CONCEPT REPORT & DRAFT DEATAILED PROJECT REPORT ON REMEDIATION OF OPEN DUMP AND RECYCLING OF SPACE AT AJJDONHALLI DUMPING SITE, TUMAKURU

Project Management Consultant for Implementation of Smart City Mission Project of Tumakuru City

April 2019

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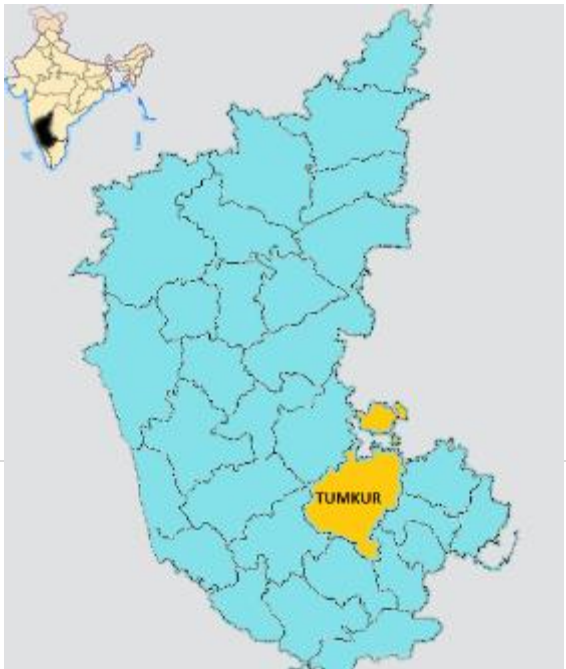


1 Project Overview

Tumakuru has been selected in the second round of the SC Challenge as one among the 100 Smart Cities to be developed in India under the Smart Cities Mission. A

Special Purpose Vehicle (SPV) – Tumakuru Smart City Limited has been set up under the Companies Act, 2013 for the implementation of the project. Tumakuru's Area-Based Development (ABD) proposal revolves around a retro-fitting of about 1400 Acres in the CBD area having an aim of upgrading the available infrastructure services, decongesting the city center, and integrating the built space and the environment.

Solid Waste Management (SWM) is an important infrastructure service that decides the quality of life in a city. An effective SWM system includes four main components - collection, transportation, treatment, and disposal of waste. It is an integrated process comprising several collection methods, varied transportation equipment, storage, recovery mechanisms for recyclable material, reduction of waste volume and quantity by methods such as composting; refuse derived fuel (RDF), waste-to-energy (WTE) and disposal in a designated engineered sanitary landfill.

Understanding the significance and requirement of waste management in Tumakuru City, Smart City Proposal for the city includes Integrated and Sustainable Solid Waste Management as a prior project under the Area Based Development. An indicative budget of INR 10 crores has been allotted for filling the gaps in the Integrated solid waste management developed under Swacch Bhart mission.

After having joint discussions in the subsequent board meeting with the Tumakuru City corporation (TCC), TCC has come up the requirement As per letter no. TCC/Admin/CR/01/2018-19 from TCC dated 8th Jan, 2019, Corporation requested to implement Remediation of open dump and recycling of space at Ajjdonhalli dumping site, Tumakuru

2 Project Objectives

Main aim of the assignment is **to study and facilitate** Remediation of open dump and recycling of space at Ajjdonhalli dumping site, Tumakuru

3 As-Is Situation of SWM in Tumakuru

3.1 Introduction

The management of solid waste generated in the city is one of the key responsibilities performed by TCC in Tumakuru. The government of Karnataka has created a post of Environmental Engineer in the urban local bodies for managing the Municipal Solid Waste and City Sanitation. The environmental Engineer is assisted by the senior and junior health Inspectors for managing the various aspects of the municipal waste management. Tumakuru has undertaken improvements of its Solid Waste Management system based on the policy of the Government of Karnataka.

