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

INDEX

SL. NO.	PARTICULARS	PAGES
1.	Affidavit on behalf of the State of Sikkim	566 – 571
2.	**Annexure R-1 (colly)** True copies of the Notification No. GOS/ UD&HD/6(87)07/2064 dated 29.09.2007 and Notification No. GOS/UD&HD/1(206)GMC/01 dated 9.04.2012	572 – 575
3.	**Annexure R-2** A copy of the Detailed Project Report for one Urban Local Body namely the Singtam Nagar Panchayat	576 – 647
4.	**Annexure R-3** A copy of the Municipal Solid Waste Plan for Sikkim	648 – 669

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Date: 28.02.2017

566

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AFFIDAVIT ON BEHALF OF THE STATE OF SIKKIM

I, Govind Mohan, Principal Secretary and Principal Resident Commissioner, Government of Sikkim, Sikkim House, Chanakayapuri, New Delhi, do hereby solemnly affirm and state as under:

NOTARY MANJU SHARMA Delhi Regn. No. 8414 Date of Expiry 25 May 2021 GOVT. OF INDIA

1. The presentaffidavit is being filed by the State of Sikkim in compliance with the judgment dated 22.12.2016 and various subsequent orderspassed by this Hon'ble Tribunal and on the basis of the instructions received from the Urban Development & Housing Department, Government of Sikkim, Gangtok, Sikkim.

2. That the Waste Generation Details for the year 2015, as obtained while preparing the Detailed Project Reports for the various Urban Local Bodies, are tabulated as under:

Urban Local Body (ULB)	Dry Waste	Wet Waste	Waste Generation in TPD(Tonnes per day)
NayaBazar-Jorethang Municipal Council	2.4	3.3	5.7
Mangan Nagar Panchayat	1.3	2.8	4.2
NamchiMunicpal Council	3.7	3.0	6.7
Rangpo Nagar Panchayat	3.7	4.8	8.4
Singtam Nagar Panchayat	1.75	1.95	3.7
GyalshingMunicpal Council	1.82	2.10	3.92
Gangtok Municipal Corporation	20.72	35.28	56
Total for Sikkim			88.62

3. That the answering State pursuant to the powers conferred under Section 8 of the Sikkim (Repeal and Miscellaneous Provisions) Act, 1985 had specified the sanitation charges per month to be levied on households, establishmentsetc. Vide Notification No. GOS/ UD&HD/6(87)07/2064 dated 29.09.2007 and Notification No. GOS/UD&HD/1(206)GMC/01 dated 9.04.2012, a copy of which are annexed hereto and marked as **Annexure R-1 (colly).**

NOTARY MANJU SHARMA Delhi Regn. No. 8414 Date of Expiry 25 May 2021 GOVT. OF INDIA

4. Thatthe Municipal Solid Waste Plan for the answering State had already been prepared by the State Mission Directorate for Swachh Bharat Mission (Urban), Urban Development & Housing Department in the year 2014, which is prior to the notification of the new Solid Waste Management Rules, 2016. Further, detailed Action Plan for Municipal Solid Waste

Management has been prepared in the form of Detailed Project Reports (DPRs) which inter alia contain the strategies, systems, and technologies to be implemented in the Urban Local Bodies for modern and scientific Solid Waste Management.The Municipal Solid Waste Management Plan as well as the DPRs are simultaneously being implemented through Urban Development & Housing Department in the Urban Local Bodies (ULBs) under the Swachh Bharat Mission (Urban). A copy of the Detailed Project Report for one Urban Local Body namely the Singtam Nagar Panchayat is annexed hereto and marked as **Annexure R-2.**

5. That the status of progress as well as some highlights in the DPRs are as under:

NOTARY ★ MANJU SHARMA Delhi Regn. No. 8414 Date of Expiry 25 May 2021 ★ GOVT. OF INDIA

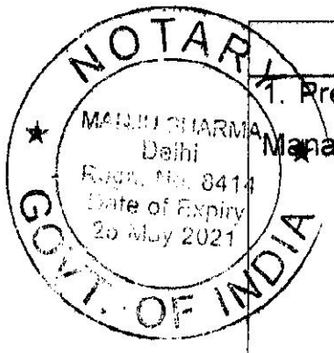
Action	Progress
1. First level of waste segregation at Source/Household: Wet waste, Dry waste, and Domestic Hazardous waste	Colour coded waste bins have been distributed in 11 wards of Gangtok Municipal Corporation as a pilot project.
2. Wet waste to be composted at the level of households in Composter bins (i.e. Eco Bin, Smart Bin, Sampoorna Zero Waste Bins). Dry waste to be stored in bag and sold to scrap dealers, Domestic Hazardous waste to be handed over to door to door waste collection vehicle of Local Bodies	Sensitization and awareness programs have been conducted in all the ULBs of Sikkim. Arithang ward is the first ward where the system is being implemented by Gangtok Municipal Corporation and civil society groups.

which will take it to the landfill for scientific disposal.	
3. A Waste Collection Centre (WCC) to be constructed in every ward of all the ULBs. These WCCs will be located near the road where vehicles are accessible. Only Domestic Hazardous waste and the Dry waste(which could not be sold to scrap dealers) will be allowed to be handed over at these WCCs.	Gyalshing Municipal Council has already identified land for construction of WCCs. Mangan Nagar Panchayat will not be requiring WCC as the area of the Nagar Panchayat is very small and 1 Eco Bank would cater to the needs of the entire ULB. In the rest of the 5 ULBs process of identification of land is undergoing.
4. An Eco Bank shall be constructed for each ULB. Waste collected from WCCs will be brought to Eco Banks. It shall include a waste reception, computer entry, Dry waste segregation system with compacting, bailing and stacking and sale to recycling agencies, Wet waste (apart from household composting) shall be transferred from Primary Collection Vehicle to Refuse Compactor Vehicle directly through hydraulic tipping machine.	Mangan Nagar Panchayat has already constructed an Eco Bank
6. At present there are two landfills in the State of Sikkim and two more landfills need to be constructed near Mangan and Rangpo. These	Out of the two landfills in Sikkim, the one at Martam is being converted into a scientific landfill, which is expected to be completed

NOTARY MANJU SHARMA Delhi Regn. No. 841 Date of Expiry 25 May 2021 GOVT. OF INDIA

landfills will be part of a Regional Facility which will also have a Weigh Bridge, Wet waste composting plant, RDF facility, Scientific landfill, Leachate Treatment Plant.	by April 2017 and the one at Shipsu needs to be converted into a scientific landfill. Process of identification of land for two more landfills at Mangan (North District) and Bhasmey (East District) has been undertaken.
7. Apart from these plans, small scale Biomethanation Plants and Composting Plants will be put up near vegetable markets/haats for management of wet waste generated thereof.	A small scale composting plant is scheduled to be installed in the vegetable market of Kanchendzongna Shopping Complex under Gangtok Municipal Corporation by April 2017.

6. That the initiative taken under the New Solid Waste Management Rules, 2016 are as under:



Action	Progress
1. Preparation of a State Waste Management Policy	First stakeholders meeting and consultative workshop on State Waste Policy has already been held on 26th of Sept, 2016. Process of formulation of a State Level Advisory Body is underway.
2. Registration of Waste pickers and Waste/Scrap dealers	Identity cards have already been provided to Waste pickers.
3. Formulation of State Level Steering Committee for Promotion of City Compost	Process of notifying the members is being undertaken.
4. User fee for Solid Waste Management	User charges for waste collection have been notified in the year 2007 and 2012 itself.

571

7. That the Municipal Solid Waste Plan for Sikkim is annexed hereto and marked as **Annexure R-3**.

DEPONENT

Govind Mohan, IAS
Principal Resident Commissioner
Government of Sikkim
Sikkim House, 12, Panchsheel Marg,
Chanakyapuri, New Delhi

VERIFICATION:

I, Govind Mohan, the above named deponent, do hereby verify that the contents of paras 1 to 7 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.

NOTARY
MANJU SHARMA
Delhi
Regn. No. 8414
Date of Expiry
25 May 2021
27/2/17
GOVT. OF INDIA

VERIFIED THAT THE CONTENTS EXPLAINED TO THE DEPONENT EXECUTANT WHO APPEARS PERFECT TO UNDERSTAND & AFFIRM / DEPOSE BEFORE ME AT DELHI ON 27/2/17 IDENTIFIED BY IDENTIFIED THE EXECUTANT/DEPONENT WHO HAS SIGNED IN MY PRESENCE

DEPONENT

Govind Mohan, IAS
Principal Resident Commissioner
Government of Sikkim
Sikkim House, 12, Panchsheel Marg,
Chanakyapuri, New Delhi

Verified at New Delhi on this the day of 27th February, 2017.

ATTESTED

NOTARY, DELHI
REGN. No. 8414
GOVERNMENT OF INDIA

VERIFIED THAT THE CONTENTS EXPLAINED TO THE DEPONENT EXECUTANT WHO APPEARS PERFECT TO UNDERSTAND & AFFIRM / DEPOSE BEFORE ME AT DELHI ON. IDENTIFIED BY IDENTIFIED THE EXECUTANT/DEPONENT WHO HAS SIGNED IN MY PRESENCE

~~562.~~
572.

ANNEXURE-R1 Colly

SIKKIM

GOVERNMENT GAZETTE

EXTRAORDINARY
PUBLISHED BY AUTHORITY

Gangtok | Wednesday 3rd October, 2007 | No. 446

GOVERNMENT OF SIKKIM
URBAN DEVELOPMENT AND HOUSING DEPARTMENT
GANGTOK

No.GOS/UD&HD/6(87)07/2064

Dated:29.09.2007

NOTIFICATION

In exercise of the powers conferred by Section 8 of the Sikkim (Repeal and Miscellaneous Provisions) Act, 1985, the Government hereby specify the following rates of sanitation charges per month to be levied from the household, shop establishment etc. with immediate effect.

1. Sanitation charges for residential areas per family - Rs.30/-per month
2. Sanitation charges for shops viz. grocery, manihari,electronic, electrical, betel, hardware, cloths, ready made garments, liquor shop, shoes, studio, and saloons etc. - Rs. 45/- per month
3. Sanitation charges for printing press, garage, motor parts & lubricants, petrol pump, vegetable, vendors fish, meat shops, fast food, tea stall, lottery and restaurant etc. - Rs. 60/- per month
4. Sanitation charges for hotels having food & lodging, guest house upto 8(eight) rooms and below. - Rs.120/-per month
5. Sanitation charges for hotels having foodand lodging more than 9(nine) rooms. - Rs.150/- per month
6. Sanitation charges for shops dealing the business indicated in schedule-I and schedule-II of the Sikkim Trade Licence and Miscellaneous Provision Rules, 1985 but not indicated above. - Rs. 60/- per month

SECRETARY
URBAN DEVELOPMENT AND HOUSING DEPARTMENT
GOS/UD&HD/6(87)07

S.G.P.G-446/Gazette/150 Nos. Dt:20/09/07

~~563~~
573

GOVERNMENT OF SIKKIM
URBAN DEVELOPMENT AND HOUSING DEPARTMENT
GANGTOK

NO: GOS/UD&HD/ 1(216)GMC/01 Dated: 09.04.2012

NOTIFICATION

In exercise of the powers conferred by Section 8 of the Sikkim (Repeal and Miscellaneous Provisions) Act, 1985, the Government hereby specifies the following rates of sanitation charges per month to be levied from the households, establishments etc. falling under the Gangtok Municipal Corporation with immediate effect:

Sl. No.	Type of Consumer		Rate (in ₹)
1	House holds		50/- (extra if involves head loads)
2	Small shops		50/-
3	Big shops		100/-
4	Garage/ Fabrication shops		500/-
5	Hotels	upto 5 rooms	250/-
		6 to 10 rooms	500/-
		11 to 15 rooms	750/-
		16 to 20 rooms	1000/-
		more than 20 rooms	1500/-
6	Offices - Having separate building (including Central Office)		1000/-
7	Secretariat	Home Department	1000/-
		Others	500/-
8	Online Lottery shops		200/-
9	Petrol Pumps		500/-
10	Private Hostel	Upto 10 Beds	100/-
		11 to 20 Beds	150/-
		20 and above beds	300/-
11	Private Tutorials		100/-
12	School	Upto Secondary level	300/-
		Upto Senior Secondary level	300/-
		with Hostel	500/-
13	Transport Company		250/-
14	Carpenters shop		150/-
15	Cinema halls		500/-
16	Small restaurants/ Fast Food		100/-

17	Restaurants	Medium	500/-
		Large	1000/-
18	Luxury Hotels		5000/-
19	Big Bazaar/ Departmental store/ Shopping Mall		5000/-
20	Hospitals		2000/-
21	Clinical Laboratories		300/-
22	Casinos		2500/-
23	Factory/Manufacturing Industries		500/-
24	Pan shops		150/-

Sd/-
(TOBJOR DORJI)
Commissioner- Cum Secretary
Urban Development & Housing Department

Memo No: 29/UD&HD. Dated: 09.04.2012.

Copy to:

1. Joint Secretary (Home Department) for publication in the Official Gazette.
2. Joint Secretary (II), Urban Dev. & Housing Department.
3. Municipal Commissioner, Gangtok Municipal Corporation.
4. Pr. P.S. to CCS, UD&HD.
5. PS to Hon'ble Minister, Urban Dev. & Housing Department.
6. File Copy
7. Guard Copy.

a/4/12

Joint Secretary (I)
Urban Dev. & Housing Department

575

ANNEXURE-R2

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 Singtam,

DECEMBER 2015

Prepared By:

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

Contents

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
SB	-	Swachh Bharat
SIPMIU	-	State Investment Program Management and Implementation Unit
SNP	-	Singtam Nagar Panchayat
SWM	-	Solid Waste Management
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	Singtam, Rangpo, Geyzing, Mangan, Namchi, Jorethang & Nayabazaar, Rhenock,
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 Singtam
6	Area/Wards Covered	5 Municipal wards
7	Population Covered – Phase 1 (2015-2020)	2015 : 7913 2020 : 8282
8	Project Components	

1	Household Segregation - Supply of Jute Bags for storing dry waste (Wet waste in existing Bin only)	1300
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	5
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	40
4	Supply of Weighing scale at Waste Collection Center	5
5	Mini Garbage Tipper - 4.5 cum capacity	2
6	Construction of Eco Bank Shed	1
7	Provision for Computer for Data entry on waste deposit, alongwith Computer Table, UPS, Colour Printer, etc complete	1
8	Installation of small incinerators at Eco Bank shed for handling diapers, sanitary napkeins	1
9	Installation of Compacting Machine for Volume reduction of dry waste Paper waste, Plastic bottles,	1
10	Installation of Weighing scale with platform at Eco Bank for weighing recyclable waste bundles/bales	1
11	Supply of Bins (360 liter capacity) for Segregataion at Eco Bank - 15 Nos per EB	15
12	Supply & Installation of Conveyor belts for waste Segregation at Eco Bank	1
13	Biomethanation Plant for Market waste - one plant per ULB	1

		14	Closed Compactor Trucks for carrying waste from ULB to Regionl Facility	1
		15	Supply of Eco Bins in pilot study households (about 5% of households in each ULB)	70
		16	Push carts for Street Sweeping	15
		17	Pole Mounted Twin Bin for road side Litter Bins - 60 ltrs capacity each HDPE	20
		18	Shoulder Bins for waste collection from Inaccessible areas	12
		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. Singtam shall utilize the centralized Compost Treatment Plant and Land fill disposal & associated infrastructure at Regional Facility, Martam, East Sikkim		
9	Project Cost	Rs. 36.02 Million (Rs. 360.2 lakhs)		
10	Annual Operation & Maintenance (O & M) Cost	Rs. 31.3 lakhs		
11	Annual Recovery by Selling Dry waste and Collection of User Fee	Rs. 24.9 lakhs		
12	Annual Profit to ULB	Rs. 6.41 lakhs		
11	Implementing Agency	UD & HD, Gangtok		
12	Operation & Maintenance	Urban Local Bodies		

1. 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;

[illegible]	[illegible]	[illegible]
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 Singtam and is based on secondary data collected from Singtam 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 Singtam 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 Singtam 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 Singtam

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.

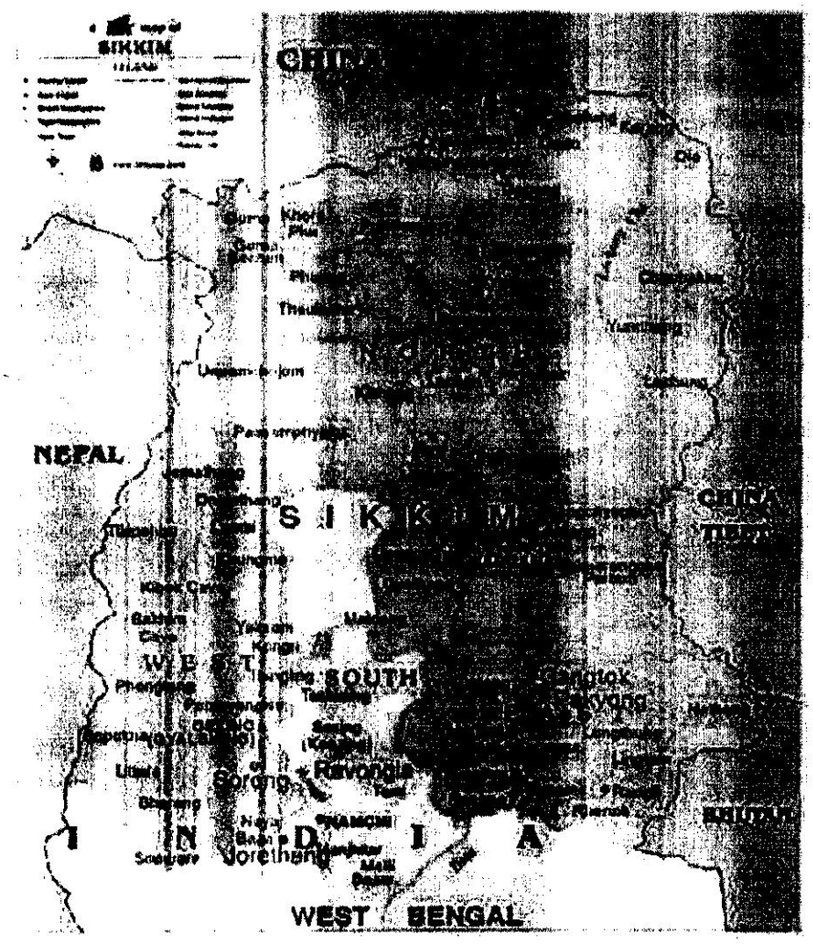


Figure 2.1: Map of Sikkim with Project ULBs

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

Singtam is located at 27.15°N 88.38°E.[1] It has an average elevation of 1396feet). **Singtam** is in East Sikkim district of Indian state of Sikkim.The town is connected to the capital city Gangtok located at about 30 kms. Singtam is located at 27.15°N and 88.38°E.[1] It has an average elevation of 1396 feet. As per the Census 2011, the population of Singtam is 5868. **The Regional setting Map is given in Drawing 1.**

2.3 Climate

The climate of Singtam is warm and temperate. The summers here are much rainier than the winter.. The temperature here averages 23° C. The average annual rainfall is 3057 mm.

