RESEARCH REVIEW JOURNALS
Volume-04
Issue-05
May-2019

ISSN: 2455-3085 (Online)
RESEARCH REVIEW International Journal of Multidisciplinary
www.rrjournals.com[UGC Listed Journal]

Municipal Solid Waste: A Major Footprint in Urban Environment of Siliguri

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ARTICLE DETAILS

Article History
Published Online: 15 May 2019

Keywords
Solid waste management, biodegradable, 3R concept, Dumping, Health issue, Environmental Impact..

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ABSTRACT

Siliguri is the largest and fastest growing urban centers in North Bengal, as being Gateway of North-east India and break of bulk point it is most commercially active and always act as center of attraction. The urbanization trends of Siliguri can be understood by its continuously increasing population from only 738 in 1901 to 513264 in 2011. As increasing urbanization trends it has close-packed relationship with solid waste whose management must be carried in sustainable way. According to A Status Report on various scheme & project of Siliguri municipality corporation (SMC) 2013, Siliguri produce solid waste of 300 tons/day which rose to 313 tons/day according to June & July survey 2015 and 335 tons/day by 2017 according to SMC report. An analysis made by CRIS (CRISIL Risk and Infrastructure Solutions Limited) they projected solid waste generation of urban Siliguri should be 360 tons/day by 2021, to 455 tons/day by 2031, to 573 tons/day by 2041 which should be huge impact over environment. Thus, in this paper we endeavor to find major specification of Municipal Solid Waste (MSW) and its trend analysis, to review about daily generation of solid waste, its types and constituents, process of waste collection by SMC, major issues related to solid waste and its impact over urban environment of Siliguri and also its management practices. We conduct our study based on both primary and secondary data after which we analyze and represent it through various cartographic and statistic techniques. As we discover some of major environmental constraints due to solid waste mainly near dumping sites like suffocating odor and toxic gases, leaching, filthy dirt, vectors and stray animals spreading the solid waste causing the environment more harmful etc. The study concludes about the recent measures and proposal taken by SMC to restrain solid waste and also some findings and recommendation by us.

1. Introduction

In today's world a new threat is hunting a man i.e. the fear of self-destruction .As we know that we are residing in a "throw-away society" where humans are vigorously dominated by consumerism. Consumerism means over consumption & the constant purchasing of new goods, without realizing its consequence. In recent years, gargantuan urban population growth and technological outpaced consequence in tremendous solid waste generation waste in both qualitative and quantitative manner. As being a gateway of North-east India, Siliguri is a swiftly growing city with strong base of trade and commerce as a major economic activity. The population of Siliguri is just 738 in 1901 have now grown to 513264 in 2011 under only 41.9 sq.km **(Gazetteer of India, West Bengal, Darjeeling, March, 1980 & Census of India, 2011)**. Not just only huge population growth but also unplanned urbanization, increased per capita income, huge day-time floating population due to high trade and business activity, etc all these factors has lead to enormous municipal solid waste generation.

Municipal solid waste includes commercial and residential wastes generated in a municipal or notified area in either solid or semi-solid form excluding industrial hazardous wastes but including treated biomedical wastes **(National Solid Waste Association of India, 1998 and Ministry of Environment and Forest, 2000)**. Also **'**Municipal Solid Waste' as defined in **The Municipal Solid Wastes (Management and Handling) Rules, 2000**, includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes and treated bio-medical wastes.

Currently, Siliguri produce more than 350 tons of solid waste daily (according to SMC) from various domestic and commercial sources. A substantial amount of these wastes is extremely dangerous to the living organisms including human beings (**Misra et al. 2004**). It may deteriorate the overall surrounding of the environment of Siliguri. To mitigate this problem of solid waste a proper effective solid waste management must be necessary. The management scenario of solid waste in Siliguri is still long way to achieve an effective management practices. Even today, no scientific measures have been adopted and waste is directly dumped in open ground. Insufficient of waste segregation is another major obstacle. Inappropriate collection, lack of awareness, lack of treatment, financial difficulties of municipality all these result in lack of solid waste management practices. A comprehensive review of MSW of Siliguri was presented in this study to analysis its current status and major problems. Also present and future trend analysis of solid waste has been summarized here. However, it covers many other spheres of MSW of Siliguri.

