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**THE HON'BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI
ORIGINAL APPLICATION NO. 199 OF 2014**

IN THE MATTER OF:-
Almitra H Patel & Anr.

....Petitioners

versus

Union of India & Ors.

....Respondents

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Filed by

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COUNTER AFFIDAVIT ON BEHALF OF THE STATE OF SIKKIM

I, Ashwani Kumar Chand, Special Resident Commissioner,
Government of Sikkim, Sikkim House, Chanakayapuri, New Delhi,
do hereby solemnly affirm and state as under:

1. That the present affidavit is being filed in response to the comments of the Central Pollution Control Board dated 12.06.2017 on the Action Plan filed by the State of Sikkim and on the basis of the instructions received from the Urban Development & Housing Department, Government of Sikkim, Gangtok, Sikkim.
2. That the issue-wise response to the comments of the Central Pollution Control Board are as under:
 - A. Comment 1: MSW plan for Sikkim is required to be revised as per SWM Rules, 2016 and implemented setting time targets

Response: It is humbly submitted that the MSW Plan is a generic plan for Solid Waste Management (SMW) which was formulated in February, 2015 prior to the notification of the SWM Rules 2016. After the notification of the SWM Rules, 2016, Detailed Project Reports (DPR) have been designed for each Urban Local Body (ULB) in the State of Sikkim. The DPR will serve as a more detailed supplement to the MSW Plan. The technologies and strategies to be adopted in the State of Sikkim for proper Solid Waste Management are detailed in the DPRs. For illustration, a true copy of the DPR for Solid Waste Management in Rangpo is annexed hereto and marked as **Annexure R-1**.

Further, as mandated under SWM Rules 2016, a State Waste Policy is also being formulated. Government approval for the same has been obtained. The 1st and 2nd Stakeholders meet involving line departments has already been conducted and communities are constituted.

- B. Comment 2:** Waste generation to be assessed based on actual basis covering village panchayats levels and visiting tourists .

Response: It is humbly submitted that waste generation has been assessed on actual basis only. The visiting

tourists have also been covered and included in the population projection which would give the actual waste generation. This data is reflected in Table 3.2 of all the Detailed Project Reports. However, waste generation at the village panchayat level is under the jurisdiction of Swachh Bharat Mission (Gramin) running under Rural Management Development Department, Government of Sikkim.

- C. **Comment 3: Waste characterization and composition to be studied**

Response: It is humbly submitted that waste characterization and composition has already been studied and the results have been published in Table 3.7 of all the DPRs for all the 7 ULBs in the State of Sikkim. Further, characterization will be taken up minutely during formulation of the State Waste Policy.

- D. **Comment 4: Landfill sites for Regional clusters to be identified for better management of Solid waste in the state**

Response: It is humbly submitted that landfill sites have already been identified for all the four districts in the State of Sikkim, namely, Martam and Basmei (East

District), Shipsu (South & West District) and Ringdang (North District).

- E. **Comment 5: Segregated collection of waste from door step is proposed; but segregated transportation also to be ensured**

Response: It is humbly submitted that segregated collection of waste had been launched on 5th June in all the. Segregated transportation is being ensured through collection of wet waste and dry waste on separate days in a few wards. The decision on "*which day-which waste*" is under the discretion of the ward-wise waste collection agencies and it has been ensured that the public is being properly sensitized with regard to the said routine.

- F. **Comment 6: Material recovery facility (MRF) may be adopted for maximizing resource recovery**

Response: It is humbly submitted that in every DPR, Resource Recovery Centre (Waste Collection Centre) and EcoBank have been already provided.

The DPRs have already been appraised as well as approved and are being implemented in all the ULBs. However, it is relevant to mention that it is the discretion

of the ULB in-charge to construct a RCC (WCC) or Eco-Bank, which will serve as a Material Recovery Centre.

Further, it is submitted that in the Gyalshing Municipal Council, a RCC (WCC) is nearing completion.

- G. **Comment 7: State policy need to support composting activities like incentive, marketing, concessions, rebates, etc.**

Response: The State Waste Policy is in the process of formulation.

- H. **Comment 8: Proper mechanism (CCTV/vigilance) to be planned for prevention of waste burning or throwing, littering, etc.**

Response: It is humbly submitted that awareness on the issue is being imparted during IEC programmes.

Further in the State of Sikkim, burning of agricultural waste, leaves, litter, paper wastes and garbage is prohibited. A true copy of the Notification No.196/FEWMD dated 05.01.2015 is being annexed hereto and marked as **Annexure R-2**.

It is submitted that with regard to vigilance through CCTV, a joint effort with Rural Management

Development Department, Government of Sikkim is being undertaken.

- I. **Comment 9: Byelaws to be framed for user fee, tipping fee, spot fine, etc.**

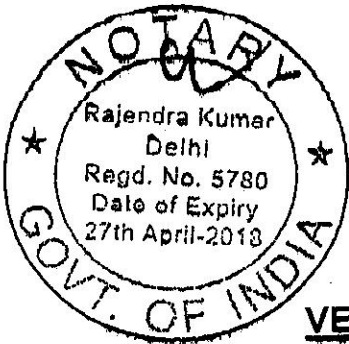
Response: It humbly submitted that the bye-laws have been framed and notified in the State of Sikkim. True copies of the User-charge Notifications dated 16.03.2017 and 21.04.2017 are annexed hereto and marked as **Annexure R-3 and R-4** respectively.

- J. **Comment 10: Local authorities need to be strengthen with resources, budgetary provisions, tools/ tackles, training, awareness program, etc.**

Response: Strengthening of Local authorities/ULBs is an ongoing process. Budget allocation under SBM (U) is being regularly transferred to the ULBs as and when it is transferred to the State Mission Directorate. Resources and tools can be acquired with the budget allocated to the local authorities. Training and awareness programs are being conducted in all the ULBs of Sikkim.

- K. **Comment 11: Bulk generators be asked to handover segregated waste or manage within their premises as far as possible**

Response: It is humbly submitted that the segregation of waste is mandatory across the State of Sikkim. The proposal regarding decentralized management of waste within the premises of Bulk generators is pending consideration. It is further submitted that organic waste convertor has been installed in the vegetable market of Gangtok Municipal Corporation. Additionally, a Bio-methanation plant is proposed to be installed inside the campus of a Government Girls School at Gyalshing Municipal Council as well as at NayaBazar-Jorethang Municipal Council.



DEPONENT

Ashwani Kumar Chand, IPS
Special Resident Commissioner
Government of Sikkim
Sikkim House, 12, Panchsheel Marg,
Chanakypuri, New Delhi-110 021

VERIFICATION:

I, Ashwani Kumar Chand, the above named deponent, do hereby verify that the contents of paras 1 to 2 of the above affidavit are true and correct to the best of my knowledge and belief as derived from the records, no part thereof is false and nothing material has been concealed therefrom.

DEPONENT

CERTIFIED THAT THE CONTENTS EXPLAINED TO THE DEPONENT EXECUTANT WHO IS SEEMED PERFECT TO UNDERSTAND & AFFIRMED DEPOSED BEFORE ME AT DELHI ON..... IDENTIFIED BY.....
06 JULY 2017
IDENTIFIED BY THE EXECUTANT / DEPONENT WHO HAS SIGNED IN MY PRESENCE

RAJENDRA KUMAR, NOTARY, Reg. No. 5780
F No.-5(486)
EMPOWERED TO ADMINISTER THE
SECTION 139 OF CPC 1908
SECTION 207 OF CRPC 1973
DELHI HIGH COURT RULES 1967
PART-4, CHAPTER XVIII-227
EVIDENCE BY AFFIDAVIT BEFORE NOTARY
SUPREME COURT RULES, 2013

Verified at New Delhi on this the 6th day of July 2017
ATTESTED
RAJENDRA KUMAR
NOTARY, DELHI-R-5780
GOVERNMENT OF INDIA

Ph. 0212491892
9899448209

Ashwani Kumar Chand, IPS
Special Resident Commissioner
Government of Sikkim
Sikkim House, 12, Panchsheel Marg,
Chanakypuri, New Delhi-110 021

ANNEXURE R-1

Swachh Bharat Project , Sikkim(Urban)

Draft Final Report, Rangpo

Director, Swachh Bharat Mission
Urban Development and Housing Department,
Government of Sikkim

Swachh Bharat Project for Sikkim (Urban)

DETAILED PROJECT REPORT

Volume 1 – Solid Waste Management Project for Rangpo,

DECEMBER 2015

Prepared By:

Infrastructure Development & Engineering Associated Services (IDEAS)
Design Consultant,
Bangalore, Karnataka