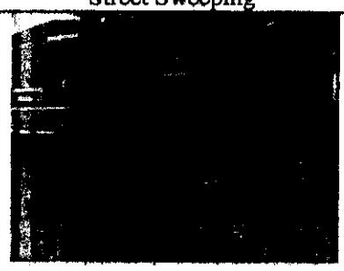
2.4 Existing Solid Waste Management (SWM)

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 Singtam Nagar Panchayat (RNP) includes, There are 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 10 Safaikarmachari, two driver 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.

Street Sweeping	Street Sweeping	Street Sweeping
		

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 Singtam during August 2015. The outcome of the opinion survey are given below;

- 97%of households informed that they hand over the garbage to the trucks directly on arrival of vehicle, 3% indicated that they are throwing on the road.
- 35% of households had expressed that walking distance to dispose off garbage is less than 50 feet, 65% indicated that they walk more than 50 feet
- 100 % of the households have indicated that time spent for existing disposal is about 5 minutes during operation of collection system
- Regarding frequency of collection or disposal of waste, 94 % informed that daily collection is being done, 6 % indicated alternate day.
- All the households had informed that they are paying for the present SWM services. Out of which, about 61 % of the households pay Rs. 30 per month and 31% pay more than Rs. 30 per month.
- 91 % of the households are satisfied with the current level of service and nine percent are not satisfied with the existing system

Due to absence of door-to-door collection system and delay from collecting vehicles, many

households throw away their waste on the streets, and dogs scatter theses 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 (Johras) 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.

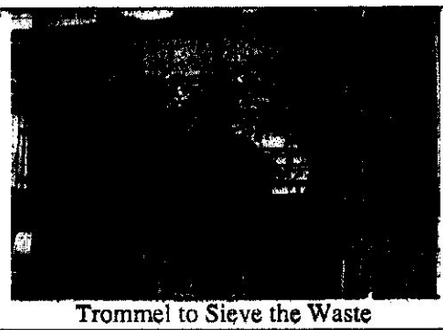
Garbage Disposal

Waste dumping

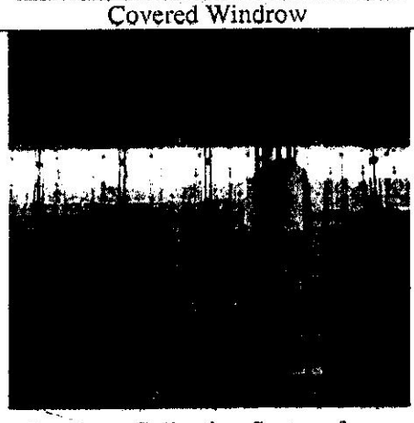
2.4.4 Treatment

Presently Singtam 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.

Covered Windrow



Trommel to Sieve the Waste



Leachate Collection System from Windrows

Leachate Collection System from Windrows

Trommel to Sieve the Waste

Trommel to Sieve the Waste

2.4.5 Disposal

Currently, the mixed waste collected from Singtam 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.

Existing Dumping ground at Martam, East Sikkim

2.4.6 Key Issues:

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

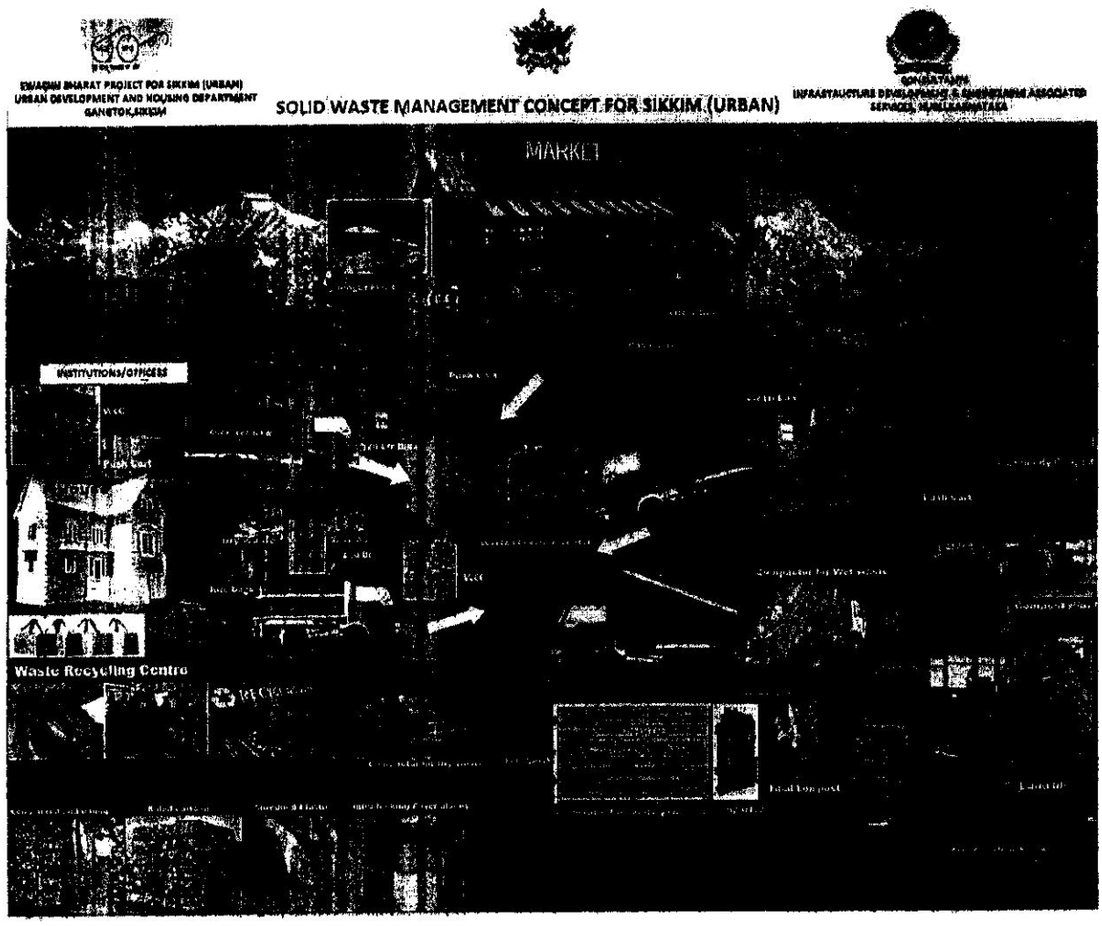
- Absence of Solid waste quantification and characterization
- Solid waste collection performance is less.
- Absence of Door to Door collection
- Throw away garbage into streams (Jhoras)
- Absence of waste segregation
- Unhygienic disposal of waste in open dumping areas posing threat to public health
- 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 Singtam 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	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	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	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	1. Refuse Compactor Vehicle shall transport from Eco Bank to nearest Regional Facility (RF) at Martam.
Treatment & Disposal Facilities	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 Singtam 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 Singtam is given in the **Drawing No. 2.**

3.2 Population Projections :

The 2011 census of India population for Singtam is 5868. Considering the district decadal growth rate of 15.73% the projected population for 2021 is 6791. Considering the tourist population the details and further calculations are given below.

Table 3.2 : Projected Population for Singtam

Population (as per 2011 Census)	5868
Decadal Growth Rate*	15.73%
Projected 2021	6791
Projected 2015	6237
Tourist Population**	1676
Proj 2015 + Tourist	7913
Projected 2019	6606
Projected Population + Tourists	8282
Design Population (80% of above 2019)	6626

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 per capita 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 370 gm as against the 347 gm for MIG and 359 gm per capita for LIG households.

Table 3.3: Household Per Capita Generation

[illegible]	[illegible]	[illegible]
LIG	24	359
MIG	30	347
HIG	6	370
Total	60	354

Source: Field Assessment Surveys and Analysis.

Table 3.4: Per Capita Generation from other sources

Per capita waste generation from residential area	**354 grams/person**
Add 15 % for Municipal Waste from Commercial sector	53 grams/person
Add 15% for Waste from Road sweeping	53 grams/person
Add 2% waste from Institutions	7 grams/person
Total	**467 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	Population	Per capita @ 1.40%					
2015	7913	467	3.70	1.75	1.95	5.8	3.9
2020	8374	501	4.2	2.0	2.2	6.6	4.4
2025	8999	537	4.8	2.3	2.5	7.6	5.1
2030	9665	576	5.6	2.6	2.9	8.8	5.9
2035	10415	617	6.4	3.0	3.4	10.2	6.8
2040	11186	662	7.4	3.5	3.9	11.7	7.8

Table 3.6: Sources of Waste generation in Singtam

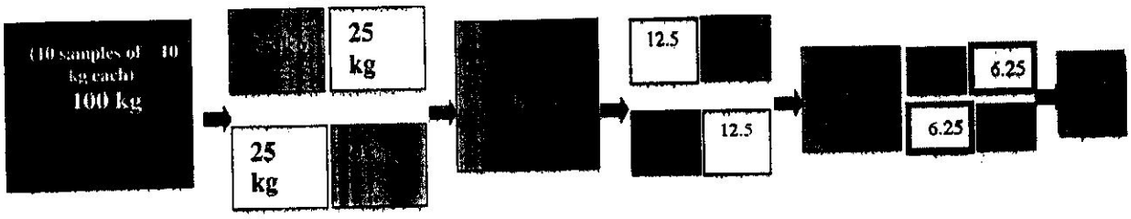
Sources	Percentage of Total Waste (%)
Residential	68
Commercial	15
Institutional	15
Road Sweeping	2
Total	**100**

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 Ultimum 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.

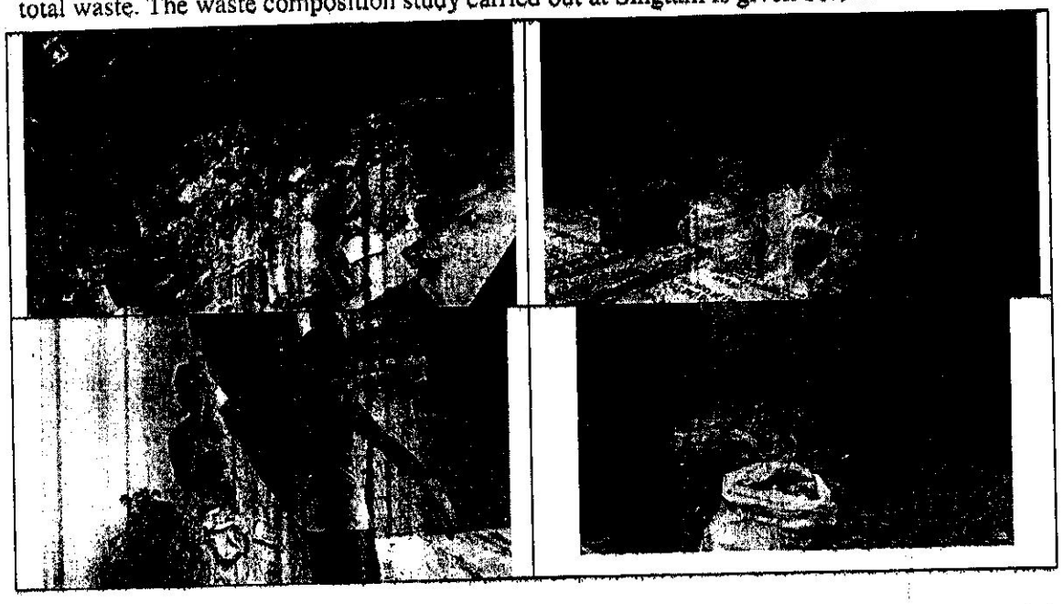
Waste from pre-decided sampling locations was collected on daily basis. A day before the sampling survey each of the selected households were given a labeled sampling bag and were requested to deposit all domestic waste generated on the next day in the bag for collection on the day after in the morning. 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 53 % of the waste consists of organic waste and 31 % is recyclable waste (paper, plastic, metal and glass). Inert comprises of 16 % of the total waste. The waste composition study carried out at Singtam is given below.



The detailed physical and chemical characteristics are furnished below;

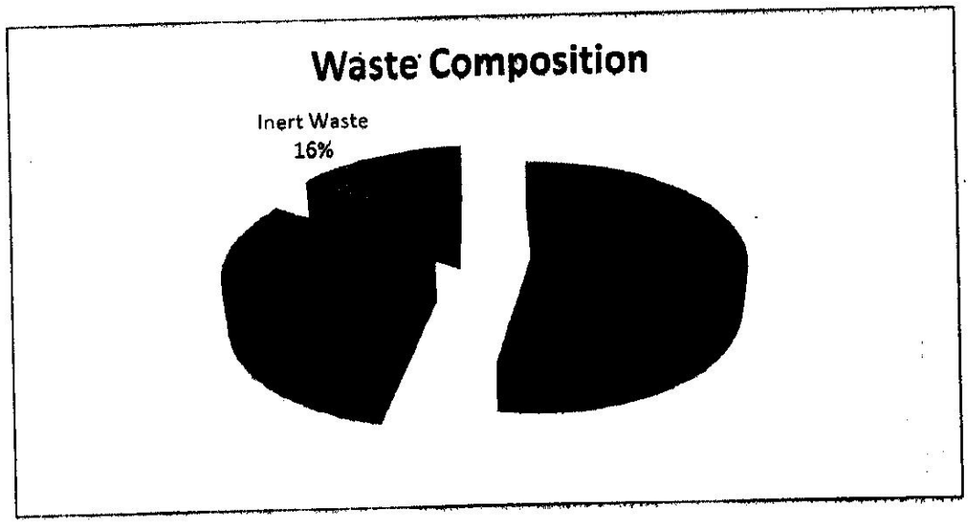


Table 3.7: Physical Characteristics of Garbage

Biodegradable Waste	1457.9	174.8	17.9	147.0	1797.7	53.2
Metal	26.6	0.0	0.0	0.0	26.6	0.8
Glass	127.0	10.2	0.0	1.9	139.0	4.1
Ceramics	23.9	0.0	0.0	4.8	28.8	0.9
Paper	283.2	16.2	0.0	21.3	320.7	9.5
Textiles	161.5	9.4	7.9	10.2	189.0	5.6
Plastics	273.7	13.2	2.7	16.5	306.0	9.1
Rubber	146.3	0.0	6.1	4.6	157.0	4.6
Miscellaneous combustible (Wood, Leather)	87.4	7.4	0.0	4.8	99.6	2.9
Miscellaneous Non combustible (dust/dirt, ashes)	43.7	6.1	1.3	29.2	80.4	2.4
Inert (Street sweeping-Soil/Stones, bricks, ash, coal)	171.1	22.2	2.5	37.0	232.7	6.9

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

Table 3.8 : Chemical characteristics of Garbage

Parameter	[illegible]	[illegible]
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.	Tests/Parameter	[illegible]
1.	Moisture Content	[illegible]
2.	Organic Carbon	[illegible]
3.	Nitrogen	[illegible]
4.	Phosphorous	[illegible]
5.	Sulphur	[illegible]
6.	Ash content	[illegible]
7.	Calorific Value	[illegible]
8.	Heavy Metals (As, Se, Zn, Fe, Mn, Ni, Cd, Cu, Hg, Pb, Cr)	[illegible]

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

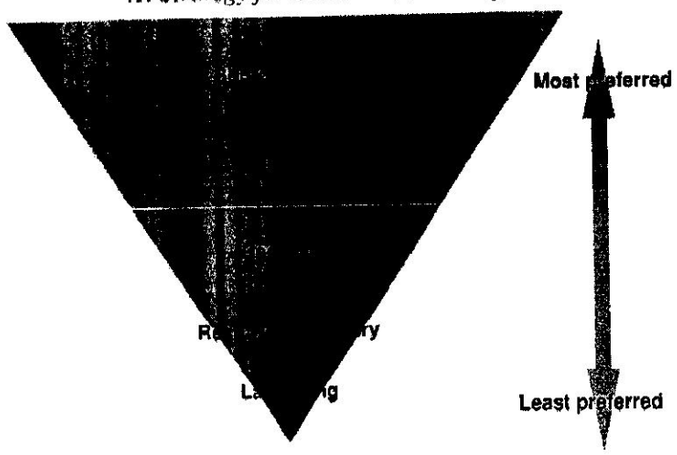
The implementation of the above proposed sub projects can ensure that the solid waste management operations in Singtam are safe and efficient and confirm to the national regulations. The success however depends on many factors, important of which is the public participation, co-operation, and support. 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 Singtam 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.

4R Strategy for Solid Waste Management



- 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 Singtam, 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

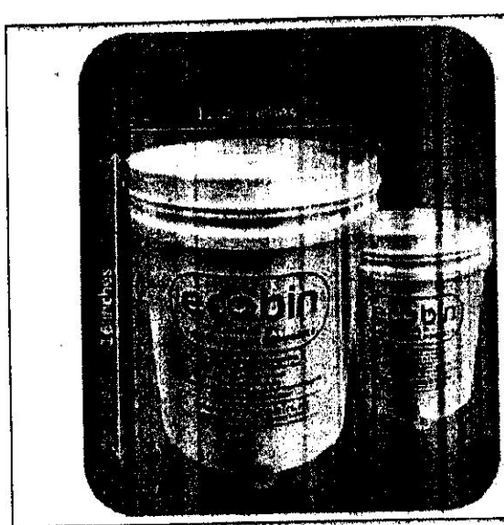
- Aerosol cans, Batteries from flashlights and button cells
- Bleaches and household kitchen and drain cleaning agents
- Car batteries, oil filters and car care products and consumables
- Chemicals and solvents and their empty containers
- Cosmetic items, chemical-based, Insecticides and their empty 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.



Eco Bin

Microbial Culture

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	70

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 Singtam. 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 rods 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	20
To be Procured	Nos	20

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 Singtam The life of the Push cart is considered as 5 years and thereafter these are to be replaced. Accordingly, the procurement of vehicles are indicated in Table below for every five years.

Table 3.12 : Requirement of Push Carts for Street Sweeping

Gross Requirement	Nos	15
To be Procured	Nos	15

The typical waste collection Bins, Push Carts Storage Bins proposed for Singtam is given in **Drawing No. 3.**

3.8.7 Introduction of Waste Collection Centers (WCC)

The proposed system shall abandon all existing Community Bins and are replaced by small Waste Collection Centers. The size of WCC is 3 meter x 3 meter x 2.5 meters, made of MS grill with door and window. The Residents shall handover garbage to Waste Collection Centers (WCC). WCC operation hours is 3 Hrs in the morning (6 a.m. to 9 a.m). One WCC for every ward covering about 260 Households, to be located nearer to road where vehicles are accessible but inaccessible households find easy to deposit the garbage.