2. Objectives

This research paper tries to meet and analysis the following objectives as follows;

1. To study the present and future trends of solid waste (SW) generation as a major foot print in Siliguri city.
2. To analysis the major sources of solid waste generation, their composition and nature.

3. To interpret the process and management of waste collection and disposal in Siliguri city.
4. Another most important objective to find out the impression of municipal solid waste over environment & health (mainly in the neighboring areas of dumping ground of the city).
5. To examine the key issues related to management of solid waste.
6. And lastly, to study the recent concept and proposals related to solid waste management by Siliguri municipality.

3. Data and methodology

For this research paper both primary and secondary data has been used.

- Primary data has been collected on the basis of interview and questionnaire method of 80 household, in order to analysis the solid waste impact over them and related health issues, mainly near the localities of dumping site and this primary survey was conducted for two months i.e.duriing the month of January and February, 2019.
- Secondary data has been collected from Conservancy department of Siliguri municipality and through various internet sites.
- The methodology for this paper is straightforward and unambiguous. For trend analysis of solid waste generation a simple line graph is used on the basis of Ms excel. Again for various cartographic expressions like bar and pie diagram excel have been used. Arc Gis 10.3.1 software utilized for map preparation. Through the map, ward-wise location of the city and location of dumping ground was unveiled.

4. Location of study area

Siliguri municipality was selected for present study. The Siliguri municipality was inaugurated in 1949, till 1994 it has only 30 wards. It was designated as Siliguri municipality corporation (SMC) only in 1994 and 17 new wards was added to its jurisdiction (presently 47 wards) with total area of 41.9 sq.km. Siliguri is popularly called *'gateway'* or *'the chicken neck'* of north-east India as its corridor establishes a connection between the rest of India and the north-eastern states. The city expands over two districts of Darjeeling and Jalpaiguri under the state of West Bengal. The coordinate of the city is from 26.71°N and 88.43°E in the foothills of Himalaya. The river Mahananda is a trans-boundary river that crosses through the heart of the city.