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ABBREVIATIONS

ADB	-	Asian Development Bank
CPCB	-	Central Pollution Control Board
CSP	-	Country Strategy and Program
FY	-	Fiscal Year
GoS	-	Government of Sikkim
GoI	-	Government of India
HPC	-	High Power Committee
ICB	-	International Competitive Bidding
IDEAS	-	Infrastructure Development & Engineering Associated Services
IEE	-	Initial Environmental Examination
JnNURM	-	Jawaharlal Nehru National Urban Renewal Mission
MoUD	-	Ministry of Urban Development
MSW	-	Municipal Solid Waste
NABARD	-	National Bank for Agriculture and Rural Development
NCB	-	National competitive bidding
NERCCDIP	-	North Eastern Region Capital Cities Development Investment Program
NGO	-	Non government organization
O&M	-	Operation and maintenance
PSP	-	Private sector participation
RF	-	Regional Facility
RNP	-	Rangpo Nagar Panchayat
SB	-	Swachh Bharat
SWM	-	Solid Waste Management
SIPMIU	-	State Investment Program Management and Implementation Unit
TA	-	Technical assistance
ULB	-	Urban local body
WSPHED	-	Water Security and Public Health Engineering Department

SALIENT FEATURES OF THE PROJECT

1	State	Sikkim																																											
2	City/ULBs	Rangpo, Geyzing, Mangan, Singtam, Rhenock, Namchi, Jorethang & Nayabazaar																																											
3	Name of Project	Swachh Bharat Project, Sikkim (Urban)																																											
4	Scheme/Funding	Ministry of Urban Development, Government of India																																											
5	Scope	Providing Solid waste management facilities to Rangpo																																											
6	Area/Wards Covered	5 Municipal wards																																											
7	Population Covered - Phase 1 (2015-2020)	2015 : 15,028 2020 : 15,818																																											
8	Project Components	<table border="1"> <tr> <td>1</td> <td>Household Segregation - Supply of Jute Bags for storing dry waste (Wet waste in existing Bin only)</td> <td>3110</td> </tr> <tr> <td>2</td> <td>Waste Collection Centers in each Ward (3 meter x 2 meter) made of MS fabrication angles and grill work with Door and waste collection window</td> <td>7</td> </tr> <tr> <td>3</td> <td>Storage Bins 360 liters capacity HDPE - 8 Nos in each Waste Collection Center/ ward - 3 for Wet waste, 4 for dry waste and one for Domestic Hazardous Waste</td> <td>56</td> </tr> <tr> <td>4</td> <td>Supply of Weighing scale at Waste Collection Center</td> <td>7</td> </tr> <tr> <td>5</td> <td>Mini Garbage Tipper - 4.5 cum capacity</td> <td>3</td> </tr> <tr> <td>6</td> <td>Construction of Eco Bank Shed</td> <td>2</td> </tr> <tr> <td>7</td> <td>Provision for Computer for Data entry on waste deposit, alongwith Computer Table, UPS, Colour Printer, etc complete</td> <td>2</td> </tr> <tr> <td>8</td> <td>Installation of small incinerators at Eco Bank shed for handling diapers, sanitary napkeins</td> <td>2</td> </tr> <tr> <td>9</td> <td>Installation of Compacting Machine for Volume reduction of dry waste Paper waste, Plastic bottles,</td> <td>2</td> </tr> <tr> <td>10</td> <td>Installation of Weighing scale with platform at Eco Bank for weighing recyclable waste bundles/bales</td> <td>2</td> </tr> <tr> <td>11</td> <td>Supply of Bins (360 liter capacity) for Segregataion at Eco Bank - 15 Nos per EB</td> <td>30</td> </tr> <tr> <td>12</td> <td>Supply & Installation of Conveyor belts for waste Segregation at Eco Bank</td> <td>2</td> </tr> <tr> <td>13</td> <td>Biomethanation Plant for Market waste, one plant per ULB</td> <td>2</td> </tr> <tr> <td>14</td> <td>Closed Compactor Trucks for carrying waste from ULB to Regionl Facility</td> <td>2</td> </tr> </table>		1	Household Segregation - Supply of Jute Bags for storing dry waste (Wet waste in existing Bin only)	3110	2	Waste Collection Centers in each Ward (3 meter x 2 meter) made of MS fabrication angles and grill work with Door and waste collection window	7	3	Storage Bins 360 liters capacity HDPE - 8 Nos in each Waste Collection Center/ ward - 3 for Wet waste, 4 for dry waste and one for Domestic Hazardous Waste	56	4	Supply of Weighing scale at Waste Collection Center	7	5	Mini Garbage Tipper - 4.5 cum capacity	3	6	Construction of Eco Bank Shed	2	7	Provision for Computer for Data entry on waste deposit, alongwith Computer Table, UPS, Colour Printer, etc complete	2	8	Installation of small incinerators at Eco Bank shed for handling diapers, sanitary napkeins	2	9	Installation of Compacting Machine for Volume reduction of dry waste Paper waste, Plastic bottles,	2	10	Installation of Weighing scale with platform at Eco Bank for weighing recyclable waste bundles/bales	2	11	Supply of Bins (360 liter capacity) for Segregataion at Eco Bank - 15 Nos per EB	30	12	Supply & Installation of Conveyor belts for waste Segregation at Eco Bank	2	13	Biomethanation Plant for Market waste, one plant per ULB	2	14	Closed Compactor Trucks for carrying waste from ULB to Regionl Facility	2
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		15	Supply of Eco Bins in pilot study households (about 5% of households in each ULB)	165
		16	Push carts for Street Sweeping	20
		17	Pole Mounted Twin Bin for road side Litter Bins - 60 ltrs capacity each HDPE	40
		18	Shoulder Bins for waste collection from Inaccessible areas	27
		19	Personnel Protection Equipments for safety operations - Masks	516
		a	Rain Coat and Pyjama	45
		b	Gum Boots	86
		c	Protective caps	45
		d	Hand Gloves	172
		20	Sanitation : Supply and Delivery of High Pressure Automounted Jet Desilting Machine for Narrow lanes to clean Septic Tanks	1
		21	Community Toilet Block with ten seater Toilet with four Urinals including watersupply and electrification (36 sq.m)	5
		22	Individual Toilet with Septic Tank (Twin Pit Pour Flush)	50
			Individual Toilet with Leach Pit (Twin Pit Pour Flush)	50
		23	Public Awareness	1
		Excludes the project sub components towards construction of Treatment and Disposal Facility. Rangpo shall utilize the centralized Compost Treatment Plant and Land fill disposal & associated infrastructure at Regional Facility, Martam, East Sikkim		
9	Project Cost	Rs. 51.24 Million (Rs. 512.4 lakhs)		
10	Annual Operation & Maintenance (O & M) Cost	Rs. 50.05 lakhs		
11	Annual Recovery by Selling Dry waste and Collection of User Fee	Rs. 56.4 lakhs		
12	Annual Profit to ULB	Rs. 6.38 lakhs		
11	Implementing Agency	UD & HD, Gangtok		
12	Operation & Maintenance	Urban Local Bodies		

I. INTRODUCTION

1.1 Project Background

The Urban Development & Housing Department (UD&HD), Government of Sikkim has taken up implementation of Solid Waste Management schemes under Swachh Bharat Mission (SBM)–Urban. The Swachh Bharat Mission (SBM) emanates from the vision of the Government articulated in the address of The President of India in his address to the Joint Session of Parliament on 9th June 2014: *“We must not tolerate the indignity of homes without toilets and public spaces littered with garbage. For ensuring hygiene, waste management and sanitation across the nation, a “Swachh Bharat Mission” will be launched. This will be our tribute to Mahatma Gandhi on his 150th birth anniversary to be celebrated in the year 2019”*. SBM is being implemented by the Ministry of Urban Development (MOUD) and by the Ministry of Drinking Water and Sanitation (MODWS) for urban and rural areas respectively.

The Objectives of SBM are (1) Elimination of open defecation, (2) Eradication of Manual Scavenging, (3) Modern and Scientific Municipal Solid Waste Management, (4) To effect behavioral change regarding healthy sanitation practices, (5) Generate awareness about sanitation and its linkage with public health, (6) Capacity Augmentation for ULB's, (7) To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance). The project components under SBM includes, (1) Household toilets, including conversion of insanitary latrines into pour-flush latrines; (2) Community toilets, (3). Public toilets, (4) Solid waste management, (5) IEC & Public Awareness, (6) Capacity building and Administrative & Office Expenses (A&OE).

The estimated cost of implementation of SBM (Urban) shall be funded partly by the Government of India and partly i.e 25% of GoI funding shall be contributed by the States as State/ULB share. The balance funds is proposed to be generated through various other sources of fund namely (a) Private Sector Participation, (b) Additional Resources from State Government/ULB, (c) Beneficiary Share, (d) User Charges, (e) Land Leveraging, (f) Innovative revenue streams, (g) Swachh Bharat Kosh, (h) Corporate Social Responsibility, (i) Market Borrowing, (j) External Assistance, etc.