About five such WCC's are proposed for Singtam. The typical waste collection center proposed for Singtam is given in **Drawing No. 4.**

3.8.8 Primary Collection System :

Since the terrain is difficult the smaller vehicles cannot move in narrow paths and Door-to-door waste collection system is difficult therefore the waste collected at Waste collection center shall be transported to Eco Bank. This shall be collected on a daily basis in the morning. Waste collectors shall be provided with shoulder bins to inaccessible areas, access through steps and waste shall be deposited by the households in container. The waste collector shall collect the waste and shall deposit to Waste collection centers. Litter bins shall be provided along main roads, bus stand, other public places etc. to avoid littering. The waste collection system through small mechanical vehicles are proposed for project ULBs. The salient features of the same are detailed below;

Table 3.13: Mini Tipper (Mahindra Jeep) Requirements for Door Step Collection

Description		
Primary Collection Vehicle with Hydraulic Tipping vehicle (4 cum capacity).	4000	liters
One vehicle load at waste density of 400kg/cum	1600	Kg
Number of house holds covered in one trip at generation rate of 2.24 kg/day/HH	685	Nos
Estimated time taken is 3 HH/ minute, time required for one trip	228	minutes
Travel time to Eco Bank station (average distance 5 km; 5 km x 2way at 20 km.p.h)	30	minutes
Unloading time	10	minutes
Delay	10	minutes
Total time for one trip	278	minutes
Number of trips in 480 minutes (8 hours) of working time	1.7	Nos
Coverage/day –Number of house holds	1370	Nos
Total no. of Households	1300	Nos
No, of Primary Collection Vehicle with Hydraulic Tipping vehicle (4 cum capacity) required.	1	0.9

Based on the above collection efficiency by each vehicle three vehicle is required for 100 % collection of garbage from residential area. The existing vehicle may be used to collect the garbage from Commercial, Institutional and Road sweeping waste including Bi-weekly Haat. The life of the vehicle is considered as 10 years and thereafter these vehicles are to be replaced.
The typical waste collection vehicle proposed for Singtam is given in **Drawing No. 5.**

3.8.9 Strategies for Segregation and Collection of Waste

The following strategies are suggested for which appropriate actions are to be initiated by state government;

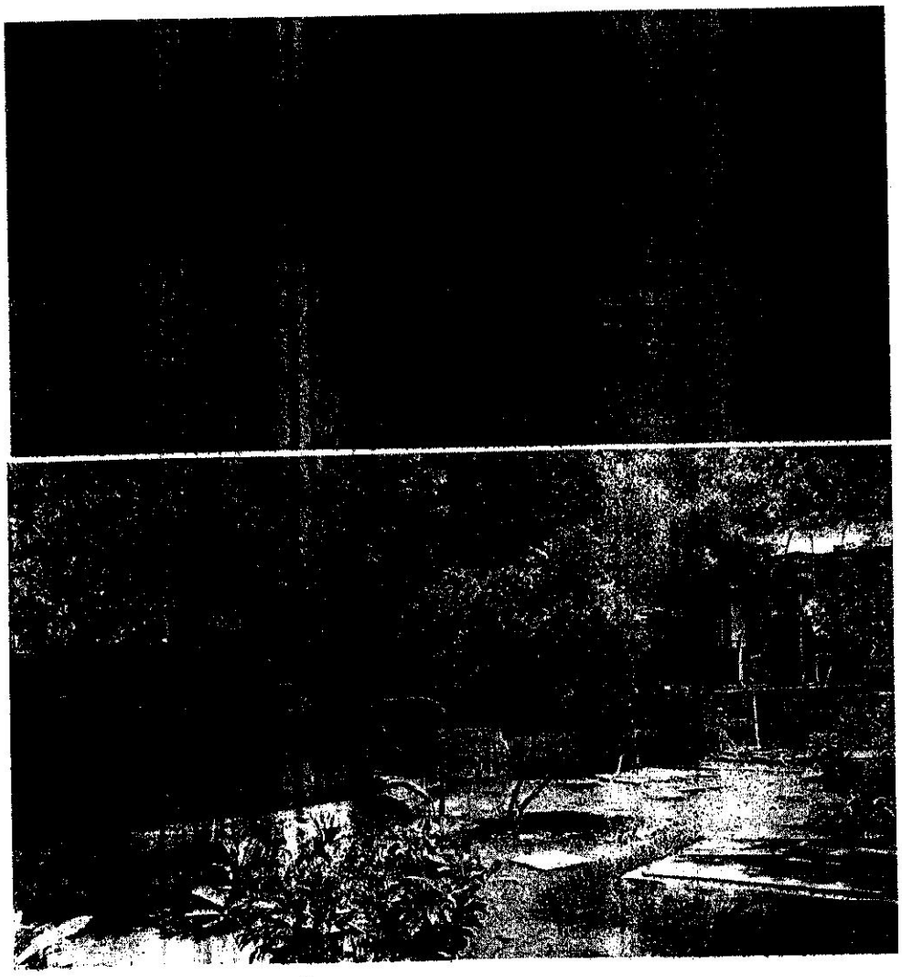
- To make segregation at source compulsory to all Households, Commercial (Hotels, Shops, Markets), Institutional (School, Colleges, Offices) premises etc.
- All dry and wet waste need to be dumped in separate jute bags and handed over to the garbage collectors.
- Residents may be asked to deposit the segregated waste to WCC in the morning hours
- Wet garbage to be cleared on daily basis. Wet Waste is sent to Eco Bank
- Dry garbage may be collected Once/Twice a week.
- Dry waste may be then segregated at Eco Bank maximum portion of the dry garbage can be sold to scrap dealers
- To form local resident welfare associations to promote and regularize the simple practice.
- Publicity campaign for creating community awareness and public participation (CAPP) for segregation of waste should be carried out and continued to achieve segregated biodegradable waste for composting and minimising the waste for final disposal.
- Borawalas and recycling industries should be encouraged to maximise reuse and recycling of dry waste.

3.9 Waste Collection from Bulk Generators:

The proposed system shall undertake direct collection of waste from large and medium sized hotels, restaurants, party halls, hospitals (domestic and non-bio medical waste) and from construction sites. Separate vehicles with adequate crew shall be provided for the purpose and the collection shall be carried out on a fixed daily schedule; waste shall be directly transported to disposal site. Existing waste transport vehicles available shall be utilized to the maximum extent. Each vehicle will employ two sanitary workers and two vehicle crew, including the driver.

3.10 Biomethanation Plant for Market (Haat) Waste

Every week there shall have two Haats one on Wednesday and another on Sunday. These waste shall be taken to the Biomethanation plant (1 TPD capacity) and processed using Nisargruna Biogas plant which include biodegradable kitchen waste, paper waste, green grass, leaf litter, animal remains in abattoirs, hospital waste, green plant waste, cow dung, crop residues, sugarcane, baggase, water hyacinth, etc. The waste is first segregated carefully to remove non-biodegradable material and then homogenized to make a slurry. It is then processed in a sequential manner first by aerobic and then by anaerobic process. The products of the process are biogas consisting of methane, carbon dioxide and water vapor & weed free good quality manure. About 70% of Water can be recycled at the end of the process. The following picture gives the details of the same.



3.11 Salient Features of Bio-Methanation Plant:

Nisargruna Bio Gas Plant would serve many purposes such as:-

1 Environment friendly disposal of waste, which is the need of the hour.

2 Generation of fairly good amount of fuel biogas, which will definitely support the dwindling energy resources. The gas can be used for as fuel in the kitchen

3 Generation of high quality, weed free manure, which is an excellent soil conditioner. This is very important for replenishing organic carbon in the undernourished soil after years of agriculture.

4 Water can be used for planting and gardening.

5 Need only one time investment.

6 Power Generation from organic waste generated in Suburban Area using Spatial Techniques -Refuse into Resource through Biogas

7 40-45% urban organic waste is the organic can be easily treated by anaerobic digestion.

8 Organic waste is treated in closed vessels where, in the absence of oxygen microorganisms break down the organic matter into a stable residue, and generate a methane-rich biogas in the process.

9 Reduced Greenhouse Gas Emissions - Stopping release of @ 180 cum of Methane in to the atmosphere per day per plant which is 22 times danger than CO2 for Global Warming.

Table 3.14 : List of Civil Components for Biomethanation Plant

S.No.	Component	No.
1	Processing Room	1
2	Receiving platform Primary Digesters	1
3	Primary Digester	2
4	Main Digester	1
5	Transit Chamber	4
6	Sump	1
7	Drying Shed	1
8	Storage Shed	1
9	Balloon Room	1
10	Generator Room	1
11	Toilet for workers	1
12	Office room	1

Table 3.15 : List of Mechanical/Electrical Components for Biomethanation Plant

S. No.	Component	No.
1	Sorting Table(SS-304)	1
2	Conveyer Belt*	1
3	Magnetic Separator*	1
4	Mixer (3-5HP)	1
5	Weighing Scale (1-100kg)	1
6	Gas Holder (MS 5mm) with fiber coat from outside and epoxy coat inside	1
7	Air Compressor(3HP)	1
8	Air Compressor(2HP)	1
9	Slurry Pump(2HP)	1
10	Water Pump (1HP)	1
11	Gas Meter	1
12	Gas Stove	2
13	Weighing Scale	1
14	Gas Blower (8-10m3/hour and at 75 mbar pressure at user end)	1
15	Gas Baloon	1
16	Biogas Generator	1
17	Wall Mounted Fans	2
18	Exhaust Fan	1
19	Fly repellent Lamp	1
20	Aeration grid	1
21	Methane recycling grid	1
22	Water trap	1

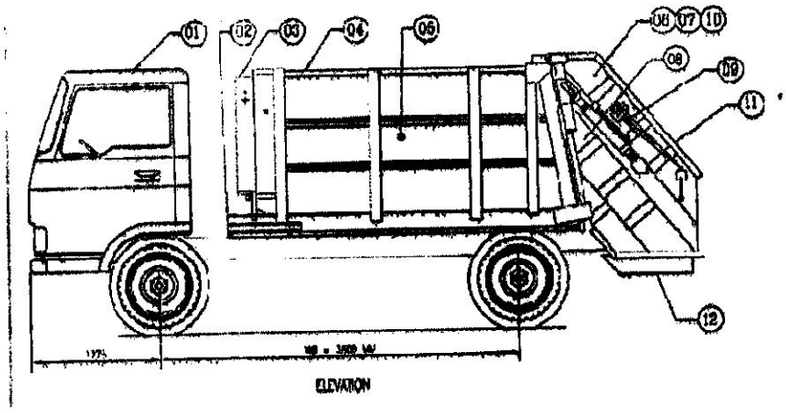
The ULB shall identify suitable land for the Biomethanation Plant nearby the town.

3.12 Eco Bank for Collection of Garbage for further waste handling

A new concept of Eco Bank is developed for Singtam. This Eco Bank shall function as a Transfer point wherein smaller vehicle can unload wet garbage into Compactor vehicles directly and shall be taken to Martam for composting. This Waste Bank shall receive all the garbage generated from the town and shall segregate the dry waste on segregation conveyor belt, compact and bailed and stored for further recycling process. The inert waste and special waste shall be stored here for further handling. Within this premises there is a provision for handling sanitary napkeins by using small Incinerator. A Waste receiving platform to receive waste by weighing and making record of waste received on regular basis and computer entry is also made. 360 liter bins with wheels are provided for carrying waste from segregation to compaction unit and also used for storage of waste during emergency situations. There shall be one Eco Bank for Singtam for which the ULB need to identify the land. The typical drawing proposed for Singtam is given in **Drawing No. 6.**

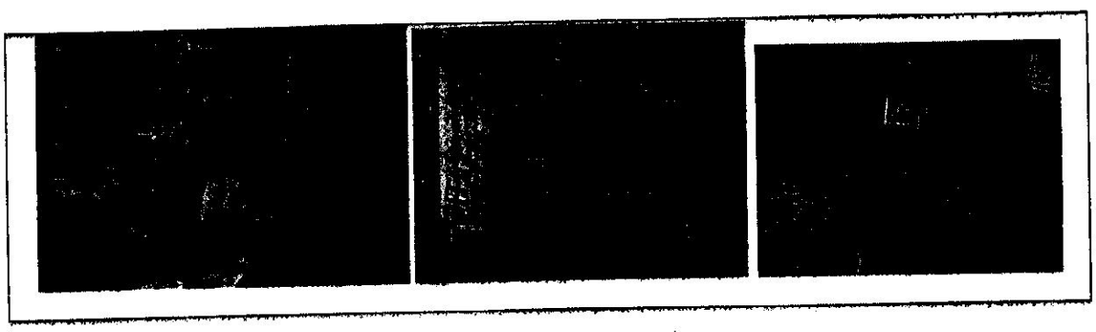
3.13 Solid Waste Transportation by Secondary Collection to Disposal Site:

Understanding the existing collection vehicles fleet to the Regional facilities which consume more time and carry less garbage. Presently these vehicles make only one trip. As a result the complete waste is not removed and collection efficiency is 60% only. In order to overcome the difficulties Refuse compactor vehicles are proposed to lift the garbage from Eco Bank to Regional Facility. The waste volume is thus compacted and transported to the disposal site. The life of Compactor Vehicles are considered as seven years. The compactor Vehicle is depicted below.

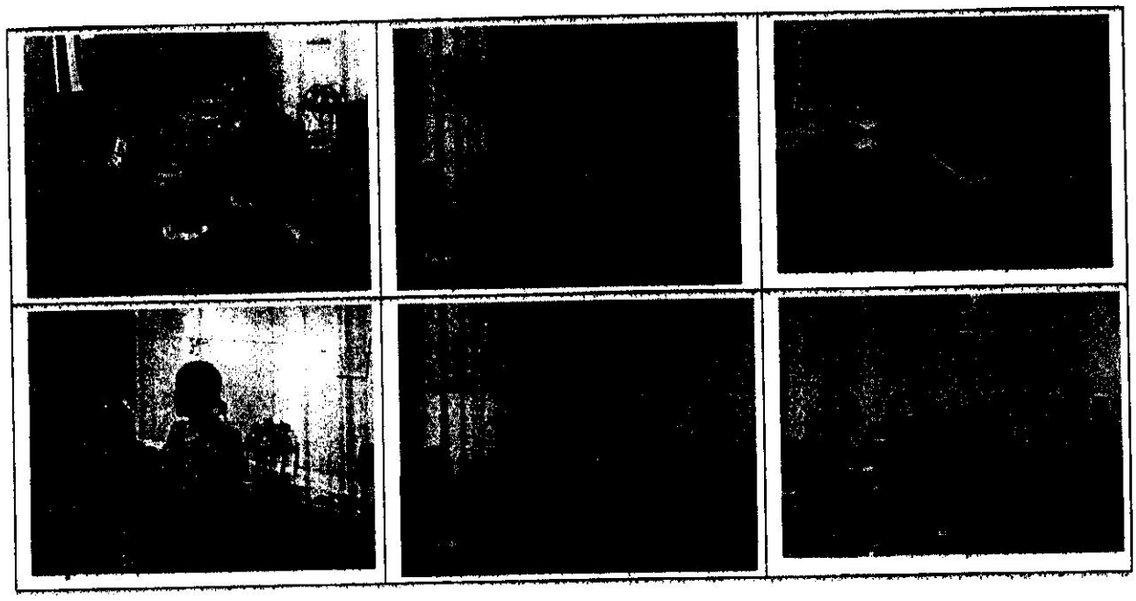


Since the hilly terrain and long distance one Compactor vehicle can make two trips per day. Also, the proposed system shall undertake direct collection of waste from large and medium sized hotels, restaurants, party halls, hospitals (domestic and non-bio medical waste) and from construction sites. Separate vehicles (existing) with adequate crew shall be provided for the purpose and the collection shall be carried out on a fixed daily schedule; waste shall be directly transported to disposal site at Martam located at about 30 kms distance. One number of compactor are provisioned to meet the total fleet. The typical drawing for Secondary transportation vehicle proposed for Singtam is given in **Drawing No. 7.**

Photos showing Stakeholder Consultations at Singtam



Photos during Orientation Training Session for Survey Team from respective ULBs



3.14 Waste Treatment & Disposal Options:

3.14.1 Methods of Treatment and Disposal

The Municipal Solid Waste (MSW), generally, can be treated and disposed off by the following five methods/options:

(1) Bio-methanation/Bio-chemical conversion/Anaerobic digestion
(2) Incineration (Mass burn)
(3) Refuse Derived Fuel (RDF)
(4) Pyrolysis /Gasification – Thermo chemical conversion
(5) Aerobic Composting
(5) Vermi- Composting
(6) Land filling

The principle of above technologies/ treatment options for solid waste are detailed below;

Table 3.16 : Various Technologies / Treatment options

Sl	SWM Technologies/Options	Principle	Remarks
1	Bio methanation	When municipal solid wastes with a large proportion of organic matter is subjected to anaerobic decomposition, a gaseous mixture of Methane & Carbon di-oxide (CH4 & CO2) known as biogas could be produced under favourable conditions. The process is quite stable and upsets do not easily occur. The gas production ranges from 0.29 m3 /kg of Volatile solids added/day to 0.16 cubic metre (m3)/kilogram of Volatile solids added/day in different seasons. The sludge has good manure value of Nitrogen,	Successful solutions to this option will only develop if they are basically self-sustaining and

		Phosphorous, Potassium (NPK : 1.6 : 0.85 : 0.93) and is observed to drain easily. The process gives a good performance at a detention time of 25 days. Anaerobic digestion to produce bio-gas (and then power) is feasible with food wastes free of plastics and ash.	economically viable.
2	Incineration	Incineration is the process wherein the waste is burned at high temperature. The air pollution to meet the stringent environmental standards are difficult.	Many plants fail because of low net calorific value and high moisture and high inert content.
3	Refuse Derived Fuel (RDF)	The process of conversion of garbage into fuel pellets involves primarily drying, separation of combustibles from garbage, size reduction and pelletisation after mixing with binder and/or additives as required. The MSW collected to be dried if the moisture content is more than 35- 40%,until 10-12% moisture content is desirable to be maintained in the garbage for densifying into fuel pellets. By open sun drying and also fed into a rotary drying system i.e. Hot Air Generation burning oversize garbage or other fuel to further bring down the moisture After drying the garbage is passed through a screening equipment to separate sand/grit (below 8mm), heavier combustibles and ferrous materials The dried and screened garbage is then passed through an Air-Classifier (Density Separator) in which the light combustibles and dense fractions (e.g. stones, glass etc.) are separated over an air barrier. At the same time, the garbage is passed over a magnetic separation unit to remove magnetic materials. The light combustibles are ground to 10/15mm particle size. The binder and/or additives are mixed with ground garbage in mixer/ conditioner before pelletising. The pellets coming out of pelletiser are cooled and stored in the pellet storage yard for despatch. The pellets so produced can be used in industrial boilers and thermal power plants as fuel.	RDF is not suitable for Singtam because 1) High moisture content in waste2) Low temperature 3) Sun drying of waste is difficult) High cost for artificial drying
4	Plasma Arc Technology/ Plasma Pyrolysis Vitrification (PPV)	The system basically uses a Plasma Reactor which houses one or more Plasma Arc Torches which generate, by application of high voltage between two electrodes, a high voltage discharge and consequently an extremely high temperature environment (between 5000-14,000° C) approximating the temperature of the Sun. This hot plasma zone dissociates the molecules in any organic material into the individual elemental atoms while all the inorganic materials are simultaneously melted into a molten lava. The waste material is directly loaded into vacuum in a holding tank, preheated and fed to a furnace where the volatile matter is gasified and fed directly into the plasma arc generator where it is	This is an emerging technology for energy/ resources recovery from organic wastes. High cost.

		pre-heated electrically and then passed through the plasma arc dissociating it into elemental stages. The gas output after scrubbing comprise mainly of CO and H_2. The liquefied produce is mainly methanol.	
5	Composting	Aerobic composting is the process of degradation of biodegradable waste matter into simple organic compound by certain micro-organisms in the presence of air. The main requirements are adequate supplies of air and moisture. Compared to anaerobic process, aerobic conversion process is preferable as it is fast, exothermic and free from odour. Aerobic process also helps to eliminate pathogenic organisms, weed seeds, larva etc. as a result of high temperature developed during the process. Main factors affecting the composting through aerobic process are Moisture Content (50% to 60% optimum), Temperature (50- to 60 degree C (5 to 7 days for pathogens to get killed), C/N Ratio (Between 20 – 40), If C/N Ratio is less – straw, saw dust, paper to be added as carbon Source, If C/N Ratio is more – sewage sludge, slaughter waste to be added as nitrogen source At the end of composting C/N Ratio=20. Adequate oxygen throughout the mass-normally ensured by the turning every 5-7 days.	Composting, a proven technology in many locations, is also the cheapest available waste-management option today
6.	Vermi composting	Vermicomposting involves the stabilisation of organic solid waste through earthworm consumption which converts the material into worm castings. Vermicomposting is the result of combined activity of microorganisms and earthworms. The worm species that are commonly considered are Pheretima sp, Eisenia sp & Perionyx excavatus sp. These worms are known to survive in the moisture range of 20-80% and the temperature range of 20-40°C. The worms do not survive in pure organic substrates containing more that 40% fermentable organic substances. Hence fresh waste is commonly mixed with partially or fully stabilised waste before it is subjected to vermicomposting. The worms are also known to be adversely affected by high concentrations of such heavy metals.	Developed and adopted extensively This technology may be useful for decentralized facility at Singtam in small scale.