3.2 Overview of Solid Waste Management in Tumakuru city

Table 1: Snapshot of SWM in Tumakuru City

Sl No	Particulars	Specifications
1	Municipal area (in sqkm)	48.21
2	Population (2011 census) in lakhs	3.05
3	Floating Population	Around 20000

4	No of wards	35
5	Number of establishments (including commercial)	88525
6	Number of slum households	24432
7	Total waste generated in the city (in Metric Tonnes Per Day)	130
8	Total waste collected (in Metric Tonnes Per Day)	90 to 100
9	Number of permanent Pourakarmikas	383 (62 +321)
10	Vehicles owned by TCC	4 Compactors, 3 Tippers, 2 Autos, 10 Tractors
11	Location of the Disposal site	Ajjagondanahalli
12	Total area of Disposal Site	40.24 acres
13	Average distance to disposal site from city centre	17 km
14	Land ownership of Disposal site	TCC
15	Mode of Treatment and Disposal	Composting 1. Windrow composting 2. Vermi Composting
16	Landfill	2500sqm (50m*50m) Scientific Landfill

Source: Final DPR prepared for Tumakuru city under Swachh Bharat mission for Solid Waste Management, 2016

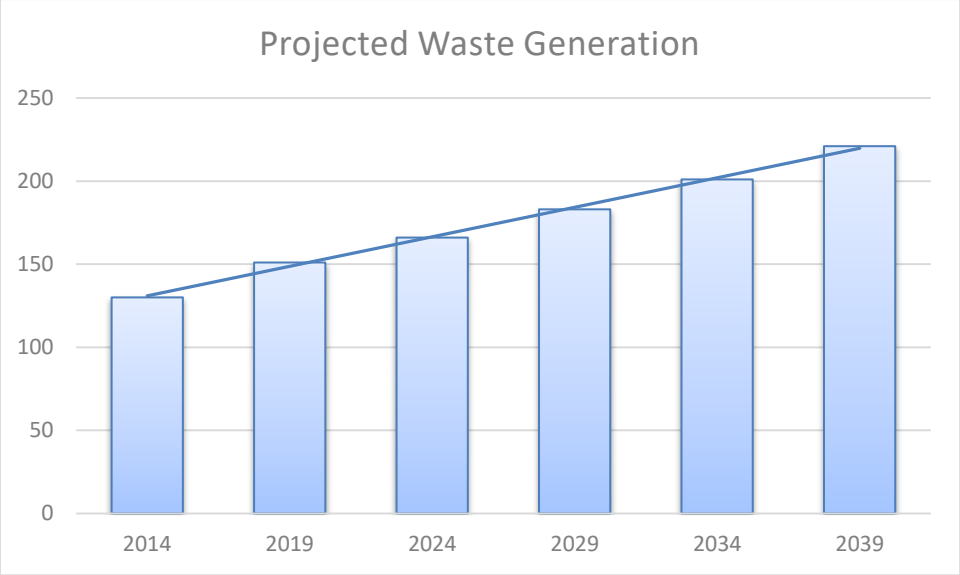
3.3 Projection for Population and Waste Generation

Table 2 : Projection of Population and Waste generation

S. N	Year	Population	Quantity of waste in tons
1	2014	305926	130
2	2019	336518	151
3	2024	370169	166
4	2029	407185	183
5	2034	447903	201
6	2039	492693	221

Source: Final DPR prepared for Tumakuru city under Swachh Bharat mission for Solid Waste Management, 2016

