemented and a number of latrines were found to be dysfunctional. The 'pour flush pit latrine' technology requires appropriate dimensioning of pits for percolation of wastewater which is dependent on among others, the permeability of the soil. However, with central and eastern parts of the State having black cotton soil and hard rock strata respectively, this is a major limitation. Secondly, as the name says, pouring and flushing requires at least 3-5 litres of water after every use and in drought prone areas in the eastern part this has been difficult to arrange. For instance in village Vatefal which is located about 20 km from Ahmednagar, 50 odd 'pour flush latrines' constructed under the programme were found to be out of use due to severe scarcity of water. In the coastal belt, which has the problems of stagnation of rain water and shallow groundwater table, functioning of a 'pour flush latrine' is again a difficult proposition. This is because of the back-flow problem and the threat of groundwater contamination.

14. Moreover, in order to keep the cost of the on-site sanitation structures low, the necessary corrections in the basic design of a 'pour flush latrine' connected pit such as (a) provision of a sand envelope (b) raising the pit to avoid groundwater pollution and flooding related problems (c) provision of a soil mound around a raise pit and (d) provision of pit lining are often omitted. For instance a 0.5 m sand envelope alone can require around 3.9 cum of sand which can cost more than the cost of a completed latrine. However, under the given boundary conditions these corrections become essential for ensuring that the structures function satisfactorily over their designed life span.

SUITABILITY OF ECOSAN IN MAHARASHTRA

15. Recognising these limitations, the manual recommended among others, a paradigm shift in the selection of technology options. For a large part of the State which has black cotton soil or hard rock strata or shallow groundwater table, dry or low water consuming toilets become imperative. In view of this, as against the current practice of uniform application of 'pour flush latrine' option, it was suggested among others, to explore less water consuming options such as a single or double pit VIP latrine, and single or double vault latrine. The latter represents the traditional 'ECOSAN' concept (without modern sanitary fittings) which involves urine separation, maintaining dry conditions in alternating storage chambers and use of ash/soil/dry leaves as a covering material after every use. However, it is also recognised that implementation of this type of system is easier said than done because of established practices of personal hygiene, strong preference for constructing septic tanks, lack of interest in operating a urine deverting dry toilet due to the associated manual labour and perceived inconvenience and deriving and utilising compost out of excreta. Nonetheless, based on an assessment of the geological and climatic boundary conditions in the State it is felt that there is a strong need to promote dry sanitation systems both at the policy level as well as at the field level to make the Total Sanitation Campaign in the State successful and sustainable in the long run.

References

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2. Pickford, J. *Low cost sanitation – A survey of practical experience*. International Technology Publications, 1995.

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Note:

The views expressed in the paper are of the Author's and do not, in any way represent the policy of WSP-SA or any other organisation associated with the preparation of the Manual.