Solid and Liquid Waste Management in Rural Areas

Introduction

Water, sanitation, and hygiene (WASH) directly impact human health and have far reaching consequences when ignored. India is one of the fastest developing economies, but when it comes to WASH indicators, it continues to lag behind. With a population of over 1.2 billion, there is a mounting and urgent need to address sanitation.

Solid and Liquid Waste Management[1] (SLWM) is one of the key components of Swachh Bharat Mission (SBM) (G), launched with the objective of bringing improvement in cleanliness, hygiene and the general quality of life in rural areas. This document presents a basic, quick introduction to Solid Liquid Waste Management (SLWM) in rural areas. The document is geared, particularly for district administrators to help focus on SLWM along with Open Defecation Free (ODF) activities.

1. What is Waste?

Waste is any item beyond use in its current form and discarded as unwanted. It can be solid or liquid with respective management methods.

1.1 Solid Waste

In rural areas, examples of solid waste include wastes from kitchens, gardens, cattle sheds, agriculture, and materials such as metal, paper, plastic, cloth, and so on. They are organic and inorganic materials with no remaining economic value to the owner produced by homes, commercial and industrial establishments.

Manual Segregation of Waste. Photo: Ministry of Drinking Water and Sanitation (MDWS)

Most household waste in rural areas is organic, with little inorganic material, and is non-toxic. Because of its environment-friendliness, composting is a highly suitable method of waste management in rural areas.

[1] SLWM is the collection, transportation, processing, recycling, treatment, and disposal of waste material in a scientific manner.

1.2 Liquid Waste

When water is used once and is no longer fit for human consumption or any other use, it is considered to be liquid waste. Wastewater can be subcategorised as industrial and domestic:

- Industrial wastewater is generated by manufacturing processes and is difficult to treat.
- Domestic wastewater includes water discharged from homes, commercial complexes, hotels, and educational institutions.

2. SLWM under SBM Guidelines[2]

SBM focuses on generating awareness and providing community managed sanitation systems. To implement SLWM initiatives economically and efficiently, ownership at grass root level and community involvement at all stages is critical.

Information, Education, and Communication (IEC) interventions should focus on SLWM to create a demand for a sustainable system. This must lead to setting up systems for waste disposal in such a way that it has tangible impact on the population. The community/Gram Panchayat (GP) has to be encouraged to come forward and demand such a system, which they can subsequently operate and maintain.

Awareness and education campaigns should aim for panchayat officials, elected representatives, schools, non-governmental organisations (NGOs) working in villages, shop keepers, families, and general public.

ompost Pits being inaugurated (Madurai District, Tamil Nadu). Photo: MDWS

The GP functionaries would be responsible for design, implementation, operation and maintenance (O&M) of SLWM systems with support from respective state governments. Mechanisms for involving third parties in construction and management activities under GP and community supervision can be explored. In such cases, absolute clarity in the roles and responsibilities of various stakeholders in managing SLWM systems is a must. Community contribution and appropriate user charges for sustainable SLWM initiatives are also desirable.

[2]Ministry of Drinking Water and Sanitation, Government of India (2014) Swachh Bharat Mission (Gramin) Guidelines. [online], available at: http://www.mdws.gov.in/sites/default/files/SwachBharatGuidlines.pdf (accessed 7 September 2016)

3. Institutional Arrangements for SLWM

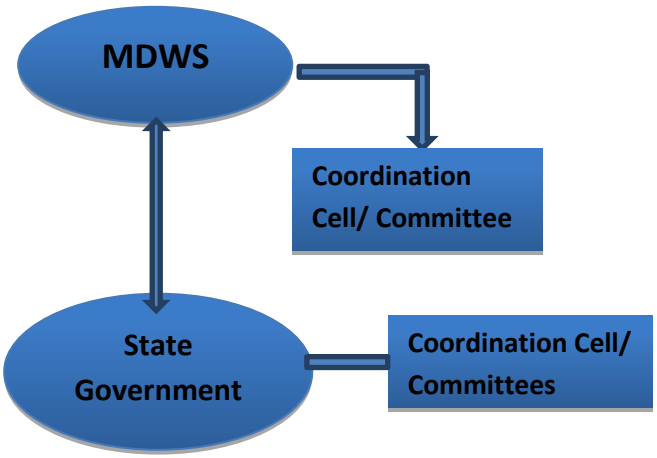
- SLWM resource team at state level: states should decide on technologies suitable to their areas.
- SLWM resource team at district level.
- Explore the need for qualified persons at GP for O&M and enable GP to make provisions.
- Involve Self Help Groups (SHGs), other community groups, and private sector / entrepreneurs for SLWM as a 'Village Level Sanitarian' (service provider)
- Enable basic monitoring/recording systems at GP level for indicators identified through SBM (G).