Chart 1: Projected Waste Generation for Tumakuru City



3.4 Waste Generation

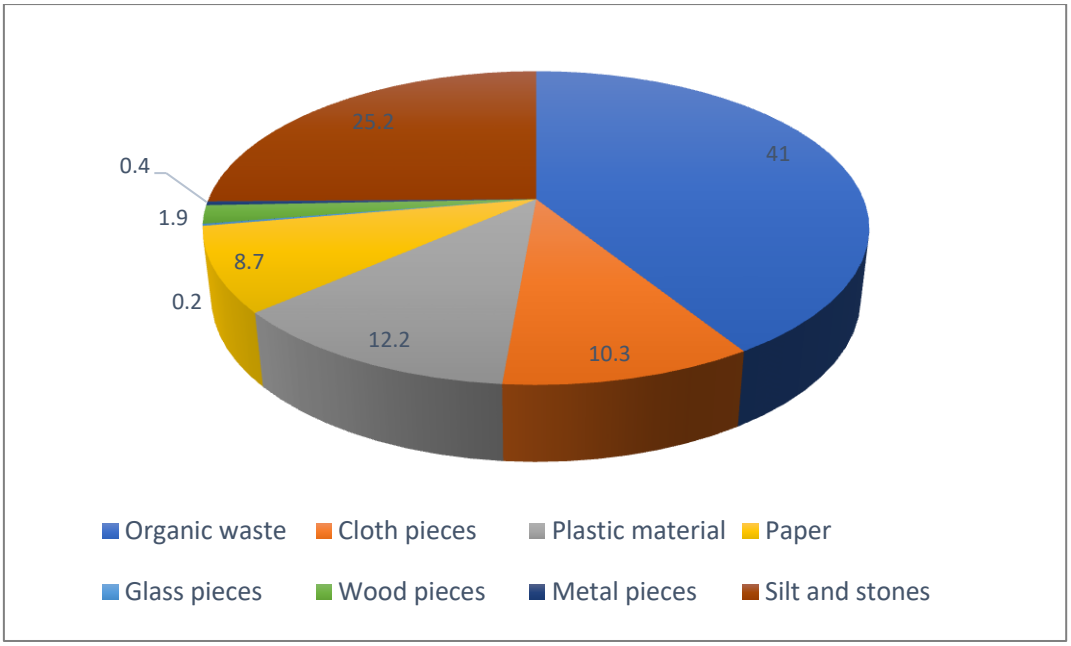
The population of Tumakuru city as per census conducted in 2011 is 3.05 Lakhs. The city being a commercial and educational hub experiences a floating population of about 20,000 per day. The total quantity of waste generated in the Tumakuru as per normative standards is about 113 tons per day. The actual quantity of waste generation estimated is about 130 tons and is higher than the normative standards.

Table 3: Physical composition of waste

S. N	Particulars	Percentage by weight
1	Grass & Leaves	20.4
2	Food Waste	20.2
3	Silt & moisture	18.3
4	Plastic material	12.1
5	Cloth Piece	10.2
6	Paper	8.7
7	Stones	6.7
8	Wood Pieces	1.9
9	Metal pieces	0.4
10	Glass pieces	0.2

Source: Final DPR prepared for Tumakuru city under Swachh Bharat Mission for Solid Waste Management, 2016

Chart 2: Qualitative analysis of MSW



3.5 Waste Collection

The TCC is collecting about 90 to 100 TPD of waste every day with an efficiency of about 70%.

3.5.1 Door to Door collection:

The door to door collection of waste from the households, commercial establishments, and other waste generators is outsourced to a private contractor. The TCC has classified its area into 6 packages for the purposes of conducting collection & transportation of waste and has contracted out to 6 private parties. The door to door collection mechanism is done using auto tippers which are owned and operated by private parties. The collection process starts at 6:00 am and extends up to 10:00 am every day. The waste collected by the door to door collection and street sweeping is disposed into nearest container/ compactor bins provided by the TCC.

Figure 2: Door to door collection by auto tippers

Figure 1: Door to door collection by Tractor Trailor

The door to door collection in commercial areas takes place twice a day by tractor trailor. The first round of collection starts from 6:00 am and extends up to 10:00 am and the second round of collection starts from 6:00 pm and extends up to 9:00 pm.

There is a separate mechanism for collecting, transporting and disposing of biomedical waste. The separately collected bio medical waste is managed by M/S Ramky in Tumakuru city. The solid waste aspects of the hospitals and clinics have been considered along with the regular commercial establishments and are included in the door to door collection mechanism.