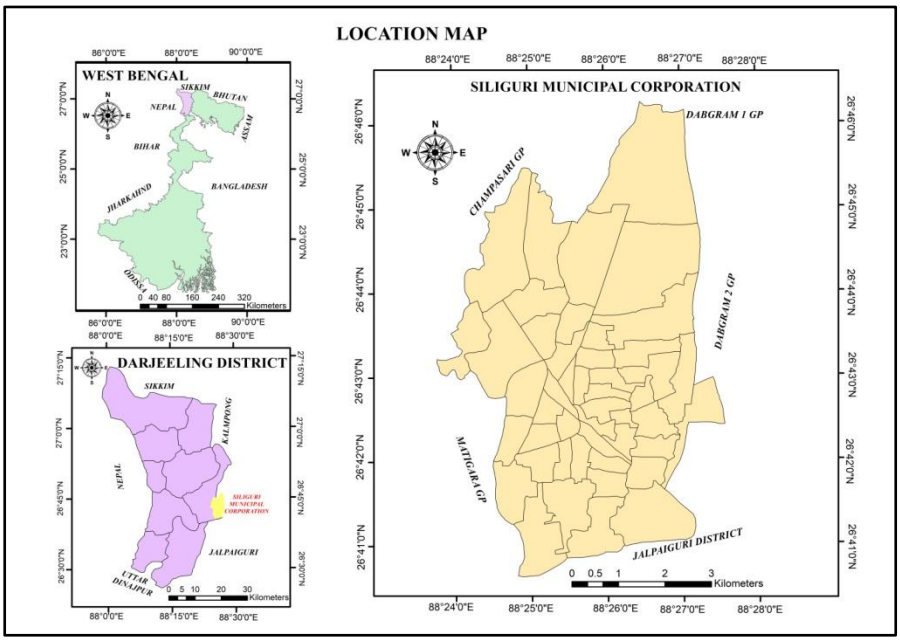


Fig. 1: Location Map

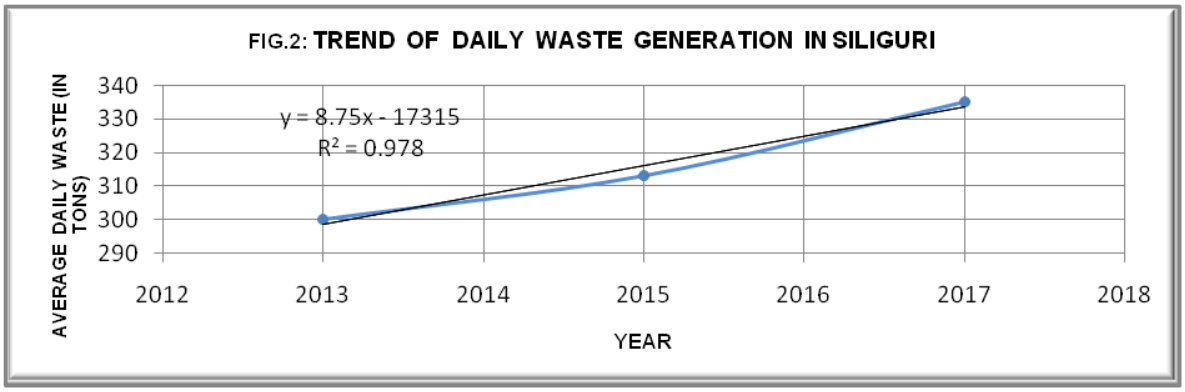
The motto behind the selection of the study area was its strategic location which makes it a base for trade and commerce, tourism activity, center of rapid population growth, nucleus of employment and also essential supplies to the entire north-east region which in total result in massive solid waste generation.

5. Result and discussion

Trends of solid waste generation:

In order to analysis the scenario of solid waste in Siliguri as a major footprint, the first and foremost step is to analysis the trend of solid waste generation and its future projection. So, fig 2 depicts the trend of average daily waste generation of Siliguri from 2013 to 2017. The graph clearly shows that there is a tendency of continuously incessant growth of yearly solid waste in tons. According to the report of Siliguri Municipality Corporation (SMC) in year 2013 the average solid waste generation was 300 tons per day, which hike to 313 tons in 2015 and 335 tons in 2017(except bio-medical waste, as not handled by SMC directly).The range of solid waste generation differs from 300 to 400 tons daily(approximately). So the propensity of waste generation must be positive increase in near future. Also SMC estimated that solid waste generation became 500-550 tons per day in the season of cauliflower, pineapple and during festivals (i.e. mainly in the month of

October to December) and this sudden increase in waste generation is due to seasonal variations.



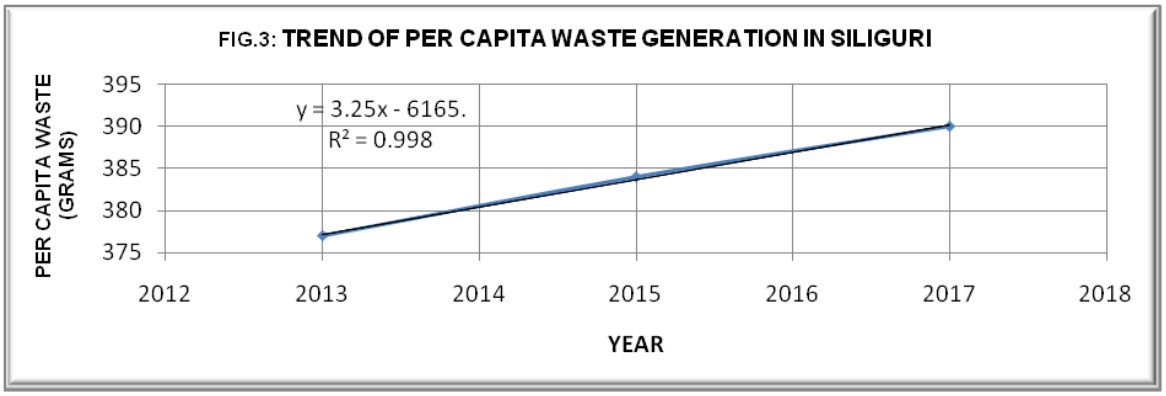


Fig 3 shows the daily per capita solid waste generation from 2013-2017. According to SMC in 2013 per capita daily solid waste generation is 377 grams, which increase to 384 grams/capita/day in 2015 to 390 grams/capita/day in 2017. So here also, the graph indicates uninterrupted rise of per capita solid waste generation in Siliguri city.