The Swachh Bharat program is proposed for 5 years period (2015 – 2019). M/s Infrastructure Development & Engineering Associated Services (IDEAS) has been selected and engaged as the Consultant for the preparation of DPR for following towns:

Direction	Town	Local Body
North	Mangan	Nagar Panchayat
West	Gyalshing	Municipal Council
	Nayabazar	Notified Bazar Area
South	Namchi	Municipal Council
	Jorethang	Municipal Council
East	Singtam	Nagar Panchayat
	Rangpo	Nagar Panchayat
	Rhenock	Census Town

1.2 Solid Waste Management

Municipal solid waste management is an obligatory function of the urban local bodies (ULB) in India. With growing population and increasing waste generation, solid waste management has become a major environmental issue. ULBs across India face similar challenges in handling and disposal of municipal solid waste: lack of adequate financial and human resources, poor technology adopted (i.e. open burning, dumping in outskirts of town etc.) and lack of public participation to list a few. In 2000, Government of India enacted "Municipal Solid Waste (Management and Handling) Rules", stipulating compliance criteria for collection, segregation, storage, transportation, processing and disposal of municipal wastes.

1.3 Assignment Output & Report Structure

The Detailed Project Report for SWM, is the draft final output envisaged to facilitate implementation of Swachh Bharat Project on Solid Waste Management component. The SWM Report is referred as Main Volume (Volume I), organized in eight sections

Section I provides an overview of the report and a profile of the city focusing mainly on aspects impacting SWM activities.

Section II analyses the present SWM practices of Rangpo and is based on secondary data collected from Rangpo Nagar Panchayat /UDHD and other secondary sources; the section identifies key issues to be addressed while preparing the SWM Plan.

Section III analyzes the quantity and quality of waste generated in Rangpo through various surveys carried out by the Consultant – the analysis broadly comprises computation of source wise unit waste generation, combined per capita waste generation, total waste generation and waste composition, presents the SWM Plan for Rangpo ULB which includes all aspects of solid waste management such as storage of waste at source, primary collection of waste, secondary collection and transportation of waste to the disposal site including the options for waste processing and disposal. The SWM Plan, closely analyses, statutory requirements of solid management as per Municipal Solid Waste (Management & Handling) Rules, 2000 by the Ministry of Environment & Forests, GoI and consultations with the officials of UDHD/RNP.

Section IV deals with Community toilet and individual toilets.

Section V, presents the detailed cost estimates for the SWM Plan and Operation & Maintenance cost,

Section VI presents about the Cost Benefit Analysis and Willingness to Pay.

Section VII presents Packages, Procurement & Implementation Strategy,

Section VII presents the Recommendation & Conclusion.

2 Existing Solid Waste Management Practice in Rangpo

2.1 Description of Project Town Area

Sikkim is a thumb-shaped state lying between 27-28 degrees North latitude and 88-89 degrees East longitude and is the second smallest state in India. It is 7,096 sq km in size. Sikkim constitutes 0.22 % of the total geographical area of India. It extends approximately 114 km from north south and 64 km from east to west with altitude ranging from 250 to 8598 mts. Sikkim is surrounded by vast stretches of Tibetan Plateau in the North, Chumbi Valley of Tibet and the kingdom of Bhutan in the east, Darjeeling district of West Bengal in the south and the kingdom in Nepal in the west.



Figure 2.1: Map of Sikkim with Project ULBs

The summit of the Kangchenjunga is the highest point which falls on the border between Sikkim and Nepal. For the most part, the land is unfit for agriculture because of the precipitous and rocky slopes. Teesta acts as the "lifeline of Sikkim"; Rangeet is its main tributary. About a third of the land is heavily forested. The Himalayan ranges surround the northern, eastern and western borders of

Sikkim in a crescent. The state has 28 mountain peaks, more than 80 glaciers. Some of the important glaciers are: Teesta Khangsa glacier, Lhonak North glaciers, Lhonak South glaciers etc. Sikkim has more than 150 lakes located at different altitudes and all these are considered sacred. Eight mountain passes connect the state to Tibet, Bhutan and Nepal.

2.2 Town Profile

Rangpo is in East Sikkim district of Indian state of Sikkim. The town is connected to the capital city Gangtok, Rangpo is located at 27.18°N and 88.53°E.^[1] It has an average elevation of 333 metres (1093 feet). The town borders West Bengal and is situated along the Teesta river. It is the first town in Sikkim on NH 10 that links Siliguri to Gangtok. All vehicles entering Sikkim have to stop here. Foreign tourists require documents to enter Sikkim state and have to show them at the border police post. It is the Gateway to Sikkim. Rangpo has a large population of Nepalis and Bhutias. Marwari and Bihari businessmen have settled in the town and own most of the shops among them are few old settlers in town who have history of business since 1912. As per the Census 2011, the population of Rangpo is 10,450. The **Regional setting Map is given in Drawing 1.**

2.3 Climate

The climate of Rangpo is warm and temperate. The summers here are much rainier than the winter.. The temperature here averages 23° c. The average annual rainfall is 3148 mm.

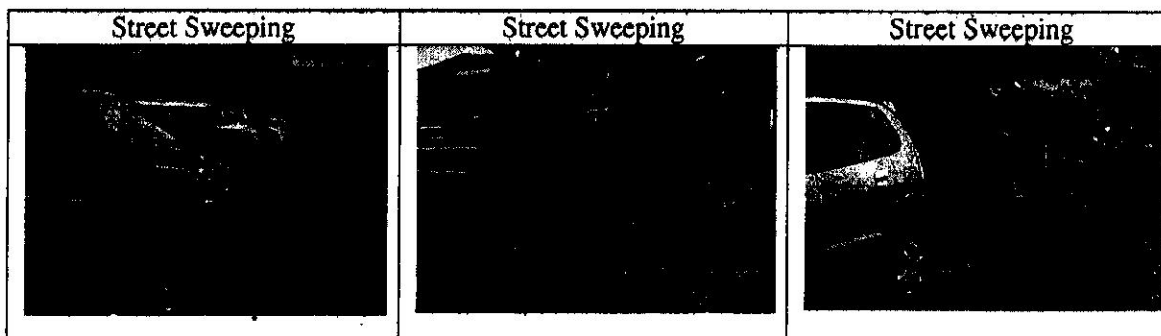
2.4 Existing Solid Waste Management (SWM)

In the year 2000, the Government of India enacted "Municipal Solid Waste (Management and Handling) Rules"- 2000, stipulating compliance criteria for collection, segregation, storage, transportation, processing and disposal of municipal wastes. The Government of Sikkim is amongst the first State in the country to successfully enforce a total ban on polythene bags. With growing population and increasing waste generation, ULBs in Sikkim today is facing challenges in handling and disposal of municipal solid waste viz., lack of public awareness for waste segregation, poor collection efficiency, lack of adequate financial and human resources, non availability of landfill site has lead to crude open dumping method posing threat to environment and public health.

The SWM infrastructure at Rangpo Nagar Panchayat (RNP) includes, 30 numbers of dustbin spread out in the town, two numbers of waste collection vehicle. The waste collection frequency is daily for some area, alternate day for few areas and twice a week for some areas. There are about 13 Safaikarmachari, two driver and one Supervisor and all are on Muster roll.

2.4.1 Street Sweeping and Manpower deployment

One of the major activities of the solid waste management is street sweeping, which is time consuming and labor intensive. ULBs/UDHD carries out both street sweeping and streams (Jhoras) desilting activities.



2.4.2 Solid Waste Collection

Primary & Secondary Collection. Presently there is no door-to-door waste collection system in project ULBs. In most of the areas, the waste is collected directly by transportation vehicles(trucks). The vehicles shall stop on particular location on the side of the road at a particular time and the households and shops handover the waste to these vehicles. Also the community Bin collection system

2.4.2.1 Public Consultation on Existing Solid Waste Collection System

In order to get the opinion of households on the existing garbage collection system, a sample survey (5% Households of the town) was carried out in Rangpo during August 2015. The outcome of the opinion survey are given below;

