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No. Government of India
Ministry of Drinking Water and Sanitation
Nirmal Bharat Abhiyan

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To
The Principal Secretary/Secretaries
I/c of Rural Sanitation
All States and UTs

Sub.: Guidelines on Solid and Liquid Waste Management (SLWM)- Workshop to enable States to expedite the process intimating of,

Sir/Madam,

Please refer to this Ministry's letter No. 11035/05/2012-NBA dated 9/12/2013 enclosing the draft guidelines for SLWM prepared by the Ministry of Drinking Water and Sanitation with the assistance of ADB. A Video Conference was also held on 17-18th December, 2013 on the issue.

Many States have given their feedback to the draft Guidelines which have been considered and appropriately incorporated. The Guidelines have now been finalized and is being enclosed with this letter.

2. In order to facilitate States to move ahead on preparing and implementing SLWM Projects at the field level, 4 Regional workshop are proposed to be organized in which experts from the ADB and from the Ministry shall explain the SLWM Guidelines. State Shall also share their response to their SLWM Guidelines. Some States which have successfully implemented SLWM shall be asked to make presentations of their best practices. The proposed Schedule of the workshop is as below:

Tentative dates	Proposed venue	Participating States
11,12 and 13 th Aug.2014	Trivandrum	Maharashtra, Karnataka, Tamil Nadu, Kerala, Andhra Pradesh, Pondicherry, Goa
20,21 and 22 nd Aug.2014	Jaipur	Rajasthan, Madhya Pradesh, Punjab, J&K, Gujarat, Haryana, NCT Delhi
26,27 and 28 th Aug.2014	Guwahati	Assam, Meghalaya, Manipur, Nagaland, Mizoram, Arunachal Pradesh, Sikkim, Tripura and Himachal Pradesh

Contd..2..

2,3 and 4 th Sept. 2014	Ranchi	Uttar Pradesh, Chattisgarh, Orissa, Uttaranchal, Bihar, Jharkhand, West Bengal
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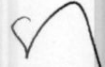
The third day will be for field visits.

3. The participation of 4 officers from each State is requested which should include the following:

- (i) State NBA Coordinator
- (ii) SLWM Consultant at the State level
- (iii) 1-2 District level officers preferably with experience in implementation of SLWM Projects.

Encl.: As above

Yours faithfully,


(Saraswati Prasad)

भारत गणराज्य

REPUBLIC OF INDIA



सत्यमेव जयते

Ministry of Drinking Water and Sanitation



Asian Development Bank

IND (Cluster-TA0003)
Advanced Project Preparedness for Poverty Reduction
Technical Assistance for Supporting Clean Villages for
Millennium Development Goals

Guidelines on Solid and Liquid Waste
Management (SLWM)
in Rural Areas

16 July 2014

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From the beginning of this endeavour, the team engaged by ECOPSIS and the Asian Development Bank has visited a number of States, Districts and Gram Panchayats and met with a number of individuals who provided contributions which are greatly appreciated.

Special thanks to Shri Bharatsinh Solanki, Hon. Minister of Drinking Water & Sanitation, Shri. Jairam Ramesh, Hon Ex Minister, Shri Pankaj Jain, Secretary, Mrs. Vilasini Ramchandran, Ex Secretary, Shri Saraswati Prasad, Joint Secretary (S & A), JS Mathur, Ex-Joint Secretary, Shri Sujoy Mojumdar, Director (NBA) and Dr. G.Murugan, Nodal Officer, DWS.

Thanks are also due to officials in the districts of Maharashtra, Tamil Nadu, Bihar, Karnataka, Haryana, Andhra Pradesh, Gujarat who extended warm support during field visits, workshops and consultations.

A number of national and international organisations such as UNICEF, WSP and WaterAid also provided valuable contributions during consultations.

Special thanks go to the GP Presidents, members, community leaders and households who are too numerous to mention, but who all contributed positively towards the field studies.

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List of Abbreviations and Acronyms

ACA	Additional Central Assistance
ADB	Asian Development Bank
APL	Above Poverty Line
BPL	Below Poverty Line
BSUP	Basic Services to Urban Poor
CBO	Community Based Organization
CCDU	Capacity and Communication Development Unit (at State level)
CRSP	GoI's Central Rural Sanitation Programme
CSR	Corporate Social responsibility
DRDA	District Rural Development Authority
EA	Executing Agency
FGD	Focus Group Discussion
GoI	Government of India
GP	Gram Panchayat
GR	Government Resolution
HH	Household
IAY	Indira Awaas Yojana
ILCS	Integrated Low Cost Sanitation Scheme
INR	Indian Rupees
IPC	Inter-personal communication
M&E	Monitoring and evaluation
MDG	Millennium Development Goal
MDWS	Ministry of Drinking Water and Sanitation
MLALAD	Member of Legislative Assembly Local Area Development
MNREGS	Mahatma Gandhi National Rural Employment Scheme
MPLAD	Member of Parliament Local Area Development
NBA	Nirmal Bharat Abhiyan
NGO	Non-governmental organisation
NGP	Nirmal Gram Puraskar
NRLM	National Rural Livelihood Mission
NTSM	National Total Sanitation Mission
ODF	Open Defecation Free
O&M	Operation and Maintenance
PRI	Panchayati Raj Institutions
PURA	Provision of Urban Amenities in Rural Areas
RAY	Rajiv Awas Yojana
RGDWSM	Rajiv Gandhi Drinking Water & Sanitation Mission
SC/ST	Scheduled Castes/ Scheduled Tribes
SHG	Self Help Groups
SJGSY	Swarna Jayanti Gram Sudhar Yojana
SLWM	Solid and liquid waste management
SSA	Strategic Sanitation Approach
TA	Technical Assistance
T&CB	Training and Capacity Building
ToC	Table of Contents
ToR	Term of Reference
TSC	Total Sanitation Campaign
WSSO	Water & Sanitation Support Organisation (at State level)
VWSC	Village Water and Sanitation Committees

0. EXECUTIVE SUMMARY

Objective

In 1999, only around one in five rural households used a toilet. Therefore, the focus was on prompting behaviour change to eliminate open defecation and encouraging the use of toilets was seen as the highest priority. Subsequently, as sanitation coverage has increased and the number of open defecation free (ODF) villages has grown, the focus of the NBA has widened to include issues such as waste management in rural areas.

In order to address this situation ADB was requested by MWDS to focus on the third of the goals, *solid and liquid waste management (SLWM)*, with a specific aim of providing support for the development of policy by States and guidance on implementation of SLWM by Gram Panchayats (GP).

This policy framework is intended as a guide to assist states in developing their own policies for solid and liquid waste management in rural areas. As such, it does not prescribe what should be in the state's policy. It raises the issues and challenges that may need to be addressed for the state to formulate its own policy and provides suggestions on how to do this.

This framework means that the efforts undertaken by States at the local level are part of an overarching national goal given in the NBA. Although the States will be responsible for setting their own Policies, they should contribute to the national objective.

More information available at www.ecopsis.com/documents/3207.

Definitions

In a national policy aimed at the rural environment the best definitions are those which include both descriptions and approaches so that they can facilitate action. A new definition of SLWM in rural areas of India is being introduced in this Policy Framework, with the aim of supporting action than producing one very broad "catch-all" definition for national use in all contexts.

Roles and responsibilities

Subsidiarity is the driving force of SLWM in rural areas: when applied to rural SLWM, subsidiarity means that maximum efforts should be focused on the management of waste at the point of generation e.g. a household, institution or market place.

The policy should clearly assign the roles and responsibilities to the appropriate organisations involved in the sector in accordance with current legislation, such as the Panchayati Raj Act. Altogether there are 4 different types of actors:

- Government (from national to GP level).
- Households (APL and BPL).
- Communities (either formally or informally associated).
- Providers (products and services). This category would also include financial services.

Key Principles and technologies

- The identification of motivations and conditions for *ownership, sustainability and scaling up* of SLW services should reflect the demand expressed by the population as closely as possible, rather than perceived demand or speculative demand. Demand can be voluntary or it can be created because specific actions are required or enforced.
- *Generic demand*, includes all direct benefits perceived by the community as motivations to change without external influence. Generic demand includes all measures that will contribute to increasing the quality of the local environment for everyone.
- *Enforcement*, includes all motivations from external resources, such as local regulations. Enforcement creates a demand that would not exist if the community is left to adopt behaviours independently.

Within households, *men and women* have different interests in sanitation, different reasons for installing a disposal system and different roles in the installation process. In managing sanitation programmes it is important that women and men from the different social and economic groups are equitably represented and involved.

The best way to avoid having to dispose of solid waste is to avoid generating it in the first place. The most common approaches to achieve this are *reduction*, *re-use*, *recycling* and *recovery*. The Policy Framework identifies an initial list of technologies that are expected to be suitable for rural areas in India for dealing with organic solid waste, bio gas from organic solid waste, facilities for grey water treatment and septage management.

Financing

The costs associated with implementing national sanitation policies include: (a) the capital costs required for initial investment in sanitation infrastructure and facilities, which can be met through loans or grants; (b) the recurrent costs required to operate and maintain the facilities and; (c) the programme costs for activities such as training, institutional development, community organisation and hygiene improvement.

Given that the benefits of properly managing SLW are shared between those generating the waste (i.e., households, commercial and industrial establishments) and the community as a whole, the costs of collecting, transferring and disposing of waste should be shared with contributions from both public and private bodies.

The public sector can recover the costs of providing solid waste management services through, instituting or enhancing refuse taxes, collecting tipping fees, adding a surcharge to electricity or water supply bills, or relying on other general revenues (including property tax and business licenses).

a. Capital finance

The NBA Guidelines make provision for capital costs based on the population of the GP. Capital finance for the development of services is required for software components such as planning, community participation processes, and IEC for promoting the purpose of SLWM and how to use the services in addition to the financing needed for the infrastructure components.

b. Operational finance

There are three main sources of funds for operational finance which can be used independently or in combination, these are: payments by users of the service; subsidies from GPs and/or government funds; and revenue from the value of selling waste materials as resources.

Guidance for Developing a State Policy

The chart below shows the steps that are expected to be adopted for developing a State Policy on SLWM.

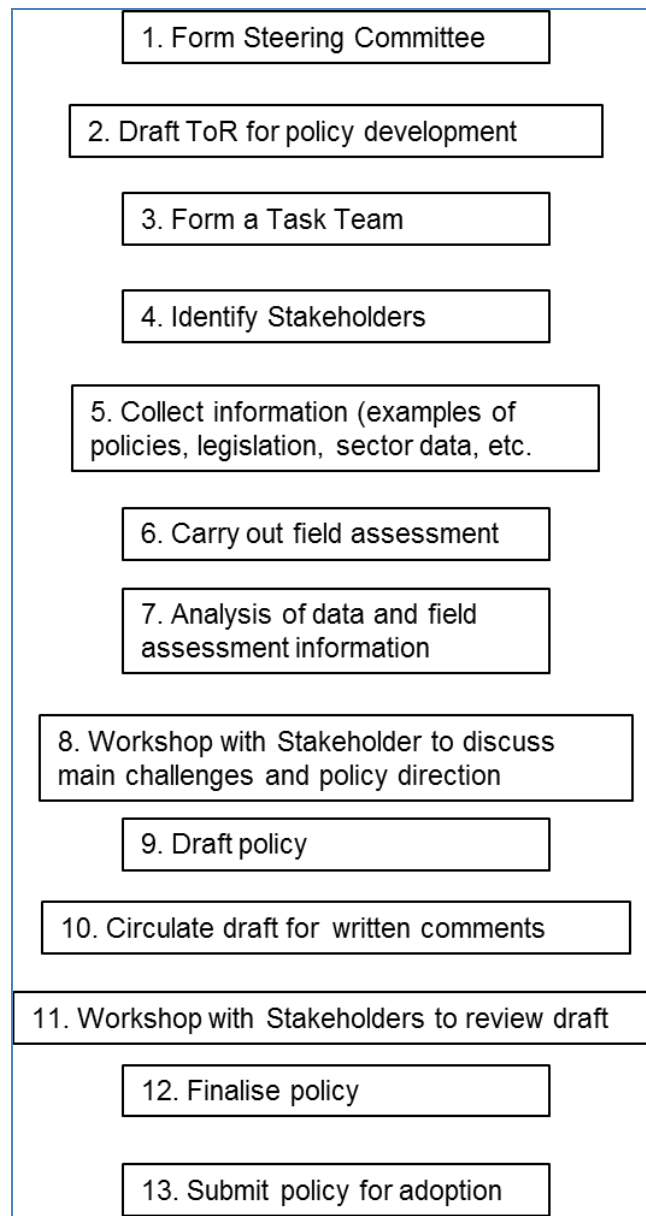


Figure 1: Steps for developing a State SLWM Policy

1. INTRODUCTION

1.1 Background

1.1.1 Waste management in rural areas: a real challenge

In rural areas, waste is a severe threat to public health and cleanliness. Despite the waste generated being pre-dominantly organic, incorrect disposal can lead to serious problems including the growth of water borne diseases such as diarrhoea, malaria, dengue, cholera and typhoid. It is estimated that people in rural India are generating 0.3 to 0.4 million metric tons of organic/recyclable solid waste per day and that 88% of the total disease burden is due to a lack of clean water, sanitation and improper solid waste management (Gol, 2008).

In October 1997, the Empowered Committee (Ministry of Rural Areas and Employment), recommended that 20% of central sector funds be earmarked to fund participatory community based projects including IEC. In 1999, revised guidelines for the implementation of rural water supply and sanitation were issued (including, recommendations for 10% capital cost sharing, community management, capacity building, hygiene education, community monitoring, operation and maintenance etc.). Based on this, several districts were selected in different States to implement pilot projects.

In 1999, the Government of India's Central Rural Sanitation Programme (CRSP) (which was started in 1986) was expanded to cover all aspects of environmental sanitation and adopted a "demand driven" approach. It was renamed the Total Sanitation Campaign (TSC).

In 2003, the Gol adopted a reward scheme, Nirmal Gram Puraskar (NGP), for achieving total sanitation coverage in a Gram Panchayat. Based on the success of NGP, the TSC was renamed as "Nirmal Bharat Abhiyan" (NBA), with the objective "to accelerate the sanitation coverage in the rural areas so as to comprehensively cover the rural community through renewed strategies and saturation approach" (MDWS, 2012). In July 2011, "Towards Nirmal Bharat: Rural Sanitation and Hygiene Strategy 2012 – 2022" was published with three goals (DDWS, 2011):

- Creation of Totally Sanitized Environments – By 2017: The end of open defecation and achievement of a clean environment where human faecal waste is safely contained and disposed.
- Adoption of Improved Hygiene Practices – By 2020: All people in the rural areas, especially children and care givers, adopt safe hygiene practices during all times.
- Solid and Liquid Waste Management – By 2022: Effective management of solid and liquid waste such that the village environment is kept clean at all times

This was followed in July 2012 by the publication of the Nirmal Bharat Abhiyan Guidelines.

There are three key problems associated with improving waste management;

- Institutional capacity is a challenge because the by laws and regulations in place to ensure proper waste management are difficult to enforce without sufficient human and financial capacities being in place. There are also staff shortages throughout the waste management departments at the GP level.
- Financial capacity is probably the biggest constraint on expanding service levels. Lack of financial resources impacts on so many areas including, hiring staff, purchasing and maintaining large scale equipment, managing dumpsites more effectively, increasing levels of household collection, enforcing by laws and regulations, developing new, more modern landfill sites and engaging in targeted public awareness campaigns.
- Public attitude was cited throughout the study visits as being a critical issue to tackle. Many areas suffer from indiscriminate dumping of solid and liquid wastes in open spaces, especially along roads, in rivers and in market places.

1.1.2 A new focus on solid and liquid waste management

In 1999, only around one in five rural households used a toilet. Therefore, the focus was on prompting behaviour change to eliminate open defecation and encouraging the use of toilets was seen as the highest priority. Subsequently, as sanitation coverage has increased and the number of open defecation free (ODF) villages has grown, the focus of the NBA has widened to include issues such as waste management in rural areas.

ADB was requested by MWDS to focus on the third of the NBA goals, solid and liquid waste management (SLWM), with a specific aim of providing support for the development of policy by States and guidance on implementation of SLWM by Gram Panchayats (GP).

1.1.3 Development of the policy framework

There were a number of different steps in the development of this Policy Framework:

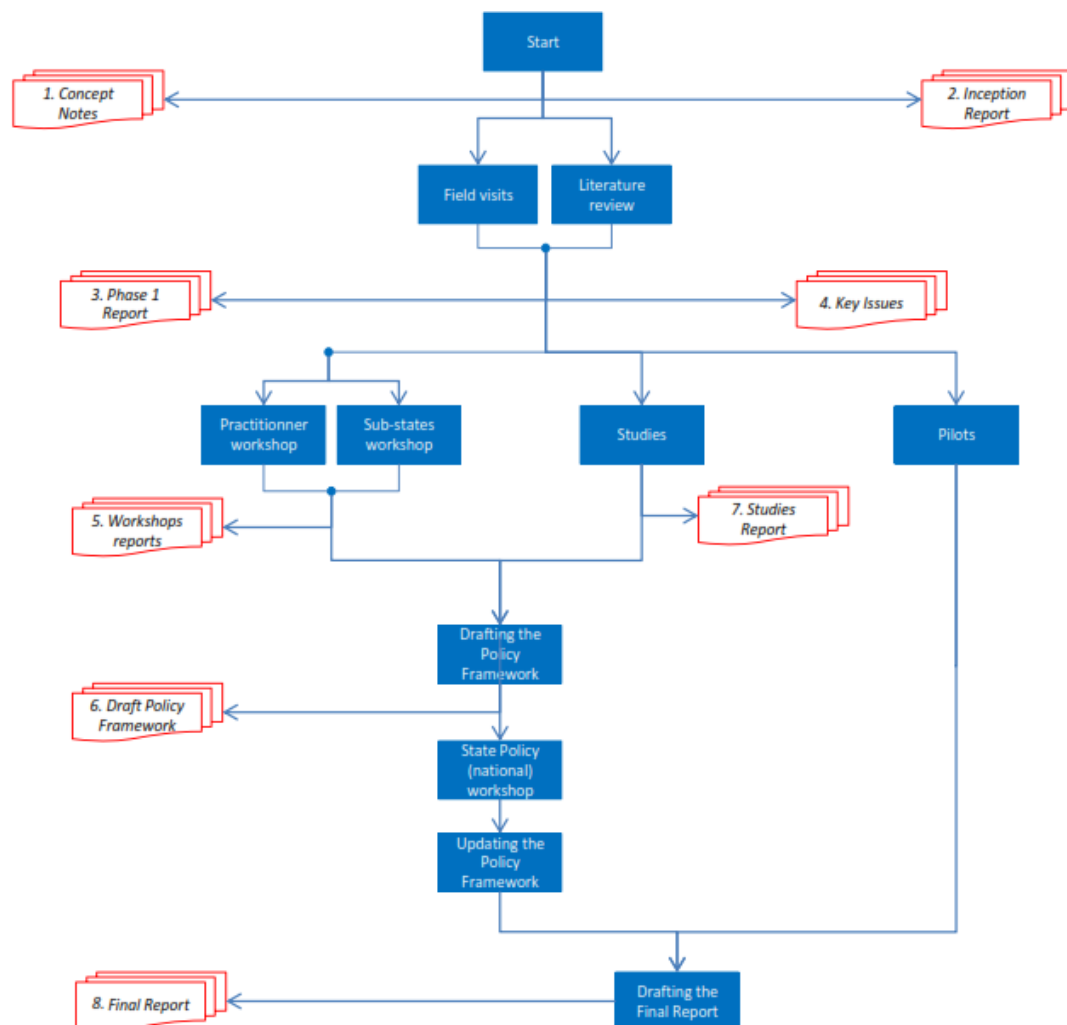


Figure 2: Steps in the development of the Policy Framework

- A review of Indian and international experiences and literature on SLWM
- Field visits to five states to understand the challenges, needs and capacity at village, Gram Panchayat (GP), Block, District and State levels. The five states selected for assessment were Orissa, Haryana, Bihar, Maharashtra and Karnataka.
- Assessment of examples of good practice by visits to places where SLWM services have been developed, and identification of case studies and reports of such operations (including examples in Andhra Pradesh, Karnataka, Tamil Nadu and Gujarat)
- Interviews with organisations and individuals at National and State level

- Based on these assessments and consultations, preparation of a discussion paper on key issues of SLWM. Consultations with key stakeholders on the principles and contents of the SLWM policy framework to create a sense of ownership, including;
 - Sub-state consultation workshops (in Haryana, Bihar, Maharashtra and Orissa), involving representatives of GPs, blocks and district and State governments.
 - A national practitioner workshop with representatives from research and academic institutions, NGOs, government, and development support agencies
 - Further interviews at State and National level
 - A National State Policy Workshop to review the draft policy framework (forthcoming).

Minutes of the workshops are presented in Appendix 5.

- Studies and trials into particular aspects of SLWM in a range of rural villages (in Tamil Nadu, Maharashtra and Bihar) including
 - Solid waste assessment and characterisation study
 - Liquid waste assessment and characterisation study
 - Septage management scoping study
 - A study of the business orientation and financial viability of SLWM services in rural areas
 - A review of legislation and regulation, including local governance institutions relevant to environmental sanitation.

All documents collected and produced during the Technical Assistance assignment are available at www.ecopsis.com/documents/3207. They constitute a useful source of information for States willing to draft their own SWLM Policy.

1.2 Objectives of the Guidelines

This policy framework is intended as a guide to assist states in developing their own policies for solid and liquid waste management in rural areas. As such, it does not prescribe what should be in the State's policy. It raises the issues and challenges that may need to be addressed for the State to formulate its own policy and provides suggestions on how to do this.

Each State has a set of unique legal, institutional, economic, social, demographic, physical, and environmental conditions that are likely to influence its solid waste and wastewater policies. Whilst national experience is useful for generating policy options, solutions to each State's problems must be tailored to meet the specific circumstances in each state.

The formulation of State policies for solid and liquid waste management can be complex and is dependent on many factors including, the size and topography of the State, its hydrological and environmental conditions and the diversity of stakeholders. A State specific assessment is an essential step in developing policy.

Table 1 below introduces the Framework for Policy, Strategy and Planning.











<p>Policy and Legislation Sets the development goal (vision) for the sector. Outlines the roles, rules and approaches that will need to be adhered to in order to achieve the goal</p>		<p>Vision statement A declaration of where the sector is headed – the future state. To formulate a picture of what the future will be and where the sector is headed</p> <p>Principles</p>	<p>National Govt. State Govt.</p>
			
<p>Legislation Acts National and state laws Local by-laws and ordinances Regulations</p>		<p>Measures that allow or limit policy Measures for enforcement of policy principles</p>	<p>National Govt. State Govt. GP</p>
			
<p>Strategy the means by which policy is effected – the bridge between policy or high-order goals and detailed actions It comprises a set of medium-to long-term objectives and associated components to support the achievement of development goals and to implement policy</p>		<p>Strategic objectives The medium and long-term aims for strategic areas which combine to achieve the vision</p>	<p>State</p>
		<p>Implementation guidelines and procedures Technical guidelines Standards – technical and process</p>	<p>State National</p>
<p>Long-Term (5-Year) Plan</p>		<p>Multi-year planning</p>	<p>District State National</p>
			
<p>Annual operational plan A set of tasks assigned to an individual, team or organisation that lists targets for each task as well as due dates, responsible persons, and measures for success. Action plans illustrate for individuals or teams how they will affect the completion of organization-wide objectives</p>		<p>Annual planning Activities Outputs Indicators Inputs Staffing Budget Other resources</p>	<p>GP Block District State National</p>

Table 1: Framework for Policy, Strategy and Planning

2. GUIDELINES FOR SLWM IN RURAL AREAS

2.1 Objective

Due to the current lack of a National level policy or operational guidelines, most of the States have reported that there is no clarity on “*how to go about addressing the SLWM issues*”. Whilst the States have indicated that the SLWM initiatives will be taken up as per the NBA guidelines, they have expressed concern over weaknesses and inadequacies on guidance and implementation aspects.