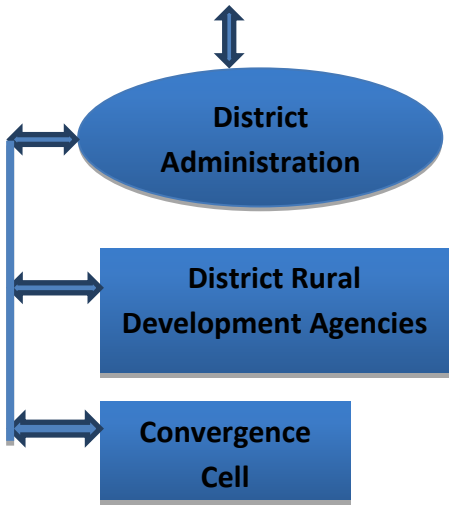
Table 1: Actors in rural SLWM

Level	Organisation
State	Public Health Engineering Department
	Water Supply and Sanitation Department
	Communication and Capacity Development Unit
	Panchayati Raj and Rural Development Department
	Tribal Development Department
	State Pollution Control Board
District	Zila Panchayat
	SBM (G) Cell
	NGOs
	Private sector
Block	Block Development Officer
	Panchayat Raj Public Works
	Block Resource Centre
	NGOs
	Private sector
GP	Gram Sevak/Sachiv
	Panchayat Development Office
	Community based organisations
	SHGs
	Private sector/entrepreneurs
	Households

Source: Ministry of Drinking Water and Sanitation and Asian Development Bank (2014) Guidelines on Solid and Liquid Waste Management (SLWM) in Rural Areas. Government of India.

Figure 1: Suggested framework for convergence & coordination





Source: Ministry of Drinking Water and Sanitation and Asian Development Bank (2014) Guidelines on Solid and Liquid Waste Management (SLWM) in Rural Areas. Government of India

All GPs are to be targeted for coverage with an SLWM project. SLWM projects for each GP should be part of Annual Implementation Plan (AIP) of a district. The AIP should be approved by State Level Scheme Sanctioning Committee. Each individual SLWM project may be approved at the District Water and Sanitation Committee (DWSC) level according to the technical and financial rules of the individual states. Every state should have at least one SLWM consultant at the state level and one SLWM consultant in each District Water and Sanitation Mission (DWSM)/DWSC to guide preparations for SLWM projects). Professional agencies/NGOs may be sought to prepare, develop, test and implement such projects. Costs payable to such agencies may be made a part of the project cost itself.

4. Funding

Under SBM (G), assistance for SLWM projects is based on the total number of households within a GP. Table 2 outlines the maximum permissible costs.

Table 2: Funding under SBM (G)