Projected solid waste generation:

According to the **CRIS (CRISIL Risk and Infrastructure Solutions Limited) report** of 2013, in table 1 shows that they estimated average solid waste generation of Siliguri by 2021 should be increased to 360 tons per day (TPD), by 2031 it should be 455 TPD and 573 TPD in 2041, which should be alarming then, if absence of proper management. In case of, per capita daily SW generation they predict 384 grams by 2021, which should be 391 grams/capita/day in 2031 and 397 grams/capita/day by 2041, an interesting facts is that in 2017 it already crossed CRIS estimated figure for the year 2021 and we can predict that due to the impact of increasing consumerism the per capita waste generation will further more upsurge in future.

TABLE 1: PROJECTED SOLID WASTE GENERATION OF SILIGURI

Year	Projected population(in Lakhs)	Per capita waste generation(in grams)	Average daily waste generation(in tons)	Annual SW generation in metric tons)
2021	9.38	384	360	1,33,806
2031	11.64	391	455	1,68,791
2041	14.43	397	573	2,12,596
SOURCE: CRIS analysis				

Waste generation as a major impression:

The population of the city is expanding day by day due to its strong base of economy. According to Census 2011, Siliguri had a population of **513264** under **41.9 sq.km** only with density of **11,274 persons per sq. km.** According to SMC, the daytime floating population of Siliguri is almost 3-4 Lakhs every day, which consist more than 50% Siliguri resident population and during festive season (especially during month of Durga puja) it rise to 6-7 Lakhs every day and such great population will surely produce massive solid waste.

sources & types of solid waste:

Table 2 clearly shows that residential and commercial sectors are the major originator of solid waste in Siliguri of about 215 TPD (69%) and 58 TPD (19%) approximately, followed by transport sector 25 TPD (8%), agriculture and water bodies 11 TPD (3%), public and semi-public sector 3 TPD (1%). On the other hand solid waste from recreation and industrial sectors is almost nil. So from here we can able to identify and classify the major types of solid waste that has been produced in Siliguri, which includes Domestic/Residential Waste (consist of waste from cooking, vegetable residue,

packaging, clothing, old books, writing/new paper, and old furnishings) followed by commercial waste that originate in wholesale and retail stores, hotels & restaurants, markets & haats, warehouses and other commercial establishments), demolition and construction waste (consist of concrete, stones, plaster, Lumber, wire, roofing and bricks etc.), street waste (from sweeping of roads) and rubbishes(include organic matter & non-combustible matter.