States have discussed that they lack the capacities to decide on the policy aspects and framing of State level guidelines. The NBA does not provide clarification on these aspects. There are examples of SLWM initiatives and activities which have been implemented by States under programmes aimed at improving rural living conditions. For example, roads constructed under schemes including MNREGS (Mahatma Gandhi National Rural Employment Scheme), MPLAD (Member of Parliament Local Area Development) and MLALAD (Member of Legislative Assembly Local Area Development) and have included the construction of drainage channels. The World Bank has supported this type of project in Jalswarajya, Maharashtra and in Jal-Nirmal, Karnataka. Awareness raising programmes are also helping communities to understand the problems created by poorly managed solid and liquid waste.

Individual States have launched their own State based reward schemes similar to the Nirmal Gram Puraskar. In 1999, the State of Maharashtra initiated a competition based campaign “Sant Gadge Baba Gram Swachata Abhiyan” (Saint Gadge Baba Clean Village Campaign). In 2003, the Government of Tamil Nadu launched the Clean Village Campaign to increase awareness of and motivation to tackle sanitation problems. In initiatives where GPs were given some flexibility in the use of their award money, activities financed include the maintenance and repair of sanitation infrastructure, providing dustbins for refuse collection and cleaning up previously neglected sites.

There are also reward schemes for schools and Anganwadi centres. These types of initiative help to support a growing awareness of sanitation issues and can be individually tailored to meet the needs of each State. State supported initiatives also show a high level of willingness from States to prioritise sanitation issues with the overall aim of supporting the national vision, a Nirmal Bharat.

“A Nirmal Bharat is the dream of a clean and healthy nation that thrives and contributes to the wellbeing of people”.

The vision of a Nirmal Bharat is enshrined in the Rural Sanitation and Hygiene Strategy 2012- 2022. Three goals are set in the Strategy:

- Creation of Totally Sanitized Environments – By 2017: The end of open defecation and achievement of a clean environment where human faecal waste is safely contained and disposed.
- Adoption of Improved Hygiene Practices – By 2020: All people in the rural areas, especially children and caregivers, adopt safe hygiene practices during all times.
- Solid and Liquid Waste Management – By 2022: Effective management of solid and liquid waste such that the village environment is kept clean at all times.

To achieve the vision and goal in rural areas a number of commitments are set:

- Completely eliminating the traditional habit of open defecation and making this a relic of the past
- Operationalizing systems for the safe management of solid and liquid waste at scale
- Promoting the adoption of improved hygiene behaviours
- Addressing inequalities in access with special attention to vulnerable groups such as women, children, aged and disabled
- Ensuring that providers have the capacity and resources to deliver services at scale

- Stimulating and enabling cooperation across public sector agencies concerned with rural development, health, environment and vulnerable sections
- Working with business, academic and voluntary partners to achieve the goals of the strategy

The main objectives of the NBA are:

- Bring about an improvement in the general quality of life in the rural areas.
- Accelerate sanitation coverage in rural areas to achieve the vision of Nirmal Bharat by 2022 with all Gram Panchayats in the country attaining Nirmal status.
- Motivate communities and Panchayati Raj Institutions promoting sustainable sanitation facilities through awareness creation and health education.
- To cover the remaining schools not covered under Sarva Shiksha Abhiyan (SSA) and Anganwadi Centres in the rural areas with proper sanitation facilities and undertake proactive promotion of hygiene education and sanitary habits among students.
- Encourage cost effective and appropriate technologies for ecologically safe and sustainable sanitation.
- Develop community managed environmental sanitation systems focusing on solid and liquid waste management for overall cleanliness in the rural areas.

This framework means that the efforts undertaken by States at the local level are part of an overarching national goal given by the vision of the NBA. Although the States will be responsible for setting their own policies, they should contribute to achieving the national objectives.

2.2 Definitions

2.2.1 Solid and Liquid Waste

The NBA Guidelines define solid and liquid waste by referring to specific management options including 'compost pits, vermi-composting, common and individual biogas plants, low cost drainage, soakage channels/ pits, reuse of waste water and systems for collection, segregation and disposal of household garbage etc.... Projects should be approved by State Scheme Sanctioning Committee (SSSC)'. This definition focuses more on what can be done with solid or liquid waste rather than what it actually is.

In the manual on scaling up SLWM in rural areas the World Bank Water and Sanitation Programme (2012) define waste as "*any material or liquid that is left over after productive use or which is beyond any use in its current form and is generally discarded as unwanted; it can also be defined as any material linked to human activity in comparison to nature which has its own system of recycling waste such that it eventually becomes a resource: for example, organic matter such as leaves, branches, and so on, decompose to form manure*". This is a much more general definition of what constitutes solid and liquid waste.

Although most of the challenge is generated by domestic activity, rural SLWM is not limited to households, villages and communities. Industries located in rural areas may severely impact the local environment. Institutions (such as schools and health centres) are also facing SLWM challenges. The State policy should be exhaustive and cover all situations found in rural areas. Therefore, the definition of solid and liquid waste should cover domestic and non-domestic wastes.

In a national policy aimed at the rural environment the best definitions are those which include both descriptions and approaches so that they can facilitate action. Producing a definition which is specific to the types of rural waste and management options applicable to rural areas is more useful in supporting action than producing one very broad "catch-all" definition for national use in all contexts (e.g. urban and rural areas, domestic and industrial waste, hazardous or toxic waste etc.). Identifying specific actors or stakeholders can also be beneficial as it helps to define roles and responsibilities for implementation.

Based on this objective a definition of wastes is introduced in Figure 3.

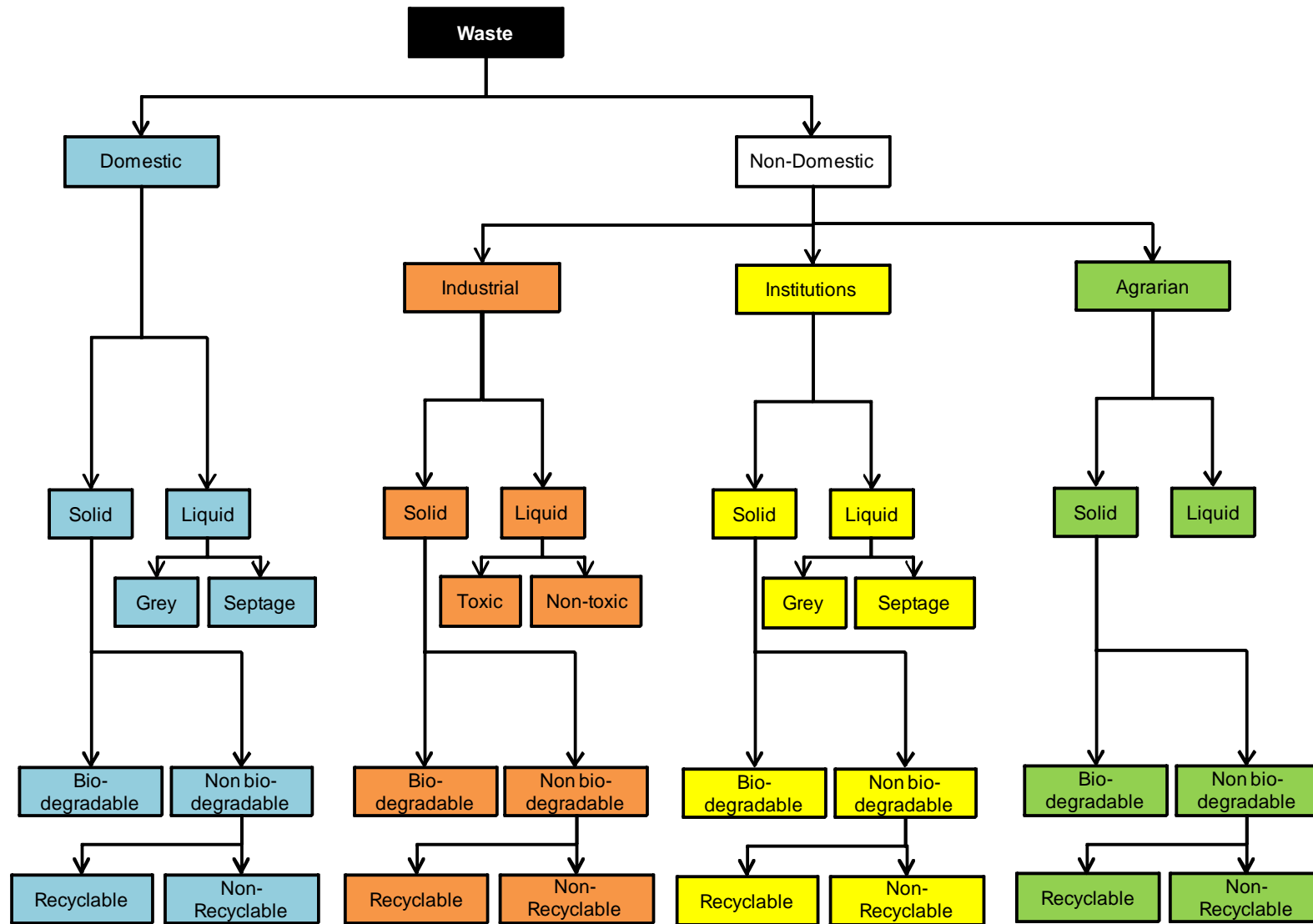


Figure 3: Definition of Solid and Liquid waste in rural area



2.2.2 Rural

Rural areas are also known as the "countryside" or a "village" in India. The main characteristic is a very low population density. In rural areas, agriculture is the primary source of livelihoods in conjunction with fishing and cottage industries (e.g. pottery).

In the Census of India, 2011, rural areas are defined by stating that they are not urban areas as shown in the definition of urban and rural areas;

Urban: Statutory town, census town and out growth

- Statutory town: All places with a municipality, corporation, cantonment board or notified town area committee etc.
- Census town: Places that satisfy the following criteria; a minimum population of 5000, at least 75% of the male main working population engaged in non-agricultural pursuits. A density of at least 400 peoples per km².
- Out growth: Out growth should be a viable unit such as a village or part of a village contiguous to a statutory town and possesses the urban features in terms of infrastructure and amenities such as pucca roads, electricity, taps, drainage system, education institutions, post offices, medical facilities, banks etc. Examples of OGs are railway colonies, university campuses, port areas that may come up near a city or statutory town outside its statutory limits but within the revenue limit of a village or villages contiguous to the town or city.

Urban Agglomeration: is a continuous urban spread constituting a town and its adjoining urban out growth or two or more physically contiguous towns together and any adjoining urban out-growths of such towns.

All other areas other than urban are rural. The basic unit for rural areas is the revenue village¹.

Given that SLWM is service based, a definition that takes into account population density would be the most useful. The fieldwork highlighted that different areas have different needs regarding waste management and densely populated areas will require different service structures to those with a low population density. Sanitation services are usually designed to serve the needs of specific population groups.

In the specific case of a rural State SLWM Policy it will be necessary to clearly define the range of application of the Policy. The definition of "rural" can lead to several interpretations, ranging from political (administrative boundaries), institutional (under GP responsibility), technical (densities), economical and social. When included in an overarching national constitution the definition of "rural" is not expected to be different from one state to another. However, the way it is described and clarified in the Policy may be different, and should therefore be given sufficient attention.

2.3 Key principles

2.3.1 Demand driven approach

The identification of motivations and (internal and external) conditions for *ownership*, *sustainability* and *scaling up* of SLW services requires specific expertise and the use of well implemented research methods,

In order to reach this ownership objective, the Policy should ensure it stays as true as possible to the real demand.

"Demand" is a key principle for the implementation of SLW services. Demand can be generic or enforced;

- *Generic demand*, includes all direct benefits perceived by the community as motivations to change without external influence. Generic demand includes all measures that will contribute to increasing the quality of the local environment for everyone.

Based on a thorough analysis of generic demand, the Policy should focus on the best ways to enhance it, considering a large range of *direct and indirect benefits for the*

¹ Ministry of Home Affairs, 2011



communities, for example, (i) positive impacts of improved cleanliness (ii) better economic conditions (iii) additional gains resulting from “green” marketing and better environmental image, (iv) savings made e.g. through reductions in water and energy use, grey water separation and reuse options. Figure 4 outlines some of the benefits that can be achieved by improving environmental sanitation.

- *Enforcement*, including all motivations from external resources, such as local regulations. Enforcement creates a demand that would not exist if the community is left to adopt behaviours independently. Enforcement is particularly necessary in cases of environmental protection including the protection of natural resources and human safety.

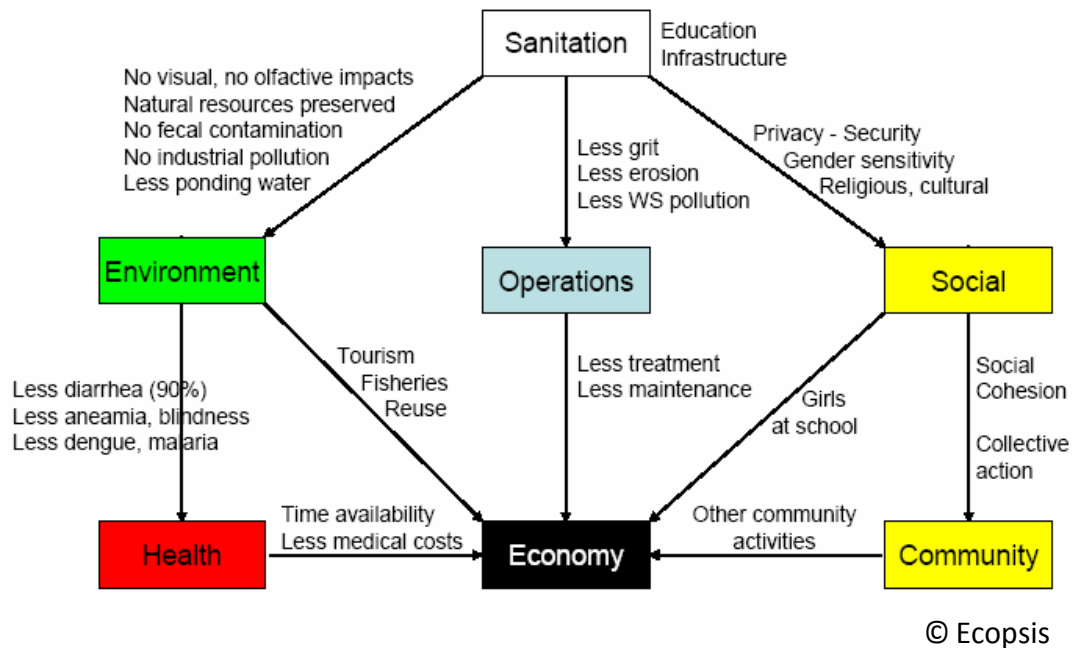


Figure 4: Benefits of sanitation

Demand for waste management services is growing, as are the costs for waste treatment, however, at the same time, there is growth in the emerging markets for recycled goods, and an increasing possibility of being able to achieve economical energy recovery. Return on Investment for SLW services remains low, consequently, beyond a certain service level, demand for SLW services is primarily due to the enforcement of environmental laws rather than economic benefits.

For example, recovering energy from waste is an attractive option in terms of treating waste (environmental benefits) and increasing access to energy (social benefits) but the systems currently have low returns on investment and are therefore financially unattractive. Figure 5 shows the relative attractiveness of 4 types of environmental projects. Waste water and solid waste management are both less attractive than water supply or energy projects.

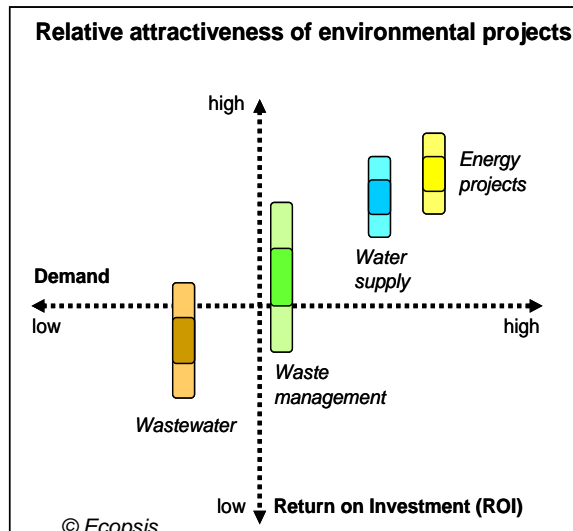


Figure 5: Relative attractiveness of environmental projects

Designated standards and the approaches used to meet those standards need to be adapted to the developmental profile and financial capacity of the villages. Even if a given village commits to implementing SLWM measures, it must be ensured that operation and maintenance costs will be affordable, properly collected and properly spent.

Therefore, the Policy should consider a differentiated approach according to village size and profile and, if relevant, the SLWM requirements. Technical solutions can be brought in gradually, in phases. The (cheaper) soft and (expensive) equipment investment components must be carefully balanced.

2.3.2 Subsidiarity

Subsidiarity is an organizing principle which is based on the understanding that matters should be handled by the smallest, lowest or least centralized stakeholder. This principle should be the driving force of SLWM in rural areas: it implies that whatever can be done at the household level should be done at household level. If not possible at household level, then the possible association of multiple households (neighbours) could play a role and so on up to State level.

When applied to rural SLWM, subsidiarity means that maximum efforts should be focused on the management of waste at the point of generation e.g. a household, institution or market place. By managing the waste as close to the source of generation as possible, it is possible to save time, money and labour.

Only waste that cannot be managed at the household level should be part of the collective or public waste management system.

This principle is already recognised by national level actors and in sector documents (e.g. the Rural Sanitation and Hygiene Strategy 2012-2022).

The selection of the best responsible entity for SLWM will depend on a long list of factors, ranging from capacity to economies of scale. However, as a general approach, experience has shown that the subsidiarity principle should be considered as a starting point for selecting the best share of responsibilities between actors.

The identification of solutions should start at household level, and then go upward like the rungs on a ladder. *Whatever can be done at household level should be done at household level.*

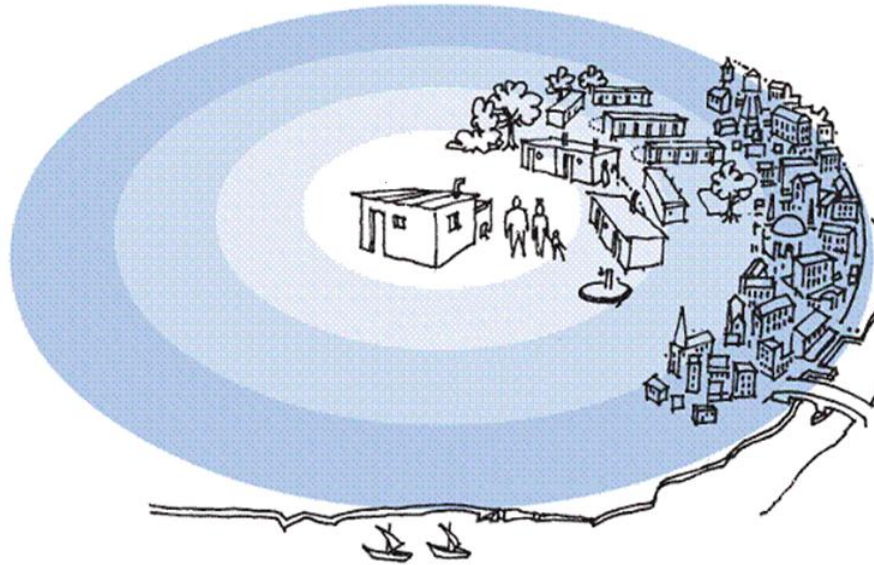


Figure 6: Application of the subsidiarity criteria: the household at the start of the approach (source: WBG)

2.3.3 Waste Hierarchy

a. Definition

The waste hierarchy is a classification of waste management priorities in order of their impact.

The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.



Figure 7: The Waste Hierarchy [Source: US EPA]

- Stage 1 "Source Reduction & Reuse" means reducing waste at the source. It can take many different forms, including reusing or donating items, buying in bulk, reducing packaging, redesigning products, and reducing toxicity. Prevention of waste is important in manufacturing. Purchasing products that incorporate waste reduction features or those that can be given an extended life support source reduction of waste.



- Stage 2 "Recycling or Composting" are a series of activities that includes the collection of used, reused, or unused items that would otherwise be considered waste; sorting and processing the recyclable products into raw materials; and remanufacturing the recycled raw materials into new products. Consumers provide the last link in recycling by purchasing products made from recycled content. Recycling also can include composting of food scraps, garden trimmings, and other organic materials. Recycling prevents the emission of many greenhouse gases and water pollutants, saves energy, supplies valuable raw materials to industry, creates jobs, stimulates the development of greener technologies, conserves resources and reduces the need for new landfill sites and combustors.
- Stage 3 "Energy Recovery" from waste is the conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolyzation, anaerobic digestion, and Landfill Gas (LFG) recovery. This process is often called Waste-To-Energy (WTE).
- Stage 4 " Treatment and Disposal " is the least favoured option and should only be applied to the remaining section of waste that was not managed through stages 1 to 3. This stage includes landfills and septage treatment facilities.

The Waste Hierarchy implies that there is an order of priorities when planning for waste management. See Figure 8:

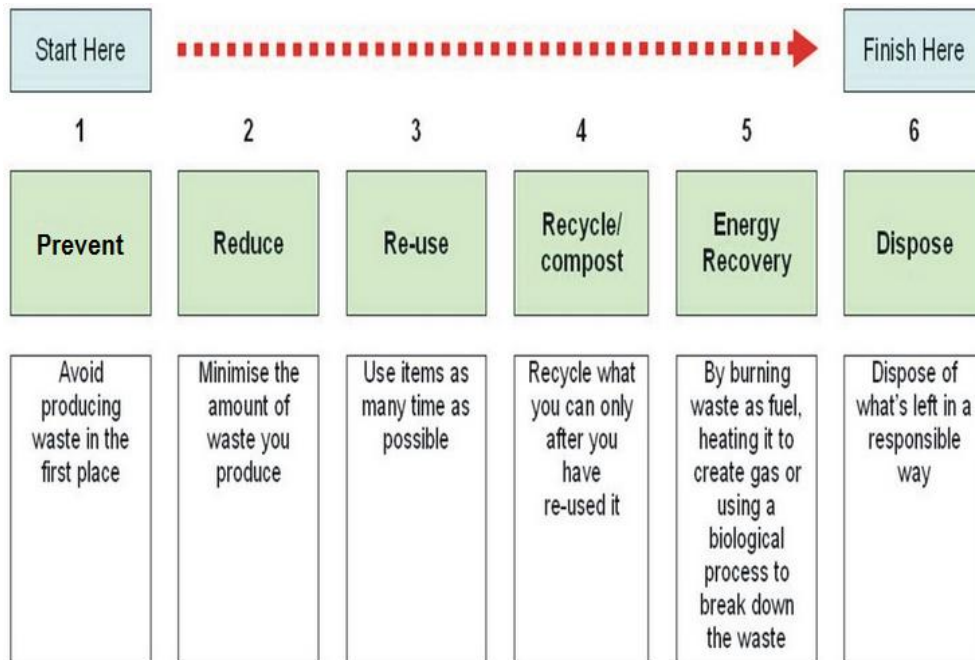


Figure 8: Sequence of the Waste Hierarchy [adapted from Staffordshire County Council, UK]

The full application of the Waste Hierarchy may have a huge impact on the cost of public services. In specific circumstances (for instance in some industries) prevention, reuse and recycling may eventually lead to zero waste processing in which there are no waste produced at all.

Should all preventive measures be applied and prove to be successful then the cost of public services (and more importantly the cost of sustainable operation and maintenance) will be considerably reduced.

Conversely, should no prevention measures be implemented, and no use made of household responsibility and ability to reduce waste at source, then the cost of public services will remain a very heavy burden on public finances. By combining both the Waste Hierarchy and the Household responsibility approach it is possible to identify potential opportunities for optimized SLWM. This list of actions is not exhaustive, but will illustrate



the kind of measures that need to be taken for each priority. States (and Districts, Block and GP) may identify additional measures suitable for the local conditions.