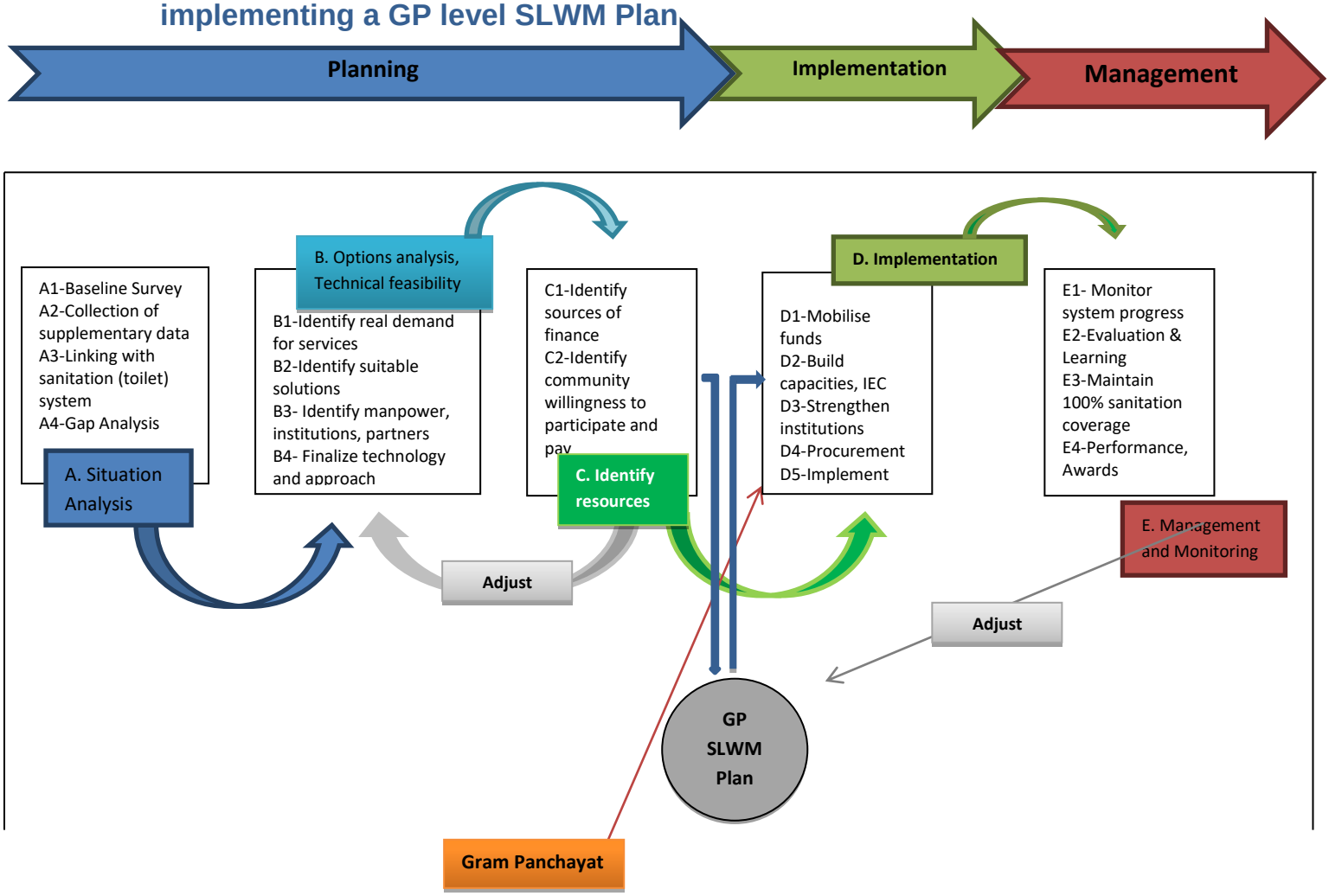
Maximum Permissible Funds for SLWM (SBM)	Number of households in the GP
INR 7 lakh	< 150 households
INR12 lakh	< 300 households
INR 15 lakh	< 500 households
INR 20 lakh	> 500 households

Source: Ministry of Drinking Water and Sanitation, Government of India (2014) Swachh Bharat Mission (Gramin) Guidelines. [Online], available at: http://www.mdws.gov.in/sites/default/files/SwachBharatGuidlines.pdf (accessed 8 September 2016)

Funds for SLWM project under SBM (G) are provided by central and state governments, which if required, can be supplemented by dovetailing funds from other programmes and sources like Mahatma Gandhi National Rural Employment Guarantee Scheme(MGNREGS), Member of Parliament Local Area Development scheme (MPLADS), Member of Legislative Assembly Local Area Development scheme (MLALADS)funds, Finance Commission funds, Corporate Social

Responsibility contribution, Swachh Bharat Kosh (SBK), donor funding, programmes of other ministries and departments, etc. Maintenance costs for the first five years of operation may be made part of the project cost.

Figure 2: Schematic flow of different processes for developing and implementing a GP level SLWM Plan



Technical Support				Financial Support			Monitoring & Management			
State	District	Block	Private	GP	Government	User, other (private)	State	Division	District	Block
- 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 mobilised.				- Different sources of finance to meet capital cost. O&M costs shall be mobilised from different sources - Government grants (including finance commission grant), GPs own fund, user fee, private sector finance, etc. may be explored.			- 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.			

Source: Ministry of Drinking Water and Sanitation and Asian Development Bank (2014) Guidelines on Solid and Liquid Waste Management (SLWM) in Rural Areas. Government of India

5. Criteria for Selection of Technology

- Availability of space near houses and housing pattern.
- Geophysical condition of the village including topography, soil structure and ground water conditions.
- Sources and pattern of water supply (individual / public).
- Availability of common space in and around the village.
- Economic status and human resources available with the GP.