3.14.2 Evaluation of Treatment & Disposal Options

The detailed evaluation of various waste treatment options viz., (1) Bio-methanation/Bio-chemical conversion/Anaerobic digestion, (2) Incineration, (3) Refuse Derived Fuel – Thermo chemical conversion, and (4) Pyrolysis /Gasification – Thermo chemical conversion are reviewed. Based on quality and quantity of garbage generated in East district of Sikkim, the above four options involving waste-to-energy technologies are not suitable for East Sikkim district of Sikkim. Moreover these technologies are very costly, complex ones and are suitable only where waste generation is in very large quantity. In view of these constraints, high capital cost, complex design and high cost of O&M as mentioned above, these treatment methods are not recommended.

3.14.2.1 Compost Plant

The MSW Rules, 2000 of GoI, stipulate waste processing of the organic component either through composting or other useful purposes. Considering the fact that East Sikkim districts of Sikkim has good potential for Compost 50 TPD capacity of Compost plant is being constructed at Regional Facility at Martam. The organic waste shall be brought from Singtam to Martam by Compactor vehicle. The details of the design of compost plant and Landfill have already been done and construction is under progress.

3.15 Design of Treatment & Disposal Facility for East Sikkim Districts - Regional Facility No 1 at Martam:

The proposed Solid Waste Treatment & Disposal facility at Martam is being developed under ADB assisted NERCCDIP project. The same facility shall be utilized until a new land is identified for establishing Regional facility at Chamrey near Rangpo and shall consider waste generated from Rangpo, Singtam, Rhenock, Rorathang, Rongli, Pakyong.

3.15.1.1 Action required for procurement of Land

In future the Singtam/Rangpo Nagar Panchayat may utilize the above facility for treatment and disposal facility. Therefore it would be advisable for procurement of land.

- The UDHD to take immediate action for identification of land in consultation with Forest department, Revenue department, Pollution Control Board, Private land owners, etc
- Landfill site fulfilling the minimum criteria like proposed site away from river, human habitation, within economical distance etc. to be considered during identification of land (Annexure 11)
- The identified landfill site shall be examined by the State Pollution Control Board with reference to potential impacts on the Environment
- On finalization of site selection process UDHD shall fix the boundary and take necessary actions to procure the selected land.
- Detailed survey work shall be carried out for the proposed selected landfill site.
- Geo-technical investigations at the proposed landfill site shall be carried out to assess the sub-soil characteristics, depth of ground water table, underground strata etc.
- Design of landfill, sizing of various units and preparation of layout shall be done for the second phase

3.16 Recommendation & Conclusion

1) ***Primary Collection & Secondary Transportation:*** The existing unscientific practice of garbage collection system and erratic disposal of garbage in drains and open spaces, burning the garbage etc needs to be stopped. The old system to be replaced with handing over garbage to Waste collection centers (WCC) located in each wards, followed by Primary collection vehicle collecting this garbage from WCC and transport to Eco Bank

2) ***Waste Processing by Composting:*** Since there is no land available with ULB, and considering the amount of biodegradable waste generation in Singtam, it is recommended to continue the transportation of organic biodegradable waste to Regional facility at Martam during Phase 1 period and alternatively ULB to initiate actions to procure land for independent facility.

3) ***Waste Disposal by Landfill:*** The rejects from the compost plant, and non-biodegradable waste, i.e. construction/ demolition waste silt, rejects from recyclable waste (not collected by rag pickers and scrap dealers) are to be disposed off in the Sanitary landfill at Martam Phase 1 period and alternatively ULB to initiate actions to procure land for independent facility

4) ***Land requirement for Rangpo Regional Facility:*** It is estimated about 7.0 hectare of land is required for land filling. The State government and UDHD to initiate actions to search landfill site.

5) ***Identification of Landfill site:*** The UDHD to take immediate action for identification of landfill site fulfilling the minimum criteria like proposed site away from river, human habitation, within economical distance etc.(Annexure 11). The identified landfill site shall be examined by the State Pollution Control Board with reference to potential impacts. On finalization of site selection process UDHD to take necessary actions to procure the selected land.

4 Community Toilet & Individual Toilets

Singtam has no sewerage facility at present. Human waste is disposed off into septic tanks or sealed pits constructed in building yards. The outflow from septic tanks are let out into the road side drains. As the City population is growing rapidly, within a limited area, densification of buildings is too high to provide proper gardens or back yards for each house. Many households are having individual toilets. The survey carried out by ULB reveals that few houses require individual toilets and few do not have space therefore it is essential for having community toilets. A large number of floating populations from adjacent villages and districts visit the City and remain in the day time. Since adequate toilet facility is not available at public places, they also find a real hard time. Therefore Public Toilets are necessary for Singtam. This needs to be provided at appropriate places for which ULB need to identify suitable sites. The detailed drawings for Individual toilet and Community toilet are presented in Drawing No 8 and Drawing No. 9 respectively. About 100 numbers of individual toilet comprising 50 number of Twin Pit Pour flush toilets with leach pits and 50 numbers of Toilet with Septic Tanks are provisioned. Due to scarcity of land five community toilets is proposed. The estimated cost of individual toilet and Community Toilet are presented in subsequent sections under cost estimation. Further to clean the septic tanks a High Pressure Automounted Jet Desilting Machine for Narrow lanes is provisioned.

615

5 Cost Estimate, Procurement Program and Implementation

5.1 Cost Estimates

The Preliminary Cost estimate for the SWM for Singtam is given below.

Table 5.1 : Summary of Cost Estimation

A	Vehicles & Equipment				
1	Household Segregation - Supply of Jute Bags for storing dry waste (Wet waste in existing Bin only)	1300	Nos	33	**42901**
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	5		239500	**1197500**
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	40		14795	**591800**
4	Supply of Weighing scale at Waste Collection Center	5		33000	**165000**
5	Mini Garbage Tipper - 4.5 cum capacity	2		1705000	**3410000**
6	Construction of Eco Bank Shed	1		2482400	**2482400**
7	Provision for Computer for Data entry on waste deposit, along with Computer Table, UPS, Colour Printer, etc complete	1		159500	**159500**
8	Installation of small incinerators at Eco Bank shed for handling diapers, sanitary napkeins	1		93500	**93500**
9	Installation of Compacting Machine for Volume reduction of dry waste Paper waste, Plastic bottles,	1		1243000	**1243000**
10	Installation of Weighing scale with platform at Eco Bank for weighing recyclable waste bundles/bales	1		33000	**33000**
11	Supply of Bins (360 liter capacity) for Segregation at Eco Bank - 15 Nos per EB	15		14795	**221925**
12	Supply & Installation of Conveyor belts for waste Segregation at Eco Bank	1		1485000	**1485000**
13	Biomethanation Plant for Market waste - one plant per ULB	1		3520000	**3520000**

14	Closed Compactor Trucks for carrying waste from ULB to Regional Facility	1		2948000	**2948000**
15	Supply of Eco Bins in pilot study households (about 5% of households in each ULB)	70		2201	**154079**
16	Push carts for Street Sweeping	15	Nos	8580	**128700**
17	Pole Mounted Twin Bin for road side Litter Bins -60 ltrs capacity each HDPE	20	Nos	9240	**184800**
18	Shoulder Bins for waste collection from Inaccessible areas	12	Nos	4620	**54671**
19	Personnel Protection Equipments for safety operations - Masks	516		99	**51084**
a	Rain Coat and Pyjama	45		1386	**62370**
b	Gum Boots	86		1078	**92708**
c	Protective caps	45		143	**6435**
d	Hand Gloves	172		132	**22704**
20	Sanitation : Supply and Delivery of High Pressure Automounted Jet Desilting Machine for Narrow lanes to clean Septic Tanks	1		2860000	**2860000**
21	Community Toilet Block with ten seater Toilet with four Urinals including water supply and electrification (36 sq.m)	5		1955000	**9775000**
22	Individual Toilet with Septic Tank (Twin Pit Pour Flush)	50		32590	**1629500**
	Individual Toilet with Leach Pit (Twin Pit Pour Flush)	50		31020	**1551000**
23	Public Awareness	1		800000	**800000**
	Contingencies - Physical - 5%				1048997
	Rs. In Million				**36.0**

From the above, it is observed that during first phase (2015-2020) an investment of Rs.36.02 Million (360.2 lakhs) needs to be provided.

5.2 Operation & Maintenance Cost

The various O & M cost for SWM activity are detailed into following heads;

1. Primary Collection of Waste from Household
2. Secondary Collection & Transportation

3. SWM facilities (Compost Plant and Landfill)

Table 5.2 : Operation & Maintenance (O & M) Cost

Summary of Adminstration Cost of ULB							
(A)Staff Salary/ Wages	1	Supervisor - Garbage Management - Existing on Permanent/Regular	No.	1	8000	8000	96000
		Sub-total A					
	2	Sweepers - Existing on Master Roll	No.	7	5000	35000	420000
	3	Sweepers - proposed	No.	3	5000	15000	180000
	4	Drivers for Existing vehicle	No.	2	5000	10000	120000
	5	Operator for Open Nala Desilting Machine	No.	1	8000	8000	96000
	6	Helpers	No.	1	5000	5000	60000
	7	Broom/Thapa etc.	LS			10000	120000
	8	Lime, Disinfectants etc	LS			8000	96000
		Sub-total B					
(B) PPE	9	Rain Coat	Set/year	11	1386	1270.5	15246
	10	Gloves	Pairs/year	44	132	484	5808
	11	Gumboots	Pairs/year	22	1078	1976	23716
	12	Protective Helmets	No./year	11	143	131	1573
	13	Masks	No./year	132	99	1089	13068
		Sub-total C					
(C) Annual Repairs & maintenance	14	Annual Operation & Maintenance cost of Vehicles		2	170000	28,333	340,000

Summary of O & M Cost for Primary Collection/ Waste Collection Center

(A) Staff Salary/ Wages	1	Drivers for Mini Tipper/ Tipper - On Contract	No.	2	10,000	20,000	240,000
	2	Helpers/Attenders for Mini Tipper- on Contract	No.	4	5,000	20,000	240,000
	3	Helpers/Attenders for Waste Collction center - On Contract	No.	5	5,000	25,000	300,000
	4	Waste Collectors from Vehicle inaccessible areas (Additional Sweepers proposed above are utilized for both activities)	No.	0	5,000	0	0
		Sub total A					
(B) Personnel Protective Equipments	5	Rain Coat	Set/year	11	1386	1,271	15,246
	6	Gloves	Pairs/year	44	132	484	5,808
	7	Gumboots	Pairs/year	22	1078	1,976	23,716
	8	Protective Helmets	No./year	11	143	131	1,573
	9	Masks	No./year	132	99	1,089	13,068
	10	Sub total B					
(C) Annual Repairs & maintenance	11	Annual Maintenance cost of Vehicles		2	40000	6,667	80,000
		Sub total C					
(D) Fuel	12	Diesel for Mini Tipper Truck	Lts/month	173	60	10,400	124,800
		Sub total D					

Summary of O & M Cost for Secondary Collection & Transportation of Waste

(A)	1	Drivers for Compactor /Tippers - Proposed staff	No.	1	12000	12000	144000

	2	Helpers for Compactor/Tippers - Proposed	No.	2	5,000	10,000	120,000
		[redacted]					
(B) Personnel Protective Equipments	3	Rain Coat	Set/year	4	1386	462	5,544
	4	Gloves	Pairs/year	12	132	132	1,584
	5	Gumboots	Pairs/year	6	1078	539	6,468
	6	Protective Helmets	No./year	4	143	48	572
	7	Masks	No./year	36	99	297	3,564
		[redacted]					
(C) Annual Repairs & maintenance	8	Annual Maintenance cost		1	80000	6,667	80,000
		[redacted]					
(D) Fuel	9	Diesel for Compactor	Lts/month	195	60	11,700	140,400
		[redacted]					
[redacted]							
							Rs./Household
		Summary O & M Cost					
	1	Administration Expenses				8,000	96,000
	2	Sweeping Expenses				124,284	1,491,411
	3	Primary Collection				87,018	1,044,211
	4	Secondary Transportation				41,844	502,132
		Grand Total				**261,146**	**3,133,754**
[redacted]							
				50	Rs	39,781	477,367
				25		2,340	28,080
				800		43,334	520,008
[redacted]							

6 Cost Benefit Analysis & Willingness to Pay

6.1 Cost-Benefit Analysis of the SWM Project

The cost-benefit analysis of SWM project on its sustainability is a difficult to implement so as to make the system self-sustainable. This exercise may appear feasible in theory but difficult to implement under prevailing local conditions in Singtam.

The main objective of the project is to keep the environment of the town or city neat and clean and make the people free from any disease arising out from the mismanagement of solid waste. The SWM services should be available throughout the year without fail due to the fact that any negligence on the part of urban local body responsible for managing the solid waste may lead to spread of many diseases through vectors. And therefore, the Cost-Benefit Analysis for the project such as this SWM Project for Singtam under social sector should be analyzed for **Cost-Effectiveness** of the project.

The expenditure incurred on SWM activities can be compensated to some extent in earning revenue by adopting following approaches:

(i) By levying suitable charges to the beneficiaries. This is a very elaborate exercise involving the entire cross-section of society, different professional activities, willingness to pay for the services rendered etc.

(ii) Charging heavy penalty for the defaulters. It is a very important component to be give due consideration while modifying the State/City by-laws. Such bylaws should make necessary provisions for imposing suitable penalty for defaulters. It would be a very good for making the break-even approach for keeping the area neat and clean on one hand will generate revenue for sustainability of the SWM activities to some extent.

(iii) A proper mix of private and public sector to collect segregated waste from households may be a revenue earning model to meet the expenditure of primary collection system upto Eco Bank. Further expenditures have to be met from ULB. This approach would certainly make the SWM system more efficient.

(iv) A proper strategy need to be evolved for marketing of the compost. All the methodologies for propagating the sale of compost should be used. And the central/state governments could suitably subsidize the sale of compost as in case of inorganic fertilizers.

6.2 Willingness to Pay Survey

Under the socio economic survey (SES) component, willingness to pay survey was undertaken in Singtam during August 2015 towards understanding the satisfaction levels with present SWM, waste collection frequency in their locality, the improvements sought in SWM and their willingness to pay towards such improvements. A total of 60 households were surveyed within the Municipal area covering LIG/MIG & HIG households. The results are detailed below;

6.2.1 Satisfaction with Current Service Levels

The survey indicates that the solid waste collection system in Singtam had a satisfaction level of 91 % and 9 % says that they are not satisfied with the current service levels. This is good indication of existing regular services in accessible areas. About 2% of households in inaccessible areas throw the garbage in open areas and later burn the garbage.

6.2.2 Desired Service Level

55% of the households preferred for door step collection and 45% felt the existing one is acceptable. The survey also revealed that most of the households preferred morning time for garbage collection (in between 5 to 10 a.m).

6.2.3 Segregation of Waste

The survey reveals that in Singtam area, 100% are willing to segregate the waste at source of generation.

6.2.4 Willingness To Pay

Survey shows that about 80% are willing to pay for the much improved service while 20% are not willing to pay for the improved services . Also 75 % of the Households have expressed their willingness to pay for improved service to the tune of above Rs.30 per month, 22% indicated upto Rs. 30 - 50 and 3% indicated a range in between Rs. 50 to Rs. 100. Overall the People of Singtam have expressed willingness to pay for improved collection facility for Solid Waste for an amount ranging from Rs. 30- 50.

7 Details of Packages, Procurement and Implementation strategy

All the vehicles and equipment required will be procured through centralized procurement process. Thus the procurement program for Singtam will comprise the following:

- Procurement of goods, equipment and vehicles;
- Item rate contracts for civil works for Waste Collection Center and Eco Bank.

7.1 Vehicles & Equipment

The procurement of collection and transportation vehicles/ equipments may be procured in single lot. For the purposes of this report, a time period of one year has been assessed together comprises of mobilizing the community, procurement of the equipment and operationalizing the collection and transportation plan. Upon successful completion of this phase (2015-2020), the authority shall review the suitability and performance of the equipment procured and appropriately revise the subsequent phases of procurement, both in terms of number of equipment of requirement and the specifications.

7.2 Procurement Packages

The total contract packages for the project can be summarized as below.