The City Corporation does not have a plan for disposing or processing the construction waste generated in its limits. The waste is disposed in the low-lying areas in the outskirts of the city by the waste generators. Most of the builders and contractors use their own or hired tractors to carry the waste away from the city. The construction waste is usually dumped in the Maraloor Dinne area and low-lying areas of Jayanagar.

3.5.2 Street sweeping

The total lengths of the roads in the TCC limits are about 666 km (as per the action plan of Tumakuru city) out of which only 133 km is considered for daily sweeping while other streets are swept once in 2 days or once in 3 days. The street sweeping in the city has been outsourced to private contractors and they are expected to deploy their men and equipment for conducting the street sweeping activity. The street sweeping work is carried out from 7.00 am to 1.30 pm in the morning hours. One Street Sweeping Machine is also procured by TMC, it is awaiting commissioning

Figure 3: Street Sweeping

3.5.3 Drain Cleaning

Drain cleaning is done once or twice in a week and also done on request made by the community. The drain cleaning in the city has been outsourced to private contractors and work is carried out from 7.00 am to 1.30 pm in the morning hours. Waste is manual transfer to auto tipper or tractor trailor while door to door collection for the final disposal to landfill site.

3.5.4 Open Dumping Points

It is estimated that there are about 400 open points in the city which are small heaps near the commercial establishments and in places where container bins are located. These open points hold waste of about 20 kg each on an average and tractors are used to clear the waste from these open points.

Figure 4: RC Bins for secondary collection

3.5.5 Secondary collection

The waste collected through primary collection is then transferred to the compactors which are owned and operated by both TCC and private contractors. The waste is then transported to the final disposal site. Following are the location of compactors.

1. Dhobighat
2. Upparalli bridge
3. Sira gate
4. Sadashivanagar mill
5. Toll gate
6. Dana Palace
7. Private Bus Depot
8. Hanumanthapura
9. Gubbi gate

Figure 5: Secondary Collection & Transportation by Compactors

3.6 Transportation of waste:

The **Primary transportation** refers to transporting the municipal waste generated at the source to the waste storage depot. In Tumakuru the municipal waste from the generators is collected from door to door collection and street sweeping operations. The collected wastes are disposed into the nearby container bins which are the waste storage depots. The vehicles involved in these primary waste collection activities are the primary transportation vehicles. The primary transportation vehicles are auto tippers, wheelbarrows, hand carts and pushcarts. In Tumakuru city only auto tippers are operational at present in the primary transportation of waste. The primary transportation of the waste in Tumakuru city has been outsourced to private contractors.

Secondary transportation refers to carrying the waste from the intermediate storage depots to the disposal site. There are 3 types of vehicles involved in secondary transportation in Tumakuru city. They are compactors, tractors and tipper trucks. The intermediate storage depots in Tumakuru are $3m^3$ compactor bins. The city is yet to achieve 100% efficiency in the door to door collection. The result of which has resulted in a number of open points. The street sweeping staff waste is also made into a waste heap by the staff on the streets. The open points and the street waste heaps are cleared by the tractors and tipper trucks in the city. The secondary transportation performance has been split among private parties and TCC in Tumakuru. The TCC has been conducting clearance of the compactor bins using compactor and the private contractors are involved in clearing the waste from open points using tractors and tippers.

Table 4: Vehicles for Infrastructure

Sl No	Vehicle Type	Number of Vehicles	
		TCC	Private Contractor
1	Compactors	5	4
2	Tractor Trailers	10	13
3	Tippers	3	-
4	Auto Tippers	2	75
5	JCB	4	-
6	Tractor Mini JCB	1	-
7	Sweeping Machine	1	-
8	Fogging Machine	4	-

Source: Tumakuru City Council

3.7 Dry Waste Centers

Hasirudala NGO has set up dry waste centers at 5 location in the city for separate storage of recyclables and further selling of valuable materials to local vendors. The recyclables is transferred by primary collection vehicles - auto tipper and tractor trailor to these dry waste centers. Rag pickers are involved in segregating the recyclable categorically and selling it to local vendors which in turn they get Rs. 250 per day from TCC and also earn while selling to local markets. This regulates formalization of rag pickers in a more efficient manner.