Priority	Government input	Household input
1. Prevent Take upstream actions so that <u>no</u> waste is produced by households or institutions. <i>The most effective way to reduce waste is to not create it in the first place.</i>	<ul style="list-style-type: none"> Run information and awareness campaigns to inform households about their responsibility. Ban products that have higher chances of becoming waste. E.g. ban the use of plastic bags². This measure can be applied at State or National level. Promote the use of alternative packaging and transportation means. 	<ul style="list-style-type: none"> Refuse to buy packaged products.
	<ul style="list-style-type: none"> Promote the separation at source of black and grey water. Issue technical standards that will support households in keeping separation of waste a priority activity on their lot. Train service and facilities providers to promote the separation of waste. 	<ul style="list-style-type: none"> Avoid discharging excreta into the same facility as grey water (from washing). Use soak pits for grey water.
2. Reduce Take upstream actions so that <u>as little waste as possible</u> is produced by households or institutions.	<ul style="list-style-type: none"> Run information and awareness campaigns to inform households about their responsibility. 	<ul style="list-style-type: none"> Use products that can be used again and again. Purchase durable and long-lasting goods. Purchase products with minimal packaging, or purchase items in bulk or in concentrated form. Seek products and packaging that are as free from toxins as possible.
	<ul style="list-style-type: none"> Install and monitor water meters. 	<ul style="list-style-type: none"> Don't waste water.
3. Re-use Reusing products, where possible, is better than recycling because <u>the item does not need to be reprocessed before it can be used again.</u>	<ul style="list-style-type: none"> Run information and awareness campaigns to inform households about their responsibility. Issue technical standards that will support households in keeping separation of waste a priority activity on their lot. Promote local markets for re-used materials. 	<ul style="list-style-type: none"> Purchase products with a reusable design. Sort waste at household level.

² Himachal Pradesh is the first state in the country to ban polythene-packed edible items in compliance with the order of the State High Court which has completely prohibited use of polythene packaging for non-essential food items.



<p>4. Recycle Unlike reducing or re-using, recycling <u>involves processing</u> of the old or used materials.</p>	<ul style="list-style-type: none"> • Run information and awareness campaigns to inform households about their responsibility. • Issue technical standards that will support households in keeping separation of waste a priority activity on their lot. • Promote technologies that will facilitate recycling at the household level • Support households in accessing these technologies. • Promote products designed with recycling in mind. 	<ul style="list-style-type: none"> • Use twin-pit latrines. • Compost.
	<ul style="list-style-type: none"> • Promote local markets for recycled materials. 	<ul style="list-style-type: none"> • Market and sell recycled materials.
	<ul style="list-style-type: none"> • Provide a recycling collection service and support collective recycling. 	<ul style="list-style-type: none"> • Recycled waste needs to be separated from trash and other wastes to prevent contamination, and sorted by material type to facilitate processing. • Pay collection fee
<p>5. Energy recovery Conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes.</p>	<ul style="list-style-type: none"> • Collect sorted waste. • Operate energy recycling plant. 	
<p>6. Disposal</p>	<ul style="list-style-type: none"> • Collect sorted waste and septage. • Operate landfill or septage treatment plant. 	

Table 2: Share of responsibilities for optimized SLWM between GP and HH

b. International examples

Districts can also establish incentive programs to encourage more private sector involvement. For example, utilities in Vietnam and Thailand sell treated septage for fertilizer. Indah Water Konsortium in Malaysia has also built a methane gas recapture facility at one of its treatment plants [58].

There are many international examples of the establishment of community based solid waste management organisations. However, the role of these CBOs is limited to collection and sorting of the waste into those that can be recycled or re-sold.

In some cases community composting is promoted but the issue of what to do with the remaining solid waste remains unsolved in countries around the world. Recycling centres and waste to energy processes require large quantities of waste which involve transporting the waste large distances from rural areas to these centres. In most cases the waste is still put into local landfills, which although this is not ideal, it is a step forward from indiscriminate dumping.

International examples are presented in order to illustrate the opportunities for solid and liquid waste management in rural areas:

- Philippines: Ecosavers programme

The scheme was introduced by the Department of Environment and Natural Resources but is managed by a local women’s co-operative. People generate savings by recycling their waste. People bring their segregated waste to the Material Recovery



Facility (MRF) on a Friday where they deposit their recyclables with a caretaker who weighs them and assigns points to the deposits which are recorded in a personal savings book (a pass book). The Co-op gets a 10% share of the worth of each item (e.g. 1kg of plastic). Contracted buyers take the recyclables immediately so there is no need to store them at the MRF. The Co-op has set periods for the depositors to withdraw their deposits in cash values, these are in May, before their town Fiesta, June before the opening of classes, October before All Saints' Day, and December, either before Christmas or New Year. The women in the co-op gain a livelihood and manage solid waste at the same time. The scheme focuses specifically on women vendors and microenterprise operators. Although it currently operates in towns and schools there is potential to operate a similar scheme in rural areas. (Ref: <http://www.denr.gov.ph/>).

- Brazil: Santo Antônio community proposed biomass energy production from waste

The Santo Antônio community has no road access, it can only be accessed by boat, current power is supplied by diesel generators. There are two factories in the area, a sawmill and a broom factory. A case study has been conducted to assess the viability of building a biomass fed power plant in order to provide an alternative source of power to the community using current waste products. It is estimated that a small plant would need 300kg/hour of biomass to meet a 50kW demand which would be provided to households. The factories produce at least 750kg/hr of wet biomass which would guarantee a supply of biomass for the plant. Households would be supplied with electricity through a mini-grid approximately 600m long with a low voltage (220v) which requires little maintenance. It is unlikely that the plant could meet all of the existing power needs of the whole community and the factories therefore the households are prioritised. In the case of any excess power being available it could be used in the factories. (Ref: Renewable Energy in Brazil, Biomass, www.en.wikipedia.org)

- Jordan: USAB-hybrid reactor

In Jordan, a study into wastewater treatment in rural areas identified that an up-flow anaerobic sludge blanket (USAB)-hybrid reactor was the most suitable technology to use at the household level. A USAB is a type of anaerobic digester. A USAB-hybrid combines a standard UASB with an anaerobic filter to reduce the production of solids. Wastewater flows upwards through a blanket of granular sludge containing microorganisms which treat the wastewater. The blanketing of the sludge allows solids requiring a long time for digestion to be retained whilst simpler compounds are processed and released within a day. Biogas with high concentrations of methane is produced as a by-product which can be captured and used as an alternative source of energy if required.

In Jordan, the total surface area needed for the system was calculated at 0.138 m², which is very small, compared to other systems which rely on discharge into the ground. Local materials are available to construct a majority of the system but polyurethane foam is not available locally and needs to be imported. Sludge should be discharged every 3-4 months but can be done locally.

(Ref: www.sciencedirect.com/science/article/pii/S0960852407010188)

- Sweden: Södertälje municipality

Development of a decentralised system for wastewater treatment. Wastewater is separated at source. Grey water is treated locally through settling and infiltration whereas black water is stored in a septic tank before being removed by tanker to a local treatment facility which uses a combination of wet composting and urea treatment to sanitise the waste ready for agricultural application. The wet composting is a form of thermophilic composting which uses high temperatures and constant air flow to rapidly produce compost. Although the system is used in a rural area of Sweden the population of the municipality is still 85,000. The use of the same system in a more rural setting with a smaller population has not been tested. (Ref: www.smtc.se/file/karl-axel-reimer.pdf)

- Malaysia: Sludge management in rural areas



Sludge is buried in trenches sited in dedicated areas or plantations with non-food crops. When full, the trenches and sites are closed and left for several years whilst the sludge naturally decomposes and is re-absorbed into the ground. As land prices increase there is an increasing shortage of land for disposal. (Ref: www.jsanic.org/publications/Country_Survey_Reports/Malaysia/JSC_Malaysia_Sanitation_Assessment_Report.pdf).

2.3.4 Levels of intervention

The Policy requires a thorough listing of the *different roles of SLWM*. Some roles may be shared by the same actor, e.g. septage treatment and solid waste collection. In most of the cases, the activities will be specific to local conditions.

The roles of SLWM include for instance:

- The household services, owned, operated and maintained by private households.
- The promotion of specific approaches towards hygiene at different levels.
- The monitoring of applied local rules or by laws for appropriate SLWM.

Figure 8 lists the different roles within SLWM and compares them with objectives and specific sub-sectors:

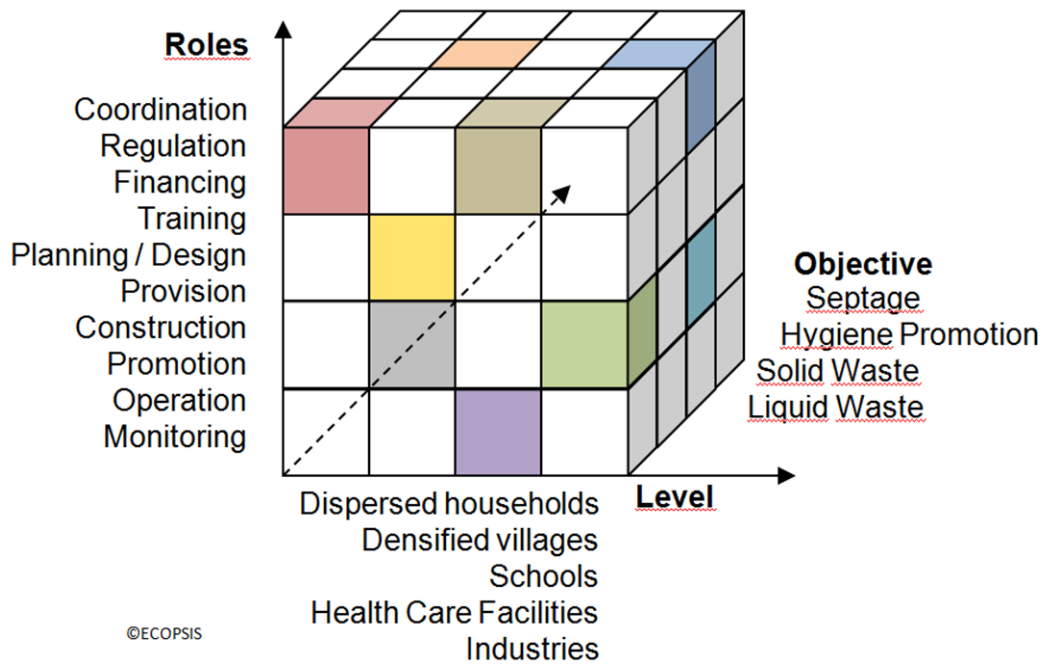


Figure 9: The "SLWM Cube": level of intervention, objectives and roles

It is not possible for all of the issues given in figure 8 to have the same level of importance; there must be some that are of greater priority than the others. Not all of the issues will be relevant for all States and some are only likely to be relevant in very specific circumstances e.g. septage management for industries (industrial waste) is unlikely to be of widespread concern in the majority of rural areas. State policies should list relevant issues according to priority, paying particular attention, when needed, to specific important issues including financing of SLWM, operation, promotion of hygiene in rural areas, and so on.

There are a number of roles and responsibilities for developing, operating and regulating services for rural solid and liquid waste management at different levels of the state administrative structure (as shown section 2.4.2).

The policy should clearly assign these to the appropriate organisations involved in the sector, in accordance with current legislation such as the Panchayati Raj Act. In some cases it may be necessary to establish a new organisation to take on a particular responsibility.



Level	Organisation
National	Ministry of Drinking Water & Sanitation
	Ministry of Health
	Ministry of Rural Development
	Ministry of Women and Child Development
	Ministry of Human Resource Development
	Ministry of Environment and Forest
	Ministry of Urban Development
	Ministry of Tribal affairs
State	Central Pollution Control Board
	Public Health Engineering Department
	Water Supply and sanitation Department
	Communication and Capacity Development Unit
	Panchayati Raj and Rural Development Department
	Tribal Development Department
District	State Pollution Control Board
	Zilla Panchayat
	NBA Cell
	NGOs
Block	Private sector
	Block Development Officer
	Panchayat Raj Public Works
	Block Resource Centre
	NGOs
GP	Private Sector
	Gram Sevak/Sachiv
	Panchayat Development Office
	Community based organisations
	Self-help groups
	Households

Table 3: Actors in rural SLWM

An exhaustive list of roles and responsibilities is presented in Appendix 4.

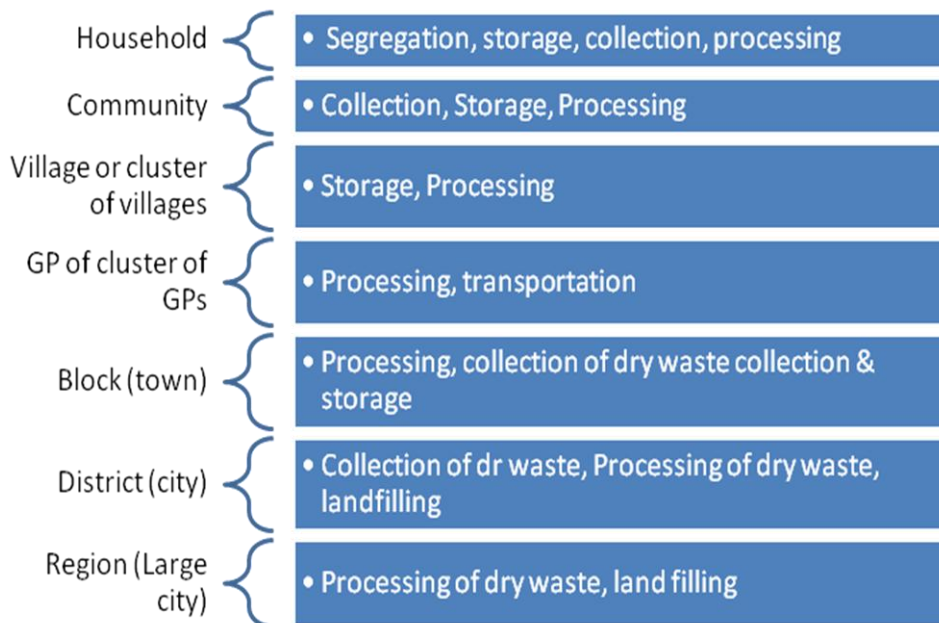


Figure 10: Example of solid waste processing: tasks and responsibilities



2.3.5 Information Education and Communication

Information Education and Communication (IEC) campaigns are strategically important in leading to the ultimate goal of “waste free environments” and in promoting compliance with the Waste Hierarchy (see §2.3.3). There is a felt need for IEC for implementation of various measures for SLWM in rural areas.

IEC should be considered as a policy measure as well as a tool for use during projects and programmes. MDWS, State Governments, District Water Sanitation Missions, The Block Panchayat, Gram Panchayat and the Village water and Sanitation Committees; all have a major role to play in creating an IEC with necessary and appropriate support framework for SLWM in rural areas, depending on the specificities both at the local level and upwards, that can be used to promote good practices and meet the goals of NBA. State and District authorities are expected to take lead in implementing IEC initiatives. The following suggestions present the background and the approach that could be adopted for IEC.

a. Uniqueness of Rural SLWM and IEC Focus:

In contrast to urban areas, households in rural areas are already used to reusing and recycling a large proportion of both their liquid and solid waste e.g. kitchen leftovers are used for feeding animals, grey water for kitchen gardens, etc.

It is critical to support such practices of prevention and usage at the household level in rural areas in the larger interest of “not creating waste”, by advocating basic principles of prevention and minimization at the household level. IEC focus for SLWM should be to highlight the significance and support the continuation of these good practices. Likewise IEC can focus on encouraging new ones (e.g. opting to buy products with less packaging) which can further reduce the amount of waste generated at the household level. This in turn would reduce the burden on public services.

A focus on household level management would minimise waste generation and the upfront costs of handling as well as disposal. With such an approach, the projectisation effort supported by the MDWS could be advocated for a much smaller component/quantum for which IEC could focus on highlighting disposal strategies for either dovetailing plans with neighbouring villages, urban areas or Panchayats collectively.

It is therefore important to note that rural households are central and critical to rural SLWM implementation and have a definitive role. IEC campaigns for SLWM in rural areas, need to be designed to show the significant importance and greater role played at the household level, to create awareness among SHGs/CBOs, sanitary workers, PRIs and other stakeholders, of principles of waste prevention and minimisation at household level which would support them in achieving the NBA goals.

IEC campaigns for SLWM in rural areas need to be designed to;

- support existing practices and create awareness to maximise use of waste in-house for various purposes and not mix with other waste
- minimise waste components to be disposed of by removing or segregating useful reusable components- such as paper, plastic, glass, cans and metallic objects, promote reuse and recycling by setting up market linkages for formal recycling of materials with secondary market players / companies / manufacturers and linking rural areas with them
- Provide information on the approaches that can be used to dispose of waste in an environmentally safe manner.

b. Existing Focus of IEC Activities under NBA

Under the NBA, the Ministry of Drinking Water and Sanitation is strategizing IEC activities for Rural Sanitation, and is preparing the strategic Central and State Level plans for rollout of IEC activities at State, District and Panchayat level.

The current focus of this IEC plan is to create demand for the construction and use of sanitation facilities in a sustained manner, particularly the use of household toilets with the overall aim of achieving ODF status.

IEC campaigns in addition to the one already under way from the MDWS are therefore required.



Table 4 provides suggestions on how policy measures could be communicated using IEC.

Policy measure	Objective of Awareness/Advocacy Campaigns
State, PRI & HHs Awareness and Advocacy of Good Practices Campaigns	
Prevention of indiscriminate disposal of waste	Raise awareness of damage done by indiscriminate dumping e.g. health, environmental, economical and educate people on fines or legislation in place
Prevention at household level	Promote in-house re-use or recycling of wastes. Prevent activities that lead to generate waste- for e.g. avoid use of plastic bags/substitute with alternate materials possibly bio degradable
Waste minimization (significance of 4Rs)	Minimise waste going to disposal Identify additional sources or alternative routes for direct disposal e.g. collective approaches Awareness of environmental damage done by plastic packaging
Reuse of waste	Recycle to vendors of secondary market Set up market links for reuse of waste components Formalise arrangement/linkages with manufacturers for buy-back (pet bottles, glass or metal cans)
Health Benefits of prevention of disposal	Create awareness of a clean waste free Panchayat- Nirmal Gram Panchayat Demonstrate clean environments Minimise incidence of disease- dengue, malaria, gastro, leptospirosis, skin diseases
State/PRI Level/SHG level	
Organised disposal	Raise awareness of damage done by indiscriminate dumping e.g. health, environmental, economical and educate people on fines or legislation in place Educate people about avoiding littering, and the maintenance of clean surroundings e.g. prevent pollution of drains and nullahs
Selection of options for SLWM	Prioritise options/measures based on components/ characteristics of waste, topography and geographic parameters of location Apply planning tools such as selection criteria for selecting disposal option
Disposal of liquid waste	Apply planning tools such as selection criteria for selecting disposal option Promote the use of appropriate technologies for different aspects of liquid waste management e.g. twin pit latrines, soak pits etc.
Disposal of solid waste	Apply planning tools such as selection criteria for selecting disposal option Promote the use of appropriate technologies for different aspects of solid waste management e.g. collective management, waste to energy, reuse of waste in construction, dovetailing with neighbouring urban areas etc

Table 4: Share of responsibilities for optimized SLWM between GP and HH

c. Implementation of IEC activities:

The IEC Plan for Rural SLWM needs to be evolved at Central State and district levels in a similar manner as has been followed by MDWS for sanitation. Budgeting for this purpose would be required.

There are a wide range of options for implementing IEC campaigns. Tools can include social and print media for widespread communication as well as Inter-personal communication (IPC) at the grass roots level. Interpersonal communication and door-to-door contact are significant tools in achieving NBA program goals, IPC could be implemented at PRI level through the Gram Sevak, "Swacchata Doots" as well as SHGs and CBOs. Mass media and outdoor media could also be explored. Private Sector and Corporates active in rural areas could also be encouraged to participate and their resources tapped to support this activity. IEC materials have to be developed according to specific needs but could include the description of good case studies, the design of pamphlets and background notes or instructions for successful IPC for those who will be directly responsible for its implementation.



Training and capacity building in good IEC techniques is needed at all levels to ensure that the right messages are getting to the right people in the most effective and cost efficient manner. There is a strong need for training and capacity building for IEC as the perception of officials, support agencies and implementing authorities needs to be aligned with an IEC focus for SLWM and critical aspects of waste prevention and minimisation as a priority particularly in the rural context. Training and capacity building is to ensure that the thrust of IEC campaigns is primarily on prevention and minimisation rather than disposal which would be secondary.

People already trained in IEC techniques can be identified and if necessary their skills should be updated to focus of the specific needs of rural areas (especially if the original training was focused on urban areas or in other sectors e.g. IEC for education or agriculture). Existing practices of households which are good should be encouraged even if what they are doing is not the 'best option' in the short term.

A suitable program has to be designed that would aid in quickly bringing up and aligning policy level actions, peoples thoughts and approaches to this goal. As there is limited capacity in the sector but this could be created through such a program and enhanced or upgraded and propagated at field level on a continuous basis. Over time, with a strong, well planned IEC campaign, new messages can be delivered and people will adopt 'better' practices which are more in line with policy goals and objectives.

2.3.6 Economies of scale

Economies of scale for SLWM applies to determining the most appropriate type of disposal technology (e.g. landfill, septage treatment plants), the optimal facility sizes in the best location for the lowest cost, including that of considerations to geography, culture, behaviour specificities and climate.

In one geographic area, there can be a large number of potential waste disposal sites for household waste from rural communities. Each potential disposal site may be able to accommodate different annual quantities of waste and, because of economies of scale, the larger the size of a landfill, the lower the average disposal cost per ton.

In a world without transportation costs and community resistance, the most obvious least cost solution with the best economies of scale would be one huge site handling the solid waste from all GPs in the area. However, the existence of high waste haulage costs complicates the issue. Beyond a certain haulage distance, the increase in transport cost from some waste generation points to a single large disposal facility may more than offset the fall in disposal cost per ton associated with accommodating the extra waste. This makes it more economical to build additional disposal facilities to reduce haulage costs. When there are many generation points and a number of alternative site locations, the site selection and transport routing problem rapidly becomes quite complicated. However, the sites can become too small to be economically effective.

For example, placing a disposal site in each GP, independent of the amount of waste each generates, would not be an optimal solution because economies of scale could not be exploited, and system wide costs would not be minimized [57]. At the opposite extreme, the trivial solution of placing a disposal site in each GP, independent of the amount of waste each generates, would not be optimal since economies of scale could not be exploited, and system wide costs would not be minimized.

In the case of septage, given the difficulty of collecting septage and hauling it across rural areas to designated disposal and treatment sites, medium-scale satellite treatment plants in easily accessible locations may significantly reduce collection and haulage costs. Capital, operating and maintenance costs decrease with increasing plant size. However, since larger treatment plants require longer haulage distances between pits and disposal sites, the frequency of availability of enough septage etc, costs escalate for collection companies, which in turn, increases the risk of indiscriminate and illegal dumping. The optimum plant size has to be determined on a case- by-case basis as it depends on the local context (e.g. labour cost, land price, treatment plant scale, haulage distance, and site conditions).

Fixed costs per unit associated with land acquisition, permits and licenses, buildings, erosion control and construction management fall with increasing landfill size. In addition, larger landfills have lower per unit operating costs for labour, equipment maintenance, operation of the leachate collection system, and well monitoring. It should also consider other externalities



associated with stocking of waste and generation of leachate, while designing systems. Such externalities should be well contained and should not influence or impact the environment, specifically the ground water potential and aquifers in the area.