Package No.	Name of Package	[illegible]	Period of Execution		[illegible]
			From Date	End Date	
SGM-SWM-1	Supply of Various Types of Bins, Push Carts, Personnel Protective Equipments for solid waste management in Singtam	4	April 2016	Aug 2016	LCB Item Rate
SGM-SWM-2	Supply of Primary and Secondary collection Vehicles for solid waste management in Singtam	4	April 2016	Aug 2016	LCB Item Rate
SGM-SWM-3	Construction of Waste Collection Center, Eco Bank, Community Toilet and Individual Toilets in Singtam	9	March 2016	Dec. 2016	LCB Item Rate

7.3 Appointment of Nodal Agency for Community Awareness and Education

As a step towards implementing the SWM plan, a Nodal Agency (NGO or other suitable institution shall be appointed by UDHD for imparting the community awareness to the community and operationalizing the segregation of waste and collection plan for Singtam. This

agency will prepare the road map for phase wise implementation in each ward. The agency shall be commissioned before the procurement of goods of equipment for the city, so as to ensure that the equipments procured are utilized without being idle for want of implementation plan. An amount of Rs. 8.0 lakhs is proposed for Public Awareness.

Some of the contract models are given below;

Contract Model for Door to Door	Cities
Contracts are generally given for door-to-door collection of waste in the morning hours with or without the equipment of the contractor. This activity is labour intensive and generally taken up by small contractors or NGOs at a low cost.	Bangalore, Nagpur, Jaipur, North Dumdum, New Barrackpore (West Bengal), Gandhinagar, Ahmedabad Vejalpur (Gujarat) etc.
Contracts are given to private operators for doorstep collection and transportation based on wards allotted to each contractor, who appoints his own manpower, uses his own tools, vehicles and equipment and is paid per month by the municipal corporation for the services rendered	Bangalore, Jaipur, Nagpur
Contracts are awarded to NGOs for door-to-door collection and supervision only against a monthly payment	Vejalpur
Contracts are given to NGOs or individuals to collect the waste from door-to-door but the contractor is expected to recover the user fee from the citizens directly as prescribed by the local body	Gandhinagar, New Barrackpore, North Dumdum, etc
Door-to-door collection is entrusted to residents welfare associations and associations of backward classes and they are given a monthly grant for supporting sanitation workers and annual grants for purchase of tools, etc. On an average 200 houses are served by one part time sanitation worker in a four hour shift.	Ahmedabad

7.4 Project Time Line

Activity	SGM-SWM-01/02/03
Complete detailed project Report	30 December, 2015
Approval of DPR	15 January, 2016
Issue bid documents	22 January 2016
Bid opening	22 Feb, 2016
Complete technical bid evaluation	07 Mar 2016
Approval of technical bid evaluation	14 Mar 2016
Open financial bids	21 Mar 2016
Complete financial bid evaluation	28 Mar 2016
Approval of financial evaluation	05 April 2016
Contract award	15 April 2016

8 Conclusions and Recommendations

Though the Willingness to Pay survey indicated partial positive signal by the Singtam citizens to pay for the services, the cost-benefit analysis of SWM project on its sustainability is impracticable to implement so as to make the system self-sustainable.

The Door to Door collection system along with segregation of waste at source with appropriate Public awareness programmes would contribute for better quality compost and earn revenue out of recyclable dry waste.

The sub-project is considered not to have significant environmental impacts. In fact the proposed system for Singtam shall improve the environmental condition. Therefore the Singtam Nagar Panchayat will implement the project with due considerations by following Environmental Management Plan (EMP) during construction and operation Phase as specified in Tender document. Therefore, no further environmental assessment is needed.

Overall the proposed sub-project "Singtam SWM" will greatly improve the environmental quality of the Nagar Panchayat area.

It is concluded that. the proposed sub-project should proceed to the implementation phase, subject to the implementation of mitigation measures and monitoring programs identified in the EMP and the above recommendations.

COST ESTIMATION

626

COST ESTIMATE

ESTIMATE FOR CONSTRUCTION OF PROPOSED ECO BANK

1	4.1	Earth work in excavation by mechanical means (Hydraulic Excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil.								
		For Foundation: Centre line length	Cum	1	105	0.9	0.90	85.05		
		Ramp	cum	8	1.5	0.75	0.45	4.05		
		For Foundation Columns	cum	18	1.5	1.5	1.20	48.60		
			Cum					**137.70**	**164.74**	22685
2	7.1.7	Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.								
		1:4:8 mix. (1 cement, 4 coarse sand, 8 stone aggregate of 40mm & down size)								
		For Foundation	Cum	1	105	0.9	0.15	14.18		
		For Foundation Columns	cum	18	1.5	1.5	0.15	6.08		
		Ramp	cum	8	1.5	0.75	0.15	1.35		
			Cum					**21.60**	3136.71	67753
3	12.6	Providing and Laying Random Rubble Stone Masonry in 1:3:6 c.c. (1 cement, 3 sand, 6 clean hard graded stone chips, size 40mm gauge) including bond stone, through stone of size 150mm x 150mm x 450mm manufactured in 1:4:8 (1cement, 4 clean coarse sand, 8 clean hard stone aggregate of size 40 mm and down) and curing etc, complete as per the direction of Engineer in Charge, excluding the cost of carriage of materials.								
		For Foundation	Cum	1	105	0.75	0.4	31.50		
		For Foundation	Cum	1	105	0.6	0.4	25.20		
		For Foundation	Cum	1	105	0.45	0.4	18.90		
		Ramp	cum	8	1.5	0.45	0.45	2.43		
		Deduct for Columns	Cum	-18	0.23	0.3	0.90	-1.12		
			Cum					**76.91**	2863.31	220223

4	7.1.2	Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.								
		1:1.5:3 (1cement, 1.5 coarse sand,3 graded stone aggregate of 20mm & down size)								
		Column Concreting	**Cum**							
		Raft	**Cum**	18	1.4	1.4	0.3	10.58		
		Columns	**Cum**	18	0.23	0.3	5.5	6.83		
		For DPC / Plinth	Cum	1	104.77	0.45	0.15	7.07		
			Cum					24.49	5427.24	132897
5	10.3	Providing and Laying first class brick masonry in one and half brick thick wall in superstructure with 1:6 cement mortar (1 cement, 6 clean coarse sand) as per the direction of Eng.-in-charge including curing etc. all complete.								
		For Walls	Cum	1	104.77	0.23	1.50	36.15		
			Cum	1	45	0.23	3.00	31.05		
		Deductions								
		Door	Cum	-5	3.00	0.230	2.50	-8.63		
			Cum					58.57	5327.85	312056
6	9.2.2	Providing and Laying 12mm thick cement plaster of specified mix in single coat including finishing even and smooth and curing complete.								
		1:4 mix.								
		for both internal and external wall faces								
		For Walls	Sqm	2	104.77	-	1.5	314.31		
			Cum	2	45		3.00	270.00		
		Deductions								
		Door	Sqm	-5	3	-	2.5	-37.50		
			Sqm					546.81	136.05	74394
7	9.2.2	Cement ornamental ceiling plastering in CM (1:3) prop. 12 mm thick including cost and conveyance of all material, labour charges, curing etc., complete in first floor.								
		For Brick wall	Sqm	2	104.77	-	3.24	678.91		
								678.91	132.3	89820
8	20.8	Providing, fitting and fixing in position collapsible steel shutter with vertical channel (20x10x2)mm and braced with flat iron diagonals (20 x 5)mm size with top and bottom rail of T-iron (40x40x6)mm with 40mm dia steel pulley complete with bolts, nuts, locking arrangements, stoppers and handles including applying of priming coat of approved steel primer as per the direction of Engineer - in- Charge all complete:								
		Door	No	5	3	-	2.40	36.00	2184.	78646

									62	
9	20.6	Providing and fixing M.S grills in timber frames of windows with M.S flats with nuts, bolts, and smooth finishing of welded joints/surface with Grills weighing 8.00Kg/sqm as per the direction of Engineer - in- Charge all complete								
		Grill work	Sqmt	1	104.77	1.5	-	157.16		
		Grill work interms of Kg	Kg					1257.24	73.13	91942
10	11.31	Providing and Laying white or colored glazed tiles of size 200mm x 300mm of plain/normal prints colours (white, grey, ivory, platinum, cream, glacier white, summers and, beach, wood duro, melody, or equivalent) in skirting, risers of steps and Dados on 12mm thick cement plaster (1cement, 3coarsed sand) 1:3 bare and jointed with white cement slurry.								
		Total inner area								
		Below flooring in total inner area	Sqm	1	15	15	-	225.00		
			Sqm					**225.00**	970.58	218381
11	11.31	Providing and Laying white or colored glazed tiles of size 200mm x 300mm of plain/normal prints colours (white, grey, ivory, platinum, cream, glacier white, summers and, beach, wood duro, melody, or equivalent) in skirting, risers of steps and Dados on 12mm thick cement plaster (1cement, 3coarsed sand) 1:3 bare and jointed with white cement slurry.								
		Platform	Sqmt	1	3.00	0.60	-	1.80		
								1.80	**970.58**	1747
12	20.2	Supplying, fabricating, fitting and fixing tubular truss including putty, hoisting, fixing in position and applying a priming coat of approved steel primer, welded and bolted including special shape washer etc complete in curve shaped Sikkim- style roofing as per the standard specification and design and as per the direction of Engineer - in- Charge all complete.								
		Quantity	Kgs					**4335**	**72.64**	314894
13	19.2 -	Providing, fitting, fixing of 24 BWG GP sheet roofing by making corrugation of 50mmx50mm x50mm on both side with G.I. hooks, bolts and nut 8mm dia with bitumen, GI limpet washers filled with white bad including coat of approved steel primer and two coats of approved paint, on overlapping of sheet excluding carriage all complete.								
		Roof Area	Sqmt	1	17	17		289.00		
		Add 20% for Laping	Sqmt					57.8		
		Total Quantity	Sqmt					**346.8**	997.05	345777
14	8.2.3	Providing & Laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements with Recron 3S of fiber length 6 or 12 mm (125 gm of recron 3S per a bag of cement) as per the direction of Engineer in Charge.								
		1:2:4 (1cement,2coarse sand, 4 graded stone aggregate of 20mm nominal size).								
		Platform	Sqm	1	3	0.6	0.1	0.18		

							Total	0.18	5183.19	933
15		Supplying, bending and placing in position tor- steel reinforcement in all R.C.C works including cost of binding wires, all complete.								
		Concrete Quantity	Cum	24.49						
		Steel per Cum of concrete 120Kg	Qtl	29.4				29.384	6728.30	197707
								Sub Total Rs		1972148
16		Provision for Electrical 7.5% of Sub total								147911
17		Provision for Water supply 7.5% of sub total								147911
								Total Rs		2267970
18		Provision for Price escalation for three years @ 7.5% increment= 7.5% x 3 =22.5%								510293
		Grand Total Rs								**2482441**
		Total Rounded								

COST ESTIMATE

ESTIMATE FOR CONSTRUCTION OF PROPOSED WASTE COLLECTION CENTRE

Sl. No	[illegible]	Description of Work								
1	4.1	Earth work in excavation by mechanical means (Hydraulic Excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil.								
		For Foundation: Centre line length	Cum	1	12.92	0.9	0.90	10.47		
		Steps	cum	1	2	1.2	0.45	1.08		
		For Foundation Columns	cum	4	1.5	1.5	1.20	10.80		
			Cum					**22.35**	164.74	3681
2	7.1.7	Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.								
		1:4:8 mix. (1 cement, 4 coarse sand, 8 stone aggregate of 40mm & down size)								
		For Foundation	Cum	1	12.92	0.9	0.15	1.74		
		For Foundation Columns	cum	4	1.5	1.5	0.15	1.35		
		Steps	cum	1	2	1.2	0.15	0.36		
			Cum					**3.45**	3136.71	10835
3-	12.6	Providing and Laying Random Rubble Stone Masonry in 1:3:6 c.c. (1 cement, 3 sand, 6 clean hard graded stone chips, size 40mm gauge) including bond stone, through stone of size 150mm x 150mm x 450mm manufactured in 1:4:8 (1cement, 4 clean coarse sand, 8 clean hard stone aggregate of size 40 mm and down) and curing etc, complete as per the direction of Engineer in Charge, excluding the cost of carriage of materials.								
		For Foundation	Cum	1	12.92	0.75	0.4	3.88		
		For Foundation	Cum	1	12.92	0.6	0.4	3.10		
		For Foundation	Cum	1	12.92	0.45	0.4	2.33		
		Steps	Cum	1	2	1.2	0.40	0.96		
		Steps	Cum	1	2	0.9	0.4	0.72		

							0			
		Steps	Cum	1	2	0.6	0.20	0.24		
		Deduct for Columns	Cum	-4	0.23	0.23	0.90	-0.19		
			Cum					**11.03**	2863.31	31588
4	7.1.2	Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.								
		1:1.5:3 (1cement, 1.5 coarse sand,3 graded stone aggregate of 20mm & down size)								
		Column Concreting	**Cum**							
		Raft	**Cum**	4	1.4	1.4	0.3	2.35		
		Columns	**Cum**	4	0.23	0.23	1.5	0.32		
		For DPC / Plinth	Cum	1	12.69	0.45	0.15	0.86		
			Cum					3.53	5427.24	19136
5	10.3	Providing and Laying first class brick masonry in one and half brick thick wall in superstructure with 1:6 cement mortar (1 cement, 6 clean coarse sand) as per the direction of Eng.-in-charge including curing etc. all complete.								
		For Walls	Cum	1	12.69	0.23	1.50	4.38		
		Deductions								
		Door	Cum	-1	0.90	0.230	2.10	-0.43		
			Cum					**3.94**	5327.85	21010
6	9.2.2	Providing and Laying 12mm thick cement plaster of specified mix in single coat including finishing even and smooth and curing complete.								
		1:4 mix.								
		for both internal and external wall faces								
		For Walls	Sqm	2	12.69	-	1.5	38.07		
		Deductions								
		Door	Sqm	-1	0.9	-	2.1	-1.89		
			Sqm					36.18	136.05	4922
7	9.2.2	Cement ornamental ceiling plastering in CM (1:3) prop. 12 mm thick including cost and conveyance of all material, labour charges, curing etc., complete in first floor.								
		For Brick wall	Sqm	2	12.69	-	3.24	82.23		
								82.23	132.3	10879

8	20.8	Providing, fitting and fixing in position collapsible steel shutter with vertical channel (20x10x2)mm and braced with flat iron diagonals (20 x 5)mm size with top and bottom rail of T-iron (40x40x6)mm with 40mm dia steel pulley complete with bolts, nuts, locking arrangements, stoppers and handles including applying of priming coat of approved steel primer as per the direction of Engineer - in- Charge all complete:								
		Door	No	1	1.2	-	2.10	2.52	2184.62	5505
9	20.6	Providing and fixing M.S grills in timber frames of windows with M.S flats with nuts, bolts, and smooth finishing of welded joints/surface with Grills weighing 8.00Kg/sqm as per the direction of Engineer - in- Charge all complete								
		Grill work	Sqmt	4	3	3	-	36.00		
		Grill work interms of Kg	Kg					288.00	73.13	21061
10	11.31	Providing and Laying white or colored glazed tiles of size 200mm x 300mm of plain/normal prints colours (white, grey, ivory, platinum, cream, glacier white, summers and, beach, wood duro, melody, or equivalent) in skirting, risers of steps and Dados on 12mm thick cement plaster (1cement, 3coarsed sand) 1:3 bare and jointed with white cement slurry.								
		Total inner area								
		Below flooring in total inner area	Sqm	1	3	3	-	9.00		
			Sqm					**9.00**	970.58	8735
11	11.31	Providing and Laying white or colored glazed tiles of size 200mm x 300mm of plain/normal prints colours (white, grey, ivory, platinum, cream, glacier white, summers and, beach, wood duro, melody, or equivalent) in skirting, risers of steps and Dados on 12mm thick cement plaster (1cement, 3coarsed sand) 1:3 bare and jointed with white cement slurry.								
		Platform	Sqmt	1	3.00	0.60	-	1.80		
								1.80	970.58	1747
12	20.2	Supplying, fabricating, fitting and fixing tubular truss including putty, hoisting, fixing in position and applying a priming coat of approved steel primer, welded and bolted including special shape washer etc complete in curve shaped Sikkim- style roofing as per the standard specification and design and as per the direction of Engineer - in- Charge all complete.								
		Quantity	Kgs					**500**	**72.64**	36320
13	19.2	Providing, fitting, fixing of 24 BWG GP sheet roofing by making corrugation of 50mmx50mm x50mm on both side with G.I. hooks, bolts and nut 8mm dia with bitumen, GI limpet washers filled with white bad including coat of approved steel primer and two coats of approved paint, on overlapping of sheet excluding carriage all complete.								
		Roof Area	Sqmt	1	4	4		16.00		
		Add 20% for Laping	Sqmt					3.2		
		Total Quantity	Sqmt					**19.2**	997.05	19143

14	8.2.3	Providing & Laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements with Recron 3S of fiber length 6 or 12 mm (125 gm of recron 3S per a bag of cement) as per the direction of Engineer in Charge.								
		1:2:4 (1cement,2coarse sand, 4 graded stone aggregate of 20mm nominal size).								
		Platform	Sqm	1	3	0.6	0.1	0.18		
							Total	0.18	5183.2	933
								Sub Total Rs		195495
15		Provision for Price escalation for three years @ 7.5% increment= 7.5% x 3 =22.5%								43986
		Grand Total Rs								**239481**
		Total Rounding								

COST ESTIMATE – TWIN PIT POUR FLUSH – OPTION - 1

FOR LOW COST SANITATION UNIT FOR (CIRCULAR DOUBLE LEACH PIT)

Sl.No	Description of Items	Unit	No	L (m)	B (m)	D (m)	Qty.	Rate (Rs)	Amount (Rs)
1	Earth work in excavation by mechanical means (Hydraulic Excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil.								
Ref	4.1								
	Toilet room Long wall	Cum	2	1.46	0.33	0.45	0.43		
	Short wall	Cum	2	0.8	0.33	0.45	0.24		
	W C portion	Cum	1	0.57	0.57	0.30	0.10		
	Chamber	Cum	1	0.53	0.53	0.38	0.11		
	Leatch pit	Cum	2	$(1.13)^2$	3.142/4	1.6	3.21		
	Total	Cum					4.08	164.74	673.00
2	Providing and laying in **position plain cement concrete of mix** (1:4:8) using 40mm and down size graded granite metal, machine mixed, concrete laid in layers not exceeding 15 cms thick well compacted in foundation and plinth, HOM of machinery, curing complete as per specifications.								
Ref	7.1.7								
	For toilet room	Cum	2	1.46	0.33	0.10	0.10		
		Cum	2	0.8	0.33	0.10	0.05		
	For Chamber	Cum	1	0.53	0.53	0.10	0.03		
	For leach pit (Perimeter =3.18)	Cum	2	3.18	0.23	0.10	0.15		
	Below WC Pan	Cum	1	0.9	0.9	0.3	0.24		
	Deduction for WC pan (2/3 of Pan volume0	Cum	1				0.05		
	Total	Cum					0.52	3136.71	1620.00
3	Providing and constructing **Burnt Brick masonry** for basement and superstructure with approved quality non modular bricks of standard size of class designation of 35 with cement mortar 1:6 including cost of materials, labour charges, scaffolding, curing complete etc. as per specifications.								
Ref	10.3								
	For foundation of toilet room	Cum	2	1.36	0.23	0.45	0.28		
		Cum	2	0.9	0.23	0.45	0.19		
	Pillar for door support	Cum	1	0.9	0.23	2.07	0.43		
	Deduction for door	Cum	1	0.75	0.23	1.8	0.31		
		Cum				**Total**	0.59	5327.85	3121.00