Figure 6: Dry Waste Centres for recyclables

3.8 Processing and Disposal

The TCC has identified a processing and disposal site near a village called Ajjagondanahalli which is 17 km from the city centre. The plot is about 42 acres and is provided by the TCC. The processing and disposal of Municipal Solid Waste is outsourced to Sadhana Enviro Infra Limited. Their contract is operational till May 2018. The site infrastructure includes peripheral compound wall, approach road to the facility, odour controller, street lights, borewells for water supply, electricity generator, Govt. quarters for the sanitary workers, waste processing concrete platform, Weighbridge, guard room, Temporary landfill, and social plantations. Windrow composting and Vermi composting methods are adopted in the disposal site.

There are 4 Windrow platforms of total 3950 sqm for composting process facility designed to handle 70 tons per day.

i) 30m * 30m (900 sqm)
ii) 30m * 30m (900 sqm)
iii) 30m * 45m (1350 sqm)
iv) 15m * 45m (675 sqm)

Vermi composting is carried out in 2 plots with an enclosed shed. The system can handle 5 - 6 TPD of organic waste and ideally the waste which has undergone degradation of 15-20 days will be used for vermicomposting.

i) 713sqm (31m*11.5m
ii) 2, 437 sqm (38m * 11.5m)

The screening equipment in the site can handle around 50 tons per day. New tender has been called by TCC for the procurement of additional equipment to increase their capacity to 200 tons per day.

The disposal site consists of a functional landfill facility of area 2500sqm (50m*50m). The landfill is expected to serve for 10 more years, but it might reach its full capacity in coming 5 to 6 years.

Vermi Composting at the disposal site

Windrow Composting at dumpsite

Sanitary Landfill facility at the dumpsite

Compost

Figure 7: Waste Processing Facilities at Sanitary Landfill Site

Figure 8: Bird view of Processing and Disposal site

3.9 Infrastructure present in the existing landfill

Facility	Specifications and sizing
Security building	The site has a 8.5 m x 6.2 m of watchman room
Boundary walls	A wall for 40.2 acres is constructed of height about 5 meters
Lab room	The site has a 7m x 6m of lab room
Entrance Gates	The site has a 60 tons weighbridge of electromechanical type with 3 m x 7m loading platform at the entry of the waste management facility.
weigh bridge	Weigh bridge with control room with weighing capacity of 30 tons
Peripheral Roads	1800 sqm Peripheral concrete roads.
Water Supply & Electricity	One borewell with tank and 250kv transformer is provided at site

Aerobic Composting	3 Windrow platforms of total 3950 sqm for composting process facility designed to handle 70 tons per day. i) 30m * 30m (900 sqm) II) 30m * 30m (900 sqm) III) 30m * 45m (1350 sqm) IV) 15m * 45m (675 sqm)
Segregation and Shredding	The waste from the aerobic composting process taken in 3 parts were one parts enters into: i) Garbage Segregation and Shredding Machine which has a capacity to handle waste upto 10 tons per day, were waste in conveyed on a belt conveyor through manual loading and it is hand sorted. ii) Garbage Segregation and Shredding Machine which has a capacity to handle waste upto 4 tons per day, were waste in conveyed on a belt conveyor through manual loading and it is hand sorted. iii) Koppal Model waste sorting and segrigation Machine which has a capacity to handle waste upto 4 – 5 tons per day, were waste is manually loaded into the machine were compost falls at the bottom of the machine, followed by denser material.
Vermi Composting shed	713sqm (31m*11.5m)* 2, 437 sqm (38m * 11.5m) of vermicomposting facility with an enclosed shed designed to handle 5 - 6 TPD of organic waste, Ideally the waste which has undergone degradation of 15-20 days will be used for vermicomposting,
Screening	Two types of screening machines are available: i) Rotary Screening machine with belt conveyor: This machine has a capacity to handle upto 4.5- 5 tones per day. Were the Shredded waste is manually loaded on the conveyor belt which enters into screen with manually sorting facility and waste are screened into 14mm and 4mm mesh and collected at the bottom. ii) Vibrating Sieving Machine: This machine has a capacity to handle upto 4.5- 5 tons per day. Were the Shredded waste is manually loaded on the vibrating tray which has porous screens 30mm and 4mm were the bigger materials are screen at the top of the 30mm tray and the waste smaller than 30mm is again screened at 4mm mesh leaving behind the compost
Bailing	The plastic and paper waste sorted is taken into bailing machineswere they are pressed and Compacted.
godown	356.5sqm (11m * 31 m) Sheet covered shed for bagging and Storage of compost form the site.
landfill	2500 Sqm (50m X 50m) landfilling facility is under progress