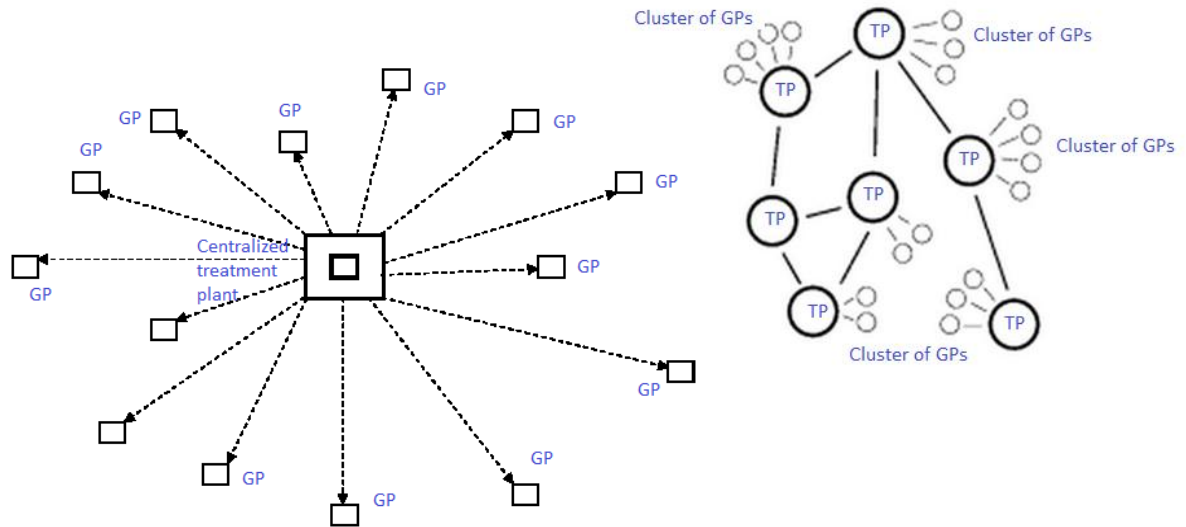


Figure 11: Centralized and decentralized (cluster) approaches

As a consequence, the following criteria should be regarded by GP or cluster of GPs when analyzing the opportunity of shared facilities:

a. Economic least cost analysis

At first an *economic least cost analysis* should be run, taking into consideration all costs (investment and O&M). This analysis would be based on a Net Present Value calculation in order to compare different options: one facility in each GP, one facility for all GPs, or several facilities shared between selected GPs, and so on.

The *least cost* solution will depend on several factors, such as size of service area, population density, distance between GPs and the facility, unit costs in this specific area, and so on.

b. Political decision

By their very nature, landfill and septage treatment plants proposals may attract opposition. While many potential problems can be reduced by proper design and management, landfills or septage treatment plants nevertheless may impose hidden costs on surrounding communities, which can become significant in the absence of professional waste management practices, such as groundwater pollution.

Ultimately, because of these potentially negative externalities, the choice of a waste disposal facility location and technology must ultimately be made in the political arena after a series of public consultation and consensus building; and the results of an economic least cost analysis would best be used to inform the decision making process, not determine it.

2.3.7 Environmental protection, climate change and health

Increasingly SLWM is being seen as a major issue in environmental protection. Improper disposal of wastes can pollute surface and groundwater bodies and the land surface, causing great risks to health and impacting the local economy. Poor waste disposal practices also adversely affect general aesthetics and the overall quality of life for those living in the vicinity. A growing problem in many countries is the economic impact of environmental degradation on tourism, fisheries and other industries sensitive to pollution. The most serious problems occur when large quantities of waste are concentrated in small areas.

The health impacts of SLW and the associated economic implications for national and household economies are a primary reason for developing SLWM policies.



The policy should guide the implementation of SLWM programmes with a view to achieving specific health outcomes. In order to accomplish this, Policies should address specific health concerns related to SLW including; diarrhoeal rates, infant mortality, helminth infections and cholera epidemics. It is essential that the general public is made aware of the problems that arise from poor SLWM and understands the role that proper SLW services can play in addressing these problems.

Challenged by a limited budget, the States (and eventually the GPs as the implementing local body) have to reach several objectives at the same time, including environmental protection and health objectives. They also have to comply with the new challenge of climate change in the long run.

As they will be preparing their Panchayat Plan with a list of activities to be carried out, the GP will have to set priorities in order to optimize the limited financial resources available. For most of the activities the objectives will be related: for example, by improving the environment, the GP will also contribute to improving the health of the population.

However, there will also be cases where the environmental and health priorities may not be so easy to define. For example, it might be cheaper for households to bury their waste rather than treating it. Whilst this approach may remove the waste from the visible environment and protect their health in the short term, the long term consequences of ground water pollution may be severe in terms of both environmental and health impacts. How far it is problematic if the households are in possession of sufficient land and if the disposal goes on a disaggregated disposal, need to be addressed. The Panchayat Plan should therefore establish priorities and plan for investment accordingly.

Although decisions may be made on the basis of service levels, convenience, costs or regulatory factors, the *health consequences* of SLWM provision should be the key rationale for the formulation of State Policies.

2.3.8 Capacity building

The optimized approaches introduced above underlines the importance of setting priorities for SLWM: all efforts should be focused on the prevention and reduction of waste generation before looking for the best way of providing public services (collection and disposal), which is feasible in a more densely populated region. Public services should only be used when all other measures have been exhausted to their full potential, and waste volumes left to be collected are reduced to the minimum.

GPs are struggling to provide the best services to their population. Public services include water supply, transportation, health services and so on. All of these services are primarily based on a public service approach and consequently, the existing staff at GP (and upper levels, block and districts) are trained in and focused on public service provision.

SLWM requires a different approach, many of the actions related to SLWM require specific competences and specialised knowledge e.g. landfill management, septage treatment which should always be carried out by experienced staff using the correct tools, machinery and operating processes. These staff will not always be available at the GP level.

In order to be able to address this challenge and apply a full Waste Hierarchy methodology, measures should be taken to build the capacity of different stakeholders at State, District, Block and GP level. Some action should also be taken in order to build the capacity of the private sector and local providers.

Particular areas of focus for capacity building are in planning, implementation, monitoring and management of SLW facilities for staff from GP level up to State level.

Appropriate training institutions (including; State, regional and district resource centres, competent government and private training institutions, NGOs and individuals with a proven track record) may be identified and contracted to provide training to all levels of stakeholders based on the specific capacity gaps at a given level, e.g. GP level.

The types of capacity building can vary according to what is most suitable for a given situation but could include; site visits, on-site or on the job training, demonstrations, class room training, IT based online training etc. All initiatives can be planned to be completed in phases with different levels of training for different stakeholders. For example, whilst all staff in a GP could be given a basic introduction to waste management processes, a selected individual can be



trained in much more depth over a longer period of time with the intention of giving them a greater share of the responsibility for managing waste management in the GP. Training and capacity building must focus on all aspects of SLWM, ranging from waste minimisation to the promotion and implementation of service delivery. State Governments should carry out capacity analysis to identify their key gaps in order to develop a long term capacity building plan.

2.3.9 Legal and institutional framework

The chosen solution may be different from the “optimal” configuration prescribed by an economic model because of the need to take into account concerns and considerations raised during the consultation process. What an economic analysis can do for the decision maker is pinpoint locations that are likely to be accepted or unpopular, and show the added cost implications of deviations from the efficient solution that are made to accommodate external concerns. The following are the existing rules and regulatory framework in India.

The current legal and regulatory frameworks are relevant only in urban areas, with the exception of the National Green Tribunal Act and E-Waste management rules.

- Water (Prevention and Control of Pollution) Act, 1974
- Air (Prevention and Control of Pollution) Act, 1981,
- Environment Protection Act, 1986
- Biomedical Waste (Management and Handling) Rules, 1998.
- Hazardous Waste (Management and Handling) Rules, 1989,
- Municipal Solid Waste (Management and Handling) Rules, 2000 and draft revision July 2013
- Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2009
- E- waste (Management and Handling) Rules, 2011,
- Plastic Manufacture, Sale and Usage Rules, 1999,
- Plastic waste (Management and Handling) Rules, 2011

The original guidelines on TSC (DDWS, 2010) state that the Panchayati Raj Institutions (PRIs) are required to establish mechanisms for refuse collection and disposal and to prevent water logging. The Rural Sanitation and Hygiene Strategy 2012-2022 (GoI, 2011) clearly indicates that the Gram Panchayat are responsible for solid and liquid waste management at the village level. The strategy states that *"a GP will view SLWM service delivery as an obligation"* (GoI, 2011). In their role as service providers GPs are also expected to be custodians of any assets developed. The role of institutions at other service levels is to provide support and facilitation with communication, financial, technical and human resources, in combination with participation of communities wherever feasible and plausible.

The role of Block Panchayats in rural drinking water and sanitation is envisioned as one of support, awareness generation, motivation, mobilisation, training and assistance for village communities, GPs and VWSCs. The BRC is intended to serve as an extended delivery arm of the District Water & Sanitation Mission in terms of software support and to act as a link between it and the GPs, VWSCs and village communities. However, it is acknowledged that the BPs need to be strengthened before they can take on this role (DDWS, 2010).

The problem of local organisation is reflected in the Rural Sanitation and Hygiene Strategy (GoI, 2011). It is recognised that in some states, greater priority has been given to NBA (and therefore SLWM) than in others and that the department handling the implementation of the NBA programme at State level has a significant influence on the success of implementation. Implementation can be carried out by the Department of Public Health Engineering, Department of Rural Development, and the Department of Panchayati Raj, depending on the convenience of the State. There have been greater levels of success in states where either the Department of Panchayati Raj or the Department of Rural Development are responsible.



2.3.10 Sector Coordination

Solid and liquid waste management involves a number of national, state and local government agencies and programs, NGOs and the private sector. Effective coordination between stakeholders, is necessary to make services work, both at the development stage and in the long term. The policy should define the coordination mechanisms necessary at each level for service delivery, regulation and performance management, and monitoring. Coordination of funding arrangements and convergence with other funding programs will also be necessary to ensure efficient and effective disbursement of funds for the development and ongoing sustainability of services.

a. Ministries and departments

There are multiple agencies with at least some responsibility for SLWM activities in rural areas. However, legislation for SLWM is fragmented, consequently, the roles and responsibilities assigned to each actor are also fragmented which leads to the duplication of some responsibilities and the neglect of others. Co-ordination between so many agencies is a significant challenge. Developing more effective legislation will support a stronger, more coordinated sector but legislation is only effective if there is the capacity to enforce it. Roles and responsibilities assigned to each actor must therefore take into consideration their real ability to successfully carry out the activities assigned to them.

Table 5 outlines the different agencies involved in SLWM activities in the three States visited during the elaboration of these guidelines.

Maharashtra	Tamil Nadu	Bihar
Water and Sanitation Support Organization	Panchayati Raj and Rural Development Department NREGS	Water and Sanitation Support Organization
Rural Development and Panchayat Raj Department- NREGS	TWAD Board	Rural Development- NREGS
Environment Department	Clean Village Campaign	
Pollution Control Boards	Pollution Control Boards	Pollution Control Boards
Khadi and village industries Commission	Water Management & Watershed	Non-Conventional Energy
Health Department, NRHM	Health, NRHM	Health, NRHM
Department of Women and Child Development	Department of Women and Development	Department of Women and Child Development
Maharashtra Energy Development Agency (MEDA)	Minor irrigation department	Khadi and village industries Commission
SC/ST department Ministry of Social Justice and Empowerment	Khadi and village industries Commission	Agricultural department
Indira Awas Yojana	Roads, Culverts & bridges	Public Health and Engineering Department
Education department/SSA	Non-Conventional energy- National Biogas programme	SC/ST department
Agricultural department	PURA	India Awas Yojana
PWD	SC/ST department	PWD
Eco Village Project - Rural Development Department	Indira Awas Yojana	
Home Department	Education department/SSA	Education department/SSA
Tribal Development Department	Tsunami rehabilitation programme	



MP, MLA funds	MP, MLA funds	MP, MLA funds
ESA – World Bank, UNICEF etc.	ESA – World Bank, UNICEF, ADB etc.	ESA – World Bank, UNDP, UNICEF, WaterAid etc.

Table 5: Agencies with a role in SLWM activities in Maharashtra, Tamil Nadu and Bihar

b. Coordination

Coordination of a complex sector like SLWM is always a challenge. Bringing together the different inputs (construction, community development, training, business management, finance and accounting), each of which may be provided by different organisations at different levels, in order to develop a service, and then to manage, regulate and monitor the service over the long term requires continuous communication and co-ordination between stakeholders.

c. Private sector

The role of the private sector is not clearly defined in the existing literature from India. The private sector in its various forms, from individual artisans, entrepreneurs and consultants to engineering contractors, manufacturers of products and materials have an important contribution to make. The challenge is to positively engage the private sector.

There are private sector service providers working in SLWM. However, there is very little interaction between these service providers and the public sector. Private sector service providers should be viewed as collaborators rather than competitors. The role that private sector service providers can play in improving sanitation in India has not been fully explored.

The physical capacity of service providers is available, people are willing to work in SLWM sector and they can see the potential to make SLWM into a business. Examples of successful SLWM based businesses are already operating (especially for septic tank emptying, collection of paper, glass bottles, etc.). For medium sized operators, their financial capacity is boosted through bank loans and for small scale operators there are a number of NGOs and development programmes working to develop the idea of SLWM as a business. Technical capacity is available to some extent and machines, trucks and low-cost technologies are being used for services like pit-emptying, decentralized treatment plants, prefabricated plants, etc.

The most important aspect that needs to be developed is an understanding of government priorities, by laws, regulations and codes of practice. Service providers can include local public service providers, nationalized public service operators, private concessionaires, private contractors, or a combination of organizations. Independent service providers tend to fill gaps created by inadequate public services, and operate without public monitoring or regulation.

The NBA Guidelines identify defined roles for the corporate sector as an essential part of Corporate Social Responsibility (CSR). A similar but much more focused approach may be adopted at State level with more specific provisions for SLWM in rural areas. There are currently very few documented cases of good practice for rural SLWM, there is therefore a large scope for demonstrating good approaches, sharing new methods, strengthening linkages between markets, demonstrating good examples of reduction re-use, recycling or recovery of wastes from the corporate sector and showcasing effective technological solutions or social adaptations related to SLWM.

Corporate bodies may invest and work closely with the Government to raise the profile of SLWM. Some specific initiatives that may be supported under CSR may include:

- Support training and capacity building of staff at all levels
- Invest in product development – may include research and development, field trials/pilots, supporting the scaling up of successful and proven technologies or approaches.
- Ensure easy access to affordable products and services at different levels by consolidating supply chains and looking for areas where waste from one chain can be fed directly into another as a useful resource.
- Support in generating awareness among communities



- Support in developing SLWM plans at different level

d. Sector Regulation

As public services are developed at GP and village level, the number of individual operators and services will increase enormously. It will be essential to ensure that each of these public services continues to function in accordance with the relevant standards and to deliver the level of performance that users are paying for. Policy makers should define the scope of the regulatory system and assign responsibility for it. Such regulation should be independent of the organisations responsible for delivering the services, including the GPs. The regulator should act as a neutral arbitrator between the service commissioner (the GP), the service operator, and the users of the service (domestic households and commercial businesses).

e. Village Water and Sanitation Committee (VWSC)

Village Water and Sanitation Committee comprises members representing the various sections of the village community, traditional leaders, members of the Gram Panchayat living in the village and village institutions like youth clubs and women's groups. VWSC members can be selected through the Gram Sabha. The VWSC needs to assume direct responsibility for the planning and implementation of project activities in the village in collaboration with and support of the Gram Panchayat institution.

To perform these functions equably, VWSC need to be representative of the community social structure with members selected democratically after considering their competency, dedication and motivation. A partnership approach involving the village community (both women and men), appropriate community sub-groups and project organizations will be developed with each partner agreeing to and understanding their roles and responsibilities. The VWSC needs to be established in each village and thereafter provide the focus for continuity of community based activities. They also need to be given legal status as a sub-committee of Gram Panchayat.

The membership of the committee may consists of 7 to 15 members comprising elected Panchayat members and at least 50 percent women with due representation to Scheduled Castes and Tribes. With the help of trained VWSCs, it is possible to promote effective dialogue and to articulate the interest of communities in SLWM projects.

During planning and implementation, VWSCs need to be involved in all stages of the project cycle including the tendering process. A well-functioning VWSC can play the following roles in the context of SLWM:

- Formally represent the community in all aspects of SLWM and Hygiene promotion activities.
- Coordinate all community involvement in village/sub village and be responsible for the preparation of a Community Action Plan.
- Collaborate on all investigations, planning, design and promotional activities concerning environmental sanitation, hygiene education and other community related components.
- Direct the planning, organization and implementation of community environmental sanitation activities.
- Be responsible for the storage, use and distribution of materials for community built project works.
- Monitor the progress of all work on sanitation and hygiene related activities, especially those involving community members.
- Support the acquisition of land for SLWM and other facilities.
- Be responsible for the effective use, operation and maintenance of community environmental sanitation facilities.
- Organise (and manage) the collection of tariffs and funds for the operation and maintenance of water supply and as necessary, environmental sanitation facilities.
- Promote basic rights, responsibilities and desirable behaviour concerning the use of sanitation facilities and the maintenance of a hygienic village environment.



In order to take on these responsibilities, the Village Committee needs to be well organised and take a structured approach to the implementation of meetings and overall management of WASH activities. A detailed step by step implementation plan needs to be developed based on local requirements and conditions.

2.4 Specific approach for each type of waste

2.4.1 Solid waste management

GPs struggle to provide waste collection services to the majority of residents, especially those in high density villages and difficult to reach areas, it is also not a priority in many cases. Small scale sanitation service providers are better placed to provide more localised services which keep their costs lower and enable them to target more hard to reach areas.

However, they require training to understand how the GP would like activities to be carried out. For example, a man may decide to become a door to door waste collector in a high density village, he charges the households a fee for the service he provides but due to a lack of formal waste collection facilities he then dumps the collected waste in a nearby river. The man is providing a service that the GP is unable to provide but he is increasing the problem of environmental pollution faced by the GP.

If the small and medium scale service providers and GP staff are trained to work in collaboration with each other then there will be the potential for a strong partnership to develop and for service levels to increase. Each party can focus on a different aspect. In the case of solid waste collection, the private collectors can go door to door and the GP could collect the waste from designated points throughout the village. The GPs would no longer be expected to provide every step in the service chain from collection to transportation and processing of the waste. Figure 6 outlines the relationships between different actors.

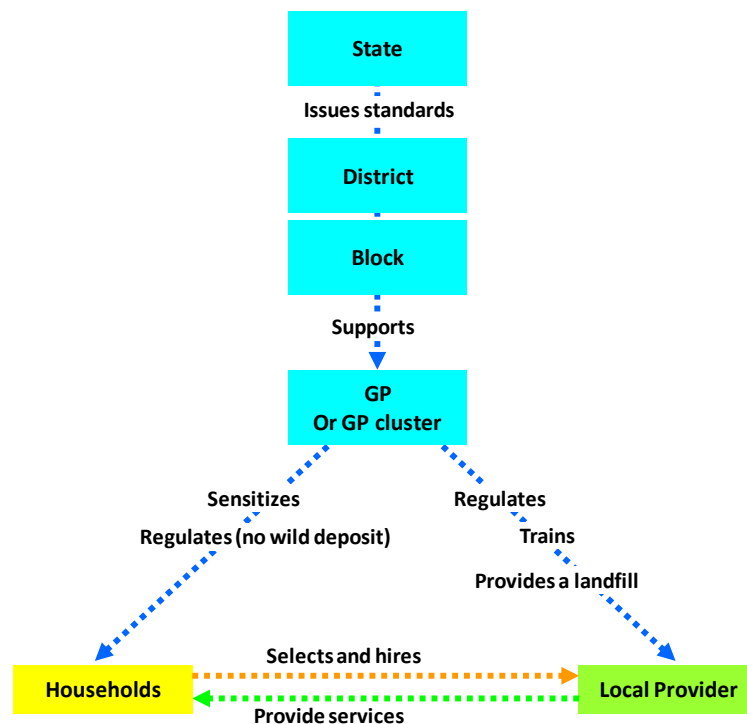


Figure 12: Roles distribution for Solid Waste Management

The scale of operations for different types of waste management should be decided based on the following factors:

1. Type of waste (e.g. dry, wet, electronic, etc.)
2. Quantity of each type of waste
3. Technology
4. Economies of scale



5. Distance from city
6. Access and availability of market, processing facilities in the vicinity
7. Finance
8. Population / level of administration

Based on these factors, decisions should be taken to decide what scale of operation is suitable for the particular area. All administrative levels should be consulted on this decision. Using administrative boundaries to define the area of service provision is a practical way to operationalize solid waste services. However, the population in an area does affect the type and quantity of waste produced, therefore, the design of any processing, treatment or disposal facility must take population size into account.

As a general guide, Figure 127 provides an overview of how solid waste operations can be scaled up at each administrative level. Technology selection at each level of operation should be decided based on need, affordability, quantity and type of waste generated. Available technologies are discussed in §2.5.1.

Scalability and its relevance for different elements of solid waste is described further in the following sections:

a. Generation, segregation & recovery

At household level, the best way to handle solid waste is to segregate it at source and recover what is possible. E.g. dry waste such as paper, plastic, glass, metal and wet organic waste.

The solid waste management system can be designed so that recovered dry waste is stored at the household level and then at the GP level for a fixed number of days; after which it is collected by a designated collector for transporting to a market place in the vicinity (at block level, district level or any existing city where a market exists). From here traders either process the waste or transport it further to a recycling facility.

It will make more economic and operational sense to develop such as system at district and / or region level, or link it with operations in a nearby city.

b. Storage, collection and transportation

In the in case of wet / compostable waste, primary storage has to be done at the household level and open dumping should be strictly prohibited. The waste can be composted or converted into biogas.

For a door to door wet waste collection system rickshaws, motorised vehicles or any local means of transport can be used to service a designated number of households. For every 500 households one motorised vehicle or three to four manual rickshaws or carts may be required depending on the quantity of waste to be collected.

Where door to door collection is not possible, easy to transfer wheeled community bins can be installed in such a way that all households have easy access to the bins. Community bins may be located in close proximity to a processing unit (e.g. a composting plant) for easy transfer and transportation of the waste for processing.

For transporting refuse (left over garbage after recovery and processing) a different strategy for a group of villages/ GPs (depending on population and the quantity of left over refuse) will have to be developed depending on the availability of landfill facilities in the area. In some cases the closet facility may be a municipal facility. If such a facility does not exist, efforts may be made to coordinate with the biggest municipality nearby and development of a regional landfill site can be advocated for at higher levels of government.

c. Processing

For wet compostable waste, local processing (at household level, community level, village level or GP level) is the best option.

If GPs are located in proximity to an existing facility or if there is a possibility to establish a large composting facility collectively (may be in partnership with a private operator), it could be given preference during the planning phase providing that local community concerns are considered Community, village or GP level biogas plants are also a possibility where there is a willingness to adopt more advanced methods of waste



disposal. The viability of any project can only be determined after conducting an extensive feasibility study.

Processing of dry waste is not advisable at village or GP level due to its economic viability. Instead, district and regional authorities should devise a strategy to promote such facilities either at district level or use the existing (if any) facilities within nearby cities and towns. It will be crucial to link the processing of dry waste (and link GPs) with urban areas nearby, to achieve economies of scale.

d. Disposal

Final disposal of refuse which should not exceed 20%, however, with effective segregation, recovery and processing; it can be brought down to less than 10%, of the total garbage generated. Final disposal should be done at an engineered sanitary landfill site if available. If such a facility does not exist, efforts may be made to coordinate with the biggest municipality nearby and development of a regional engineered landfill site can be advocated for at higher levels of government.

2.4.2 Septage management

Ideally a comprehensive septage management program includes the following elements [55]:

- Individual facilities design and construction - Regulatory oversight for the design, installation, and use of septic tanks;
- Individual facilities inspection and desludging - Requirements for periodic inspection and desludging of septic tanks;
- Procedures for Individual facilities desludging and septage transportation - Rules for transporting septage once it is removed from the tank;
- Record keeping and reporting – Tracking mechanisms, such as use of manifests and self-monitoring reports; and
- Septage treatment and disposal - Rules that prescribe the septage treatment and disposal requirements.

In order to protect health and the environment, roles should be distributed among all actors at local levels including, households, service providers, community based committees and GPs, all of which are responsible in some way for performing sludge or septage management activities. One actor working independently cannot reach the objective.

The distribution of role and responsibilities for septage management in rural areas is different from urban areas. Although there is extensive information available on urban septage management, activities in rural areas remain undocumented.

The following recommendations for assigning roles and responsibilities has been developed based on existing efforts to develop rural septage management programmes in India and around the world [8][55][56]. Figure 13 presents an overview of recommended roles in a septage management.