Vending Machines for Sanitary Pads

Table 3: Solid waste management: Composting Methods

Technology	Description	Advantages	Disadvantages	Conditions for use
NADEP method	Composting takes place in a rectangular brick tank with aeration holes. Organic material is added in layers and compost is ready in almost 3 months	Composting can be done on a larger scale than using piles. All nutrients are retained in the tank so resulting compost is more nutrient rich.	Tanks work in 3 month rotations so at least 2 are needed which increases the cost. Large quantities of soil and water are needed which can be difficult to transport in some areas. The entire tank should be filled within a maximum 48 hour period (24hrs is better).	Tanks can be built in all conditions. The thatch roof protects the tank from moisture. Tank should be monitored to check for cracking of seal which would allow moisture to escape. 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.
Bangalore method	Waste is composted anaerobically in a pit. Compost is ready in 6-8 months	Can accept municipal waste and night soil. Good for dry areas and no O+M is needed	Cannot be used in wet areas as the pit may become waterlogged. Gases produced can smell and the pit requires quite a large space. Composting process is slow	Useful in areas where the use of piles is limited by severe weather conditions e.g. strong winds and sun. Can be done at the household level where space permits as no O+M is required. Very cheap compared to tank methods as no infrastructure is required
Indore method	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.
Vermicomposting	Composting using a specific species of worms to break down waste Compost is ready in 3-4 months but	More efficient than normal composting and produces richer compost.	Needs a vermitank or verminbed and worms need to be bought or grown which increases cost Needs more O+M than normal	Worms' optimal temperature range is 15-35 degrees Celsius. Lower temperatures hamper reproduction and

	compost must be removed in stages as the worms process it		composting to keep the worms alive.	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.
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 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.		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.	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. Stoves, cookers or lamps must be converted to accept biogas but the gas itself burns without odour.

Source: Ministry of Drinking Water and Sanitation and Asian Development Bank (2014) Guidelines on Solid and Liquid Waste Management (SLWM) in Rural Areas. Government of India

Note: For details on the above methods, refer

1. Ministry of Drinking Water and Sanitation, Swachh Bharat Mission (Gramin). (2015) Technological options for solid and liquid waste management in rural areas[3]. Government of India.
2. Ministry of Drinking Water and Sanitation, Swachh Bharat Mission (Gramin) (2015). Source book on solid and liquid waste management in rural areas[4]. Government of India

[3]Ministry of Drinking Water and Sanitation, Swachh Bharat Mission (Gramin). (2015). Technological Options for Solid and Liquid Waste Management in Rural Areas. Government of India. [online], available: http://www.mdws.gov.in/sites/default/files/Solid_and_Liquid_Waste_%28E%29.pdf (accessed 8 September 2016)

[4]http://www.mdws.gov.in/sites/default/files/Source_Book_English.pdf

Table 4: Liquid waste management: Wastewater Treatment Technologies

Technology	Whether Natural or Built	Aerobic/ Anaerobic/ Mixed	Expected effluent quality (low, medium, high)	Area Requirement (m^2/person)	Power requirement kWh/ person/ year	Prevalence in India
Waste Stabilisation Pond System	Natural	Mixed	Medium to High	2.0–3.0	Nil	All over India
Duckweed Pond System	Natural	Aerobic	Medium to High	2.5–6.0	Nil	Greater number in the state of Punjab
Constructed Wetland	Natural	Aerobic	Medium	1.5–2.5	Nil	Less Implementation experience in India
Upflow Anaerobic Sludge Blanket	Built	Anaerobic	Low	0.1–0.2	Only for pumping	All over India in urban areas, but very less experience in rural areas
Anaerobic Baffled Filter	Built	Anaerobic	Low	0.2–0.4	Nil	All over India
Package Aeration System	Built	Mixed	High	0.1–0.15	20–30	All over India
Extended Aeration System	Built	Aerobic	High	0.1–0.2	15–25	All over India
Sequencing Batch Reactor System	Built	Aerobic	Very High	0.05–0.1	10–20	All over India
Soil Bio Technology	Natural	Aerobic	Very High	0.021	40–50 kWh/MLD to pump wastewater for distribution across the reactor bed	All over India