There is lot of legacy waste dumped all along the windrow platform, wet platform, dry platform of the landfill.

Some of the site photographs are as follows

Windrow platform

Segregation platform

Existing Trommel – Coarse and fine segregation

3.10 Reclamation of old dump at Ajjgondhanahalli dumping site

Landfill reclamation is a relatively new approach used to expand municipal solid waste (MSW) landfill capacity and avoid the high cost of acquiring additional land. Reclamation costs are often offset by the sale or use of recovered materials, such as recyclables, soil, and waste, which can be burned as fuel. Other important benefits may include avoided liability through site remediation, reductions in closure costs, and reclamation of land for other uses.

The existing dumping site at Ajjgondhanahalli containains mixed MSW buried for over 15 to 18 years. In this study, a detailed strategy has been worked out for the remediation of the existing dumping site.

A joint survey along with TCC corporation engineers is done and topography survey is carried to quantity the waste by taking out the volume from the contours present and estimated the following quantity of the waste

The whole waste is dumped in the five different areas which are named as five different block

Each block volume has been calculated from the contour levels and accordingly waste been quantified in the following table

s.No	Area		filling Area (Sqm)	Volume	depth of waste BGL (mts)	Average density of waste considered (t/m3)	Approx waste in Ton (tons)
1	Block 1 (Cell 2,34,5)		12487	64220		0.75	48165
3	Block 2 (windrow platform)		2222	11108	0	0.75	8331
4	Block 3		80.6	401	0	0.75	300.75
5	Block 4		278	1364	2	0.75	1023
6	Block 5		81	401.4	2	0.75	301.05
Sub total (A)			15148.6	77494.4			58120.8
	waste dumped in Cell 3 & 4 BGL 2 mts for the area 6050 Sqm (B)						12100
Sub total (C= A+B)							70220.8
Miscellaneous (6%) D= 6% XC							4213.248
	Grand total (E= C+D)						74434.05
say							75000

Drawing attached

S. No	Drawing no	Description		
1		Topography		
2		Topography showing waste blocks		
3		C/S of block 1		
4		C/S of block 2		

5		C/S of block 3		
6		C/S of block 4		
7		C/S of block 5		

Estimated total waste generation in the dump yard is an approximate total of Seventy five Thousand tons Spread across 6.0 acres of dumping needs to be cleared for reclamation of land.

3.10.1 Approach for planning a Landfill Reclamation

Reclamation or mining activities typically involves a series of mechanical processing operations designed to recover some of the recyclable materials, a combustible fraction, soil, and landfill space. Typical equipment used in these activities / operations are excavators, screens, and conveyors. The environmental and economic benefits of landfill mining include the following:

- use of recovered soil fraction as landfill cover material
- recovery of secondary materials / marketable material
- reduction of landfill footprint area
- reduction in costs of closure and post-closure operations and monitoring
- reclamation of landfill volume for reuse
- Though reclamation / landfill mining has above benefits, it is necessary to consider the following aspects, while reclaiming and excavating MSW from the present open dumpsite.
- Exposure to hazardous material, leachate, gases, odour, etc.
- Contaminated wastes that may be uncovered during reclamation operations are subject to special handling and disposal requirements. Management costs for such waste can be relatively high, but may reduce future liability.
- Excavation raises a number of potential problems related to the release of gases. Methane, Sulphur dioxide and other gases generated by decomposing wastes can also cause explosions and fires. Hydrogen Sulphate gas, a highly flammable and odorous gas, can be fatal when inhaled at sufficient concentrations.
- Excavation of one landfill area can undermine the integrity of the neighboring area, which can sink or collapse into the excavated area.
- Reclamation activities shorten the useful life of equipment, such as excavators and loaders, because of the high density of waste being handled.