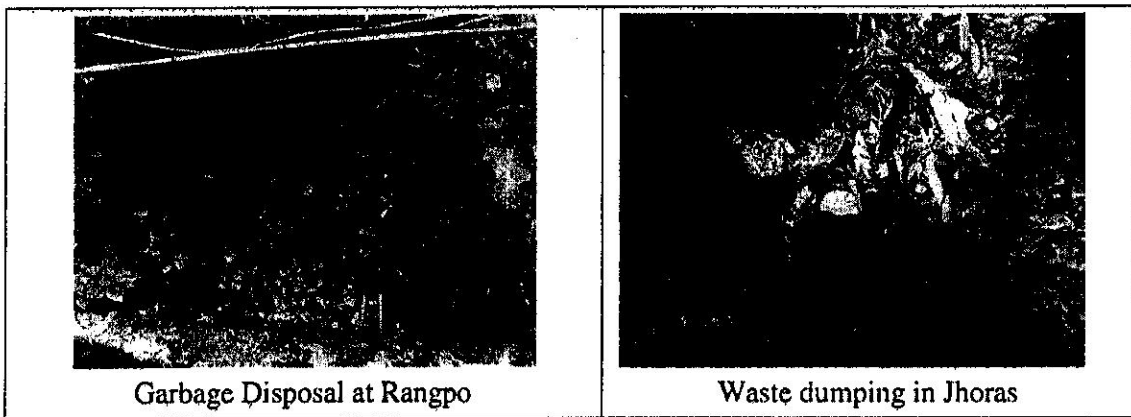
- 63% informed that they hand over the garbage to the trucks directly on arrival of vehicle, 19% indicated they are burning the garbage in open areas, 18% indicated they are throwing on the road.
- 43% of households had expressed that walking distance to dispose off garbage is less than 50 feet, 48% indicate as 50 -100 feet and 9% more than 100 feet
- 100 % of the households have indicated that time spent for existing disposal is about 5 to 15 minutes during operation of collection system
- Regarding frequency of collection or disposal of waste, 83 % informed that daily collection is being done, 16 % indicated alternate day and 1% informed twice a week.
- 81 % of the households had informed that they are paying for the present SWM services. Out of which, maximum households pay Rs. 40 per month.
- 99 % of the households are satisfied with the current level of service and one percent are not satisfied with the existing system

Due to absence of door-to-door collection system and delay from collecting vehicles, many households burn the waste and others throw their waste on the streets, and dogs scatter these waste on the roads and create unhygienic and unhealthy conditions.

2.4.3 Disposal in Open Drains (Jhoras)

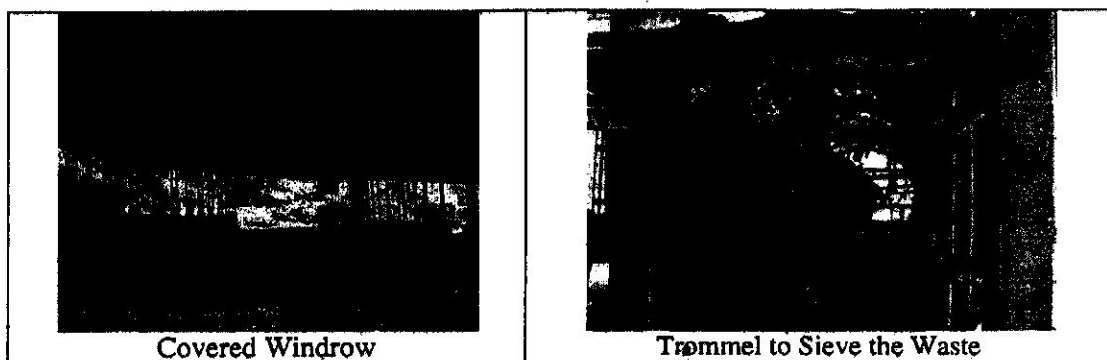
There are areas where the collection cum transportation vehicle cannot reach and those households have to carry their waste to the main road which is more than 500 m. Therefore they throw waste in the Jhoras (small streams) and Hill slopes within the localities creating unhealthy

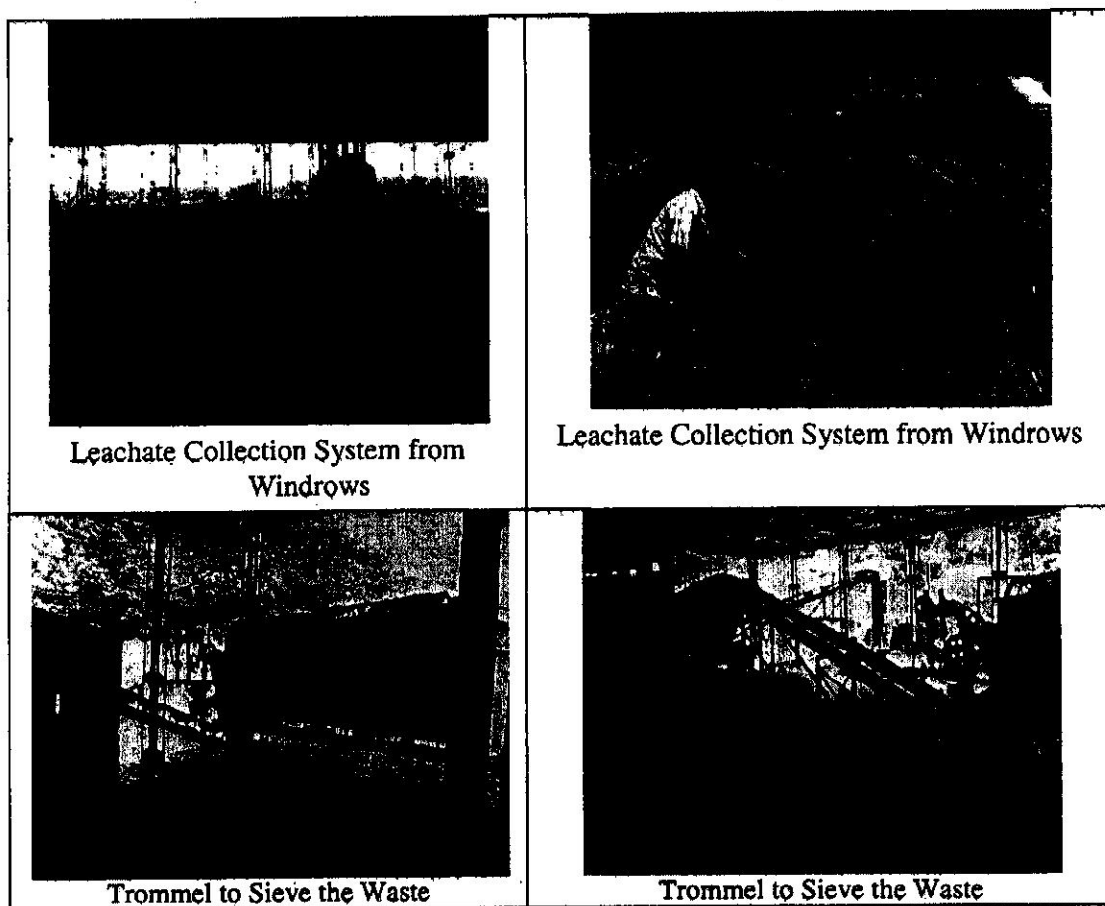
conditions.. Most open drains (Jhoras) in the city are choked due to indiscriminate solid waste disposal. The Government of Sikkim is amongst the first state in the country to successfully enforce a total ban on the use of polythene bags. The State has also passed the Non – biodegradable Garbage (Control) Rules in 1997 to minimize the generation of such waste as also its indiscriminate dumping on roads, streets and in jhoras.



2.4.4 Treatment

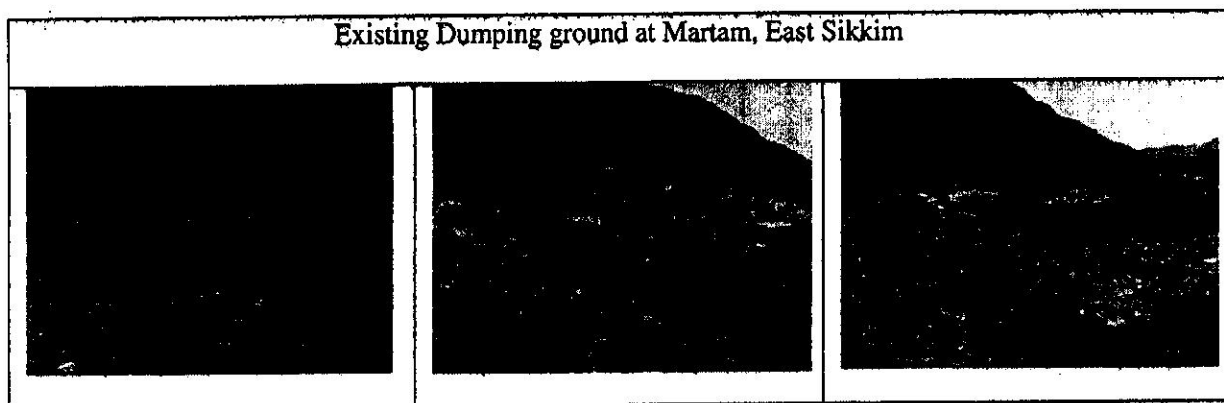
Presently Rangpo is dumping the garbage at Martam without any treatment. Presently the mixed waste is being dumped in the dumping ground which is potential threat to the environment. landfills. The State has installed a Compost plant of 50 TPD capacity at Martam, East Sikkim to treat the mixed municipal waste. The technical assistance for the compost plant was from M/s Karnataka Compost Development Corporation (KCDC), Bangalore. However, in spite of the above commitments of the State towards effective solid waste management system the existing situation is far from satisfactory. The compost plant is not in operation at present. The plant was commissioned and worked for a few months. Now the Plant is not in working condition and the plant is shut down since 2009. However rehabilitation works have been taken up under ongoing ADB assisted NERCCDIP. The following pictures depict the Compost plant site at Martam.