Note: For details on the above methods, refer

3. Ministry of Drinking Water and Sanitation, Swachh Bharat Mission (Gramin). (2015)Technological options for solid and liquid waste management in rural areas[5]. Government of India.
4. Ministry of Drinking Water and Sanitation, Swachh Bharat Mission (Gramin) (2015). Source book on solid and liquid waste management in rural areas[6]. Government of India

5 [5]available: http://www.mdws.gov.in/sites/default/files/Solid_and_Liquid_Waste_%28E%29.pdf (accessed 8 September 2016)

[6]http://www.mdws.gov.in/sites/default/files/Source_Book_English.pdf

6. Village Swachhtha Index

Government of India has developed a detailed statistical analysis to identify factors that may be necessary for measuring cleanliness across India in order to raise awareness about cleanliness and to instil a sense of competitiveness amongst villages, GPs, Blocks, Districts and States. Based on several consultations with states and experts and a large survey involving over 70,000 households in 75 districts across the country, Cleanliness Index and SLWM index have been defined.

Cleanliness index captures the overall cleanliness of a village including village households which have access to and are using safe toilets and environmental friendliness. SLWM index captures environmental friendliness as evidenced by absence of litter around houses and public places and no stagnant water around households. SLWM index is derived out of Cleanliness index as per the following:

Village Cleanliness Index (C) is defined as C = 0.4*X1 + 0.3*X2 + 0.1*X3 + 0.2*X4

In addition, Village SLWM Index is defined as S = 0.5*X2 + 0.17*X3 + 0.33*X4 where,

X1 = % of households having access to safe sanitation
X2 = % of households having no litter around them
X3 = % of households having no stagnant waste water around them
X4 = % level of litter free around public places

Gram Sabhas are responsible to estimate the various factors defined above that comprises the cleanliness index. SBM (G) implementing authorities at the GP/Block/District level are required to upload the information on the MIS. Once uploaded, the system will calculate and display the Cleanliness Index and SLWM Index scores as per the formula developed.

An independent verification process will be arranged by the Government of India to find out state level estimates of villages that lie above a certain level of SLWM index for incentivisation of states. GoI proposes to use same factors to allow members of the public to rate the cleanliness levels of villages through MDWS website or a mobile application. This will also provide an independent citizens' rating about the cleanliness of villages.

7. Frequently Asked Questions on SLWM

Box 1: FAQs (SLWM)

Q. How does one create awareness among people on the need for SLWM and health impacts in absence of it?
A. IEC campaigns can be an important way to generate awareness about proper SLWM and its positive impacts.

Q. How does one overcome gaps in state level policy and programme support?
A. This challenge may be overcome through enhanced emphasis on SLWM in policies, and also by devising and implementing state specific policy actions.

Q. What are the different ways to build SLWM capacity on ground levels?
A. This can be done by facilitating trainings for district and state level functionaries on latest technologies and developing institutional capacity on technical, financial, institutional and social aspects along with creating financial capacity at local grass root levels.

Q. How does one select appropriate technology?

A. To ensure appropriate technology selection, information on SLWM technologies needs to be disseminated to grass root functionaries, and parameters in selecting technology need to be identified in assisting GPs, suitable to their living context. Also, pilot projects should be developed for implementing SLWM solutions through NGOs or private operators, and learnings should be shared.

Q. What should be the SLWM implementation model?
A. A decentralised approach with active participation of people at all stages of waste management from the point of generation to its final disposal, treatment and reuse should be adopted.

Q. How does one overcome the challenge of limited financial resources?
A. Efforts should be made to explore sources of finance such as SBK or Public Private Partnerships, MLA or MP funds, MGNREGS fund, cess on services, 14th Finance commission, etc. Also, there is a possibility to tap potential investments from NGOs, state advanced training institutes, technical institutions of the state, support to GPs from technical departments of the state, twining arrangements and exposure visits. Other solutions to meet project related financial needs includes leveraging private sector CSR funds for SLWM initiatives, engaging with financial intermediaries to develop appropriate financial products. To ensure project cost control, it is essential for GPs to evaluate technologies from a long term perspective and charge user fees.

Q. How does one ensure proper O&M of SLWM projects?
A. At household levels, the criticality of O&M should be emphasised with a thrust on participatory methods to mobilise communities and charge user fees.