Since the dump is quite old, compostable should have been fully degraded by this time. Similarly recyclables like plastics metals glasses etc might already have been picked up by the rag pickers. Hence saleable products which can be harnessed economically will be compost and RDF fluff. Hence simple screening thro rotary screens of varying screen size in sequence will help to recover compost. The combustible fractions can be recovered from rejects from the screens by putting air classifiers on line. This can be sold as RDF fluff usable by cement industries.

An excavator removes the contents of the dumpsite. A front-end loader then organizes the excavated materials into manageable stockpiles and separates out bulky material, such as appliances and lengths of steel cable. Soil Separation (Screening)

S.no	Fractions	Resource description	% Recovery	Application	Remarks
1	Finest fractions	Organic matter + fine Soil Bio-Earth A grade		Manure in organic farming	As a soil improver, restoring alkaline or saline soils to fertility, improves soil breathing and water retention capacity
2	Coarser Fraction	Coarse Organics and sand Bio-Earth B grade	15%	Manure cum soil aggregate in farm applications	Used to control soil erosions, as an organic manure in tree pits, improves soil breathing and water retention capacity
3	Heavy fraction	Pebbles (Between 20mm and 40mm)		Construction and fillling in low areas	Used for road shoulders
4		Pebbles (Between 40 and 80 mm)	30%		
5		Tender cocoanut shells	5%		
6	Light Fraction	Plastic and other recyclables		RDF	in cement industries
7		Non recyclable combustibles	10%		
8	Residuals	inert materials	40%	landfilling	inerts in landfill

Process of Bio-augmentation - Since the treatment is proposed only for the remaining degradable waste on site, the process of bio-augmentation is very simple and cost effective.

- Step 1 – Loosening of waste using tractor or Back Hoe Loader.

- Step 2 – Spraying of Bio-culture on the waste (for decomposition of remaining waste)
- Step 3 – Sieving the degraded waste - Sieved out waste can be used as manure.
- Step 4 – Rejected waste will be recyclable and inert. - The recyclable waste will be recycled and the inert waste will be used for leveling at dumping site.

A trommel (i.e., a revolving cylindrical sieve) separates soil (including the cover material) from solid waste in the excavated material. The size and type of screen used depends on the end use of the recovered material.

A. Equipments required for this are

1. Three trommel screens of varying screen size along with set of conveyors for the compost screening.

2. Three air classifiers for separating RDF fluff from rejects.

B. Area Required

- Processing plant- 500 Sqm.
- Storage space for compost and RDF fluff--1200 sq. mtrs
- Roads and open space --1000 sq. mtrs End products

C. Time Line for the Project

For setting up the facility--2 months for screening operations----12 months for removing the facilities--2 months

However Before initiating the execution of landfill reclamation at ground to be done by any private party, a thorough site assessment is required to be done to understand the characteristic of existing dumped waste on the site. The assessment shall be done to establish the portion of the landfill that shall undergo reclamation and a material processing rate shall be estimated. Information collected in site characterization provides a basis for assessing the potential economic benefits of a reclamation project. Although economics will provide the principal incentive for a reclamation project, other considerations may also come into play, such as community-wide commitment to recycling and environmental management.