2.4.5 Disposal

Currently, the mixed waste collected from Rangpo is dumped in the Martam dumping ground. There is no scientific solid waste disposal facility in Martam and now is being constructed under ADB assisted NERCCDIP. The present practice is very unhealthy and environmentally unsafe.



2.4.6 Key Issues:

The key issues in the existing SWM system are detailed below;

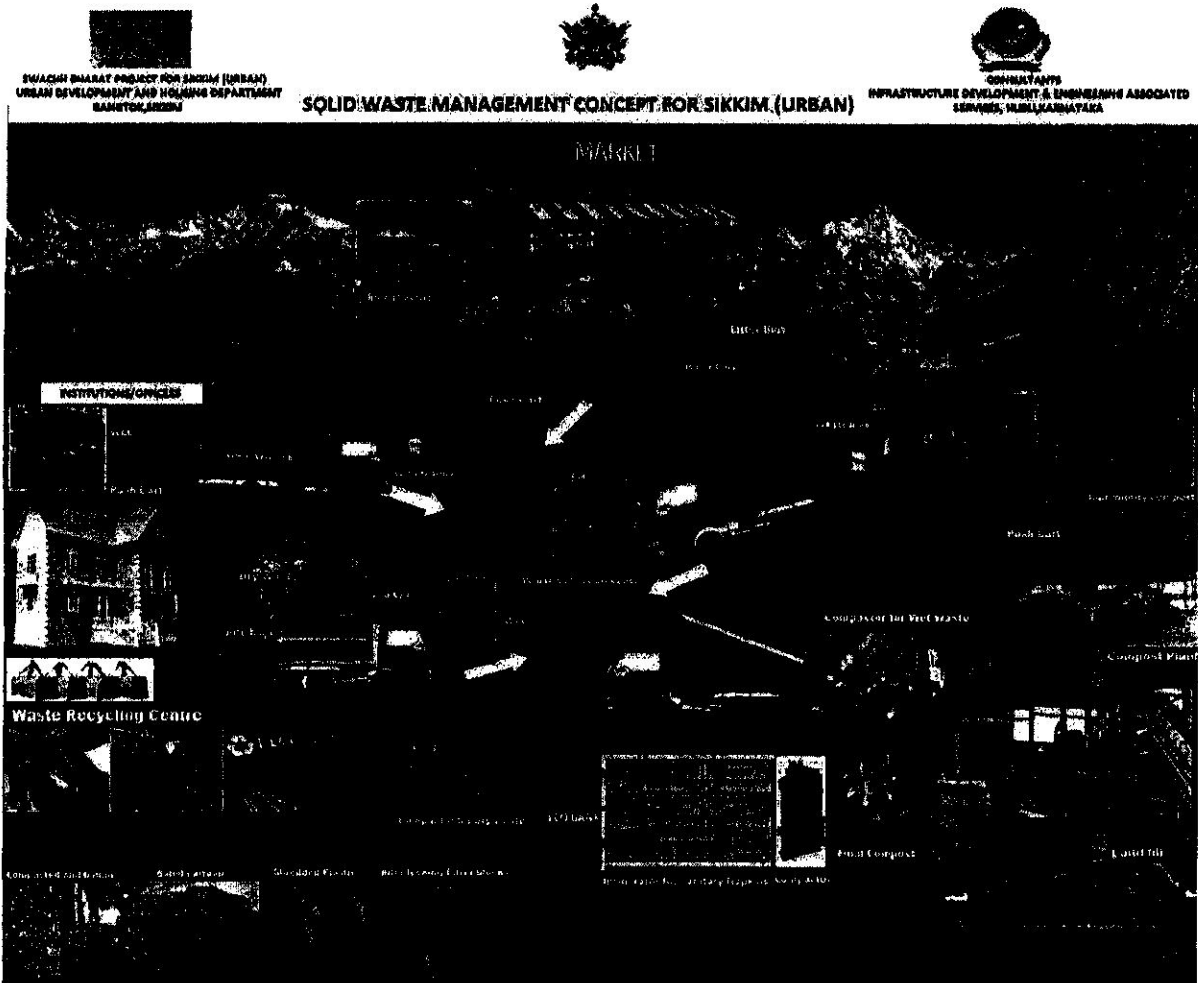
- Absence of Solid waste quantification and characterization
- Solid waste collection performance is less.
- Absence of Door to Door collection
- Throw away garbage into streams (Jhoras)
- Absence of waste segregation
- Unhygienic disposal of waste in open dumping areas posing threat to public health
- Non availability of scientifically designed landfill
- Inadequate number of vehicles and equipment for efficient collection & transportation
- Inadequate manpower
- Waste is collected and loaded on to small vehicles and trucks manually and is not covered during transportation.
- Workers use no safety or protective equipment while handling the waste manually.
- No Compost plant
- Waste being dumped without treatment in unscientific manner
- Waste due to winds often finds its way into the stream flowing adjoining the dumping area posing threat to the health and environment.

The current practices are thus unsafe and do not confirm Municipal Solid Waste (Management and Handling) Rules, 2000.

3 Design of SWM System for Rangpo Nagar Panchayat

3.1 Solid Waste Management Strategy for Sikkim (Urban) & Design Criteria:

The existing solid waste management system in Sikkim does not comply to the norms specified in MSW Rules 2000. Therefore in order to overcome the gaps in the existing service and together meet the future demand, the following SWM design criteria/ Planning principles are adopted:



The Detailed SWM Concept/strategy is briefed out in Table 3.1.

Table 3.1 SWM Strategy/Concept for Sikkim (Urban)

STEPS	CONCEPT/ STRATEGIES - SIKKIM URBAN
[STEP I] - Waste Segregation & Storage	<ol style="list-style-type: none"> 1. First level of Waste Segregation at source – Wet waste and Dry waste 2. Storage of waste at Source – Wet waste in Existing Bin (Eco Bin in pilot study area) and Dry waste storage in Jute Bags
[STEP II] - Waste Collection System	<ol style="list-style-type: none"> 1. Residents handover garbage to Waste Collection Centers (WCC) 2. WCC operation hours is 3 Hrs in the morning (6 a.m. to 9 a.m). 3. One WCC for every 300 Households, to be located nearer to road where vehicles are accessible, Size of WCC is 5 feet x 5 feet x 8 feet, made of MS grill with door and window. 4. Primary Collection Vehicles pick up garbage from WCC and transport it to Eco Bank. Wet waste shall be collected during morning time and dry waste shall be collected in the afternoon
[STEP II] - Eco Bank	<ol style="list-style-type: none"> 1. Eco Bank is a small shed of size 40 feet x 50 feet with GI sheet roofing. It includes Waste reception, computer entry, Dry waste segregation system with compacting, bailing and stacking and sold to recycling agencies, Wet waste shall be transferred from Primary Collection Vehicle to Refuse Compactor Vehicle directly through hydraulic tipping mechanism. 2. Eco Bank shall be minimum one per town. ULB need to identify the places for Eco Bank.
Transportation	<ol style="list-style-type: none"> 1. Refuse Compactor Vehicle shall transport from Eco Bank to nearest Regional Facility (RF) at Martam.
Treatment & Disposal Facilities	<ol style="list-style-type: none"> 1. Haat/Market Waste is proposed for Biomethanation Plant 2. Household level Composting in Eco Bin – On Pilot Basis for 5% of Households which are inaccessible. On successful implementation the same may be taken up in Phase 2 3. Community Composting in Agas – On Pilot Basis for each ULBs. On successful implementation the same may be taken up in Phase 2 4. Centralized Composting in Regional Facilities 5. The existing Landfill site at Martam, East Sikkim shall be designated as Regional Facility 1 (RF 1) and presently is accepting garbage from Gangtok, Singtam, Rangpo and Rhenock. As an Interim measure this facility shall be utilized. But a separate facility for Rangpo needs to be made by identifying a suitable land in or nearby Rangpo (RF 5). 6. Regional Facility shall have Weigh Bridge, Wet waste composting, Recycling/RDF facility, Scientific Landfill, Leachate Treatment Plant.

The SWM Concept for Rangpo is given in the Drawing No. 2.

3.2 Population Projections :

The 2011 census of India population for Rangpo is 10,450. Considering the district decadal growth rate of 15.73% the projected population for 2021 is 12094. But due to industrial growth and educational institutions, NHPC etc. Tremendous population influx is observed at Rangpo. Hence the ULB had indicated about 5000 numbers to consider in the DPR. Based on this further calculations are given below.