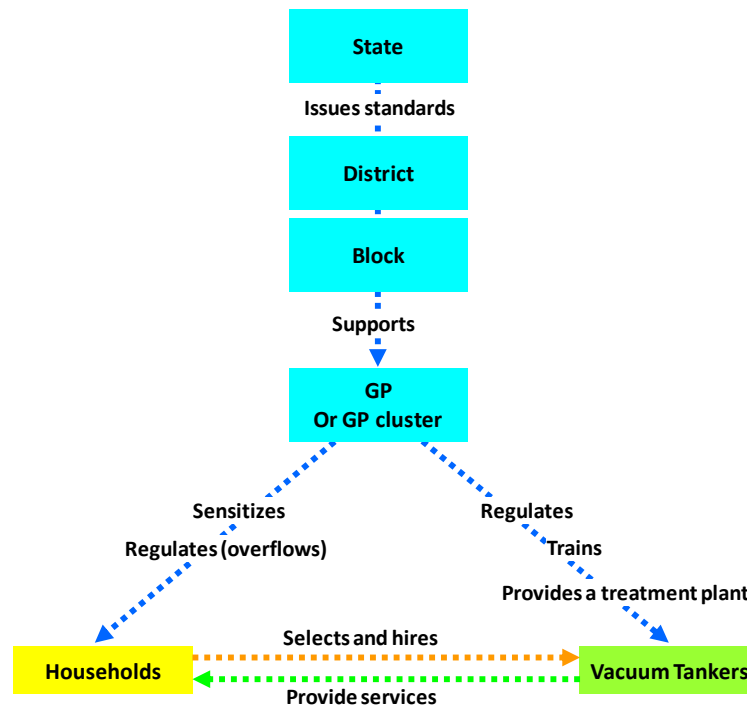


Figure 13: Roles distribution for Septage Management

a. Households

Households should take all possible measures to reduce the volume and load of septage on their own plot, using appropriate technology. This will benefit their financial situation, as it will reduce the future cost of desludging. Measures can include:

- Ensuring that new or previously constructed individual facilities comply with the provisions made in National Standards.
- Promote and use twin pit latrines to avoid the problem of septage and use the residue for manure.
- Separating effluents to be discharged into the septic facility (either a latrine or a septic tank) from effluents that can be discharged directly into the ground or any collection system. This applies particularly for dispersed areas, where water consumption remains low. Wastewater from bathing or laundry should be discharged into infiltration facilities instead of being discharged into the septic facility.
- Ensuring the septic tank is desludged before the solids exceed 50% of the tank volume, or is desludged every three to five years, whichever comes first.

b. Gram Panchayat

The GP should develop a septage management plan with supporting ordinances to promote regular desludging within the covered area, thereby ensuring the protection of the environment and citizens' health.

It will then be the GPs responsibility to [55]:

- Promote and use twin pit latrines to avoid the problem of septage and use the residue for manure, through different mechanisms.
- Provide a location for sludge disposal and treatment. GPs can associate into a GP "cluster" to reduce costs, for instance by sharing a treatment facility. This association by cluster should be made carefully, taking into consideration both costs and equity.
- Train providers on best practice service delivery.
- Enforce regulation for service providers so that no other disposal location is being used. Issue sanitary permits to service providers who comply with environmental



sanitation requirements, including the presentation of a copy of their contract with a treatment facility and disposal site, especially for mobile service providers.

- Require septic permits for all buildings with new septic tank constructions, changes of use, substantial remodelling or repair of existing services.
- Inform the households about where to get appropriate septage management services from e.g. provide a list of approved service providers.
- Enforce regulation in the GP so households do not dispose of their septage in a non-suitable way. GPs may wish to consider adopting a fee structure to support septic system permit and inspection programs. Fees should be set to cover the costs associated with administering and implementing the program. Graduated fines and sanctions for non-compliance should also be considered.

A new bill was drafted in 2012 with a view to make the law regulating manual scavengers more effective. It was passed by both Houses of Parliament on September 7, 2013 as The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013. Its main objectives are:

- o Prohibition of employment as manual scavengers
- o Rehabilitation of manual scavengers

The Act recognizes the link between manual scavengers and weaker sections of the society. It therefore, views manual scavenging as being a violation of their right to dignity.

The main features of the Act are:

- o The Act prohibits the employment of manual scavengers, the manual cleaning of sewers and septic tanks without protective equipment, and the construction of insanitary latrines.
- o The definition of 'manual scavenger' has been widened to include a person engaged or employed, inter alia, for manual cleaning of human excreta in an insanitary latrine or in an open drain or pit, railway tracks etc.
- o Express provisions for identification of manual scavengers and insanitary latrines.
- o Prohibition of hazardous manual cleaning of septic tanks and sewers, so as to ensure that health and safety of such workers is not compromised.
- o More stringent penal provisions for contravention of the new Act.
- o Vigilance and monitoring Committees to be set up at the Sub-division, District, State and Central levels.

c. District

GPs are responsible for septage management, both legally and according to the subsidiarity criteria. As such they should also be supported and regulated. This task could be handled by the district authority who would:

- Enforce regulation of the GP (or association of GPs in case of shared facilities) making sure GPs are complying with their roles and responsibilities. This regulation could be made by reporting and regular visits.
- Support the GP efforts in running awareness and information campaigns aimed at promoting appropriate behaviour such as separation of effluents, building individual facilities according to state standards and so on.
- Ensure that appropriate linkages are facilitated/established wherever necessary.

d. State

At present, private operators are major providers of septage management services. By creating new incentive schemes and regulatory programs, State governments can better leverage the private sector to scale up.



As part of local standards, a State level "manual of practice" can guide service providers on how to properly contact customers, inspect and clean tanks, take safety precautions, transport the waste, and maintain the equipment.

State authorities should also plan to update and enforce septic tank design codes.

States authorities could also contribute to the appropriate development of SLWM by creating training courses for service providers and GP authorities.

e. Service Providers

The provision of septage services in India is currently conducted only by private operators. Operators may be individuals desludging by hand, or small companies with tanker trucks.

The service providers should comply with the following rules:

- Apply for a sanitary permit for the operation of the business. The service provider first submits the application form to the GP. The GP will determine if the application is complete and meets all local requirements.
- Comply with national and local government regulatory and permitting requirements relevant to the operation of the business;
- Submit quarterly environmental reports to each GP within their approved area of operation for monitoring purposes.
- Service providers should coordinate with GP for the scheduling of desludging activities.

In case of liquid waste management, approaches for scaling up operations should be decided based on the following factors:

1. Type of liquid waste (e.g. grey, black)
2. Quantity of liquid waste
3. Technology available
4. Finance
5. Geography and geology

Under normal circumstances, designing and implementing the interventions should be done at village or cluster of village / GP level. The situation however, will differ for large and peri urban villages with more urban characteristics. Considering that the distances between villages and/GPs is large, treating multi-village liquid waste may not be economically feasible.

For onsite treatment technologies, particularly for septage treatment and management, a scale up of block level operations may be suitable.

In the case of liquid waste management, the scale of operation may be decided based on; suitability of technology in a given area e.g. a sullage stabilization pond or duckweed treatment ponds take a lot of land but can serve multiple villages in the vicinity. Ideally, household level and a village or cluster of village level systems should be the primary consideration for the most effective management of liquid waste.

2.4.3 Cattle waste management

Cattle waste (both dung and urine) is an important resource in rural areas and has multiple values in Indian culture. It has many uses including; as a soil conditioner, for biogas generation, as a source of fuel, as a sanitizing cleanser, as a raw material for generating organic compost and as a construction material.

The biggest problem with cattle dung comes from its improper storage rather than its use. Improper storage methods lead to the creation of unhygienic conditions in communities and to environmental pollution. A special emphasis must be given to cattle waste management when designing SLWM interventions. The primary responsibility for its management should rest with the households which created it (see §2.3.2). These households should be required to store the dung and urine in a well-protected, hygienic and environmentally safe manner. In order to achieve this, an enabling environment including as the provision of technical support, the generation of awareness, and ongoing educational campaigns should be created.



2.4.4 Biomedical waste management

As per the Biomedical Waste Management and Handling Rule of 2011, every occupier generating biomedical waste, such as hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories and blood banks generating, collecting, receiving, storing, transporting, disposing or handling bio medical wastes (BMW) needs to obtain authorization from the pollution control boards.

It is not a direct responsibility of the local government to manage BMW. However, to ensure effective implementation of these rules and regulations, GPs shall monitor and issue appropriate instructions to the generators of such waste and ensure that it does not get mixed with domestic and agriculture waste.

Appropriate provisions in local by-laws can be made to ensure effective regulation. GPs should educate stakeholders about the adverse impacts of biomedical waste, how to identify it and what steps should be taken if such waste is found to be mixed with domestic or agricultural waste.

2.4.5 Plastic Waste management

The Plastic Waste (Management and Handling) Rules, 2011, can be used as guiding rules for the management of plastic waste in rural areas.

It is expected that establishing a processing centre at a GP will not be financially viable. Therefore, Block and District authorities should provide active support to GPs in order to provide an enabling environment for ensuring effective plastic waste management. GPs may adopt by-laws to regulate the use, collection, segregation, transportation and disposal of post-consumer plastic waste. Since the quantity of plastic waste generated at lower levels (e.g. individual GPs) will be lower than the quantities needed to run an effective processing plant, a more economic and practical approach such as creating market linkages with nearby urban local bodies may be explored in consultation the pollution control board.

Responsibility related to segregation at source and temporary storage at home (or property) may rest with households or property owners; whereas collection and transportation may be carried out by a range of locally based stakeholders including; local youth groups, entrepreneurs, CBOs, scrap dealers etc. A suitable mechanism, for supporting the inclusion of these groups in the process should be developed during the preparation of a GP SLWM plan.

2.4.6 Hazardous waste rules

Hazardous Waste shall be handled in accordance with the Hazardous Wastes (Management and Handling) Rules issued by the Ministry of Environment and Forest. Since the hazardous waste that may be generated at village level is likely to be limited in quantity and difficult for the community to identify, emphasis shall be placed on educating stakeholders in how to identify such waste and where necessary how to segregate such waste at source ready for the correct disposal.

Due to low awareness about this type of waste and the high potential for adverse health impacts, awareness must be created about appropriate ways of handling such waste in accordance with the rules and regulations. GPs should monitor the situation and create the necessary awareness amongst stakeholders. For example, they can educate people about the existence of such rules, the types of waste covered, provisions under the rules, responsibility of the generator, etc. The State Government may take appropriate measures to facilitate and accord appropriate institutional linkages with pollution control boards and other concerned stakeholder such as operators of the facilities to ensure field effectiveness.

2.4.7 E-waste management

As per the e-waste (Management and Handling) Rule, 2011 every producer, consumer or bulk consumer involved in the manufacture, sale, purchase and processing of electrical and electronic equipment and components, collection centres, dismantlers and recyclers of e-waste shall comply with these rules. As a local government, the GP must ensure that all such generators comply with these rules locally. The GP shall monitor the implementation of the rule locally and create the necessary awareness amongst stakeholders. For example, they can educate people about the existence of such rules, the types of waste covered, provisions



under the rules, responsibility of the generator, etc. The State Government must facilitate and accord appropriate institutional linkages to ensure field effectiveness.

2.4.8 Industrial solid and liquid management

State Pollution Control Boards (SPCBs) are responsible for the implementation of legislation relating to the prevention and control of environmental pollution. As such the SPCBs will bear direct responsibility for enforcing regulation on industries located in rural areas. Small and tiny industries engaged in and generating waste should also be handled at the appropriate level as they are larger in numbers and quite often violators.

This enforcement is a serious concern and should be addressed properly by the States. Experience has shown that industries should comply with regulation if proper SLWM is expected from the GP. This condition needs to be fulfilled so that investments and efforts made by the GP and the community (both in solid and liquid waste management) are not jeopardized by (often strong) pollution impacts from industries located in the GP or even outside. Figure 14 presents an overview of the roles of the different actors with responsibilities for improving industrial SLWM activities.

The State, District and the GP are expected to;

- Inform the industries about relevant regulations and legislation.
- Support industries when needed to meet the requirements.
- Enforce the implementation of the regulations and legislation.

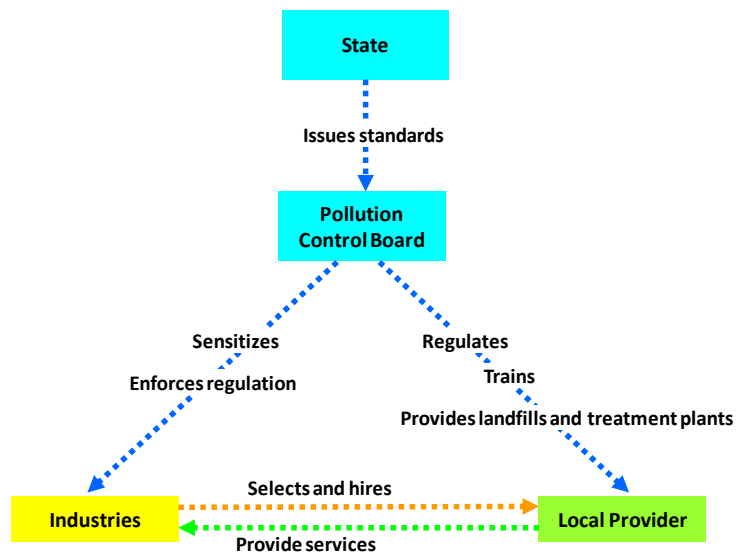


Figure 14: Roles distribution for industrial SLWM

2.5 Technologies

The following chapters present an initial list of technologies that are expected to be suitable for rural areas in India. These technologies are described in the document "Technical Options for Solid and Liquid Waste Management in Rural Areas" (MDWS, March 2013, draft version).

These technologies are only listed here for information purposes. States are expected to identify and develop technologies adapted to their local environment and conditions.

2.5.1 Specific technologies for solid waste management

- Organic solid waste

Composting, either naturally, through vermi-composting or through thermophilic composting is the most effective way to manage organic solid waste. There are many different ways to compost, some require initial infrastructure, others just require space. The table below outlines the options for composting in rural India. The most appropriate method for a given area is primarily dependent on the type of waste being composted



(e.g. does it include human waste or not) and the level of operation and maintenance that people are willing to carry out.



Technology or Approach	Description	Advantages	Disadvantages	Conditions for use
<p>Pile Composting</p> <p>(Ref: Composting at Home, www2.epa.gov/recycle/composting-home)</p>	<p>Composting is done in systematic piles above ground.</p> <p>Organic materials are added in layers and covered in soil to protect it.</p> <p>After 8 weeks the compost is ready for use.</p>	<p>Easy to establish at the household level and low cost.</p> <p>Good in areas with high rainfall as pile needs frequent addition of water.</p>	<p>Requires frequent maintenance (adding water and turning the pile after 2-3 weeks).</p> <p>Turning should not be done in the rain to prevent water-logging</p> <p>Space is needed for piles so method is unsuitable in densely populated areas</p>	<p>Composting works better in higher temperatures. In colder climates piles should be made bigger. During the winter (especially during snowfall) piles should be left without turning until temperature rises.</p> <p>Strong winds and sun have little effect on larger piles but may need more frequent addition of water and a wind breaker can be used if desired.</p>
<p>NADEP method</p> <p>(Ref: NADEP Manual www.rcsdin.org/NADEP%20tech%20manual.pdf)</p>	<p>Composting takes place in a rectangular brick tank with aeration holes.</p> <p>Organic material is added in layers</p> <p>Compost is ready in 3 months</p>	<p>Composting can be done on a larger scale than using piles</p> <p>All nutrients are retained in the tank so resulting compost is more nutrient rich.</p>	<p>Tanks work in 3 month rotations so at least 2 are needed which increases the cost.</p> <p>Large quantities of soil and water are needed which can be difficult to transport in some areas.</p> <p>The entire tank should be filled within a maximum 48 hour period (24hrs is better).</p>	<p>Tanks can be built in all conditions.</p> <p>The thatch roof protects the tank from moisture. Tank should be monitored to check for cracking of seal which would allow moisture to escape.</p> <p>Tanks require space and a lot of initial material so a community approach is better, using a communal space for the tank and agreeing the date for bringing material/ filling the tank.</p>
<p>Bangalore method</p> <p>(Ref: www.urbanindia.nic.in/publicinfo/swm/chapter14.pdf)</p>	<p>Waste is composted anaerobically in a pit.</p> <p>Compost is ready in 6-8 months</p>	<p>Can accept municipal waste and night soil.</p> <p>Good for dry areas</p> <p>No O+M is needed</p>	<p>Cannot be used in wet areas as the pit may become waterlogged.</p> <p>Gases produced can smell and the pit requires quite a large space.</p> <p>Composting process is slow</p>	<p>Useful in areas where the use of piles is limited by severe weather conditions e.g. strong winds and sun.</p> <p>Can be done at the household level where space permits as no O+M is required.</p> <p>Very cheap compared to tank</p>



				methods as no infrastructure is required.
Indore method (Ref: www.urbanindia.nic.in/publicinfo/swm/chapter14.pdf)	Waste is cut into small pieces and spread 10 -15cm thick above ground or in a pit. Compost is ready in 4 months	No infrastructure is needed and process is relatively quick	Nutrients are lost to the soil. Regular turning is needed (every 5 days). Cannot be used in wet areas or areas with heavy rainfall due to waterlogging	Pit/heap is unprotected so may need some protection from animals/children etc. A windbreaker can be used to reduce effects of drying out. Very cheap compared to tank methods as no infrastructure is required.
Coimbatore method	Waste is composted anaerobically in a pit with the addition of rock phosphate to minimize nitrogen loss. Compost is ready in 4 months	Resulting compost is nitrogen rich. Some O+M required after initial 4 weeks (turning and addition of water)	Odour can develop The pit requires space so not useful in densely populated areas	No infrastructure is required but the cost of rock phosphate should be considered. Not suitable in areas with heavy rainfall due to water logging. Pit is protected during first month but afterwards is left open so may need some protection from animals/children etc.
Vermi-composting (Ref: www.vermicompost.net)	Composting using a specific species of worms to break down waste Compost is ready in 3-4 months but compost must be removed in stages as the worms process it	More efficient than normal composting and produces richer compost.	Needs a verm-tank or vermin-bed and worms need to be bought or grown which increases cost Needs more O+M than normal composting to keep the worms alive.	Worms optimal temperature range is 15- 35 degrees Celsius. Lower temperatures hamper reproduction and higher temperatures kill the worms or make them leave. Worms are very sensitive to drought so use in very dry areas is not recommended unless a reliable water source is available.



Chinese high temperature composting (Ref: On-farm Composting Methods, www.fao.org)	Materials are heaped in alternating layers with bamboo poles inserted to make aeration holes. After 5 days the poles are removed and the holes are plastered. Compost is ready in 2 months	Can accept night soil, urine, sewage, animal dung and chopped plant residues. Turning is done once after 2 weeks	Handling of human waste and sewage requires special protective equipment. Additional waste such as ash cannot be added.	Can be used in most locations as heap is protected from weather conditions using mud plaster but water logging should be avoided.
Thermophilic composting	Composting is carried out in a specially designed thermophilic plant Compost is ready in 2 weeks	Composting is very quick compared to all other methods	Daily O+M required (adding compressed air to ensure aerobic conditions) Initial cost of thermophilic plant is high	Can be used in areas with low temperatures or hilly terrain unsuitable for digging. Requires exogenous source of energy.

Table 6: Technologies for solid waste management

- Bio gas from organic solid waste

Bio gas is created by the decomposition of organic waste in anaerobic conditions. The resulting gas can be let off into the atmosphere (as it is in the anaerobic methods of composting in the table above) or it can be tapped for burning as a fuel. As well as the biogas, the process also produces a slurry which can be used as a nutrient rich fertilizer.

The biogas plant can be linked to the family or community toilet or it can be a standalone system to which wastes are added. There are many different designs available. The choice of design will be influenced primarily by the desired capacity, the space available to install the plant, the type of feed material (cattle dung has higher gas producing capacities than human waste) and the finances available for construction. Waste should be added daily to ensure continuous gas production. Gas accumulation rates are slower than rates of use but for areas reliant on wood as a fuel for cooking biogas provides an excellent alternative. Stoves, cookers or lamps must be converted to accept biogas but the gas itself burns without odour.

(Ref: www.instructables.com/id/Bio-gas-plant-using-kitchen-waste/,
www.appropedia.org/Biogas-from-human-waste)

Specific experiences for solid waste management in hilly areas are to be found at the following links:

- www.sipmiunagaland.com – Solid Waste Management for Greater Kohima Planning Area
- www.iplportal.org – Solid Waste Management in Nepal, Aug 2013, ADB Report

2.5.2 Specific technologies for liquid waste management

The 3 main types of wastewater are grey, black and septage. Each type contains different pathogens and requires different types and levels of treatment to make it safe to return to the environment. The types of technology required to collect and transport the wastewater depends on the type of wastewater in the system. For example, for grey water only, open drains can be used but if grey water is mixed with black water all the water has to be considered as black water and a closed system should be used. The table below outlines the different options for collecting and treating waste water at the household level.

a. Grey water

Technology	Description	Advantages	Disadvantages	Conditions for use
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Soak pit (Ref: www.akvope-dia.org/wiki/soak_pit)	Dug out pit filled with stones, preferably places over burnt bricks. Porous walls to allow water to slowly soak into the ground and prevent stagnation.	Lowest cost option for treating grey water Uses very little space	Water is lost to environment Not suitable for rocky terrain or areas difficult to dig (e.g. clay soils) Excess water will overflow to surroundings and can result in standing water	Pits should be at least 1.5m above ground water table so approach is not suitable for areas with a high water table. Suitable for use in most temperatures but in areas where the ground freezes water can pool in the surrounding area.
Leach pit (Ref: A Practical Guide to Leaching Pit, www.tbdhu.com)	Brick lined circular pit using honeycomb masonry. Diameter approx. 1m. Water percolates into the ground. Pit should have a proper insect proof cover with water let in using a water seal trap to avoid mosquito breeding.	Can handle larger volumes of water than a soak pit Prevents water stagnation Prevents vector breeding	Some O+M required Not suitable for rocky terrain or areas difficult to dig (e.g. clay soils) Water is lost to environment rather than being reused Excess water will overflow into surroundings and can result in standing water	Pits should be at least 1.5m above ground water table so approach is not suitable for areas with a high water table. Suitable for use in most temperatures but in areas where the ground freezes water can pool in the surrounding area.
Kitchen garden (Ref: www.greywateraction.org)	Grey water is passed through a silt and grease trap to remove debris and into a simple surface irrigation system or into a piped root zone water system. The root system has the added feature of a filter bed around the PVC pipes which further filters the water before it reaches the plants.	Simple and cost effective technology Prevents water stagnation Prevents vector breeding Supports growth of produce for consumption or sale	Requires some O+M More expensive than a pit solution Use of strong detergents/cleaning agents in the home could lead to killing plants in garden	A kitchen garden can be scaled up according to the space available. Produce to grow should be chosen according to the success of different crops in the given location.
Three tank filtration (Ref: www.en.wikipedia.org/wiki/greywater)	Grey water passes through a 3 part structure – 1 st is a filtration grease trap, 2 nd is a treatment chamber filled with gravel, 3 rd is a treatment chamber filled with sand. The remaining water can be safely stored for future use.	Most effective form of waste water treatment. Water can be safely stored for periods of drought.	Higher cost compared to other options Regular O+M required including de-sludging and washing of sand and gravel.	Tank system can be used in any climatic conditions but building the tank and storage tank requires a large area to be available. Difficult digging conditions (e.g. rocky ground) could make the cost of construction prohibitively expensive.
Open/surface grey water drainage	System of drains connected to each house and collecting waste water for transportation to a treatment site or release into the environment	Relatively simple and easy to operate offsite system. O+M costs are low once the system has been constructed All households can be connected	Requires a master plan and technical knowledge to construct Requires regular O+M	Needs a lot of public support to keep drains free from waste If pollutants enter the water or the drainage system they will be released into the environment
Closed drains (small bore system)	Households are connected via PVC pipes to a series of intercepting tanks which	Lower in cost than conventional sewerage Can accept black	Requires a master plan and technical knowledge to construct	Unaffected by differing climatic conditions. User education is



	lead onto a main line which transport the waste water to the treatment site	water Useful in high density areas Comparable in cost to open surface drain Free from other waste/litter	High investment cost compared to household level solutions	vitaly important to control what is flushed and prevent blockages.
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Table 7: Technologies for grey water management

The table below outlines the options for decentralized treatment of wastewater.