635

4	**Construction of partition wall 11.2 cms thick with non-modular** ground moulded burnt bricks of class designation 35mm cement mortar 1:4 including cost of all materials, labour charges, scaffolding, curing complete as per specifications.								
Ref	10.1								
	For superstructure	Sqm	2	1.36	-	2.09	5.68		
		Sqm	1	0.9	-	2.09	1.88		
	For chamber	Sqm	2	0.53	-	0.30	0.32		
		Sqm	2	0.30	-	0.30	0.18		
	For leach pit below stoneware portion(Peri=3.18 rmt)	Sqm	8	3.18	-	0.15	3.82		
	Above stoneware pipe	Sqm	2	3.18	-	0.40	2.54		
						Total	14.42		
	Deductions:								
	Ventilator	Sqm	1	0.3	-	0.45	0.14		
						Total	14.29	639.14	9133.00
5	Construction of partition wall 11.5cms Honey comb wall								
Ref	10.1								
	For leach pit	Sqm	6	3.2		0.15	2.88		
	Consider 67% for Honey comb wall i.e 1.44X67%=0.96 sqm.					Total	0.96	639.14	614.00
6	Providing & Laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements with Recron 3S of fiber length 6 or 12 mm (125 gm of recron 3S per a bag of cement) as per the direction of Engineer in Charge.								
	1:2:4 (1cement,2coarse sand, 4 graded stone aggregate of 20mm nominal size).								
Ref	8.2.3								
	Over door	Sqm	1	1.13	0.23	0.1	0.0065		
	Over ventilator	Sqm	1	0.6	0.12	0.1	0.0018		
	for chamber cover	Sqm	1	0.53	0.53	0.1	0.0070		
	For leach pit	Sqm	2	$(1.13)^2$	3.142/4	0.1	0.2006		
						Total	0.22	5183.19	1119.00
7	Providing, fitting, fixing of 24 BWG GCI sheet roofing with lapping of 150mm (two corrugation) with G.I. hooks, bolts and nut 8mm dia with bitumen, GI limpet washers filled with white bad including coat of approved steel primer and two coats of approved paint, on overlapping of sheet excluding carriage all complete.								
Ref	19.1								
	For toilet room								
	For size 1.54X1.43m								
		Sqm	1	1.5	1.4		2.10	853.44	1792.00

8	d) Solid Panel PVC Door Shutter : Providing & fixing 30mm thick factory made rigid foam panelled door shutters made from M.S. tube of 19 gauge thickness, size 19x19mm for styles and 15x15mm for top & bottom rails, covered with head moulded PVC channel of 5mm thick sheet & 30x50mm wide to form styles & 5mm thick & 75mm wide PVC sheets for top rail, lock rail & bottom rail on either side & 5mm thick 20mm wide PVC sheet fitted as gap insert for top rail & bottom rail, Panelling of 5mm thick PVC sheet fitted in the M.S. Frame, Sealed to the styles & rails with 5x30mm PVC sheet beading on either side & joined together with solvent cement adhesive etc., complete as per manufacturers specification & Direction of Engineer-In-charge fixed to frames with nos of 75 mm aluminium hinges.								
Ref	PWD SR 2014-15, It No.9.83, Pg No.57								
	For toilet door								
	For size 0.75X1.80m								
		Sqmt	1	0.75	1.8		1.35	2770.01	3740.00
9	Providing and fixing anodized aluminum works for doors, windows, ventilators and partitions with extruded built up standard tubular or other section of approved make confirming IS 733 and IS 1285, fixed with rawl plugs and screws or with fixing clips or with expansion hold fasteners i/c necessary filling up the gaps at junctions, at top, bottom and sides with required PVC / neoprene felt, etc. Al. section shall be smooth, rust free, straight, mitered and joined mechanically wherever required i/c cleat angle, Al snap beading for glazing / paneling CP brass / stainless screws, all complete as per design and drawings and the direction of the Engineer - in - Charge.								
	ventilator of size 300X450mm.								
Ref	21.1	Sqmt	1	0.3	0.45		0.14	1799.88	243.00
10	Providing, fitting and fixing. white vitreous china water closet (W.C) squatting pan (Indian type) 530mm size with 100mm SCI (Sand cast Iron) P or Strap, 10 later low level flushing cistern with fittings, CI brackets, 32mm flush pipe with fittings and clamps, 20mm overflow pipe, cutting and making good the wall and floor etc complete. Long type or Orissa type pan. HINDWARE CAT NO 20004								
Ref	24.1								
	For toilet	No.	1				1.00		
						Total	1.00	3321.66	3322.00
11	Providing, fitting and fixing soil waste and vent pipes including testing etc complete.								
	75 mm dia. PRINCE / SUPREME soil Pipe								
Ref	24.24.2	Rmt	2	2			4.00		
						Total	4.00	161.61	646.00

637

12	Providing and Laying 40 mm thick 1:2:4 c.c. (1cement, 2coarse sand,4 of 12.5mm and down stone aggregate) flooring with floating coat of neat cement to give a smooth surface in not exceeding 02 sqm including cost of glass strips and curing etc complete in all building floors wherever specified.								
Ref	11.3								
	For toilet room flooring	Sqm	1	0.9	0.9		0.81	295.73	240.00
13	Providing and Laying 15mm thick cement plaster of specified mix in single coat including finishing even and smooth and curing etc all complete.								
	1:4 mix.								
Ref	9.2.2								
	For toilet room wall plastering								
	out side	Sqm	2	1.25	-	2.10	5.25		
		Sqm	1	1.13	-	2.07	2.34		
		Sqm	1	1.13	-	2.13	2.41		
	Inside	Sqm	2	0.90	-	2.10	3.78		
	Front face	Sqm	1	0.90	-	2.07	1.86		
	Back wall	Sqm	1	0.90	-	2.13	1.92		
	Door support wall	Sqm	2	0.23	-	1.80	0.83		
	Inspection chamber								
	Inside	Sqm	4	0.30	-	0.30	0.36		
	out side	Sqm	4	0.53	-	0.30	0.64		
	Top face	Sqm	2	0.53	0.15	-	0.16		
		Sqm	2	0.30	0.15	-	0.09		
	Deductions					Total	19.63		
	Door	sqm	1	0.75		1.80	1.35		
	Ventilator	sqm	1	0.30		0.45	0.135		
						Total	1.49		
						Total	18.14	136.05	2468.00
14	White washing with white lime in two or more coats to give an even shade include- ding cleaning the surface to remove dirt, dust, mortar drops etc on old surface complete.								
Ref	22.7.1								
	Qty. Same as above	Sqm					18.14	10.94	198.00
15	Supplying, bending and placing in position tor- steel reinforcement in all R.C.C works including cost of binding wires, all complete.								
Ref	18.1	Qtl	1	0.5			0.50	6728.30	3364.00
16	Water and Electrical point	L.S							300.00
							Total amount Rs.		32593.00

COST ESTIMATE FOR TOILET WITH SEPTIC TANK - OPTION 2

FOR LOW COST SANITATION UNIT FOR (SEPTIC TANK)

S.No.	Description of Item	Unit							
1	Earth work in excavation by mechanical means (Hydraulic Excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil.								
Ref	4.1								
	Toilet room Long wall	Cum	2	1.46	0.33	0.45	0.43		
	Short wall	Cum	2	0.8	0.33	0.45	0.24		
	W C portion	Cum	1	0.57	0.57	0.30	0.10		
	Chamber	Cum	1	0.53	0.53	0.38	0.11		
	Septic Tank	Cum	1	$(1.13)^2$	3.142/4	1.6	1.60		
	Total	Cum					2.48	164.74	408.00
2	Providing and laying in **position plain cement concrete of mix** (1:4:8) using 40mm and down size graded granite metal,machine mixed, concrete laid in layers not exceeding 15 cms thick well compacted in foundation and plinth,HOM of machinery,curing complete as per specifications.								
Ref	7.1.7								
	For toilet room	Cum	2	1.46	0.33	0.10	0.10		
		Cum	2	0.8	0.33	0.10	0.05		
	For Chamber	Cum	1	0.53	0.53	0.10	0.03		
	Septic Tank	Cum	2	3.18	0.23	0.10	0.15		
	Below WC Pan	Cum	1	0.9	0.9	0.3	0.24		
	Deduction for WC pan (2/3 of Pan volume0	Cum	1				0.05		
	Total	Cum					0.52	3136.71	1620.00
3	Providing and constructing **Burnt Brick masonry** for basement and superstructure with approved quality non modular bricks of standard size of class designation of 35 with cement mortar 1:6 including cost of materials, labour charges, scaffolding, curing complete etc. as per specifications.								
Ref	10.3								
	For foundation of toilet room	Cum	2	1.36	0.23	0.45	0.28		
		Cum	2	0.9	0.23	0.45	0.19		
	Pillar for door support	Cum	1	0.9	0.23	2.07	0.43		
	Deduction for door	Cum	1	0.75	0.23	1.8	0.31		
		Cum				**Total**	**0.59**	5327.85	3121.00
4	**Construction of partition wall 11.2 cms thick with non-modular** ground moulded burnt bricks of class designation 35mm cement mortar 1:4 including cost of all materials,labour charges,scaffolding,curing complete as								

	per specifications.								
Ref	10.1								
	For superstructure	Sqm	2	1.36	-	2.09	5.68		
		Sqm	1	0.9	-	2.09	1.88		
	For chamber	Sqm	2	0.53	-	0.30	0.32		
		Sqm	2	0.30	-	0.30	0.18		
						Total	8.06		
	Deductions:								
	Ventilator	Sqm	1	0.3	-	0.45	0.14		
						Total	7.93	639.14	5068.00
5	Providing and Fixing of ready made PVC/HDPE Septic tank of capacity 1000 ltrs with top cover etc as per the requirement and specification								
Ref	Market Rate								
	Septic Tank	Lts	1	1000			1000.00		
						Total	1000.00	7.00	7000.00
6	Providing & Laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements with Recron 3S of fiber length 6 or 12 mm (125 gm of recron 3S per a bag of cement) as per the direction of Engineer in Charge.								
	1:2:4 (1cement,2coarse sand, 4 graded stone aggregate of 20mm nominal size).								
Ref	8.2.3								
	Over door	Sqm	1	1.13	0.23	0.1	0.0065		
	Over ventilator	Sqm	1	0.6	0.12	0.1	0.0018		
						Total	0.01	5183.19	43.00
7	Providing, fitting, fixing of 24 BWG GCI sheet roofing with lapping of 150mm (two corrugation) with G.I. hooks, bolts and nut 8mm dia with bitumen, GI limpet washers filled with white bad including coat of approved steel primer and two coats of approved paint, on overlapping of sheet excluding carriage all complete.								
Ref	19.1								
	For toilet room								
	For size 1.54X1.43m								
		Sqm	1	1.5	1.4		2.10	853.44	1792.00
8	d) Solid Panel PVC Door Shutter : Providing & fixing 30mm thick factory made rigid foam panelled door shutters made from M.S. tube of 19 gauge thickness, size 19x19mm for styles and 15x15mm for top & bottom rails, covered with head moulded PVC channel of 5mm thick sheet & 30x50mm wide to form styles & 5mm thick & 75mm wide PVC sheets for top rail, lock rail & bottom rail on either side & 5mm thick 20mm wide PVC sheet fitted as gap insert for top rail & bottom rail, Panelling of 5mm thick PVC sheet fitted in the M.S. Frame, Sealed to the styles & rails with 5x30mm PVC sheet beading on either side & joined together with solvent cement adhesive etc., complete as per manufacturers specification & Direction of Engineer-in-charge fixed to frames with nos of 75 mm aluminium hinges.								

Ref	PWD SR 2014-15, It No.9.83, Pg No.57								
	For toilet door								
	For size 0.75X1.80m								
		Sqmt	1	0.75	1.8		1.35	2770.01	3740.00
9	Providing and fixing anodized aluminum works for doors, windows, ventilators and partitions with extruded built up standard tubular or other section of approved make confirming IS 733 and IS 1285, fixed with rawl plugs and screws or with fixing clips or with expansion hold fasteners i/c necessary filling up the gaps at junctions, at top, bottom and sides with required PVC / neoprene felt, etc. Al. section shall be smooth, rust free, straight, mitered and joined mechanically wherever required i/c cleat angle, Al snap beading for glazing / paneling CP brass / stainless screws, all complete as per design and drawings and the direction of the Engineer - in - Charge.								
	ventilator of size 300X450mm.								
Ref	21.1	Sqmt	1	0.3	0.45		0.14	1799.88	243.00
10	Providing, fitting and fixing. white vitreous china water closet (W.C) squatting pan (Indian type) 530mm size with 100mm SCI (Sand cast iron) P or Strap, 10 later low level flushing cistern with fittings, CI brackets, 32mm flush pipe with fittings and clamps, 20mm overflow pipe, cutting and making good the wall and floor etc complete. Long type or Orissa type pan. HINDWARE CAT NO 20004								
Ref	24.1								
	For toilet	No.	1				1.00		
						Total	1.00	3321.66	3322.00
11	Providing, fitting and fixing soil waste and vent pipes including testing etc complete.								
	75 mm dia. PRINCE / SUPREME soil Pipe								
Ref	24.24.2	Rmt	2	2			4.00		
						Total	4.00	161.61	646.00
12	Providing and Laying 40 mm thick 1:2:4 c.c. (1cement, 2coarse sand,4 of 12.5mm and down stone aggregate) flooring with floating coat of neat cement to give a smooth surface in not exceeding 02 sqm including cost of glass strips and curing etc complete in all building floors wherever specified.								
Ref	11.3								
	For toilet room flooring	Sqm	1	0.9	0.9		0.81	295.73	240.00
13	Providing and Laying 15mm thick cement plaster of specified mix in single coat including finishing even and smooth and curing etc all complete.								
	1:4 mix.								
Ref	9.2.2								
	For toilet room wall plastering								
	out side	Sqm	2	1.25	-	2.10	5.25		

		Sqm	1	1.13	-	2.07	2.34		
		Sqm	1	1.13	-	2.13	2.41		
	Inside	Sqm	2	0.90	-	2.10	3.78		
	Front face	Sqm	1	0.90	-	2.07	1.86		
	Back wall	Sqm	1	0.90	-	2.13	1.92		
	Door support wall	Sqm	2	0.23	-	1.80	0.83		
	Inspection chamber								
	Inside	Sqm	4	0.30	-	0.30	0.36		
	out side	Sqm	4	0.53	-	0.30	0.64		
	Top face	Sqm	2	0.53	0.15	-	0.16		
		Sqm	2	0.30	0.15	-	0.09		
	Deductions					Total	19.63		
	Door	sqm	1	0.75		1.80	1.35		
	Ventilator	sqm	1	0.30		0.45	0.135		
						Total	1.49		
						Total	18.14	136.05	2468.00
14	White washing with white lime in two or more coats to give an even shade include- ding cleaning the surface to remove dirt, dust, mortar drops etc on old surface complete.								
	22.7.1								
	Qty. Same as above	Sqm					18.14	10.94	198.00
15	Supplying, bending and placing in position tor- steel reinforcement in all R.C.C works including cost of binding wires, all complete.								
Ref	18.1	Qtl	1	0.12			0.12	6728.30	807.00
16	Water and Electrical point	L.S							300.00
							Total amount Rs.		31016.00

642

COST ESTIMATE –COMMUNITY TOILET

ESTIMATE FOR THE WORK OF CONSTRUCTION OF PROPOSED 10 SEATER TOILET BLOCK

S No	Ref									
1	4.1	Earth work in excavation by mechanical means (Hydraulic Excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil.								
		For Foundation in Outer longer side	Cum	2	11.36	0.9	0.90	18.40		
		For Foundation in Outer Shorter side	Cum	2	6.545	0.9	0.90	10.60		
		For Foundation in Inner Toilet Longer walls	Cum	2	5.645	0.9	0.90	9.14		
		For Foundation in Inner Toilet partition walls & Extensions. (C.T Room)	Cum	2	5.645	0.9	0.90	9.14		
		For Foundation of wall opp. To entry door for privacy.	Cum	1	1.5	0.9	0.90	1.22		
		For Septic Tank	Cum	1	3.0	3.0	2.00	18.00		
			Cum					**66.51**	**164.74**	10957
2	7.1.7	Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.								
		1:4:8 mix. (1 cement, 4 coarse sand, 8 stone aggregate of 40mm & down size)								
		For Foundation in Outer longer side	Cum	2	11.36	0.9	0.15	3.07		
		For Foundation in Outer Shorter side	Cum	2	6.545	0.9	0.15	1.77		
		For Foundation in Inner Toilet Longer walls	Cum	2	5.645	0.9	0.15	1.52		
		For Foundation in Inner Toilet partition walls & Extensions. (C.T Room)	Cum	2	5.645	0.9	0.15	1.52		
		For Foundation of wall opp. To entry door for privacy.	Cum	1	1.5	0.9	0.15	0.20		
		Below flooring in total inner area	Cum	1	10.46	5.6 45	0.15	8.86		
		Less wall portions (Full brick walls)	Cum	2	6.545	0.2 3	0.15	0.45		
			Cum					**17.39**	3136.71	54559
3	12.6	Providing and Laying Random Rubble Stone Masonry in 1:3:6 c.c. (1 cement, 3 sand, 6 clean hard graded stone chips, size 40mm gauge) including bond stone, through stone of size 150mm x 150mm x 450mm manufactured in 1:4:8 (1cement, 4 clean coarse sand, 8 clean hard stone aggregate of size 40 mm and down) and curing etc,								

		complete as per the direction of Engineer in Charge, excluding the cost of carriage of materials.								
		For Foundation in Outer longer side	Cum	2	11.36	0.75	0.4	6.82		
		For Foundation in Outer Shorter side	Cum	2	6.545	0.75	0.4	3.93		
		For Foundation in Inner Toilet Longer walls	Cum	2	5.645	0.75	0.4	3.39		
		For Foundation in Inner Toilet partition walls & Extensions. (C.T Room)	Cum	1	5.645	0.75	0.4	1.69		
		For Foundation of wall opp. To entry door for privacy.	Cum	1	1.5	0.75	0.4	0.45		
		Below flooring in total inner area	Cum	1	10.46	0.75	0.4	3.14		
		Less wall portions (Full brick walls)	Cum	2	6.545	0.75	0.4	3.93		
		For Foundation in Outer longer side	Cum	2	11.36	0.6	0.4	5.45		
		For Foundation in Outer Shorter side	Cum	2	6.545	0.6	0.4	3.14		
		For Foundation in Inner Toilet Longer walls	Cum	2	5.645	0.6	0.4	2.71		
		For Foundation in Inner Toilet partition walls & Extensions. (C.T Room)	Cum	1	5.645	0.6	0.4	1.35		
		For Foundation of wall opp. To entry door for privacy.	Cum	1	1.5	0.6	0.4	0.36		
		Below flooring in total inner area	Cum	1	10.46	0.6	0.4	2.51		
		Less wall portions (Full brick walls)	Cum	2	6.545	0.6	0.4	3.14		
		For Foundation in Outer longer side	Cum	2	11.36	0.45	0.4	4.09		
		For Foundation in Outer Shorter side	Cum	2	6.545	0.45	0.4	2.36		
		For Foundation in Inner Toilet Longer walls	Cum	2	5.645	0.45	0.4	2.03		
		For Foundation in Inner Toilet partition walls & Extensions. (C.T Room)	Cum	1	5.645	0.45	0.4	1.02		
		For Foundation of wall opp. To entry door for privacy.	Cum	1	1.5	0.45	0.4	0.27		
		Below flooring in total inner area	Cum	1	10.46	0.45	0.4	1.88		
		Less wall portions (Full brick walls)	Cum	2	6.545	0.45	0.4	2.36		
			Cum					**56.01**	2863.31	160381
4.	7.1.2	Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.								