8. Case Studies

Case Study 1: Seechewal Model of Waste Management in Punjab

Sant Balbir Singh, known for his tremendous efforts to safeguard the environment in Punjab, has been honoured by Parliament of Canada, Copenhagen Calendar in Denmark, Time Magazine Hero of the Environment, SAARC Environment 2010, etc.

A. Liquid Waste Management

Kali Bein, a 160 km long tributary of the Beas River, which is the life-line of the Doaba region, got polluted due to population explosion and excessive urbanisation. Sant Seechewal started work for the revival and renovation of the river on 29 July 2000. During Kar Sewa, a thick layer of silt was removed from the river as a result of which the underground water levels in Sultanpur Lodhi area rose by a metre. Treated water from Sultanpur Lodhi is used in agriculture which has augmented production. The river banks have been fixed with stones and boulders, old trees have been preserved while new one shave been planted on the sides of the roads.

B. Solid Waste Management

Solid waste from the water treatment plant in Jalandhar city is being reused in preparation of plant nurseries. Plants from this nursery are distributed at no cost to nearby towns and villages. Through these efforts, the surroundings of Sultanpur Lodhi have turned into green belt area.

C. Eco-Friendly Sewerage System

Seechewal also introduced a low-cost, an easy to install efficient sewerage system in many villages and towns of Punjab. Through the system, the dirty sewage water of a village or town is collected in one or more ponds. The collected municipal water, which is polluted but not toxic is treated by simple methods of screening, filtration, sedimentation, rotation, etc. and made environmentally acceptable and reusable for different purposes. A low-cost water treatment plant has been constructed at Dasuya town in Hoshiarpur district. In Chakar village, Seechewal with the help of funding from Non Resident Indians installed a sewerage system. The treated water supplied via underground pipelines is used for crop irrigation. This has given relief to farmers by reducing the cost of agriculture production and enhancing crop yield besides paving the way for the adoption of organic farming. These efforts have turned the dirty ponds in the village into beautiful lakes.

D. Awareness Campaigns

There have been initiatives undertaken to generate awareness amongst people like organizing an Awareness March against toxic effluents polluting natural water resources in 2009, enlightening people on the fatal effects of toxic waters, leading a people's movement against water polluting industrial units of central Punjab, use of mass and social media to create public awareness, etc.

Case Study 2: Establishment of Solid Waste Management Systems in Rural Tamil Nadu

In Tamil Nadu, MGNREGS workers are engaged as *Thooimai Kaavalars*(=Environment Protectors) in solid waste management (SWM) activities. One *Thooimai Kaavalar* takes care of 150 households in selected 9,000 village Panchayats. The SWM activities in the state involve:

- Door-to-door collection, weighing and segregation of waste
- Dumping of biodegradable waste into compost, and non-biodegradable, non-recyclable waste into landfill site.
- Sale of recyclable waste to scrap merchants.

Various provisions are made to ensure proper SWM in the state involving excavation of compost pits under MGNREGS. There are three pits for each cluster: two for bio-degradable waste and one for non-biodegradable waste with one *Kaavalar* assigned for 150 households and one supervisor responsible for every cluster. Payment of wages is done on the MGNREGS wage rate (INR 203) with separate rural schedule of worker rate based on special time. The role and responsibilities of *Kaavalars*, worksite supervisor and VPRC (nodal agency) is clearly specified to ensure clarity and completion of tasks on time. In 2015–16, modifications were made to provide infrastructure in SWM VPs like a tricycle for every 300 households, provision of jacket, gloves, cap, etc. to ensure safety of kaavalars, segregation cum storage shed, usage of cleaning implements such as brooms, aluminium basket, spade, long handle steel fork, scrapper, first aid kit, etc.

SWM activities in Madurai District, Madurai West Block Chathrapatti Panchayat. Photo: MDWS

SWM activities in Madurai District, Tiruparankundram Block Achampatti Panchayat. Photo: MDWS

Nominal Muster Roll (NMR) is designed for one week where a provision is given to enter the district, block, panchayat and habitation name, type of population (densely/sparsely), number of households in the habitation, names of Kaavalars, job card number, quantity of waste collected, certificate of work site supervisor regarding entries made in NMR, acknowledgment of households whether the waste is collected or not, certificate of VP president and ward members regarding the job done by Kaavalars, payment details etc.