4 Cost estimates

Assumptions			
Existing waste Quantity	**89000.00**	MT	
Waste Qty. to Bio-mine per day	**300.00**	MT/day	
No of plants required	**1.00**		
Time Period required	**296.67**	Days	
No of months	**9.89**	Months	

No of months such as for procurement and mobilization of resources	**2.00**	Months	
Monsoon days	**2.00**	Months	
Total time period	**14.00**	Months	
Working Hrs per shift	8.00	hrs./day	
Capacity of screening	37.50	TPH	1 plant
Trommel - Capacity of the plant @ 8 hrs/shift	37.50	TPH	1 plant
Rejects Percentage avg.	65%		
Recyclables/RDF avg.	20%		
Compost Percentage avg.	15%		

A. Trommel Capex & O&M cost	Qty	UoM		Remarks
Trommel @ 300 TPD capital cost	1	lakhs	400	Market rate taken for estimation
Transportation (2% of capex)	1	lakhs	8.00	
installation (1% of capex)	1	lakhs	4	
Total capex		lakhs	412	
Dissembling and back transportation (2.5% of capex)		lakhs	10	
Total including dissembling and TPD cost		lakhs	422	
Equipment cost including installation and TPT for 14 months of operation		lakhs	164.11	

B. operational cost @ Trommel		
Power @ 80.578 KW for 6 hours of daily operation - Yearly 271 days	Rs/ Per annum	1048163.827
	Lakhs/ per annum	10.482

C. **Vehicles @ O&M**						
	Qty					
Tipper			Rate	UoM	Rate	UoM
Hire charges	3		203	per hour	4872	per day
Generator	1		267	per hour	2136	per day
JCB	3		5695	per day	17085	per day
water tanker	1		412	per day	412	Per day
					24505	per day
					10414625	per year

D. Human resources			salary	PM	
Plant manager	1		70000	70000	840000
Trommel operator	1		25000	25000	300000
Trommel helper	1		16000	16000	192000
labour	8		16000	128000	1536000
Total human resources					2868000
E. Bailing machine cost					
			Cost in lakhs	Total cost	
Bailing machine	3		3.45	10.35	
installation and transportation				0.25875	lakh
Total cost per year				2.12175	lakhs

labour for bailing machine	3		16000	48000	PM
				576000	per year
				5.76	Lakhs/ annum
Bailing machine per year O&M cost			7.88175	Lakhs	
Routine maintenance			0.0212175		
Total bailing machine cost			7.9029675		

	F. Additives	TPD		**Amount Per Month**	**Amount per annum**
i	Add bio culture required @ 1.4Kg/ton for compost produced @ Rs 20/Kg	**45.0**	1.4	37800	
ii	Add tobacco dust required @ 10Kg/ton for compost produced @ Rs 4/Kg	**45.0**	10	54000	
III	Add coir-pith required @ 10Kg/ton for compost produced @ Rs 1/Kg	**45.0**	10	13500	
IV	Add Rich soil required @ 2Kg/ton for compost produced @ Rs 30/Kg	**45.0**	2	81000	
V	Stritching material required @ 1 box/ 100ton for compost produced @ Rs 2500/box	**45.0**	1	33750	
				220050	3080700

	Total Operation cost		
A	Equipment cost including installation and TPT for 14 months of operation	lakhs/annum	164.11
B	**operational cost @ trommel**	lakhs/annum	10.48

C	**Vehicles @ O&M**	lakhs/annum	104.14
D	Human resources	Lakhs	28.68
E	Bailing machine	lakhs/annum	7.90
F	Additives	lakhs/annum	30.80
G	Elide fire and extinguisher ball		1.34
H	Pre-operative and insurances	lakhs/annum	5.21
			352.68

Revenue from Compost	Qty estimated in Tons	12015.00	
	Per ton cost	1500	
	Total revenue from compost	18022500	
		180.22	Lakhs

Balance operational maintenance cost i.e Total operation cost minus revenue from compost	17246400.86
total quantity to be processed	89000.00
Cost per MT after deduction of revenues	193.77

5 Project Frame work

Tumakuru Smart City limited in cooperation with Tumakuru City Corporation would implement this project and the same shall be handovered to TCC after implementation.