Table 3.2 : Projected Population for Rangpo

Population (as per 2011 Census), provided by ULB	12562
Decadal Growth Rate*	15.73%
Projected 2021	14538
Projected 2015	13352
Tourist Population**	1676
Proj 2015 + Tourist	15028
Projected 2019	14143
Projected Population + Tourists	15818
Design Population (80% of above 2019)	12655

3.3 Waste Quantification :

Presently there is no authentic data on waste generation available in the ULB. An accurate assessment of the quantity and characteristics of the solid waste generated is a crucial data for any area in formulating the solid waste management plans. Rational decisions on municipal solid wastes system are possible only if reliable data of composition and quantity of solid waste are available.

3.3.1 Estimation of Per Capita Waste Generation:

The detailed percapita waste generation exercise was carried out during August 2015. The sample surveys indicate that the average per capita generation in HIG group of households is about 447 gm as against the 474 gm for MIG and 361 gm per capita for LIG households.

Table 3.3: Household Per Capita Generation

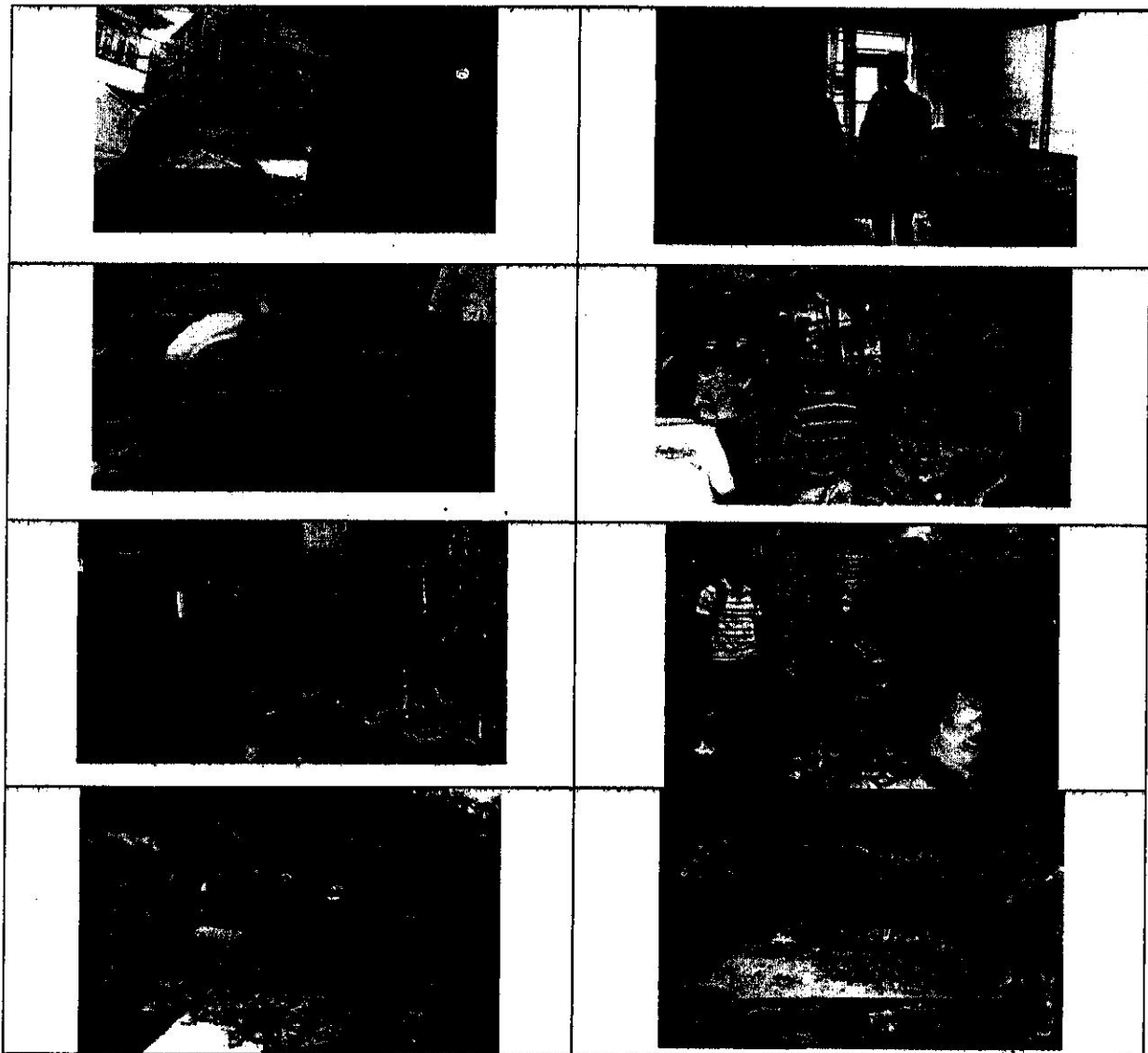
Household Category	No. of Households	Per Capita Generation (gm)
LIG	56	361
MIG	70	474
HIG	14	447
Total	140	425

Source: Field Assessment Surveys and Analysis.

Table 3.4: Per Capita Generation from other sources

Per capita waste generation from residential area	425 grams/person
Add 15 % for Municipal Waste from Commercial sector	64 grams/person
Add 15% for Waste from Road sweeping	64 grams/person
Add 2% waste from Institutions	9 grams/person
Total	562 grams/person

The details of the study carried out and members present are presented in Annexure 1. The photographs and details of the analysis are given below;



The waste quantification was calculated by projecting the population and per-capita waste generation. The projected waste quantities are given below;

Table 3.5: Waste Projections

Year	Waste Generation (MT)	Waste Collected (MT)	Waste to Landfill (%)		Waste to Landfill (MT)	
			2015	2020	2015	2020
2015	15028	562	8.4	3.7	4.8	12.3
2020	16489	603	9.9	4.3	5.6	14.4
2025	17234	646	11.1	4.9	6.3	16.2
2030	18509	692	12.8	5.6	7.2	18.6
2035	19945	742	14.8	6.5	8.3	21.5
2040	21420	796	17.0	7.4	9.6	24.8

Table 3.6: Sources of Waste generation in Rangpo

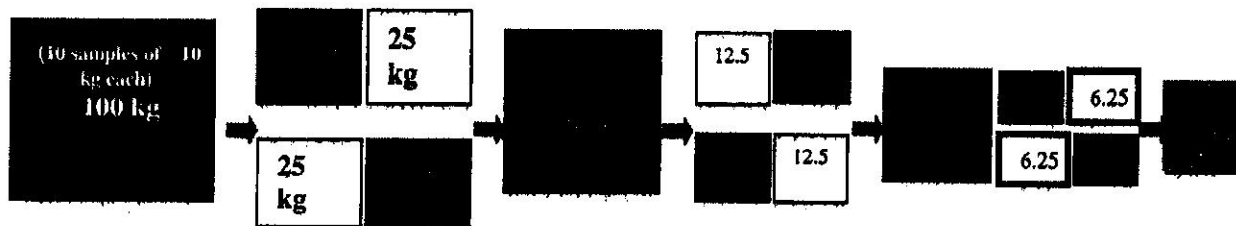
Sources	Percentage of Total Waste (%)
Residential	68
Commercial	15
Institutional	15
Road Sweeping	2
Total	100

Source: Survey Analysis

3.4 Waste Quartering :

For collection of waste from the dump site quartering procedure was followed as per CPHEEO manual. For quartering of waste about 10 kg of Municipal Solid Waste (MSW) is collected from ten points from outside and inside of the solid waste heap. The total quantity of waste so collected is thoroughly mixed and then reduced by method of quartering till a samples of such a size is obtained which can be handled in the laboratory.

Fig 3.2 : Block diagram of quartering system



The sampled waste was tested at Indore laboratory, first of all accurate weighing of each sample was done on a digital balance. There after density and individual physical components were measured. Proximate and Ultimium analysis of individual samples were

carried out. The sample so obtained is subjected to physical analysis, determination of moisture and then the sample is processed for further chemical analysis.

Waste from pre-decided sampling locations was collected on daily basis. A day before the sampling survey each of the selected households were given a labeled sampling bag and were requested to deposit all domestic waste generated on the next day in the bag for collection on the day after in the morning. On the day of sampling, the survey team collected the waste in a collection vehicle from each of the identified sample household in the morning and a fresh sample bag with label was handed over to the household for the next day's sampling. The collected samples in each bag were weighed and weight recorded against the relevant data and entered in the format containing the particulars of the sampling unit. The collected sample in each bag was weighed and recorded in the standard data format in which the details of sampling unit were recorded.

The same procedure was followed for all the seven consecutive days of sampling. Samples from commercial establishment were collected by using same methodology. Photography of sample collection from each point was done daily by digital camera. Photographs of the sampling have been attached with the report as Annexure 2. A spring balance at every waste collection point was used for weighing of waste. The daily collected samples were then packed and send to our Lab for further analysis.