In Tamil Nadu, another major initiative to ensure better waste management has been online reporting of SWM activities. In terms of revenue generation, around Rs.10.69 lakh has been realised by SWM panchayats through sale of 1.07 lakh kg of compost and Rs.28.07 lakh through the sale of 11.49 lakh kg of recyclable waste.

Case Study 3: Solid Waste Management in Sikkim

After attaining Nirmal Rajya in 2008, the focus shifted to SLWM in the state of Sikkim. A pool of resource persons on waste management was created by conducting trainings in all the four districts. Zero waste concept has been adopted for waste management across the state. There have been various initiatives undertaken in the state related to SLWM, specifically on usage of disposable items and bringing about behaviour change among people. Some measures are:

- Ban on usage of plastic carry bags throughout the state.
- Throwing garbage into streams has been made punishable.
- Ban on use of disposables in departmental meetings and during religious functions.
- Promoting school sanitation and hygiene education.
- Installation of vending machines and disposers for sanitary napkins launched in 2011.
- GREENATHON: cleaning up garbage as the participants walk along a street. The CLEANATHON, Which is the regular cleanliness drive of offices, schools, and public places, is changing the face of dirty areas.
- A monthly cleanliness drive is observed in offices on every second Saturday of a month.
- Generating money from activities surrounding waste such as selfie with garbage, walkathon, etc.

In Mellidara, South Sikkim, with financial assistance from Nirmal Gram Puraskar (NGP), the gram panchayat constructed the Resource Recovery Centre (RRC) and also purchased a resource recovery vehicle (RRV) from its own resources. The project is sustained by collecting fees from the users, involves segregating waste at community level, composting of bio-degradable waste using Effective Micro-organisms (EM) with non-biodegradable waste being segregated component-wise and then sold in the market.

Under Namthang SWM Project, a motorised vehicle is used as RRV, pucca structure as RRC, source segregation and composting using EM takes place. Gerethang is the first GP in the state to ban the use and sale of Styrofoam disposables which has reduced the waste to a great extent. Gurudongmar Lake, a popular tourist spot, used to face garbage mostly consisting of packaged drinking water. A local NGO named Lachen Tourism Development Committee introduced the concept of zero waste, and with support of Dzumsa (= a self-governing, democratic, traditional administrative wing in Lachen and Lachung), has now banned the sale and entry of packaged drinking water which greatly reduced the amount of waste around the area. As an alternative, water filters are provided in hotels and shops for clean drinking water. Due to these efforts, the three water sources in Lachen (the entry point of Gurudongmar) have become fit for consumption directly from the tap.

Case Study 4: Zero Waste Management in Vellore, Tamil Nadu

In year 2000, Exnora Green Cross (supported by UNICEF) initiated a pilot Zero Waste Management (ZWM) project in a ward of Vellore municipality. The project was piloted in rural areas of Kaniyampadi block under the TSC in 2002 and DRDA provided funds for construction of sheds, purchase of tricycles and tools and ensured the support of local bodies.

A project team comprising a coordinator, supervisors and street beautifiers was formed for each village Panchayat. Village residents were explained the concept of ZWM and each household was provided with a set of red and green dust bins for organic and inorganic waste collection. Teams with two trained street beautifiers each were formed for every 300 households and were provided a tricycle with coloured bins and a set of hand tools.

The waste collected was brought to the zero waste centre from where the inorganic waste was packed and sold to local waste collectors and recyclers every month and mixed waste (10-15 percent) which could not be recycled, was sent to landfills. The organic waste collected from the households was composted and treated through:

- Cattle dung/bio-dung composting
- Vermi-composting and the resulting rich compost was then packed for agricultural purposes and afforestation activities

IEC activities in Vellore District. Photo: MDWS

Secondary Segregation of inorganic resources. Photo: MDWS

The Vellore solid waste management project is now managed by village panchayats supported by Residential Welfare Associations and SHGs. Every family pays Rs 20 and each shop Rs 50 as waste collection charge. The user charges collected are used for paying the street beautifiers and supervisors. Gandhi Nagar village Panchayat generated an income of Rs 10,646 during the financial year 2005-06 by selling organic waste and Rs 1,62,289 from inorganic waste.

There were several factors which made the implementation of ZWM successful. Some of the critical ones being informed communities willing to pay for a clean environment along with microenterprise opportunities for rural youth. Local youth took pride in beautifying their streets and got paid for it with full support and involvement of local bodies.