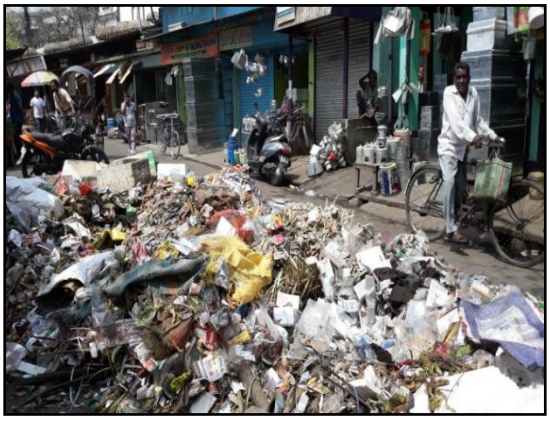
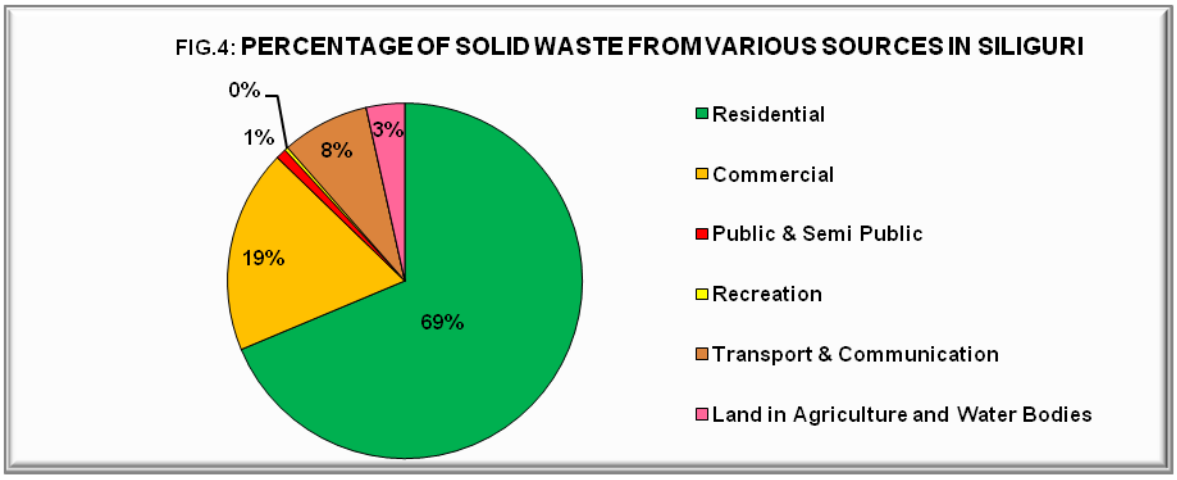


PLATE 1 & 2: Solid Waste at Bidhan Market And Bhutia Market (From Various Commercial Sources)

TABLE 2: SOURCES OF MUNICIPAL SOLID WASTE FROM VARIOUS LAND-USE CATEGORY & ITS AVERAGE DAILY GENERATION IN SMC

Sl. No.	Land use category	SMC land use (Sq.Km)	Generation of waste (TPD)
1	Residential	20.66	215
2	Commercial (Marriage hall, Hotel, Market etc)	2.93	58
3	Industrial	0.42	0
4	Public & Semi Public (Govt. Hospital , NH, Offices, & Institution)	1.68	3
5	Recreation (Park & Gardens)	1.68	1
6	Transport & Communication (Roads & Streets , Bus terminus)	5.45	25
7	Open & unused Land	5.45	0
8	Land in Agriculture and Water Bodies	3.63	11
	TOTAL	**41.9**	**313**

SOURCE: Siliguri municipality corporation June & July survey report, 2015

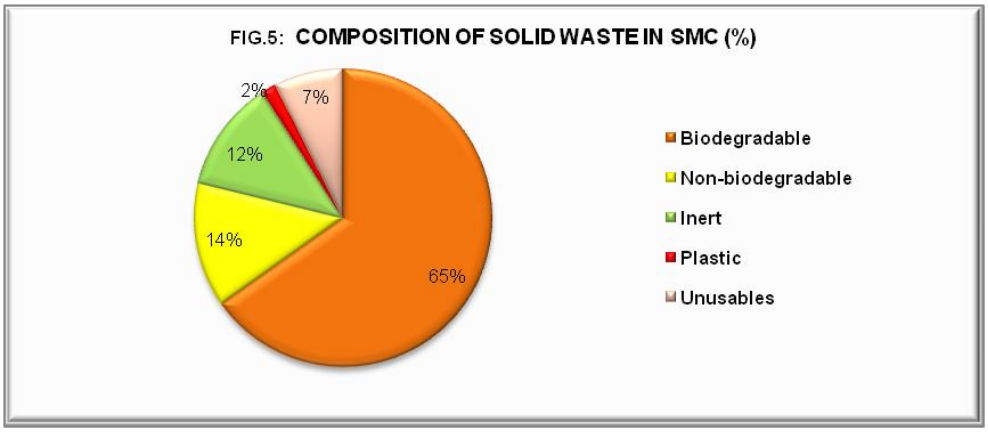


Characteristics & composition of solid waste:

In general terms, solid waste can be defined as waste not transported by water; that has been rejected for further use. It includes industrial, mining, municipal and agricultural wastes. It mainly consists of a large organic matter, ash and fine earth, paper and plastic, glass and metals (**Sharholy et al. 2007**).Table 3 represents the solid waste composition of Siliguri and it clearly depicts that biodegradable material are the major constituents of about 65.2% (those which are able to broke and decompose easily by microorganism activity, like paper, vegetables, manure, dead animals, slaughter house waste etc), followed by non-biodegradable materials 13.6 % (contains plastic, rubber, metals, e-waste, leather etc these materials does not broke down or degrade for many years), inert materials 12.1 % (includes construction waste, stones, gravels ,sands etc that neither biologically nor chemically

reactive and doesn't undergo any changes), plastic materials 1.6 % and unusable products 7.5 %. Also, according to SMC report 2015, reveals Siliguri waste has Ph value of 5.9 which indicates that it was tilted towards acidic and moisture was 29.1 %.

TABLE 3: COMPOSITION OF SOLID WASTE IN SILIGURI MUNICIPALITY	
CONSTITUENTS	**PERCENTAGE**
Biodegradable	65.2
Non-Biodegradable- Recyclable Glass	13.6
Inert	12.1
Plastic	1.6
Unusable- Like Leather etc.	7.5
TOTAL	**100%**
SOURCE: Siliguri Municipality Corporation Survey Report,2015	



Solid waste management in Siliguri:

"Solid Waste management is associated with the control of waste generation, its storage, collection, transfer and transport, processing and disposal in a manner that is in accordance with the best principles of public health, economics, engineering, conservation, aesthetics, public attitude and other environmental considerations"(**Ramachandra, 2006: 7**). Rapid urbanization, population growth, and changes in lifestyle in developing countries have contributed to increased per capita municipal waste generation (**Agdag, 2008**). The management of municipal solid waste has become an acute problem due to rapid population growth and economic development in the country (**Ramachandra and Shruthi, 2007**). So, in case of Siliguri also such huge solid waste generation can create many difficulties related to solid waste management. In Siliguri management of solid waste was done by -