Waste generated by a particular source was measured directly to estimate the quantity of waste generated. Based on the number of members in the family or size of the establishment, the waste generated per capita or per unit was then estimated. Prior to commencement of surveys, both field investigators and sample households were briefed about the purpose of the study and modalities of waste collection. In case of non-domestic generators, information on size of the establishment, number of rooms in hotels, lodges etc., was collected in a standard format.

3.4.1 Solid Waste Characteristics

Of the total waste generated in the town, about 57 % of the waste consists of organic waste and 21 % is recyclable waste (paper, plastic, metal and glass). Inert comprises of 22 % of the total waste. The waste composition study carried out at Rangpo is given below.



The detailed physical and chemical characteristics are furnished below;

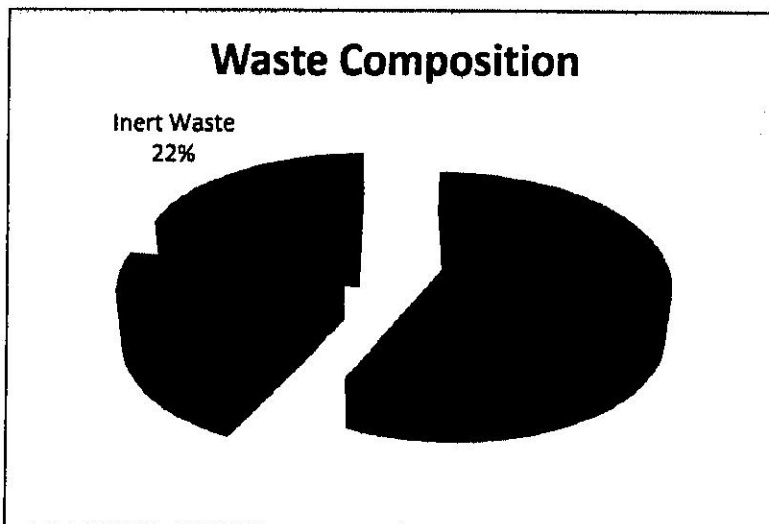


Table 3.7: Physical Characteristics of Garbage

Biodegradable Waste	3279.4	421.2	44.0	0.0	3744.6	57.0
Metal	34.9	0.0	0.0	0.0	34.9	0.5
Glass	154.4	7.7	0.0	53.9	216.0	3.3
Ceramics	176.8	0.0	0.0	47.9	224.7	3.4
Paper	410.9	18.9	0.0	83.8	513.7	7.8
Textiles	353.7	5.8	15.8	16.8	392.0	6.0
Plastics	353.7	20.3	0.7	113.8	488.4	7.4
Rubber	67.2	0.0	13.3	21.6	102.1	1.6
Miscellaneous combustible (Wood, Leather)	132.0	7.7	0.0	21.0	160.6	2.4
Miscellaneous Non combustible (dust/dirt, ashes)	328.7	21.1	1.0	71.9	422.8	6.4
Inert (Street sweeping- Soil/Stones, bricks, ash, coal)	151.9	14.3	9.0	95.8	271.0	4.1

Source : Survey Analysis, Swachh Bharat Mission, UD & HD, Gangtok

Table 3.8 : Chemical characteristics of Garbage

Parameter	Unit	Value
Bulk Density	kg/cum	410.68
pH (1:10 Aq. Extract)	-	7.23
Moisture Content	%	44.77
Carbon as C	%	35.70
Nitrogen as N	%	1.65
Phosphorous as P	%	0.65
Volatile Matter	%	24.73
Ash Content	%	23.16
Gross Calorific Value	kcal/kg	1043.31
Heavy Metals		
1. Arsenic	mg/kg	0.46
2. Zinc	mg/kg	6.40
3. Lead	mg/kg	2.49
4. Cadmium	mg/kg	0.18
5. Copper	mg/kg	2.12
6. Mercury	mg/kg	bdl
7. Nickel	mg/kg	0.76
8. Iron	mg/kg	13.42

Source: Lab Analysis for SWM, DPR for Gangtok, Sikkim, 2011

3.5 Testing Procedure

Following test methods were used to analyze the samples:

Table 3.9: Standard Testing Methods for analysis

Sr. No.	Parameter	Standard Testing Method
1.	Moisture Content	IS 1702
2.	Organic Carbon	IS 1702
3.	Nitrogen	IS 1702
4.	Phosphorous	IS 1702
5.	Sulphur	IS 1702
6.	Calorific Value	IS 1702
7.	Heavy Metals (As, Pb, Zn, Ni, Cd, Cr, Cu, Fe)	IS 1702
8.	Heavy Metals (As, Pb, Zn, Ni, Cd, Cr, Cu, Fe)	IS 1702

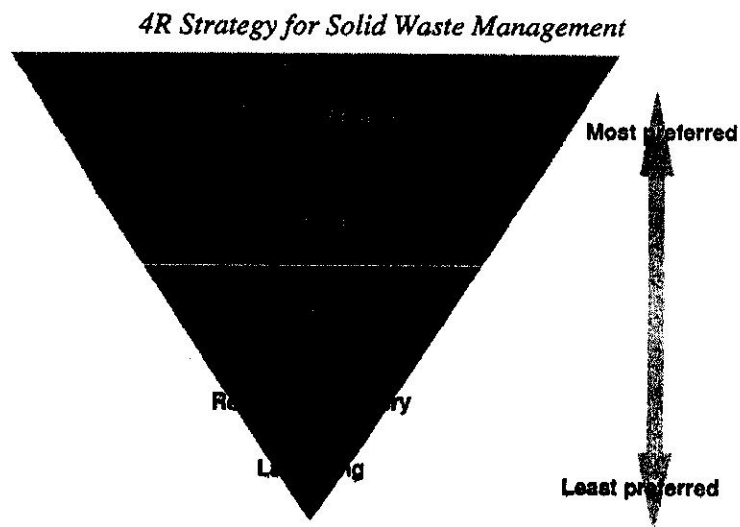
3.6 Design period :

The proposed design for Solid waste management (SWM) treatment & disposal facility shall cover a period of 20 years (2015 to 2035). Whereas, the SWM Vehicles & Equipments are designed for five years period (2015 to 2020), Compost Plant Machineries shall be designed for 10 years capacity, Landfill Cell shall be designed based on Phase wise development (Five years). Accordingly improvements and augmentation required for the SWM system in Sikkim (Urban) for Swachh Bharat are identified.

3.7 Long-term Solid Waste Management Strategy

The implementation of the above proposed sub projects can ensure that the solid waste management operations in Rangpo are safe and efficient and confirm to the national regulations. The success however depends on many factors, important of which is the public participation, co-operation, and support. In addition to this as long term strategy, it is important to make the solid waste management economical and environmentally safe. As the waste quantity to be handled will increase manifold, and coupled with resource constraints (land and financial), the SWM will be an appalling task. Therefore it is suggested to integrate 4Rs (Reduce; Reuse; Recycle; and Recover) strategy into the SWM.

- (i) **Public Participation:** Residential Welfare Associations (RWAs), at ward level, shall be created. Door-to-door waste collection can be brought into the direct monitoring of RWAs. A stakeholder based monitoring system shall be initiated to check the quality of service delivery and the RWA would certify door-to-door collection, street sweeping and container lifting services under their jurisdiction. At the city-level, a monitoring system shall be developed with the participation of NGOs.
- (ii) **Public Awareness Creation.** In addition to awareness on public health and SWM linkages, awareness about source reduction, reuse, segregation and temporary storage of waste at household level is crucial. Source reduction and reuse will reduce the net quantity of waste to be handled. Improved segregation at household level will essentially enhance the waste recovery ratio thus reducing the net quantity to be land filled and secure additional revenue from waste recovery. Practice of temporary waste storage at household level would mitigate street littering. Awareness creation through short films, neighbourhood-level meetings shall be initiated; films/information will be screened/disseminated in the city with the help of local cable TV network. Public awareness shall be a continuous activity. Accordingly a provision of Rs. 8 lakhs is included in the Cost Estimation.
- (iii) **Integrate 4 Rs Strategy.** As a long term strategy, the Rangpo shall initiate programs to integrate the 4Rs strategy into the solid waste management. As depicted in the following figure, the priority shall be first source reduction, then to reuse, recycle and recover. The aim of this is to reduce the quantity of waste to be handled and disposed.