		1:1.5:3 (1cement, 1.5 coarse sand,3 graded stone aggregate of 20mm & down size)								
		For partition walls bedding								
		For DPC along outer rear Long walls	Cum	2	11.13	0.45	0.115	1.15		
		For DPC along outer shorter walls	Cum	2	6.315	0.45	0.115	0.65		
		For DPC along inner shorter walls	Cum	2	5.185	0.45	0.115	0.54		
		For DPC along toilet partition walls	Cum	5	1.37	0.45	0.115	0.35		
		For DPC along toilet front walls	Cum	1	5.185	0.45	0.115	0.27		
		below privacy walls opp. Entry doors	Cum	2	1.5	0.45	0.115	0.16		
		For C.T.Room Roof.& Below water tank area	Cum	1	6.545	0.45	0.15	0.44		
		For water tank roof	Cum	1	6.545	0.45	0.1	0.29		
			Cum					3.86	5427.24	20931
5	10.3	Providing and Laying first class brick masonry in one and half brick thick wall in superstructure with 1:6 cement mortar (1 cement, 6 clean coarse sand) as per the direction of Eng.-in-charge including curing etc. all complete.								
		For outer Long walls	Cum	2	3.83	0.45	3.00	10.34		
		For outer shorter walls	Cum	2	6.085	0.45	2.45	13.42		
		C.T Room Longer walls & Water Tank	Cum	2	6.545	0.45	3.75	22.09		
		C.T Room Shorter walls & Water Tank	Cum	2	3.00	0.23	3.75	5.18		
		for toilet partition walls	Cum	5	1.37	0.45	2.475	7.63		
		for toilet front walls	Cum	2	6.085	0.45	2.50	13.69		
		For toilet block balance walls	Cum	3	1.8	0.23	2.25	2.79		
			Cum	1	6.085	0.23	2.45	3.43		
		For entry privacy walls	Cum	2	1.5	0.115	1.5	0.52		
		Deductions								
		toilet door (d)	Cum	2	0.90	0.230	2.00	0.83		
		toilet door (d2)	Cum	10	0.75	0.230	2.00	3.45		
		C.T.Room entrance	Cum	1	1.50	0.23	2.00	0.69		
			Cum					**84.05**	5327.85	447817
6	9.2.2	Providing and Laying 12mm thick cement plaster of specified mix in single coat including finishing even and smooth and curing complete.								
		1:4 mix.								

		for both Internal and external wall faces								
		For outer Long walls	Sqm	2	3.83	-	3	22.98		
		For outer shorter walls	Sqm	2	6.085	-	2.45	29.82		
		C.T Room Longer walls & Water Tank	Sqm	2	6.545	-	3.75	49.09		
		C.T Room Shorter walls & Water Tank	Sqm	2	3	-	3.75	22.50		
		for toilet partition walls	Sqm	5	1.37	-	2.475	16.95		
		for toilet front walls	Sqm	2	6.085	-	2.5	30.43		
		For toilet block balance walls	Sqm	3	1.8	-	2.25	12.15		
			Sqm	1	6.085	-	2.45	14.91		
		For entry privacy walls	Sqm	2	1.5	-	1.5	4.50		
		Deductions	Sqm	0	0	-	0	0.00		
		toilet door (d)	Sqm	2	0.9	-	2	3.60		
		toilet door (d2)	Sqm	10	0.75	-	2	15.00		
		C.T.Room entrance	Sqm	1	1.5	-	2	3.00		
			Sqm					224.92	136.05	30601
7	9.2.2	Cement ornamental ceiling plastering in CM (1:3) prop. 12 mm thick including cost and conveyance of all material, labour charges, curing etc., complete in first floor.								
		For toilet blocks								
		For CT Room	Sqm	2	6.085	-	3.24	39.43		
								39.43	132.3	5217
8	PWD SR 2014 -15, It No.9. 83, Pg No.57	d) Solid Panel PVC Door Shutter : Providing & fixing 30mm thick factory made rigid foam panelled door shutters made from M.S. tube of 19 gauge thickness, size 19x19mm for styles and 15x15mm for top & bottom rails, covered with head moulded PVC channel of 5mm thick sheet & 30x50mm wide to form styles & 5mm thick & 75mm wide PVC sheets for top rail, lock rail & bottom rail on either side & 5mm thick 20mm wide PVC sheet fitted as gap insert for top rail & bottom rail, Panelling of 5mm thick PVC sheet fitted in the M.S. Frame, Sealed to the styles & rails with 5x30mm PVC sheet beading on either side & joined together with solvent cement adhesive etc., complete as per manufacturers specification & Direction of Engineer-in-charge fixed to frames with nos of 75 mm aluminium hinges.								
		Toilet Room door (d2 door)	No	10	0.75	-	2.00	15.00	3167.00	47505
9	21.1	Providing and fixing anodized aluminum works for doors, windows, ventilators and partitions with extruded built up standard tubular or other section of approved make confirming IS 733 and IS 1285, fixed with rawl plugs and screws or with fixing clips or with expansion hold fasteners i/c necessary filling up the gaps at junctions, at top, bottom and sides with required PVC / neoprene felt, etc. Al. section shall be smooth, rust free, straight, mitered and joined mechanically wherever required i/c cleat angle, Al snap beading for glazing / paneling CP brass / stainless screws, all complete as per design and drawings and the direction of the Engineer - in - Charge.								
		Toilet Rooms Ventilator	No	10	0.6	-	0.3	1.80	1799.88	3240

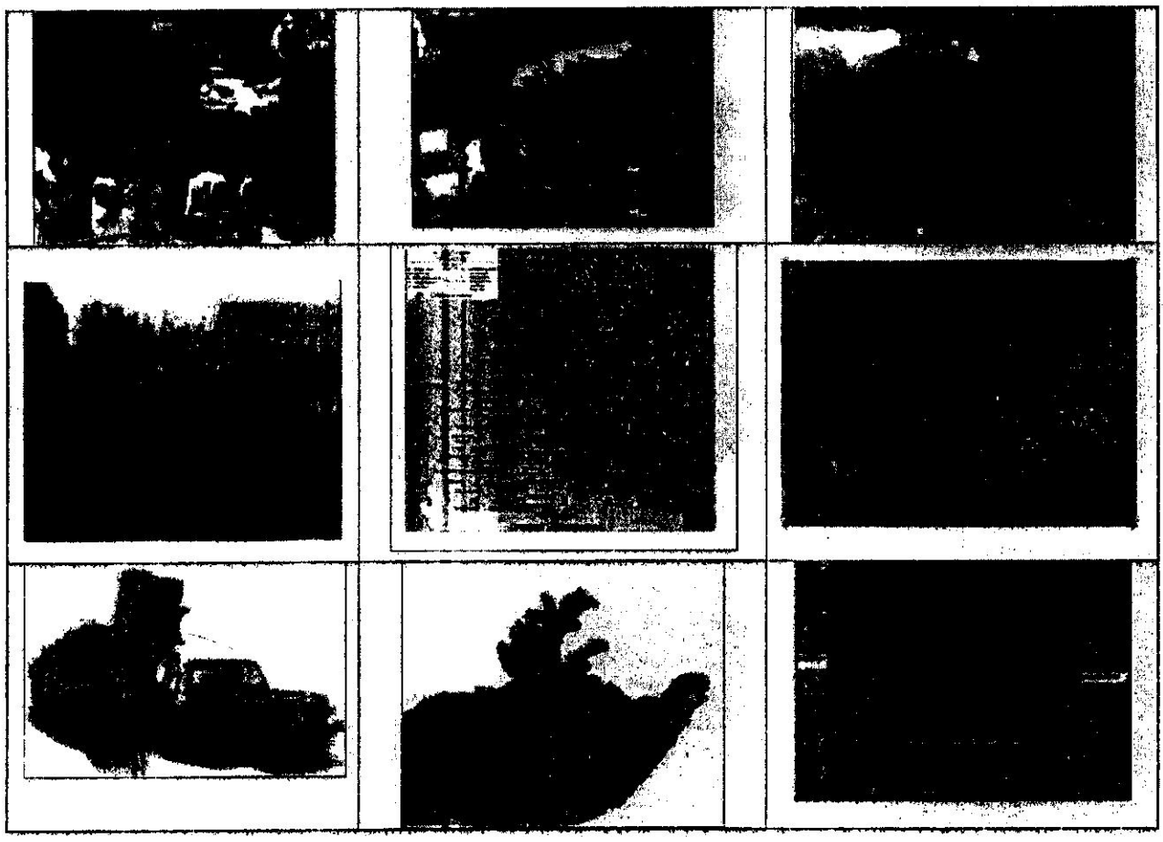
10	11.31	Providing and Laying white or colored glazed tiles of size 200mm x 300mm of plain/normal prints colours (white, grey, ivory, platinum, cream, glacier white, summers and, beach, wood duro, melody, or equivalent) in skirting, risers of steps and Dados on 12mm thick cement plaster (1cement, 3coarsed sand) 1:3 bare and jointed with white cement slurry.								
		Total inner area								
		Qty as per pcc bedding								
		Below flooring in total inner area	Sqm	1	10.46	5.6 45	-	59.05		
		Less wall portions (half brick walls)	Sqm	1	20.52	0.1 15	-	2.36		
		Less wall portions (Full brick walls)	Sqm	1	17.57	0.2 3	-	4.04		
			Sqm					**65.45**	970.58	63522
11	11.31	Providing and Laying white or colored glazed tiles of size 200mm x 300mm of plain/normal prints colours (white, grey, ivory, platinum, cream, glacier white, summers and, beach, wood duro, melody, or equivalent) in skirting, risers of steps and Dados on 12mm thick cement plaster (1cement, 3coarsed sand) 1:3 bare and jointed with white cement slurry.								
		Gents toilets block		5	3.88	1.5 0	-	29.10		
		Ladies toilets block		5	3.88	1.5 0	-	29.10		
								58.20	**970.58**	56488
12	20.2	Supplying, fabricating, fitting and fixing tubular truss including putty, hoisting, fixing in position and applying a priming coat of approved steel primer, welded and bolted including special shape washer etc complete in curve shaped Sikkim- style roofing as per the standard specification and design and as per the direction of Engineer - in-Charge all complete.								
		Quantity	**Kgs**					**3500**	**72.64**	254240
13	19.2	Providing, fitting, fixing of 24 BWG GP sheet roofing by making corrugation of 50mmx50mm x50mm on both side with G.I. hooks, bolts and nut 8mm dia with bitumen, GI limpet washers filled with white bad including coat of approved steel primer and two coats of approved paint, on overlapping of sheet excluding carriage all complete.								
		Roof Area	Sqmt	1	12	7		84.00		
		Add 20% for Laping	Sqmt					16.8		
		Total Quantity	Sqmt					**100.8**	997.05	100503
14	8.2.3	Providing & Laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements with Recron 3S of fiber length 6 or 12 mm (125 gm of recron 3S per a bag of cement) as per the direction of Engineer in Charge.								
		1:2:4 (1cement,2coarse sand, 4 graded stone aggregate of 20mm nominal size).								
		Over door	Sqm	10	1.13	0.2 3	0.1	0.26		
		Over ventilator	Sqm	10	0.6	0.1 2	0.1	0.07		
							Total	0.33	5183.19	1720

15	24.1	Providing, fitting and fixing. white vitreous china water closet (W.C) squatting pan (Indian type) 530mm size with 100mm SCI (Sand cast iron) P or Strap, 10 later low level flushing cistern with fittings, CI brackets, 32mm flush pipe with fittings and clamps, 20mm overflow pipe, cutting and making good the wall and floor etc complete. Long type or Orissa type pan. HINDWARE CAT NO 20004								
		For toilet	No.	10				10		
							Total	10	3321.66	33217
16	24.9.4	Providing, fitting and fixing white vitreous china flat back or wall corner type lipped front urinal basin of size 440x315x325 mm with 5 ltr automatic flushing cistern with C.I. brackets, GI flush pipe and spreaders with brass unions and G.I. clamps including cutting and making good the walls and floors as required all complete:								
		Range of four urinal basins with	No	1				1	10556	10556
17	24.24.1	Providing, fitting and fixing soil waste and vent pipes including testing etc complete.								
		100 mm dia. PRINCE / SUPREME or equivalent soil pipe								
		24.24.2	Rmt	1	50			50		
							Total	50	276.68	13834
18	MR	Providing and Fixing of ready made PVC/HDPE Septic tank of capacity 1000 ltrs with top cover etc as per the requirement and specification								
		Market Rate								
		Septic Tank	Lts	1	10000			10000		
							Total	10000	7.00	70000.00
19	22.7.1	Providing, Fitting and fixing DI pipe, excluding the cost of fittings, trenching, refilling and compacting all complete:								
		Qty. Same as above	Sqm					224.92	10.94	2461.00
									Sub Total Rs	1387749
20		Provision for Electrical 7.5% of Sub total								104081
		Provision for Water supply 7.5% of sub total								104081
									Total Rs	1595911
21		Provision for Price escalation for three years @ 7.5% increment= 7.5% x 3 =22.5%								359080
		Grand Total Rs								1954991
		Total Rounding								

~~648~~
648

ANNEXURE-R3

MUNICIPAL SOLID WASTE PLAN FOR SIKKIM



Urban Development and Housing Department
Government of Sikkim
Gangtok

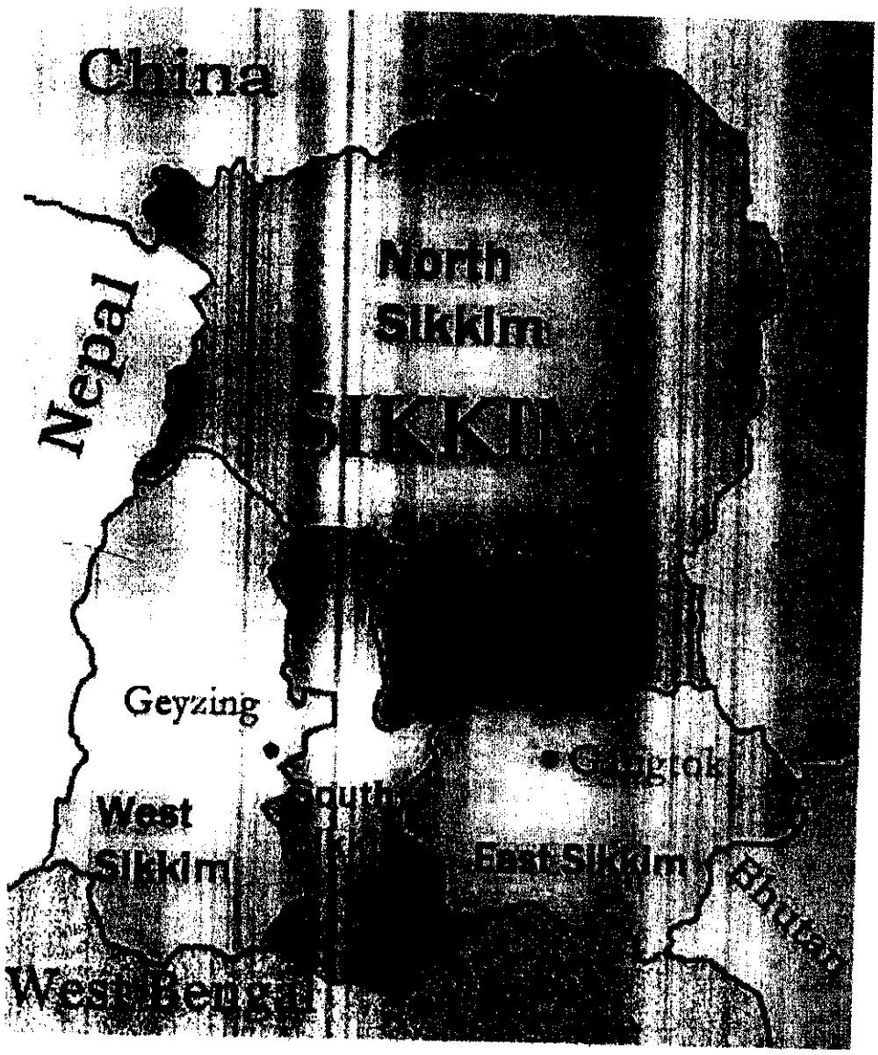
649

Contents

650

Background of Sikkim's topography and Geographic Profile

Sikkim is a landlocked state in the north-eastern region of India and shares international borders with China, Nepal and Bhutan, and state boundary with West Bengal.



Owing to its location in the Himalayan Mountainous region, the geography of Sikkim is diverse in the form of high mountain peaks and steep river valleys. Tucked between the Himalayan ranges, the state has mountainous terrain with elevations ranging from 280 meters to 8585 meters. The climate of Sikkim varies from subtropical in the south to tundra in the northern parts. The tundra region in northern Sikkim is covered by snow for four months consecutively every year. The temperature during these winter months drops down to below 0°C. Most of the populated lower regions of Sikkim experience a temperate climate with temperatures ranging from 28°C in summer at times and dropping below 0°C in winters.

Sikkim has a very rugged topography due to which there are very less flat lands – no flat area more than a few hundred square meters exists in continuity. This makes management of Municipal Solid Waste very challenging especially in terms of collection of waste from the households.

A TYPICAL URBAN SETTING IN SIKKIM

Challenges of a hilly terrain state in MSW implementation

1. Background of Existing Solid Waste Management and its Status

Although Sikkim has Urban Local Bodies in the capital city Gangtok, and six other major towns of the state, these bodies were constituted barely five years ago. Therefore, management of municipal solid waste by the ULBs in their respective areas is still in a nascent stage. The Gangtok Municipal Corporation (GMC) has formulated a Solid Waste Action Plan for Gangtok and its peripheries which is being implemented under the **North-Eastern Region Capital Cities Development Investment Programme**, being aided by the ADB. The other ULBs, on the other hand are managing municipal solid waste in their respective areas through periodic collection and transportation to the dumpsites. As such these ULBs do not have the full fledged capacity or infrastructure to manage the waste in their respective areas.