Technology	Description	Advantages	Disadvantages	Conditions for use
Community level systems for water treatment				
Sullage stabilisation pond (Ref: Book - Encyclopaedia of Environmental Pollution, Agriculture & Health Hazards by A. K. Shrivastava)	Grey water from the drainage system is passed through large shallow basins or ponds placed in series	Natural process Capital cost is very low O&M cost is low Can be managed by unskilled manpower	Needs some technical inputs	Needs large area of land to be available Flooding can occur during rainy season – needs special management afterwards. In hot climates scum accumulation rates can be higher which needs more O+M to remove it
Duckweed treatment in connection to aquaculture (fisheries) (Ref: www.documents.worldbank.org Duckweed Aquaculture) www.cpcb.nic.in (Guidelines for Duckweed Based Wastewater Treatment Systems)	Duckweed grows naturally in India and has high bio-accumulation rates for dissolved nutrients, particles and even heavy metals (to some extent). When the duckweed is harvested it removes the undesirable elements.	Duckweed can be used in fishponds Treated water is well below required limits for re-use in agri/aquaculture No additional materials or equipment is required	Requires daily maintenance to keep duckweed under control otherwise blooms could lead to eutrophication of the water	Climatic conditions will affect the viability of plant and fish growth in outdoor ponds, some species are more tolerant of higher or lower temperatures than others. A viable market for the fish should also be available.
Root zone treatment system or Constructed wetland (Ref: www.sustainable-buildings.org) Root Zone System	The process uses the natural biological process of the reeds and soil to clean the water	Technically simple Ecologically sustainable Water can be re-used in plantations Can handle a large variety of pollutants	Requires some O+M Requires a large space Can become overloaded with organic matter without careful pre-screening.	Can be used in any climatic conditions but in areas prone to freezing process will be less efficient
Aerobic treatment (can be decentralized – DEWATS) (Ref: www.bordasea.org) - DEWATS	Grey and black water is passed through a 2 tank sedimentation and filtration system with a continuous air flow (15-16 hours per day)	Quality of effluent is higher than the anaerobic version Process is quicker than the anaerobic version	Maintaining air flow requires continuous electricity (not available in all areas). Expensive compared to stabilization ponds	Can be used in any climatic conditions but maintaining an air flow requires a reliable electricity supply
Anaerobic treatment (can be decentralized – DEWATS) (Ref: www.bordasea.org) - DEWATS	Grey and black water is passed through a multi-tank (3 or more) sedimentation and	Water can be safely stored and used when needed	Expensive compared to stabilization ponds Frequent O+M can be required – removal and cleaning of filtration medium which increases O+M costs	Pumping can be required in some areas so a reliable electricity supply is needed



	filtration system			
Rotating biological contactors/filters (Ref: www.en.wikipedia.org) Rotating Biological Contactors	Fixed bed reactors, partially submerged and rotated as wastewater flows through them.	Compact system so can be used in more densely populated areas Can be used to treat black and grey water or industrial wastewater	Requires skilled staff for construction and O+M Requires a constant electricity supply. Collected sludge requires further treatment and is not high in nutrients so is not useful for agriculture High initial cost of infrastructure and ongoing maintenance costs	Must be protected against sunlight, wind and rain and cannot be allowed to freeze in cold climates.

Table 8: options for decentralized treatment of wastewater

b. Septage

The table below outlines the options for treatment of septage management

Technology	Description	Advantages for septage management	Disadvantages for septage management
Individual facilities			
Single pit latrine (Ref: www.appropedia.org/single_pit_latrine)	The Single VIP is a Ventilated, Improved Pit. It is an improvement over the Single Pit because continuous airflow through the ventilation pipe vents odours and acts as a trap for flies as they escape towards the light.	Does not require a constant source of water and thus reduces the volume of septage. Can be built and repaired with locally available materials Can be used immediately after construction. Low (but variable) capital costs depending on materials. Small land area required.	Sludge (septage) requires secondary treatment and appropriate discharge. Emptying full single pit latrines can cause a serious health hazard, as the freshly deposited sludge at the top of the pit will contain many faecal organisms that may be pathogenic Costs to empty may be significant compared to capital costs. If little or no water is used then the septage may be solid and difficult (or impossible) to pump and has to be emptied by hand. Low reduction in BOD and pathogens.
Double pit latrine (Ref: www.who.int/water_sanitation_health/hygiene/om/linkingchap8.pdf)	This toilet consists of two pits, each covered with a slab with a drop hole and a vent pipe covered with a fly screen, and one superstructure	Twin pit latrines are designed to be emptied without the need to handle fresh excreta. Removal of dried sludge from a pit that has been left undisturbed for two years should be relatively straightforward as the material will have decomposed sufficiently	Higher cost than simple pit latrine. Needs more space to install.



		and be relatively safe to handle	
Septic tank (Ref: www.nesc.wvu.edu/subpages/septic_defined.cfm)	A septic tank is a watertight, on-site treatment system for domestic sewage, consisting of two or more compartments, in which the sanitary flow is detained to permit concurrent sedimentation and sludge digestion.	Higher reduction in BOD and pathogens. Long-lasting facility. High level of comfort for the user (similar to sewerage)	If the septic tank collects all domestic wastewater then the total volume is much higher than for pit latrines. Sludge (septage) requires secondary treatment and appropriate discharge. Higher cost than any pit latrine.

Collection and transportation			
Vacuum tankers	A vacuum truck or tanker is a motorised vehicle equipped with a pump and a storage tank. The pump is connected to a hose which is lowered down into a constructed tank or pit.	Fast, and generally efficient. Minimizes risk of contact with unhygienic material. Vacuum truck enterprises can benefit a community and be a source of sustainable income.	Expensive operating and maintenance costs that are passed onto the customer; not all customers can afford the service. Cannot pump thick, dried sludge (this must be manually removed). Very high capital costs. Strong need of regulation to make sure all trucks discharge to a suitable facility. Pumps can usually only suck down to a depth of 2-3m and the pump must be located within 30m of the pit.
Small pumping units	A small pumping unit is a (motorised or not) vehicle equipped with a pump and a storage tank. The pump is connected to a hose which is lowered down into a constructed tank or pit.	Can benefit a community and be a source of sustainable income for local staff. Cheaper than vacuum tankers. Easy access to densely populated villages.	Needs proper training of the operator. Limited to close-by treatment facilities. Higher risk of contact with unhygienic material.
Manual	Some pits can only be emptied manually, for example, material left to decompose and dry out in a twin pit system. Requires manual emptying (with a shovel) because the material is solid and cannot be removed with a vacuum pump	Useful for serving sections of the population which would otherwise go unserved. Potential for local job creation and income generation.	Time consuming Hard, unpleasant work. Requires a close-by disposal point Sludge must be carried/pushed offsite which is difficult and time consuming. Spillage and bad odours are likely.
Treatment of septage			



<p>Septage stabilization ponds (WSP)</p> <p>Ref: Waste Stabilization Ponds, A Viable Alternative for Small Community Treatment Systems, www.onlinelibrary.wiley.com)</p>	<p>WSP systems comprise one or more series of different types of ponds. Usually the first pond in the series is an anaerobic pond, and the second is a facultative pond. These may need to be followed by maturation ponds, but this depends on the required final effluent quality.</p>	<p>Natural process</p> <p>Capital cost is very low</p> <p>O&M cost is low</p> <p>Can be managed by unskilled manpower</p>	<p>Needs some technical inputs</p> <p>Needs large available land in GP</p> <p>Flooding can occur during rainy season – needs special management afterwards.</p>
<p>Biogas reactors (anaerobic digestion)</p> <p>(Ref: as mentioned above for Solid Waste Technologies)</p>	<p>Septage is a great source of biogas, as it is very high in organic matter that releases methane upon anaerobic digestion. By capturing and sequestering these greenhouse gasses before they can reach the atmosphere, such systems minimize impacts on global warming. Indeed, biogas waste-to-energy systems can actually sell carbon credits on the open market, which may help recover capital or operation costs associated with the facility.</p>	<p>Capturing biogas is also beneficial because anaerobic digestion and the biogases produced from this process can generate odours. Covering and capturing biogas helps control door making these facilities more appropriate in areas that are in close proximity to residential housing.</p>	<p>Expensive</p> <p>Difficult to operate and maintain.</p> <p>Risk of odour.</p>
<p>Composting</p> <p>(Ref: as mentioned above for Solid Waste Technologies)</p>	<p>Compost is defined as “the stabilization of organic material through the process of aerobic, thermophilic decomposition. The resulting humus-like material is suitable as a soil conditioner and source of nitrogen and phosphorus [56].</p>	<p>Can be used as a soil amendment to reclaim land or used in landscaping or horticulture.</p>	<p>Exposure can occur during the composting process to workers and to people living around the composting site.</p> <p>Agricultural use or use that may include human contact requires detailed laboratory analysis to confirm concentrations of pathogens and heavy metals are within safe limits.</p> <p>Commercial septage (including that from restaurants, fuelling stations, auto repair shops, dentistry offices and jewellery shops, dry cleaning and film processing operations, and other manufacturing or industrial sources), must be segregated</p>
<p>Lime stabilization</p> <p>(Ref: Lime Stabilization of Septage Waste, www.michigan.gov)</p>	<p>Lime stabilization is the process by which hydrated lime (calcium hydroxide) is added to septage to form a product that can be disposed of on land for use as a fertilizer.</p>	<p>Kills pathogens present and stabilizes the waste thus reducing odours.</p> <p>Stabilized septage can be applied to the land at a rate of</p>	<p>Lime is expensive and difficult to handle</p>



		300,000 litres per hectare per year. It can also be used as cover for sanitary landfills [56].	
Drying beds (Ref: www.unep.or.jp Unplanted Drying Beds www.akvopedia.org)	Drying beds are either planted or unplanted sealed shallow ponds filled with several drainage layers and designed for the separation of the solid from the liquid fraction of (faecal) sludge. Sludge is dried naturally by a combination of percolation and evaporation.	Dried sludge can be used as fertiliser (either directly in the case of planted beds or after composting in the case of unplanted beds) Easy to operate (no experts, but trained community required) High reduction of sludge volume Can achieve pathogen removal Can be built with locally available materials	Requires large land area Requires treatment of percolate Only applicable during dry seasons or needs a roof and contour bund Manual labour or specialised equipment is required to remove dried sludge from beds Can cause odour problems

Table 9: options for decentralized treatment of wastewater

Specific experiences for liquid waste management in hilly areas are to be found at the following links:

- www.cseindia.org – Decentralized Waste Water Treatment System DPR in Shimla.
- www.iitg.ernet.in – Water Sensitive Planning Guidelines for Hill Area Development.

2.6 Financing

The costs associated with implementing national sanitation policies include: (a) the capital costs required for initial investment in sanitation infrastructure and facilities which can be met through loans or grants, contributions; (b) the recurrent costs required to operate and maintain the facilities and; (c) the programme costs for activities such as training, institutional development, community organisation and hygiene improvement.

Recurrent costs are those needed for ongoing management of the facilities and are paid by individual households through user fees. In addition to operation and maintenance, recurrent costs for sewered systems should include depreciation, debt service, and expansion of facilities. Programme costs include activities such as training, promotion and technical assistance.

These costs are generally ongoing, but are higher in the early stages of a project when the facilities are constructed. These three categories of costs can be allocated to various parties or stakeholders. Sources of funds typically include national government, local government, external donors and users. The national budget process is an important factor in determining how these costs are allocated.

2.6.1 Polluter-pays criteria

Adequate cost recovery is the key to sustainability in solid waste management.

- Given that the benefits of properly managing SLW are shared between those generating the waste (i.e., households, commercial and industrial establishments) and the community as a whole, the costs of collecting, transferring and disposing of waste should be shared with contributions from both the public and private bodies. Public contribution

The most important way for improving solid waste management and finance is to improve the overall management capacity of the GP authorities and the corresponding municipal



finance systems. In the latter case, it is especially important to improve service cost accounting and financial planning, in addition to introducing better cost recovery.

Systems for full cost accounting must be established for effective cost recovery by GPs. These accounting systems must have sufficiently detailed information to accurately measure the costs of operation and maintenance, billing, contract management (if appropriate), debt service and depreciation; and to distinguish amongst costs for residential versus commercial and industrial wastes.

Wherever possible solid waste management components should be included within broader GP development projects.

- Private contribution

User charges should be utilized to recover a portion of the costs of solid waste management from those generating the waste. User charges can generate substantial revenues and provide incentives to minimize waste, especially if structured so that those who pollute more, pay more ("polluter pays principle").

Although user charges can be imposed at different stages of solid waste management (including collection and disposal), they do not cover the full costs of solid waste management activities. Whilst community members, institutions and enterprises may be willing to pay for solid waste to be collected, they might be unwilling to pay the full cost of disposing of the waste in a sanitary manner. Experience has shown that charging the full costs of disposal may create incentives for littering and open dumping, especially if the enforcement of regulatory standards (i.e. no dumping) is limited and entities can avoid paying the user charge by disposing of the waste themselves³.

With the exception of a few specific experiences, current practices for cost recovery of solid waste in rural areas are limited.

Options to recover the solid waste service costs range from instituting or enhancing garbage taxes, collecting tipping fees, adding a surcharge to electricity or water supply billings, or relying on other general revenues (including the property tax and business licenses). Choosing among these options depends on the relative importance of various criteria: whether revenues are adequate and easily collected, whether the polluter pays for the damage inflicted, whether the option is politically acceptable, and whether payment of the revenue can be enforced.

For the Indian rural environment it is recommended to take advantage of a "merged" approach including upstream financing (small tax collection from the polluters), decentralized collection service providers, limited subsidies to support public collection (through external support or cross-subsidies from other sectors) and decentralized community-based organizations for recycling at the end of the chain

2.6.2 Financial resources

The availability of funds is a major issue within GPs, Budgets are small and often constrained or limited. The implementation of an extensive SLWM programme in rural areas will exceed the individual budgets of GPs. Limited resources can be combined with Additional Central Assistance (ACA) and State Government allocations to provide more resources for capital expenditure. Alternative forms of capital, other than budgetary support, gain importance and need to be explored to meet the needs of SLWM in rural areas. One significant point to note is the availability of skilled and unskilled manpower in a GP as the availability of human resources has a strong bearing on the levels of implementation possible. The technical capacity of GPs is limited and in some cases non-existent which makes them heavily dependent on State resources for support and guidance.

The rural context presents an ideal opportunity for locally active private sector partnerships. These should be explored further to develop a much greater involvement of the private sector in developing and managing facilities for and on behalf of the GPs. Local partnerships to be explored could also include community groups and associations (such as the CBOs, SHGs, etc.). Where feasible and especially in cases there skilled or highly skilled personnel are required to run technical components, the private sector could be given full management

³ This situation is similar to wastewater treatment : users benefit from sewage collection but don't feel committed to treating the waste.



responsibilities providing that they have the technical and financial capabilities to provide the required service.

The Ministry of Poverty alleviation suggests alternative forms of capital for providing basic services and access to facilities for the urban poor. There are guidelines for two national schemes, Basic Services to Urban Poor (BSUP) fund and Integrated Low Cost Sanitation Scheme (ILCS).

The BSUP fund provides support and has earmarked 25% of grant funds and budgetary resources for the development of facilities including water supply, sewerage, drainage, solid waste management, education, toilets, healthcare and sanitation. It is structured as a non-lapsable fund.

The ILCS is more focused on providing access to low cost sanitation for households in urban slum areas, its main objective is to convert dry latrines into low cost pour flush latrines and provide new ones where none exist.

These or similar funds could be applied in peri-urban and rural-urban areas which have similar demographic characteristics, population structures, and socio-cultural habits to urban areas. Close proximity to urban centres of some areas considered as 'rural' may make it necessary to provide similar services in both the urban and rural areas with the same access to available grant funds.

a. Capital finance

Capital finance for the development of services is required for software components such as planning, community participation processes, and IEC for promoting the purpose of SLWM and how to use the services, as well as for the hardware, infrastructure components. The NBA Guidelines make provision for capital costs based on the population of the GP up to a maximum limit. For GPs with more than this number of people, consideration should be given to raising the limit to reflect actual needs, based on some yard sticks of per capita norms. Consideration should also be given to revising the system of budget allocations to take into account geographic area and population densities of habitations in a GP. Other sources of finance including a GPs own funds and funds allocated for other programmes such as biogas promotion should be more effectively utilized.

The land required for recycling facilities, treatment plants and the disposal of residual wastes may be classed as a capital cost. The policy should give direction on how this land should be provided or acquired, including available funding options.

b. Operational finance

Sufficient funding for the operational costs of public service provision is essential for the sustainability of the services. There are three main sources of funds for operational finance which can be used independently or in combination, these are: payments by users of the service; subsidies from GPs and/or government funds; and revenue from the value of selling waste materials as resources, or combinations of these.

- Payment by users has generally become the norm, with the trend towards covering the full operational costs, although special provision may have to be made for the poorest groups.
- Subsidies and grants from different government schemes and programmes, which can be variable and uncertain in the long term if there is a change of policy, so it may not be wise to rely on these.
- Revenue from waste as a resource is becoming increasingly important as a way of funding domestic and public services.

There is some argument for funding the initial two to three years from subsidies. However, this just delays the move to funding by users and getting people accustomed to paying while service development is still in project mode with the accompanying software support to develop local management of all aspects of the service.

Maintenance is normally part of the operational costs; major repairs and eventual replacement of hardware is not so clear. The policy makers will need to make a decision on how the latter costs will eventually be funded.



c. Economics

Converting the value of waste into an economic resource can contribute to the operational costs of services. There are several possible policy directions for this:

- Wastewater for kitchen gardening within the household plot.
- Treated waste water for irrigation or aquaculture.
- Composting or vermiculture of biodegradable solid waste for use or sale. One precautionary note is that the resource value of compost as a fertiliser within a village is an important consideration.
- Establishing linkages with Forest, Agricultural and Horticultural Departments for marketing or use of compost.
- Recycling of non-biodegradable wastes – for rural areas it may be necessary to develop links to recycling markets in urban centres.
- Mechanisms for Delivery

The main alternatives for provision of services are:

- Households manage their own wastes, or part of them (e.g. segregation of solid waste)
- Direct labour employed by the GP
- The GP contracts the operation of the services to community based organisations or self-help groups for segregation of solid wastes, composting, vermiculture, etc.

The choice of mechanism depends to some extent on the scale and population to be served. The decision itself should be made by the GP which has direct accountability to the users of the service. For policy makers, the main point is that the various options should be allowed and not restricted

d. Private sector

Desludging tariff structures should be designed to cover the operating costs of transport, treatment, and disposal or even to recoup capital costs. National caps on septage tariffs should consider not only collection costs, but also treatment and disposal fees. Charges can be billed in a way that encourages collection companies to deliver their loads to treatment plants. Desludging fees can be broken into instalments for customers, linked to water bills to give service providers an enforcement mechanism, or paid directly to the government rather than to desludging companies to create an incentive for proper disposal.

For many years, private collectors have been providing desludging services when public agencies fail to do so. There are also many examples of private septage collectors who do not dispose of septage in treatment facilities because they were not adequately consulted or engaged in the facility's seating and design process. By involving private septage collectors, CBOs, and sanitation workers early in the planning process for new septage collection policies and treatment facilities, GPs can help develop new local business opportunities, build future compliance, and ensure that new facilities will be used.

All possible sources of finance including the ones stated above and other sources such as funds under Ministry of Health & Family Welfare, Ministry of Women and Child development, National Rural Livelihood Mission (of Ministry of Rural Development) may be identified for appropriate activities, while preparing plans at different levels.

Perhaps more relevant in the case of SLWM is the approach adopted under PURA which envisages leveraging ACA for private sector finance and participation in the provision of infrastructure in rural areas (Ministry of Rural Development, 2010).

The scheme covers cross-subsidisation of non-viable components including solid waste management, with commercially sustainable viable components such as rural BPO, commercial centres and health centres. The alternative form of capital is raised through private sector agencies using the Central Government Grant sanctioned to leverage these resources.



The PURA framework may be adopted for meeting the requirements or provisioning of SLWM facilities in a GP or a cluster of villages or a cluster of GPs (more particularly to ensure economies of scale). Under the NBA, the Ministry of DWS could in partnership with State Governments evolve a framework for such a program.

All possible sources of finance for all required purposes may be identified through a consultative process, while preparing plans at different level.

2.6.3 Convergence with existing schemes

Implementation of a Rural SLWM Plan under NBA requires substantial resources considering the number of PRIs and habitations to be covered. The involvement of various key actors and implementing agencies with overlapping functions makes the situation more challenging. The Government of India through its various Ministries and Departments under them, has administered large grant based programs in the rural sector for the improvement of rural areas. This has been achieved through the provision of basic amenities like water supply, sanitation [Rajiv Gandhi Drinking Water Supply Mission (RGDWSM)], housing [Indira Awas Yojana (IAY)], provision of employment [Mahatma Gandhi National Rural Employment Guarantee Scheme (MNERGS)], skill building and enhancement [National Rural Livelihoods Mission (NRLM)] as well as the provision of urban amenities in rural areas [Provision of Urban Amenities in Rural Areas (PURA)]. These programs are ongoing, under which support is granted through the State Governments and through District level organisations for implementation.

In the context of rural SLWM, under the NBA, grant funds are to be provided and shared between the GoI and the State in a set ratio (currently 70:30 but this is under review). The scheme envisages implementation via projects with the total amount per PRI being capped at set rate (a maximum of INR 20 lakhs for PRIs with more than 500 households). With the application of such a norm, the State Governments and MDWS are of the opinion that this may be insufficient or inadequate to meet requirements in PRIs with larger populations.

Substantial public investments are being made for strengthening of the rural economy and livelihood base of the poor, especially marginalised groups like Scheduled Caste/ Scheduled Tribes and women. To effectively address the issue of poverty alleviation, there is a need to optimise efforts through inter-sectoral approaches. Convergence with other schemes is particularly important in order to combine the resources available to a PRI and provide the opportunity to meet dual objectives through efficient project implementation. This approach prevents the duplication of efforts and by being more economically efficient, PRIs will be able to implement activities in more areas, rather than focusing a substantial portion of resources in the same area. With convergence comes the possibility for joint planning and the adoption of common, unified processes for implementation which also supports efficiency.