- **Source Reduction** is any action that reduces or eliminates the generation of waste at source, usually within a process. Source reduction measures include process modifications, material substitutions, improvements in housekeeping and management practices, and recycling within a process. For example, an individual resident could achieve source reduction by bringing bags to the grocery store to package their purchases. The fundamental goal of this effort is to influence attitudes and change behaviour.
- **Reuse** is the process of separating a given solid waste material from the waste stream and using it, without processing or changing its form, other than possible size reduction, for the same or another end use. For example, building materials that are removed during renovation or demolition can be installed in another building. Used clothing and household items can be collected for resale and reuse.
- **Recycling** is the process of separating a given waste material from the waste stream and processing it so that it may be used again as a raw material for a product, which may or may not be similar to the original product. Recycling primarily addresses materials such as: metals, glass, plastic and paper fiber. In Rangpo, recycling is practiced through informal rag picking activity on streets. However, as the waste is disposed unsegregated, recovery of recycled material is low. The current unhealthy informal activity needs to be streamlined and waste segregation at source shall be implemented.
- **Resource Recovery** is the recovery of a usable produce like compost/fuel pellets or energy from the solid waste. These processes reduce the volume of waste to be disposed safely through a landfill. Thus reduces the land and resource requirement for waste landfill. This also provides additional financial resources to the ULBs through selling of resource recovered like compost product.

3.8 Design of SWM Components :

3.8.1 Implementation of source segregation at household level

It is proposed to introduce segregation of waste at source (house level) as wet waste and dry waste. This is the first level of Waste Segregation at household level wherein Biodegradable Wet waste is stored in the existing Bins and Dry waste is stored in Jute Bags. This would facilitate maintaining hygienic condition and easy handling of the waste for further processing and also to get quality toxic free compost. The details of wet waste and dry waste are detailed below;

3.8.1.1 Wet Waste or Bio-degradable Wastes

- Food wastes of all kinds, cooked and uncooked, including eggshells, bones
- Flower and fruit wastes including fruit peels and house-plant wastes
- House sweepings (not garden sweepings or yard waste: dispose on-site)
- Household Inert (sweepings/ashes)

3.8.1.2 Dry Waste or Recyclable and Other Non-Bio-degradable Wastes

- Paper and plastic, all kinds, Cardboard and cartons
- Containers of all kinds excluding those containing hazardous materials
- Packaging of all kinds
- Glass, all kinds, Metals, all kinds, Rags, rubber, wood
- Foils, wrappings, pouches, sachets and tetrapaks (rinsed)
- Cassettes, computer diskettes, printer cartridges and electronic parts
- Discarded clothing, furniture and equipment.

3.8.1.3 List of Some Domestic Hazardous Wastes

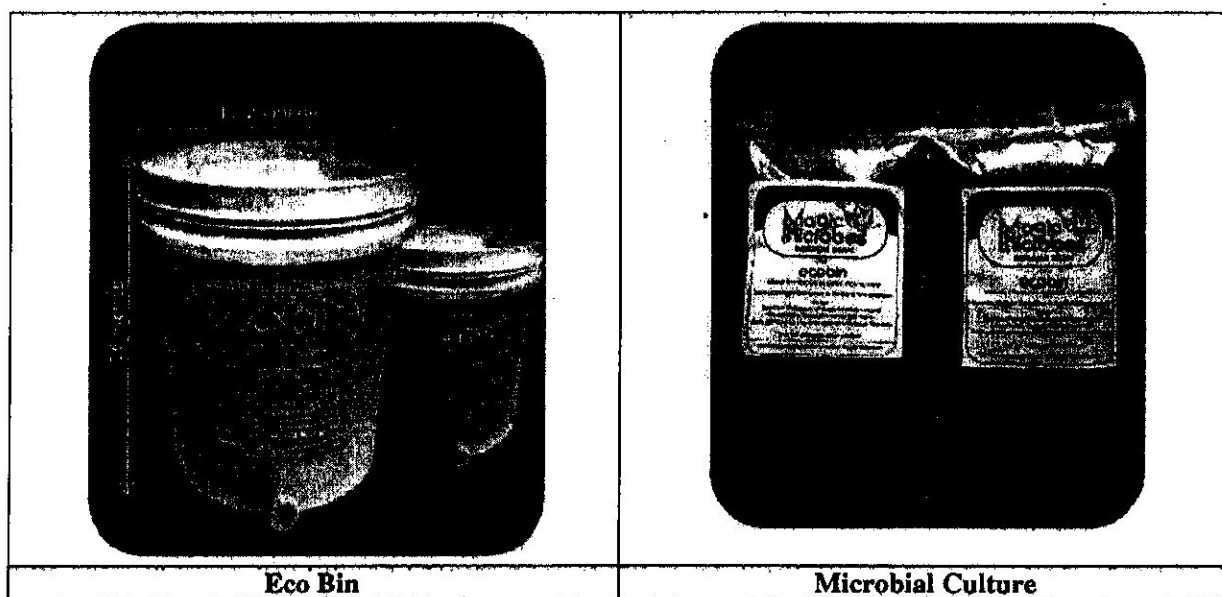
- Aerosol cans, Batteries from flashlights and button cells
- Bleaches and household kitchen and drain cleaning agents
- Car batteries, oil filters and car care products and consumables
- Chemicals and solvents and their empty containers
- Cosmetic items, chemical-based, Insecticides and their empty containers
- Light bulbs, tube-lights and compact fluorescent lamps (CFL)
- Paints, oils, lubricants, glues, thinners, and their empty containers
- Pesticides and herbicides and their empty containers
- Photographic chemicals
- Styrofoam and soft foam packaging from new equipment
- Thermometers, Mercury-containing products
- Injection needles and syringes after destroying them both
- Discarded Medicines, Sanitary towels, Disposable diapers and
- Incontinence pads (duly packed in polythene bags before disposal)

The first level of Waste Segregation at source shall be possible by separate storage of Wet waste and Dry waste. The storage of waste at source – Wet waste in Existing Bin (Eco Bin in pilot study area) and Dry waste storage in Jute Bags. The Jute Bag shall be provided to Households to promote segregation.

3.8.2 Pilot Study on Introduction of Individual Household Composting in Eco Bins and Community Composting in Aga Bins

Eco Bin is India's First "All Season" Bokashi based indoor composter kit. This unique composter is a one stop solution for all our kitchen waste, green waste, food waste, veg, non-veg, dairy products, citrus fruits, bread or cake, and so on. Eco Bin recycles all this waste into a nutrient rich organic compost, which also acts as a "soil conditioner". Eco Bin is great for those wanting an attractive counter top composter, which results in dramatically less waste, and provides great nutrient rich compost for gardens and plants. With its simple, sturdy design and easy to adapt composting process, its perfect even for people with no previous composting experience. **Eco Bin** is custom made using high quality food grade UV Stabilized LDPE impregnated plastic, to be implemented in an indoor environment, making it easy-to-use in your household, apartment, school, restaurant, business or even wilderness! Each **Eco Bin** composter kit comes along with complete user instructions and Magic Microbes Bokashi bran. As you feed your kitchen waste into Eco bin and release the Magic Microbes Bokashi bran, they get on with their job of activating anaerobic fermentation that accelerates the composting process, while eliminating odors and deterring pests. The three main protagonists, a drain tap, the strainer, and Magic Microbes Bokashi bran. The strainer and the drain tap work in tandem by allowing the moisture released by the food waste to be drained out to prevent spoiling the composting process. And this liquid (termed as Bokashi Juice / leachate), can be used as fertilizer for your plants (1:100 dilution) or to clean kitchen and bathroom drains (undiluted).

These Eco Bins are being used successfully in Bangalore and the same is proposed for Sikkim on pilot scale study. About 5% of the Households in each of the project ULBs shall be provided with these Eco Bins to study the suitability and its performance in Sikkim climatic conditions.



The details on proposed bins required are presented below;

Table 3.10 Requirements of Waste segregation Bins

Eco bins for 50 individual households on Pilot basis (A set of 2 Bins)	Nos	165
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3.8.3 Shoulder Bins

In order to collect the waste from vehicle inaccessible areas where the access is narrow or access through steps the shoulder Bins are proposed for Rangpo. Each ward shall have one Shoulder Bin .

3.8.4 Litter Bins:

Though litter bins are not recommended as per the SWM Rules, in order to cater to the needs of Tourist/ floating population in and around important roads and other major market areas, Taxi Stand , Bus station, Shopping areas, in city center area, litter bins are proposed at a spacing of 50 meters. These litter bins will be emptied by sweepers attending primary collection in the respective areas.

Table 3.11 : Requirement of Pole mounted Litter Bins for Street Sweeping

Gross Requirement	Nos	40
To be Procured	Nos	40

The life of Litter bins are considered as 5 years and are placed at every 50 m distance in main or important roads. The projections are for every 5 years term and the present procurement is limited to five years (2015-2020) requirement. The details are given in Drawing No.3.

3.8.5 Waste Collection from Street Sweeping:

It is recommended to sweep all the roads and lanes with dense habitation or commercial activities on a day to day basis, alternate day sweeping in medium density wards and once in three days/once in a week sweeping in the remaining wards.

3.8.6 Push Carts

The Push carts are proposed for road sweeping and drain cleaning. The sweepers shall transfer waste from Push cart to the Waste collection centers that are located within a reasonable distance. The number of push carts are calculated based on the road length at Rangpo The life of the Push cart is