Presently Sikkim, due to rapid urbanization and changing lifestyles is generating about 26,000 tonnes of municipal solid waste every year. Further, due to intermittent driving forces such as tourism, about 210 tonnes per year of solid waste is added to the existing waste generation quantum in the tourist destinations.

Although the ULBs in Sikkim spend a sizeable portion of the municipal budget on cleanliness of towns, they are unable to provide effective services in the MSW management sector. The MSW generation estimates are normally based on the capacity of bins or the garbage collection utility vehicles.

The Urban Development & Housing Department UDHD is the primary agency responsible for the town development and management matters, including the physical planning, growth management and the provision and management of core civic services. There is an inadequate implementation of the building regulations that has led to regional imbalances in terms of civic facilities and infrastructure development. Growth trends are estimated to continue concentrating on the major towns which will lead to the aggravation of the imbalance in the already hard pressed civic facilities.

Unplanned urban expansion has strained the State resources. In Gangtok, the capital city, an estimated 50 MT of solid waste is generated daily in the Gangtok Municipal Area. In certain areas the curb-side collection is prevalent. Though GMC is primarily responsible for collection, transportation and disposal of the solid waste, collection and transportation of waste is being handled privately in certain small, organized areas. Burning the waste and dumping into the jhoras in peripheral areas is not uncommon.

1.1 Number of Urban Bodies Constituted in the State of Sikkim

A total of seven ULBs have been constituted in Sikkim in the towns of Gangtok, Rangpo, Singtam, Mangan, Gyalshing, Jorethang and Namchi.

1.2 Current status of Municipal Solid Waste Management

Currently, among the ULBs, two wards in East District have begun with source segregation of MSW after rigorous training and IEC activities, cluster-wise in a phased manner. Separate bins are provided to residents for source segregation being executed by Community motivators. The waste thus segregated is being taken to the landfill site where degradable discards are being composted while non-degradable items are being recycled through scrap dealers. The management of MSW in 8 wards has already been outsourced to NGOs with GMC exercising stringent monitoring on a regular basis. The MSW of these wards is being collected and transported to the dumpsite at Martam which is being converted into a sanitary landfill under the afore-mentioned NERCCDIP project.

In North District, under Mangan Nagar Panchayat, all the vegetable waste of the marketing centre is being turned into compost through the Organic Waste Converter that has been installed by the ULB.

MSW from South and West Districts is being collected and sent to MSWTF under construction at Sipchu, West Sikkim, being constructed with funds received from the CPCB.

1.3 Quantity of Municipal Solid Waste generated daily from each town

The quantification of waste generation for Gangtok city has been worked out as per the sampling methodology in accordance with the SWM, CPHEEO Manual (*DPR on SWM for Gangtok under NERCCDIP, MoUD*). Furthermore, the quantum of per capita waste generation for **Class I, IV, V & VI** towns as per Census 2011 has been taken as an average count of wastes generated from residential households, commercial establishments, markets, construction etc.

Estimation of per capita waste generation (household and other sources) of towns in Sikkim based on the 2011 Census data can be seen in the table below:

Sl.No	Town	HH	Population	Average/capita generation (gms/day)	Total (Tonnes /day)
01	Mangan NP	1054	4644	400	1.85
02	Gyalshing NP	881	4013	400	1.60
03	Nayabazaar NTA	252	1235	400	0.50
04	Namchi MC	2733	12190	450	5.50
05	Jorethang NP	2107	9009	450	4.00
06	Gangtok MC	23773	100286	500	50.10
07	Singtam NP	1144	5868	450	2.64
08	Rangpo NP	2505	10450	450	4.70
09	Rhenock CT	1269	5883	450	2.65
				Estimated Total :	*73.54*

CLUSTER PLAN OF MSW MANAGEMENT FOR URBAN CENTRES

In every urban centre, MSW will be managed by dividing wards into clusters. Each cluster will comprise not more than 50-60 households, the demarcation of clusters will be so made as to suit the landscape specifications that would facilitate collection& transportation of waste. **The prevalent cluster model in two wards of East District where source segregation at household level has been introduced will be emulated in other towns as well.** ULBs will take care of MSW collection, transportation, storage right up to the disposal at landfill level. Community Collection Centres (for segregated dry waste as well as compost made at the household level) will be set up. Community composting / biogas units will also be taken up at these Collection Centres wherever deemed feasible.

However, prior to introducing the hardware and infrastructure, the software must precede it in terms of rigorous IEC & Awareness Campaigns. This cluster approach will be adopted in all ULBs.

Disposal of waste at cluster level

ULBs shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize the burden on landfills.

The biodegradable wastes shall be processed by composting, vermi composting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes, at source to the extent possible and thereafter at the community level.

Landfilling shall be restricted to non-recyclable, residual and inert wastes that are unsuitable for either recycling or for biological processing.

Furthermore, the MSW bio-degradable & non-degradable, emerging out of all marketing centres (primarily sabzi mandis) will also get linked to these Community Collection Centres. Alternatively, Biogas units of varying capacities based on waste quantum will be installed at these marketing centres for managing vegetable waste as to treat it at source and avoid burdening the community collection centres. These units will be maintained and manned by the shopkeepers & immediate stakeholders.

655

2. Initiatives in municipal SWM under Government of Sikkim

The Government of Sikkim is amongst the first state of the country to successfully enforce a total ban on the use of polythene bags. The State has also (i) 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 and (ii) installed a Compost plant at Martam to dispose the biodegradable waste which has been recently revived following a period of inoperation, thereby reducing the waste generation for disposal. (iii) Further, processes have been initiated to **impose bans on use of disposable items** like styrofoam and plastic plates, cups, spoons etc. along with other non-recyclable waste such as flex banners/hoardings/signposts in order to reduce waste at source. Burning of agricultural waste, leaves, litter, paper waste and garbage has been prohibited vide **Notification No. 196/FEWMD, dated 5/1/15.**

3. Management Principles

3.1 Effective segregation, collection and transportation

The most important components of the MSW operations namely segregation, collection, transportation and storage of waste, require active involvement of the government bodies, private operators, community, NGOs, CBOs etc., besides introduction of equipment and vehicles for efficient management of waste. **However, the key component would be awareness creation and changing the mindset of the people in their current attitude/perception of waste which is important for developing and creating a healthy environment. The mechanism to be adopted will be as per zero waste concepts.**

For effective segregation, collection and transportation, the municipal waste management will be based on the following important principles:

Effective & efficient source segregation, collection, transportation
Maximum resources recovery

Effective treatment
Safe disposal

To avoid manual handling of waste and also minimize multiple handling by adopting state of the art modern SWM vehicles and equipments suitable to hilly terrain.

Developing of skills and mechanisms in waste collection of the "waste collection crew" which are humane and dignified.

3.2 *Collection and segregation at each town*

ULBs will provide daily waste collection service to all households, shops and establishments for the collection of segregated bio-degradable waste due to its putriscible nature. This service must be reliable and regular. The practice of segregation of waste at source will be ensured through different category bins such as degradable, non-degradable, hazardous so as to prevent the discards from reaching the waste stream and facilitate material recovery by means of composting and recycling. Door-to-door collection with community participation on cost recovery basis will be organized by ULBs. In case of difficult household locations where households do not have vehicle accessibility, composting of segregated

kitchen waste will be taken up at the household level itself which will not necessitate daily collection while dry waste can be stored category-wise and handed over to the Community Collection Centres on a periodic basis. ULBs will however ensure thorough sensitization of the community and follow it up with constant monitoring.

Recyclable material can be collected at longer regular intervals as may be convenient to the waste producer and the waste collector, as this waste does not normally decay and hence need not be collected daily.

Domestic hazardous waste is produced occasionally. Such waste can be collected periodically, however the waste producers need to be advised / directed to store them separately.

Collection of waste can be done by:

Municipal workers themselves

Contracting the collection of wastes to a competent organization

Privatizing through ragpickers and scrap dealers or any suitable agencies.

It is also important to keep all the roads, lanes and surroundings clean. In order to cater to the needs of tourist/ floating population in and around major centers and market areas, taxi stands, bus stand, parking lots, shopping areas, adequate number of bins with lids (separate compartments for different waste type) will be made available by ULBs. These bins will be emptied by municipal workers attending to primary collection in the respective areas and linked to the community collection centers set up in respective wards.

Waste collectors will be organised with the assistance of NGOs for achieving segregation of waste. Kabadiwallas and recycling industries will be encouraged to maximize reuse & recycling of dry waste.

Publicity campaign for creating Community Awareness and Public Participation (CAPP) for segregation of waste will be carried out and continued to achieve segregated biodegradable waste for composting and minimizing the waste for final disposal.

3.3 *Procedure of collection:*

All clusters will be manned with adequate number of sanitary workers with requisite facilities. Vehicles (large and small) as per town size will be provided for collection bearing separate compartments / bins to carry the segregated waste. Every collection time will be announced by an audible bell.

Wherever the vehicle is not accessible, composting at the household level will be followed for degradable waste while the recyclables could be deposited periodically (since it does not necessitate daily collection) in Community Collection Centres provided by the ULBs. These community centres are also to be manned by sanitation workers. Since recyclable waste has a value, the proceeds from such sales will be rolled back into the ULB revenue for further financial strengthening and sustainability.

657

3.4 *Other responsibilities and transportation*

The local bodies will identify the Resident Committees ward-wise, in each Ward and shell out the responsibility of managing the Collection Vehicle for Door to Door collection.

The Resident Committee will engage the Collection crew and the Driver for Door to Door collection of waste in their respective wards.

The collection vehicle will collect the waste by covering the entire ward in a day.

The collection vehicle after it has reached its full capacity will transport the waste to the Community Collection Centres.

The local bodies will depute Sanitation Supervisors at every cluster to supervise the collection efficiently. Also they will coordinate and communicate among each other and the drivers of the collection vehicle and the Community Collection Centres in-charge to know the movement of these vehicles so as to effectively and economically lift and transport the garbage.

Waste compactors will be installed district-wise in the main towns at the collection centres from where the waste can be recycled / disposed to landfill.

Vehicles with hydraulic system will be introduced to achieve hygienic garbage handling in larger towns.

3.5 Regulatory measures

Solid waste management practices can never reach the desired level of efficiency until the public participates and discharges its obligation religiously. In order to improve solid waste management practices in urban areas, it is planned to incorporate suitable provisions in the state law to ensure public participation and providing for minimum level of solid waste management.

The following will be regulated by ULBs by stringent law and vigilance monitoring for all the waste generators including households, restaurants, hotels, shops, offices, institutions:

i. To make segregation at source compulsory to all Households, commercial spaces (hotels, shops, markets), Institutional premises (school, colleges, offices)

ii. Residents will be asked to deposit segregated waste to Door to Door Collection Vehicle on time. They shall not throw any solid waste in their neighbourhood, on the street, jhoras, open spaces and into vacant plots or into drains. Punishment will be meted out to those who litter and dispose waste on streets etc.

658

iii. They shall keep the kitchen discards (food waste) as and when generated, in any type of domestic waste container and (a) hand over to the waste collector daily or (b) compost it at the household itself using suitable technology provided by the ULBs. They shall keep Dry/recyclable waste preferably in bags or sacks in a segregated manner to be transported to Community Collection Centres periodically.

iv. They shall not dispose off wet waste in plastic or any other carry bags.

v. They will keep domestic hazardous waste separately, for disposal at designated place arranged by ULBs. Domestic hazardous/ toxic waste material will be deposited in special bins (provided by the local body at specific designated places in the towns) at the Community Collection Centres. These hazardous waste will be taken eventually to the landfill. This would facilitate maintaining hygienic condition and easy handling of the waste for further processing and proper disposal.

vi. Authorized bodies will be appointed by ULBs to provide uniforms, identity cards and protective equipment for sanitation workers and waste collectors.

vii. Societies/Associations/Management of commercial complexes will be responsible for keeping their premises clean.

3.6 Maximum Resource Recovery

The „Hierarchy of Waste Management" gives a priority listing of the waste management options and indicates important general guidelines on the relative desirability of the different management options. The hierarchy will be adopted and will aim at:

waste minimization/reduction at source
recycling
waste processing – with recovery of resources i.e. material (products) and energy

THE FIRST STEP TO WASTE MANAGEMENT IS WASTE REDUCTION

Reduction at source is the first in the hierarchy because it is the most effective way to reduce the quantity of waste, the cost associated with its handling, and its environmental impacts.

3.7 Effective treatment and Safe Disposal

Wastes are either burnt or dumped in open spaces and these practices will be abolished as they are deleterious to health and the environment. Landfilling occupies the lowest rung in the integrated waste management, though it is a better option than dumping the waste in open spaces. It relies on containment rather than treatment (for control) of wastes. The purpose of landfilling is to bury or alter the chemical composition of the wastes so that they do not pose any threat to the environment or public health. Landfills are not homogenous and are usually made up of cells in which a discrete volume of waste is kept isolated from adjacent waste cells by a suitable barrier. Commonly used barrier is a layer of natural soil (clay), which restricts downward or lateral escape of the waste

constituents or leachate. Sanitary landfilling normally has a double liner to prevent leaching into the groundwater. Appropriate run-off controls, leachate collection and treatment, liners for protection of the groundwater (from contaminated leachate), biogas recovery mechanism (landfill gas contains high percentage of methane due to anaerobic decomposition of organic wastes), monitoring wells, and appropriate final cover design constitute integral components of an environmentally sound sanitary landfill. Proper and regular monitoring will be done at landfill sites. All these steps will be ensured in the landfills. **Landfills shall be constructed in accordance with the provision contained in the Municipal Solid Waste (Management & Handling) Rules, 2000.**

In the context of Sikkim, where the ecosystem is fragile and the geographical terrain is highly challenging, the setting up of landfills will be in consonance with these hilly and mountainous terrain conditions as to avoid leaching into the river, streams and water bodies as to not contaminate them.

4. Vegetable and Fruit Markets waste collection centres (Rural Marketing Centres)

These markets produce large volumes of solid waste and local bodies will direct the association of the market to provide large size containers which match with the transportation system of the local body or depending on the size of the market, local body itself may provide large size containers with lids for storage of segregated market waste in separate bins at suitable locations within the marketing centres, floor-wise on full cost / partial cost recovery from the market association. This will also be applicable during **haat** days when the production volume of waste would be much higher. The following alternatives will be adopted for managing such wastes in order to manage the waste at source.

On-site bio-digesters/composters for vegetable and fruit market waste will be encouraged.

The waste from fruit and vegetable processing industries can be used for production of biogas. Biogas is produced by anaerobic digestion of fruit and vegetable wastes. The conversion of fruit and Vegetable Wastes to biogas using anaerobic digestion process is a viable and commercial option.

5. Marriage Halls/ Community Halls

A lot of waste is generated when marriage or social functions are performed at these places and unhygienic conditions are created. ULBs will assigned the task of managing such waste to the committees/ associations/ societies who run these halls. During every function the waste will be collected in a segregated manner in various bins that will contain waste of all categories separately. The waste thus collected will be transported to the Community Collection Centres set up by the ULBs.

Special arrangement will be made for collection of waste from marriage halls, community halls, puja halls etc. whenever these halls are used, on a full-cost recovery basis. The cost of such collection could be built into the charges for utilizing such halls. This service may be provided preferably through a contractor or departmentally as the local bodies deem fit. On-site, processing of food wastes by bio- methanation and composting may be encouraged.

Further, since many wedding receptions are held in hotels and private homes, direct collection of waste from homes, hotels, restaurants, party halls etc., will be managed by local bodies. Separate vehicles (existing) with adequate crew will be provided for the purpose and the collection will be carried out on a fixed daily schedule; waste will be directly transported to disposal site. Existing waste transport vehicles available will be utilized to the maximum extent.

6. Hospitals/ Pathological Labs/Health Care Centres (PHCs, PHSCs*)*

These establishments produce bio-medical as well as ordinary waste. They will be directed that:

They shall refrain from throwing any bio-medical waste on the streets or open spaces, as well as into municipal dustbins or domestic waste collection sites.

They shall also refrain from throwing any ordinary solid waste on footpaths, streets or open spaces.

They are required to store waste in colour-coded bins or bags as per the directions of the Govt. of India, **Ministry of Environment Bio-Medical Waste Management & Handling Rules, 1998** and follow the directions of CPCB and SPCB from time to time for handling, transportation, treatment and disposal of bio-medical waste.

7. Construction and Demolition waste

Directions will be given that:

No person shall dispose of construction waste or debris on the streets, public spaces, footpaths or pavements.

Till finally removed construction waste shall be stored only within the premises of buildings, or in containers where such facility of renting out containers is available. In exceptional cases where storage of construction waste within the premises is not possible, such waste producers shall take prior permission of the local authority or the State Government as may be applicable for temporary storage of such waste and having obtained and paid for such permission, may store such waste in a way that it does not hamper the traffic, the waste does not get spread on the road and does not block surface drains or storm water drains/jhoras.

To facilitate the collection of small quantities of construction and demolition waste generated in urban centres, suitable sites may be identified in various parts of the city and people notified to deposit small quantities of construction and demolition waste. Containers could be provided at such locations and small collection charge levied for receiving such waste at such sites and for its onward transportation. Rates may be prescribed for such collection by local bodies. Contracts could also be given for managing such sites.

Local bodies will prescribe the rate per tonne for the collection, transportation, and disposal of construction waste and debris and notify the same to the people.

Every person who is likely to produce construction waste may be required to deposit with the concerned local body an approximate amount in advance at the rates as may be prescribed by the local body from time to time, for the removal and disposal of construction waste from his premises by the local body. Such amount may be deposited at the time when the building permission is being sought and in cases where such permission is not required, at any time before such waste is produced.

The charges for removal of construction waste to be doubled for those who fail to deposit the amount in advance.

Large local bodies may provide skips (large containers) to the waste producers on rent for the storage of construction waste so that double handling of the waste can be avoided or use front end loader & trucks to pick up such waste. In small towns this may be done manually using trucks, tractors and manpower.

8. Garden waste

Private gardens will as far as possible compost and re-use all plant wastes on-site. Where it is not possible to dispose of garden waste within the premises and the waste is required to be disposed outside the premises, it will be stored in large bags or bins on-site and transferred into a municipal system on a weekly basis. The generation of such waste will as far as practicable be regulated in such a way that it is generated only a day prior to the date of collection of such waste. It will be stored in the premises and kept ready for handing over to the municipal authorities or the agency that may be assigned the work of collection of such waste.

Garden waste and fallen leaves from avenue trees within large public parks and gardens will be composted to the extent possible. However, if such waste has to be disposed of, large skips may be kept, which match with the municipal transportation system for transportation of such waste. Such skips may be provided by local bodies or State Governments owning such parks and gardens. In case of private parks and gardens they will make their own storage arrangement which matches with the municipal primary collection and transportation system.