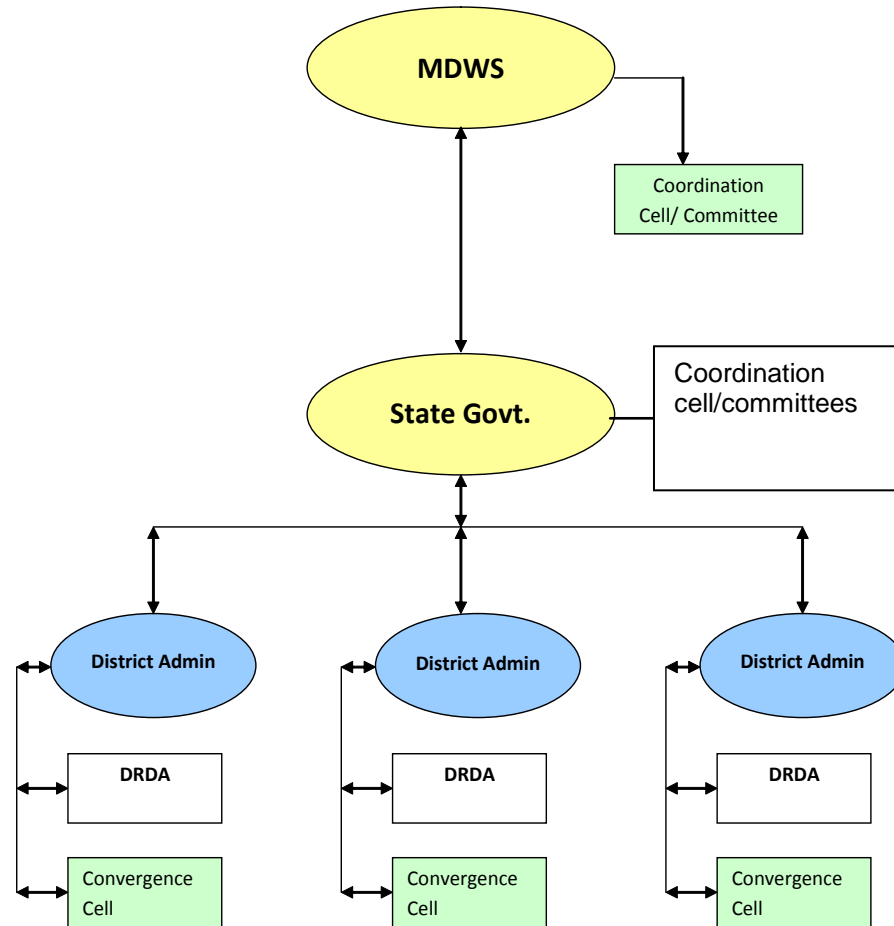


Figure 15: suggested framework for convergence & coordination

The following are suggestions for convergence of Rural SLWM:

a. Point of Convergence

The first level of convergence needs to be targeted at District level, where plans are formulated, where funds are disbursed and distributed. District Rural Development Authorities (DRDAs) are key entities at District level, where convergence of schemes has been taken up. Planning for Rural SLWM can factor in convergence under other schemes at District level and can be incorporated under plans for the District. Incorporation before budgets are approved is important. The extent to which programmes are to be planned and coaxed together needs to be considered in relation to the finding requirements of different schemes. .

b. Institutional framework

Providing the necessary institutional framework to support convergence is important, especially as more and more projects are expected to be taken up at the rural level.

As part of the Policy Framework, State Governments could create a 'Convergence Cell' in each District through the DRDA. The Convergence Cell would facilitate planning and follow-up the release of funds and fund management. The Convergence Cell could also be responsible for the routing of resources. MDWS could facilitate the development of an institutional framework where convergence scheme funds from different ministries are coordinated.

c. Optimal use of budgets under different schemes

In some cases there are caps on allocations which are linked to the percentages of below poverty households or scheduled castes/scheduled tribes in rural areas [particularly under MNREGS, NRLM or IAY]. However, certain prioritisation principles can be followed to provide benefit to such PRIs and the development of impoverished areas. Using the same concept, it would be possible in rural SLWM to prioritise Panchayats gearing towards or



having achieved Nirmal Gram status. Through careful planning and co-ordination, resources under various schemes could be targeted in such a way that all areas of a PRI can be covered under the NBA. In some countries, responsibility for certain activities, e.g, water supply is divided geographically between key stakeholders, this ensures that all areas are covered rather than focusing on 'easy' areas at the expense of more difficult, hard to reach areas.

d. Sharing of knowledge on best practices with convergence

An e-Learning initiative needs to be established for documenting and reporting successful convergence examples for others to follow and to provide an interactive platform for knowledge sharing, awareness raising and capacity building. A State level workshop or District level workshop may be organised before planning and budgeting is carried out. State Governments and DRDA could develop simple proformas for planning convergence based costing and budgeting in order to facilitate quick approvals and the release of funds without procedural delays.

e. Coordination for convergence

Convergence is difficult when there are multiple actors, multiple budgets and different procedures to be followed.

As discussed earlier, a Convergence Cell could be the focal point for implementation at District level.

Another option would be to adopt a system similar to MNREGS or PURA, MDWS could ensure direct disbursement to DRDAs for project implementation and the States could also release their contributions directly to DRDAs through inter-budgetary transfers. The funds targeted under convergence could also be facilitated by direct release to DRDAs.

This will save time and effort in transferring funds and will support coordination. This process has been well established under MNREGS. In addition, a Coordination Committee should be established under MDWS which will be responsible for coordinating National level considerations and activities under the NBA.

3. GUIDANCE FOR DEVELOPING A STATE POLICY

3.1 Process for the development of state-level guidelines

A series of key elements is recognised as defining and outlining the essential elements of good sanitation policies. These elements cover a range of important issues.

3.1.1 Stakeholders

To be effective in guiding changes in SLWM services sanitation policies must be developed and formulated with the involvement and participation of the stakeholders.

Policies have legitimacy to the extent that all stakeholders (including political leaders, government officials, donor representatives, the private sector and men and women in the general public) collaborate in their development and see them as a valid expression of current government actions and future intentions.

There has to be belief in the policies and their purposes and this can only come when stakeholders have been included in formulating the policies and in participating in making informed decisions.

3.1.2 Legal framework

A major aspect of legitimacy for SLWM policies is the legality of the policy statements. A legal basis is important and may take the form of laws, legislative acts, decrees, regulations and official guidelines.

To be comprehensive this basis should encompass the full range of legal instruments, from the essential legal statutes to the practical technical guidance materials used to implement the policies. Without a legal framework to guide overall policy implementation, SLWM programmes and projects run the risk of violating societal norms and failing to address the objectives for which the policies were established.



To be effective, SLWM policies and associated programme development and implementation must be the responsibility of one or more institutions.

In most countries responsibility for SLWM is divided among a number of ministries, based on their involvement in urban affairs, housing and public services, rural development, environmental protection and local government administration. This can lead to a confusing mix of institutional activities, sometimes resulting in overlapping authorities or a situation where no organisation seems to have clearly defined responsibilities, thereby resulting in gaps in sanitation coverage, or even conflicting directives. To avoid such problems the sanitation needs of all population target groups should be the clear responsibility of specified institutions.

Each of these elements, if well-addressed in policies, will help define an enabling environment for sanitation improvements.

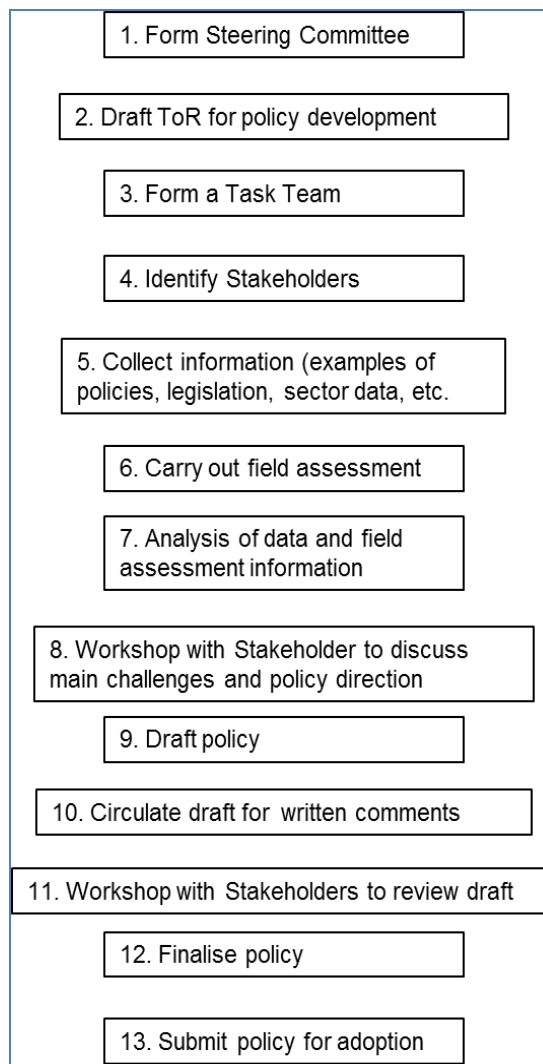


Figure 16: Process for developing a SLWM Policy at State level

3.2 Suggested content for a state policy

3.2.1 Preamble

The State’s Policy for Solid and Liquid Waste should be based on the assessment of the State carried out as part of the process of developing the policy. The following contents are suggested as a guide on what should be included in a policy, adapted to the context.

3.2.2 Context

Each State in India is different, in terms of topography and geology, climate and water resources, population and settlement patterns, and social and cultural traditions. Even within



states, there are differences in these aspects. Each State has a different context, needs and priorities. Each State's policy for solid and liquid waste management will be different in order to address the different conditions and needs. Therefore the following existing aspects need to be clearly defined as a basis for policy:

a. Geography

This should cover the type of topography and drainage patterns, surface water and hydrogeology, climate and rainfall patterns.

b. Population

This should include the total numbers of people in rural areas, the population growth rate, the number and density of habitations and range of sizes of habitation. This range is particularly important, as the services for a village of less than 5,000 people are likely to be very different to the services for a small town of more than 20,000 people.

The ethnic diversity of people should also be considered to determine whether the policy needs to define different approaches.

Population data should be disaggregated by gender and age ranges, together with some form of poverty profiling or mapping.

c. Health

General health indicators such as life expectancy and infant and child mortality rates are important. The latter rates are closely linked to the levels of sanitation found in households and communities and their impact upon the health of children. Data on the prevalence of diseases associated with poor environmental sanitation should also be presented. In particular, vector borne diseases such as dengue fever, malaria and chikungunya disease should be noted. It is also useful to show geographic variation of disease prevalence within the state.

The common hygiene practices for households disposing of solid waste and liquid waste should be noted.

d. SLWM coverage and costs

Existing coverage of domestic and public services for solid waste and liquid waste should be assessed, including whether the services are available to all the population in a habitation, and the functionality and whether the services are up to required performance standards. An assessment of the capital costs for provision of infrastructure, and the operating costs and revenue generation of these services should also be included.

The needs for services should include the range of different types of need, from small predominately agricultural villages to the semi-urban areas with a more commercial economy. The needs for industrial services should also be assessed.

Current practices (and problems associated with these) for managing wastes in communities without facilities should be assessed.

e. Institutional arrangements and capacity

All the different organisations, government actors (ministries, departments, agencies, statutory authorities, etc.), NGOs and private sector representatives, and their roles and responsibilities in SLWM should be stated. The staffing capacity and gaps in capacity to undertake these roles should also be stated. This should be defined by level: GP, Block, District and State.

f. Legal framework

Existing national and state legal instruments (laws, legislative acts, decrees, rules and regulations, and guidelines) relevant to SLWM should be listed. From a review of these, any gaps in the legal framework should also be noted.

3.2.3 Core Principles

A policy normally sets principles to act as overarching guidance on the approach and practices to be adopted to achieve the overall policy objectives. This section provides a set of principles that are derived from wide consultation at national, state and sub-state levels and a review of



the literature during the preparation of this framework. As such, they represent the core values and intentions of stakeholders in the sector. These principles should be considered by the state for adoption into its policy.

Chapter 2 of this document suggests a list of main criteria to be used for the development of SLWM in rural areas. Although aimed at supporting and guiding the State authorities in their efforts to draft State SLWM Policies they are not to be considered as mandatory standards, and can be adapted to local State context. These main criteria are based on core principles that should be reflected in the State policy.

3.2.4 Policy Goal

The Policy Goal for Solid and Liquid Waste Management is in effect pre-set by the *Rural Sanitation and Hygiene Strategy 2012 – 2022*, as given in Section 4. This could be modified for the State's particular context but the core intent should be maintained to conform to the NBA Programme.

A number of objectives are set under the NBA, only one of which is directly relevant to State Policy. The State should consider this and if necessary elaborate more specific objectives to match its needs and aspirations.

Targets for the policy should be set based on the analysis of needs and a realistic assessment of organisational capacity, including capacity development, to meet the targets.

3.2.5 Key Components of the Policy

Policy makers at State level need to consider how the following components should be addressed by the policy. This section is not intended to be prescriptive. Rather, the purpose is to raise key points and possible options for action, with questions that should be answered from the perspective of the various stakeholders and interest groups.

a. Definitions

The broad intent of policy for managing solid waste should be stated, incorporating the appropriate key principles. Aspects to be defined include: categorisation of wastes and the preferred and allowable range of treatment options; minimisation/reduction; reuse and recycling options; segregation at source; etc.

Similarly, the broad intent of policy for managing liquid wastes should be stated, incorporating the appropriate key principles. Aspects to be defined include: categorisation of wastes (grey water, black water, rainwater drainage and the preferred and allowable range of treatment options; minimisation/reduction; reuse and recycling options; etc.

The policy for addressing the growing problem of septage from septic tanks and toilet pits should be defined. This should give a broad direction on septage generation, collection, transport, treatment and disposal, adapted to rural areas from urban practice⁴

b. Household and Individual Responsibility

As the primary generators of waste, the responsibility of individual households should be defined. The range of possibilities include: minimisation of waste; on-plot composting and re-use; segregation of waste; payment for collection services; primary treatment of waste water; and limits to and control of discharge of waste water.

Responsibility may vary by type of habitation – larger more urbanised or smaller rural villages; densely or sparsely populated; and for solid waste and liquid waste.

c. Agricultural, commercial and industrial responsibility

In rural areas agriculture, commerce and industry can all be significant generators of different types of waste. Decisions should be made about whether they should be required to treat and dispose of their waste themselves, or if waste disposal services can do it, and if so, at what charge. A decision on applying the "polluter pays" principle or not should also be taken.

⁴ See, for example, *Policy Paper on Septage Management in India*, Centre for Science and Environment, 2011



At the start of the waste cycle, commercial enterprises could be required to contribute to the minimisation of waste by reducing packaging, and in particular, the amount of plastic that will end up as waste. The possibility of banning plastic bags should be considered⁵.

d. Service delivery

The Gram Panchayat will be responsible for the overall management of solid and liquid waste. Within this responsibility, it may delegate some responsibilities to households and outsource responsibility of operation and management of public services to other institutions such as CBOs/SHGs/ private operators, etc.⁶

The predominant approach under the NBA has been to develop and implement projects for SLWM, design and construction of a technical fix for the problem. Projects and programmes are essentially time-limited activities, mainly to provide infrastructure. Solid waste management and liquid waste management are essentially services; the construction of a waste recycling facility or the wastewater drainage and treatment plant is only one short input to the system necessary for a sustainable service. Solid waste and liquid waste management should be considered as services without time limit. These services need to be paid for over time, so that they are sustained. This means operating them on business principles, raising revenue to cover the operation, maintenance and asset depreciation costs. Business can be either profit or not-for-profit, the critical thing is that the costs are covered by revenue.

e. Technology

Policy on technology needs to address several points to ensure sustainability of the technologies adopted: appropriateness in terms of cost and affordability; performance and suitability for the job required; and suitable for local operation and maintenance capabilities.

Technologies come with attendant capital and O&M costs, and management systems that may or may not be appropriate to the rural situation at a given time. The danger is planning systems that are difficult to finance, institutions are not ready and geared up to operate and maintain them, and people are not ready or willing to adopt them and pay for service provision. Also, technology is linked to a whole set of environmental, behavioural and cultural parameters that need be taken into account. A holistic approach is required for technology choice.⁷

The stakeholder who makes the decision on the technology is critical: in line with the participatory approaches advocated in national planning and policy, it should be the community for both domestic and public SLWM services. This should be done based on the informed choice approach⁸: Informed choice involves decisions by consumers from among feasible technical, financial and organisational options based on an adequate understanding of alternative consequences. Potential consumers need to be provided with accurate information about the different technological options and service levels available, but also need to be aware of the trade-offs between the different options and service levels.

The various technology options are explained in DDWS (2008), *Solid and Liquid Waste Management in Rural Areas: A Technical Note*, published by the Ministry of Rural Development and UNICEF.

f. Health

Sanitation development is a preventive health intervention. Therefore generating awareness about sanitation and its linkages with public and environmental health amongst communities and institutions is important for reinforcing the need for and sustainability of services for solid and liquid waste. The risks of disease associated with indiscriminate disposal of solid waste and discharge of wastewater should be part of an IEC policy component.

g. Environment

⁵ Some states have already regulated the use of plastic bags.

⁶ From Rural Sanitation and Hygiene Strategy 2012 – 2022

⁷ Adapted from the National Urban Sanitation Policy

⁸ The TSC guidelines advocated informed technology choices, although this is not mentioned in the newer NBA Guidelines



The policy measures on environmental aspects of solid and liquid waste and their management should be based on national and state environmental legislation and rules. The primary legislation is the Environment Protection Act (1986). There are no specific rules for rural solid and liquid waste, but The Municipal Solid Wastes (Management and Handling) Rules, 2000, suitably adapted for rural areas, can serve as a guide for policy direction.

Risks to the environment from re-use of waste water must be considered. There is no national regulation on this, but the series of WHO *Guidelines for the safe use of wastewater, excreta and greywater* (World Health Organization, 2006), and in particular, *Volume 1. Policy and regulatory aspects* can serve as guide for policy formulation.⁹

h. IEC (Hygiene Promotion)

The state policy should promote mechanisms to bring about and sustain behavioural changes aimed at adoption of healthy sanitation practices, and link with the national WASH Advocacy and Communication Strategy 2012-2017.

i. operation and maintenance

The state policy document should bring in clearly the type and pattern of operation and maintenance intended in the policy document i.e., whether it will be completely carried about by the local body or a mix of different institutions involved. Operation and maintenance of the systems is the crucial aspect that tells upon the sustainability of the structures created.

3.2.6 Cross-cutting (gender, poverty, vulnerable groups)

Poor families are generally the last to improve SLWM, not because of differences in hygiene perception but because of reduced access to relevant information and to means of, or preconditions for, installation, such as land, or, for poor female heads of households, labour.

Within households, men and women have different interests in SLWM, different reasons for installing a disposal system and different roles in the installation process. In managing SLWM programmes it is important that women and men from the different social and economic groups are equitably represented and involved.

Recognising and catering for differences in means and interests, and achieving equity for women and men, contributes to the effectiveness and sustainability of programmes. In contrast, excluding individual groups from SLWM policies, or overburdening them with unrealistic expectations may result in negative effects.

In line with the key principle of gender-sensitive policy development the policy will need to ensure that the various interests of marginalised members of society are incorporated. As the Planning Commission states: *"presuming that community action will happen on its own, is only perpetuating a myth that hurts the poor. Local communities, left to themselves will not necessarily allow the poor, Dalits, Adivasis and Women to express their voice. There is need to make a specific provision ... for dedicated human and financial resources for social mobilisation, awareness raising and social audit"*¹⁰.

3.2.7 Research and Development

A number of technical options for solid and liquid waste treatment, re-use, recycling and disposal are available. There are, however, still challenges in developing and applying appropriate technology, for which further research and development may be needed at state level. It is essential that new approaches and technology are carefully introduced and applied in rural areas through a system of rigorous piloting, testing and validation before being more generally applied.

⁹ The full set comprises Volume 1: Policy and regulatory aspects; Volume 2: Wastewater use in agriculture; Volume 3: Wastewater and excreta use in aquaculture; Volume 4: Excreta and greywater use in agriculture. These are available for download at http://www.who.int/water_sanitation_health/wastewater/gsuww/en/

¹⁰ Planning Commission (2011), *Faster, Sustainable and More Inclusive Growth: An Approach to the Twelfth Five Year Plan*, Government of India



Appendix



Appendix 1 Terminology

anaerobic digestion: a controlled process involving microbial decomposition of organic matter in the absence of oxygen

authorization: the consent given by the Board or Committee to the "operator of a facility"

biodegradable: a substance that can be degraded by micro-organisms

biodegradable waste: that which can be decomposed by biological processes, for example, vegetable peel, food, farm waste, and so on. Organic waste is biodegradable and can be recycled;

bio-medical waste: any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological, and including categories mentioned in Schedule I of the Bio-Medical Waste (Management and Handling) Rules, 1998.

biomethanation: a process which entails enzymatic decomposition of the organic matter by microbial action to produce methane rich biogas

black water: wastewater from toilets containing fecal matter

collection: lifting and removal of solid wastes from collection points or any other location

composting: a controlled process involving microbial decomposition of organic matter

demolition and construction waste: wastes from building materials debris and rubble resulting from construction, re-modelling, repair and demolition operation

disposal: final disposal of solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality

environment: includes water, air and land and the inter-relationship between water, air and land, and human beings, other living creatures, plants, microorganisms and property

environmental pollutant: any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to the environment

environmental sanitation: The wider concept of controlling all the factors in the physical environment that may have harmful impacts on human health and well-being. It normally includes drainage, solid waste management and vector control, in addition to the activities covered by sanitation.

generator of wastes: persons or establishments generating solid wastes

grey water or sullage: wastewater from bathrooms or kitchens. Grey water generally contains fewer pathogens than black water.

handling: (in relation to any substance) the manufacture, processing, treatment, package, storage, transport, use, collection, conversion, destruction, offering for sale, transfer or the like of such substance

landfilling: disposal of residual solid wastes on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emissions, slope instability and erosion

leachate: liquid that seeps through solid wastes or other medium and has extracts of dissolved or suspended material from it

liquid waste: water which has been used once and is no longer fit for human consumption or other uses where clean water is required.

non-biodegradable waste: waste which cannot be broken down by biological processes, for example, paper, glass, metal, and so on. Non-biodegradable waste can be further classified into two types: recyclable and non-recyclable

recyclable waste: waste which has economic value that can be recovered, for example, metal, paper, glass, plastic bottle, and so on

non-recyclable waste: waste which does not have economic value of recovery, for example, tetra packs, thermocol, and so on.



operator of a facility: a person who owns or operates a facility for collection, segregation, storage, transportation, processing and disposal of solid wastes and also includes any other agency appointed as such by the authority for the management and handling of municipal solid wastes in the respective areas

processing: the process by which solid wastes are transformed into new or recycled products

recycling: the process of transforming segregated solid wastes into raw materials for producing new products, which may or may not be similar to the original products

sanitation: Management and disposal of human urine, excreta and domestic waste water

segregation: to separate the solid wastes into the groups of organic (biodegradable), inorganic, recyclables and hazardous wastes

septage: the combination of scum, sludge and liquid that accumulates in septic tanks

sewage effluent: effluent from any sewerage system or sewage disposal works and including sullage from open drains

solid waste: includes commercial and residential wastes in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes

State Board or the Committee the State Pollution Control Board of a State, or as the case may be, the Pollution Control Committee of a Union territory

storage: the temporary containment of solid wastes in a manner so as to prevent littering, attraction to vectors, stray animals and excessive foul odour

sullage: (same as grey water) wastewater from bathrooms or kitchens – generally contains fewer pathogens than black water.

sustainable services: services that have all the financial and economic resources required for operation, maintenance and replacement and take into account the technical, social, institutional, and environmental aspects, so that they are continuously providing the accepted basic level of service.

transportation: conveyance of municipal solid wastes from place to place hygienically through specially designed transport system so as to prevent foul odour, littering, unsightly conditions and accessibility to vectors

vermicomposting: a process of using earthworms for conversion of bio-degradable wastes into compost

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Appendix 3 References and bibliography

- [1] MDWS (2012). *Nirmal Bharat Abhiyan: Guidelines*. Delhi: Ministry of Drinking Water and Sanitation.
- [2] MDWS (2011). Twelfth Five Year Plan – 2012-2017: Report of the Working Group on Rural Domestic Water and Sanitation. Delhi: Ministry of Drinking Water & Sanitation.
- [3] DDWS (2008). Solid and Liquid Waste Management in Rural Areas: A Technical Note. Ministry of Rural Development and UNICEF.
- [4] DDWS (2011). Towards Nirmal Bharat: Rural Sanitation and Hygiene Strategy, 2012 - 2022. Delhi: Department of Drinking Water and Sanitation.
- [5] Jha PK (2013). Technical Options for Solid and Liquid Waste Management in Rural Areas. Delhi: Ministry of Drinking Water and Sanitation.
- [6] Harikumar PS and Mol BK (2012). A Synoptic Study on the Preparation of a Liquid Waste Management Plan for Kerala State, India. Environment and Natural Resources Research, May 2012.
- [7] Brikké, F. and Bredero M. (2003). Linking technology choice with operation and maintenance in the context of community water supply and sanitation: A reference document for planners and project staff. Geneva: World Health Organization and IRC Water and Sanitation Centre.
- [8] CSE (2011). *Policy Paper on Septage Management in India*. New Delhi: Centre for Science and Environment.
- [9] Cullet, P. (2007). Water Law in India: Overview of Existing Framework and Proposed Reforms. International Environmental Law Research Centre.
- [10] FANSA (2011). Peoples' Perspective on Sanitation, Freshwater Action Network South Asia. India: WaterAid India
- [11] IELRC (not date). *Ensuring Drinking Water Security in Rural India - Strategic Plan 2011-2022*, International Environmental Law Research Centre, Department of Drinking Water and Sanitation.
- [12] Singh KM, Singh RKP, Meena MS, Kumar A (2013). *Water Policy in India: A Review*. Retrieved 29 March 2013 from <http://ssrn.com/abstract=2226877>.
- [13] Narayanan, R., Norden H van, Gosling L, Patkar A (2011). Equity and Inclusion in Sanitation and Hygiene in South Asia: A Regional Synthesis Paper. UNICEF.
- [14] Planning Commission (2011). Faster, Sustainable and More Inclusive Growth: An Approach to the Twelfth Five Year Plan. Government of India.
- [15] Prasad, P. M. (2005). *Environmental Protection: Role of Regulatory System in India*. Korea: The Asian Law and Economic Association (AsLEA).
- [16] Ramachandrudu, M. V., S. Fanaian, Snehalatha M, Bachelor C, Ratna Reddy V (2009). *Institutional Mapping and Analysis of WASH Services and Costs*. WASHCost India Project.
- [17] Robinson, A. (2005). Scaling-Up Rural Sanitation in South Asia: Lessons Learned from Bangladesh, India and Pakistan. WSP.
- [18] Tyagi, A. (2011). Economic Impact of Inadequate Sanitation in India. WSP.
- [19] WASH Institute (2009). *Evaluation of Existing Capacities in WATSAN Sector*, Plan International (India).
- [20] WELL for DFID (1998). Guidance Manual on Water Supply and Sanitation Programmes. London: WEDC.
- [21] WSP (2010). A Handbook for Gram Panchayats: To Help Them Plan, Implement, Operate, Maintain and Manage Drinking Water Security. WSP.
- [22] WSP and MDWS (2012). Handbook on Scaling up Solid and Liquid Waste Management in Rural Areas.
- [23] Technologies for liquid waste management in rural areas By Dr S V Mapuskar Appa Patwardhan Safai Wa Paryawaran Tantraniketana, Dehugaon, Tal. Haveli, District: Pune, Maharashtra 412109.
- [24] Swamy A (2013). Sanitation in Rural Gujarat: Policy Lessons from Project Implementation Aga Khan Planning and Building Service, India.
- [25] IS:2470 (Part 1) (1985). Indian Standard on Code of Practice for Installation of Septic Tanks Biogas plant Construction Guidelines. Tamil Nadu: Vivekananda Kendra.

- [26] Ministry of Non-Conventional Energy Sources (2003). *Practical Hand Book for Biogas Managers*. Kharagpur: Regional Centre for Biogas Development.
- [27] National Environmental Engineering Research Institute (2006). *Grey water Reuse in Rural Schools-Wise Water Management, Guidance Manual (Draft)*. Nehra Marg, Nagpur.
- [28] Mapuskar SV (no date) An Innovative Technology for Integrated Waste Management Leading to Resource Recovery and Reuse.
- [29] Maharashtra Gandhi Smarak Nidhi, Pune and Director, Appa Patwardhan Safai W. Paryawarn Tantraniketan Dehgaon village, Tal. Haveli, Dist. Pune, Maharashtra.
- [30] *Vermitank- The most efficient way of handling biodegradable solid waste*, a handout issued by Nirmal Gram Nirman Kendra, at Govardhan, P.O. Gangapur, Via Nasik - 422222, Maharashtra.
- [31] Mapuskar SV (2007). Innovative strategy for viability of family owned night soil based biogas plant.
- [32] *Recycling of Human Wastes: Need for the Hour* by Sri Shrikant Navrekar, Nirmal Gram Nirman Kendra, Govardhan (Gangapur) Via Nasik - 422222, Maharashtra.
- [33] Bhawan P (2003). Guidelines on Construction, Operation and Application of Root zone Treatment Systems for the Treatment of Municipal and Industrial Wastewater. Delhi: Central Pollution Control Board.
- [34] Fray J (1973) Methane Digesters for Fuel Gas and Fertilizer with complete Instructions for Two Working Models. California: Eighth Printing
- [35] Low Cost On-Site Integrated Waste Management Systems by Dr. S.V. Mapuskar, Adviser Sanitation & Bioenergy, Maharashtra Gandhi Smarak Nidhi and Director, Appa Patwardhan Safai W. Paryawaran Tantraniketan, Dehu village, Tal. Haveli, Dist. Pune, Maharashtra, P.C. - 412109.
- [36] Mapuskar SV (2011), "Malaprabha" Latrine Biogas Plant, New Design for Recovery of Biogas from latrine. Pune: Jyotsna Arogya Prabodhan.
- [37] Khandelwal KC (1998). *Biogas Technology*. Tata McGraw-hill publications.
- [38] CPCB, (1986), Standard of Discharge of Sewage, the Environment (Protection) Rules. India: Ministry of Environment and Forests.
- [39] CPCB (2001). Guidelines for duckweed based wastewater treatment system. Government of India.
- [40] CPCB (2001). Guidelines on Construction, Operation and Application of Root Zone Treatment Systems for the Treatment of Municipal Industrial Waste Water. Government of India
- [41] CPCB (2008). Report on decentralized treatment and recycling of domestic waste water – an integrated approach to water management at Sangamam community- A village model in outskirts of Auroville, Tamil Nadu.
- [42] Mara D (1997). *Design Manual for Waste Stabilization Ponds in India*. Leeds: Lagoon Technology International Ltd
- [43] Jha, P.K.(2005). Recycling and reuse of human excreta from public toilets through biogas generation to improve sanitation, community health, and environment. International Seminar, organized by the Asian and Pacific Centre for Agricultural Engineering and Machinery (APCAEM) and Department of Science, Technology and Education of Ministry of Agriculture, Government of People's Republic of China.
- [44] Jha, P.K (2010). *Sustainable technical options for effective decentralized waste water treatment system*. International Conference on Decentralized Wastewater Treatment Solution in Developing Countries, organized by BORDA and IWA, Surabaya, Indonesia.
- [45] Jha, P.K. (1999). *An apparatus for the manufacture of Compost from biodegradable wastes and method therefore*. Patent SI. No. 011-006948, (2009), Intellectual Property India, Government of India
- [46] Krishnan, S. B., and J. E. Smith (1987). Public health issues of aquatic systems used for wastewater treatment. In Reddy, K. R., and Smith WH eds. *Aquatic plants for water treatment and resource recovery*. Florida: Magnolia. pp. 855-878.
- [47] Ministry of Urban Development (2000). *Manual on municipal solid waste management – CPHEEO*.
- [48] Pandharipande ND (2008). *NADEP method of compost manufacture*. Bio-manure by KVIC Centre for Micro-finance & Livelihood (CML) Resources Centre for Sustainable Development
- [49] Nagavallema et al (2006). Vermicomposting: Recycling Wastes into Valuable Organic Fertilizer. Global Theme on Agrecosystems Report no. 8. Patancheru 502 324, Andhra



- Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 20 pp. August 2006 | Volume 2 | Issue 1
- [50] Ranjith, K.A. (2012). *Sustainable Solid Waste Management in India*. New York: Columbia University.
- [51] Otis RJ and Mara D (1985). *The Design of Small Bore Sewer Systems*. TAG Technical Note No. 14 World Bank, Washington, DC.
- [52] Iqbal S (1999). *Duckweed Aquaculture, Potentials, Possibilities and Limitations, for Combined Wastewater Treatment and, Animal Feed Production in Developing Countries*, EAWAG, SANDEC Report No. 6/99.
- [53] Sasse, L. (1998). *Book on Decentralised Wastewater Treatment in Developing Countries, Bremen Overseas Research and Development Association publication*. Germany.
- [54] Sonavane PG, Munavalli GR, Ranade SV (2008). *Nutrient removal by root zone treatment systems: a review*. J Environ Sci Eng. Jul; 50(3):241-8.
- [55] USAID (2008) *Operations Manual on the Rules and Regulations Governing Domestic Sludge and Septage*. Department of Health of the Philippines.
- [56] Robbins DM (2007). *Septage Management Guide for Local Governments*.
- [57] Malarin H and Vaughan WJ (1997). *An Approach to the Economic Analysis of Solid Waste Disposal Alternatives*. Inter-American Development Bank
- [58] AECOM (January 2010). *A rapid assessment of septage management in Asia policies and practices in India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam*.
- [59] Wateraid (2013). *Urban pit waste management*.
- [60] Ministry of Rural Development (2010). *Provision of Urban Amenities in Rural Areas (PURA) Guidelines*. Gol
- [61] Ministry of Home Affairs (2011). *Some Concepts and Definitions*. Retrieved 3rd December 2013 from http://censusindia.gov.in/2011-prov-results/paper2/data_files/kerala/13-concept-34.pdf.
- [62] Waste or Resource? Indigenous Uses of Cow Dung and Urine in Rural India on this link: <http://live.libraries.psu.edu/Mediasite/Play/dd1b35a72ae0436a8595c9e45e94dabb1d?catalog=8376d4b2-4dd1-457e-a3bf-e4cf9163feda>)
- [63] Ministry of Environment and Forest, Biomedical Waste Management and Handling Rules, 2011.



Appendix 4 Exhaustive list of SLWM roles and responsibilities

Level	State	District	Block	GP	HH
Sector policy and strategy					
▪ Policy formulation					
▪ Strategy preparation					
▪ Legislation and rules					
Planning					
▪ Data collection					
▪ Inventory of SLW facilities					
▪ SLW planning and investment					
▪ Selection of GPs					
Capital finance					
▪ Budgeting/estimating					
▪ Financial planning					
▪ Budget allocation					
▪ Disbursement					
▪ Monitoring expenditure					
Organisation development					
▪ Need assessment					
▪ Staff training and capacity					
▪ Systems and procedures					
Co-ordination					
▪ Intersectoral					
▪ Intrasectoral					
Regulation					
▪ Policy					
▪ Finance					
▪ Design standards and types					
▪ Quality of work					
▪ Environmental impact					
▪ Conflict resolution					
Service development					
▪ Technical assistance					
▪ Procurement					
▪ Infrastructure provision					
Service delivery					
▪ Operation					
▪ Maintenance					
▪ Repair					
▪ Operational finance					
▪ Development of GP capacity					
▪ management					
▪ Support systems					
▪ Recycling market links					
Monitoring & evaluation					
▪ Sector monitoring					
▪ Sector evaluation					
▪ Service performance monitoring					
▪ Service performance evaluation					
▪ Environmental surveillance					
Research & development					
▪ Commissioning					
▪ Undertaking					



Appendix 5 Workshops minutes

Appendix 6 Drafting and implementing a SLWM Plan

GPs should carry out the following activities in order to plan, implement and manage SLWM interventions at GP level. Though the actual interventions would be applicable at village and habitation level, a plan must be prepared for each GP separately. Institutions such as Block, District, Division and State have to clearly define their role and support GPs in preparing these plans. It may also be suitable to identify government, non-government and private agencies and individuals to support the preparation of such plans.

A schematic representation of all the processes and an approach for planning, implementing monitoring and managing SLWM interventions is given in figure 17 and a description of the schemes is presented in the following section.

A. Situational Analysis:

A situational analysis is suggested in order to understand the real situation on the ground, not just in relation to SLWM, but also covering wider aspects of toilet coverage and the situation of SLWM and sanitation in institutional and public settings. Since liquid waste has a direct relation to water supply, it will also be necessary to understand water supply scenarios for effective planning. It is expected that most GPs will have data related to toilet coverage, the type of toilets in use, disposal mechanisms, etc. This data will be useful for designing wastewater and septage management interventions. The situational analysis can include the following;

- **A1- Baseline Survey** – a baseline survey to assess the existing solid and liquid waste situation in the GP is to be conducted by collecting the necessary information from all secondary sources and primary sources as may be required. This should broadly include-
 - Availability and access to physical infrastructure
 - Condition and adequacy of the infrastructure
 - Existing service levels, approaches and methods
 - Financial conditions (sources, availability, aspects related to user fee collection (if any),
 - Existing O & M system including community practices
 - Geography and geological features
 - Role and responsibilities of different stakeholders
 - Demographic details
 - Socio, cultural and gender aspects,
 - Awareness levels, etc.

Since NBA is being already implemented, it is expected that most of the socio economic and toilet related information is available in the GPs.

A2- Collection of supplementary data – once a baseline survey is completed, additional supplementary data as given below shall be collected -

- Data related to toilet coverage, disposal type
 - Availability of landfill site nearby
 - Existing market linkages for solid waste
 - Possibilities for recycling, processing of solid waste
 - Possibility of usage of treated waste water, etc.
 - Existing treatment facilities nearby which could be accessed
 - Role of Private player in the sector
- **A3- Establish links with the existing sanitation system**- exiting sanitation systems (e.g. treatment plants, toilets and latrines, drainage channels etc) need to be linked

with the SLWM plan so that a comprehensive and complete sanitation system can be planned. Since toilet systems have direct links with liquid waste management and septage management, a clear understanding of the existing scenario would make the planning process more effective. Mapping tools (manual or IT based such as GIS based maps) where possible may be used for better planning and implementation. This plan could be called a “GP Environmental Sanitation Plan”.

- **A4- Gaps Analysis-** once a baseline survey is completed and additional data is collected and appropriate links with all aspects of sanitation are made a gap analysis exercise should be conducted to understand gaps in the existing SLWM system specifically and the sanitation system more generally. Community consultations at all appropriate stages are mandatory for understanding real gaps.

An appropriate format for collecting data and information may be developed at State level to ensure uniformity.

B. Options analysis, Technical feasibility;

- **B1- Identify real demand for services-** community consultation may be carried out to understand the real demand for facilities and services so that interventions can be framed accordingly. Once a situational analysis is completed a series of consultations with different stakeholders may be planned to work out different options for managing SLWM effectively. Options analysis should be broad based and should look for options related to
 - Governance
 - Options for methods, approaches and service provision
 - Technology options
 - Options for meeting financial requirements
 - Options for recovery of O & M expenses
 - Options for monitoring
 - Options for achieving sustainability

The best suitable and preferred option may be assessed for technical feasibility and then may be adopted.

- **B2- Identify suitable solutions-** technology, approaches, methods, management models, preferences, etc. should be selected based on local needs, conditions. Suitability and acceptance. Best suited solution may be suggested.
- **B3- Identify manpower, institutions, and partners-** in order to plan and implement SLWM interventions appropriate skilled manpower, institutions and partners along with specific and clear roles they are expected to play has to be identified. If there is a lack of capacity at any level, suitable measures to bridge the capacity gap must also be specified. Since many interventions require not just local solutions but also external support and links, technology etc. appropriate partner/s and institutions have to be identified for possible collaboration and linkages. State, Division and District should support GPs in identifying such institutions and partners and GPs may take a final decision that suits their needs.
- **B4- Finalize technology and approach –** based on the outcomes of the situational analysis and technology and options analysis, appropriate technologies, methods and approaches should be finalized in consultation with all key stakeholders. Communities shall be well aware of the final plan and its components and the role they are expected to play including user fees and other contributions and the type of facilities and services they are expected to get.

C. Identify resources;

- **C1- Identify sources of finance–** all possible sources of finance including Government grants, GPs own funds, user charges, possible contributions by private parties (if any), funds that may be mobilized from different schemes and programmes such as MGNREGA, NRLM, etc, income from possible business opportunities, possibility of employment generation potential, etc have to be clearly

specified. Brief analysis of income versus expenditure may be carried out to ensure that the system suggested is affordable and sustainable.

C2- Identify community willingness to participate and pay for services– it is important to understand how the community responds to proposed interventions and plans. Therefore, their willingness to participate and pay for services should be assessed in order to choose appropriate options, design user fee structures and to adjust finances accordingly. It will be more appropriate to engage the community at the beginning of the planning phase and make the plan more community centred so that they take ownership of and participate in the programme as though it is their own programme. At the same time, the interest of other stakeholders such as local youth groups who may be engaged in providing certain services, private operators etc. must also be identified and encouraged to participate.

GP SLWM Action Plan (GP Environmental Sanitation Plan) – as far as possible the plan should be one integrated plan, covering all aspects of sanitation including toilets at all levels (households, institutions, community and public places) liquid waste, septage, hygiene and solid waste management. Each of the elements of environmental sanitation has to be appropriately covered. Other aspects such as institutional aspects, technology choice, capacity, IEC, governance, management, etc. should also be appropriately covered. It is possible that GPs SLWM plans for a district are prepared together and a uniform approach is adopted keeping GP level variations and needs intact. This is more suitable for certain elements of solid and liquid waste management where local solutions are not possible.

D. Implementation;

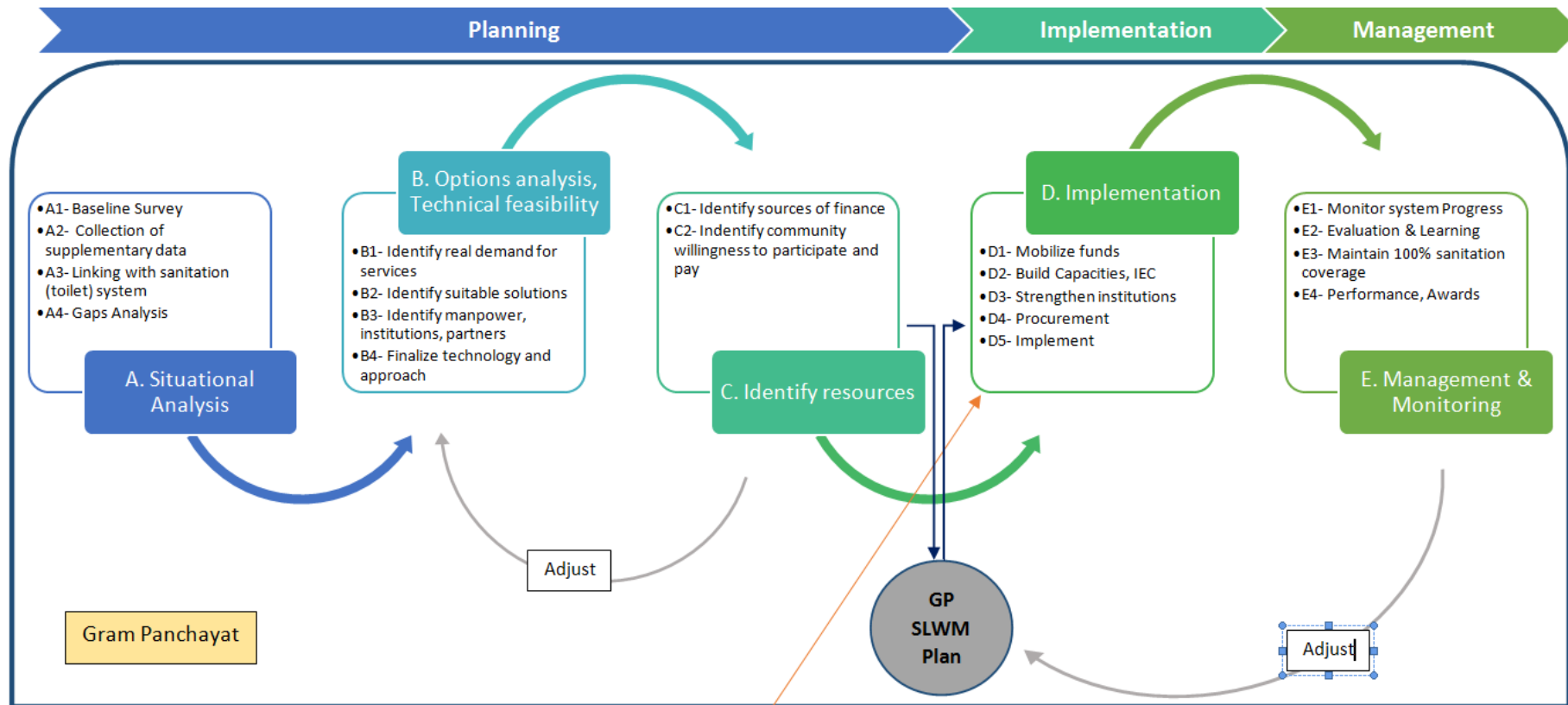
- **D1- Mobilize funds** – finances have to be arranged well in advance at the time of implementation. A realistic financial plan with income and expenditure statements should be prepared. In case of user fees, a collection system should be established to ensure timely and effective collection. A special provision must be made for operation and maintenance of the facilities and for appropriate service provision. Finance Commission grant, user fee, special allocations by State or National Government may also be considered. But whatever the source of funds, they must be assured and reliable.
- **D2- Procurement**– all identified goods and services have to be procured appropriately. Depending on the financial limit of a GP, appropriate levels of interventions/ approvals must be sought. As far as possible locally available technologies and materials should be preferred.
- **D3- Strengthen institutions** – institutional capacities in terms of appropriate and adequate manpower, their skills, infrastructure available, etc. have to be strengthened for effective implementation. It is possible that strengths of other schemes and programmes are mobilized to strengthen the institutional capacities. Programmes such as NRLM and MGNREGA may be effectively converged for this purpose.
- **D4- Build Capacities, IEC**– staff capacity at all levels must be built for effective programme implementation. At the same time different IEC tools must be used to generate awareness amongst all stakeholders.
- **D5- Implement** – once all essential parameters are in place, implementation may be initiated as per the action plan. Various activities may be implemented by identifying different technical implementers and service providers by following the norms and rules already laid out.

E. Management & Monitoring



- **E1- Monitoring the system Progress** – for effective programme implementation and service delivery, regular monitoring mechanisms must be in place. Community monitoring mechanisms may also be explored. Tools such as a customer's complaints and a complaint redress system may also be established as required. Some minimum expected service levels may be defined in order to measure the levels of services received against the expected service levels and standards.
- **E2- Evaluation & Learning** – periodic evaluation is necessary to ensure that the programme is meeting expected objectives. Based on the Learning from periodic monitoring and evaluations, adjustments may be made to the plan as required. Such adjustments have to be undertaken after the necessary approval, consultations and feasibility have been established. It is expected that any such adjustment is updated in the original SLWM plan. Therefore, the SLWM plan may be a dynamic document which can be revised as and when required and can be updated from time to time.
- **E3- Maintain 100% sanitation and SLWM coverage** – it is important to achieve 100% sanitation and SLWM coverage to achieve health, economic and environmental benefits and to ensure sustainability of the system. Therefore 100% coverage has to be achieved and maintained and upgraded as required. Appropriate provisions must be made to expand levels of services in future to ensure that population growth and village expansion and similar factors are taken into consideration.
- **E4- Performance, Awards** – Achievements and performance may be compared with other better performing GPs which keeps the competition going and provides an impetus to improve performance. GPs should always aim to win State and National level awards to keep themselves updated and perform better. However, winning awards need not be the top objective; service provision to all citizens has to be the top priority.

State and District authorities may provide technical support and guidance while preparing, implementing and managing the plans. It may also be possible that SLWM Plans for all GPs within a district are prepared at the same time by selecting appropriate technical agencies following established procurement norms. Similarly, stringent monitoring mechanisms may be practiced at Block, District and State level for ensuring sustainable outcomes.



Technical Support				Financial Support			Monitoring & management			
State	District	Block	Private	GP	Government	User, other (private)	State	Division	District	Block
<ul style="list-style-type: none"> – Technical support from all possible levels. – State may develop/ adopt/ identify technologies that are suitable to the needs and requirement of the different geographical regions in the State. – District and block level technical staff may provide direct support in preparing and implementing the SLWM plan – Expertise from market/ private players may be mobilized 				<ul style="list-style-type: none"> – Different sources of finance to meet capital cost and O & M cost shall be mobilized from different sources – Government grant (including finance commission grant), GPs own fund, user fee, private sector finance, etc may be explored 			<ul style="list-style-type: none"> – State – overall monitoring and management framework should be established. Periodic monitoring by state level staff – Division, district and block– monitoring all aspects of SLWM interventions – Community – community monitoring may be explored and established where possible 			

Figure 17: Schematic flow of different processes for developing and implementing a GP level SLWM Plan