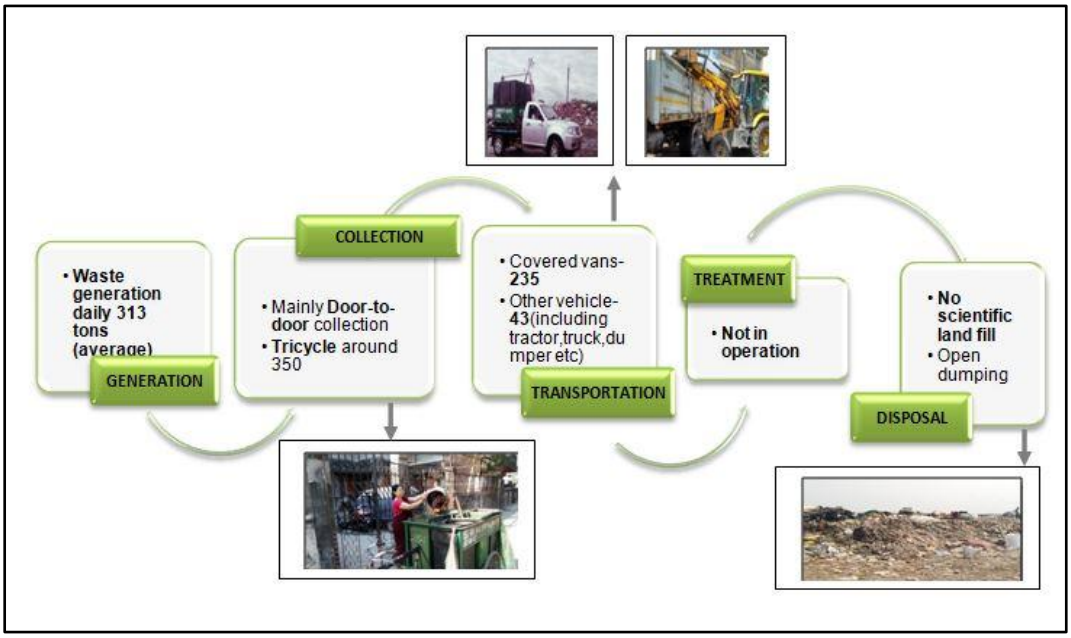


FIG.6: FLOW DIAGRAM SHOWING PROCESS OF WORK & SERVICES BY SMC

Conservancy Department of Municipality Corporation, which is accomplished in decentralized manner where each ward has its own ward level SWM committee (different from the ward committee). This system of SMC was come to force only at 2005 after multiple case studies and ground level surveys based on *"The Municipal Solid Waste (Management &Handling) Rules, 2000"* came into being existence(**CDP report of siliguri,2015**).

***Solid waste collectional & operational work by SMC**:*

There are total 47 wards under Siliguri Municipality Corporation; each and every ward has been divided into blocks of 300 to 350 houses. Door-to-door collection is the primary method of waste collection in Siliguri done by Man Pulled Tri-cycle (Rickshaw) which collects everyday waste and dumps it into Covered Vans or Secondary Collection bins. Also, each ward has 25-30 staff for street sweeping and drain cleaning. According to SMC, for secondary waste collection there are fifteen dumper placers and every day these dumper placers make 2-3 trips each. They lift the secondary bin and unload it at the dumping site and again return to keep the bin at the same location. These dumper-placers are placed on different locations throughout the city which are cleared once a day. Some of these locations are Hill Cart Road, Sevoke Road, Barddhaman Road, Bidhan Road, Bidhan Market, Darjeeling more, Bhutia market etc. Beside Compactor and dumper placer, the secondary collection of waste is done through tractor, trolley trucks etc from open dumping points showed in table 4.

RESOURCE RECOVERY BY SMC

Solid Waste Management Committee under different wards collected monthly conservancy charge from house hold and other institution regularly as follows;

- **User fee charges**:
  - General family-Rs.10/ per month
  - BPL Family-Rs.5/per month
  - Commercial Establishment-Rs.15/ per month
  - Occasion purpose- Rs.30/ per day/per drum.
- **Total collection**:
  - Total collection (**house hold**) for the year, 2016-2017, **Rs.23, 51,883** (upto Dec'16).
  - Total collection from **other Institution** (Hotel, Restaurant etc) for the year 2016-2017 Rs.**69,54,150** (Upto Jan'17).

TABLE 4: MUNICIPALITY WASTE CARRYING PRIMARY & SECONDARY VEHICLE PER DAY

Sl. No.	Vehicles Type	No. Of Vehicles	Avg. trips per day	Avg. Weight carrying per trip in Kg	Total weight carrying per day in Kg.
1	Tractor	11	2	1000	22000
2	Tata Truck	4	3	2100	25200
3	Tata DI	4	8	500	16000
4	Tata Xenon	6	8	613	29424
5	Tipper-909	5	3	2360	35400
6	Tipper-1613	10	2	5600	112000
7	Compactor -7 CUM	2	2	5000	20000
8	Compactor- 14 CUM	1	2	10570	21140
9	Covered vans	235	1	100-140	100-140
10	Tricycle rickshaw	350	1	80-100	80-100
	Total MSW Carrying (Tons)				281
	Considering 90% of the total load on the vehicle efficiency and no. of trips of vehicles. Total MSW carried per day (MT)				253
Weight of the filled and empty vehicles measured at a weight bridge on Aug'15.					
SOURCE: Siliguri municipality corporation report, 2015					

Handling Of Solid Waste & Its Dumping:

The remaining final solid waste is disposed in landfills after necessary treatment to lessen the adverse environmental impacts. The objective of treatment is to improve physical and/or chemical characteristics of waste, reduce toxicity and reduce its final volume (**Misra et al., 2005**). But unfortunately, there is no organized or scientific method at present to handle waste of Siliguri, as a result it is openly dumped at landfill site after collection and transportation. The open dumping ground is located in the North-eastern corner of the City near Don Bosco School and Salesian College which was clearly shown in map (fig.7). A new dumping ground of 21.7 acres has been purchased by SMC at Putimari in Binnaguri Mouja (12km by road from SMC office), but no dumping has started till now.

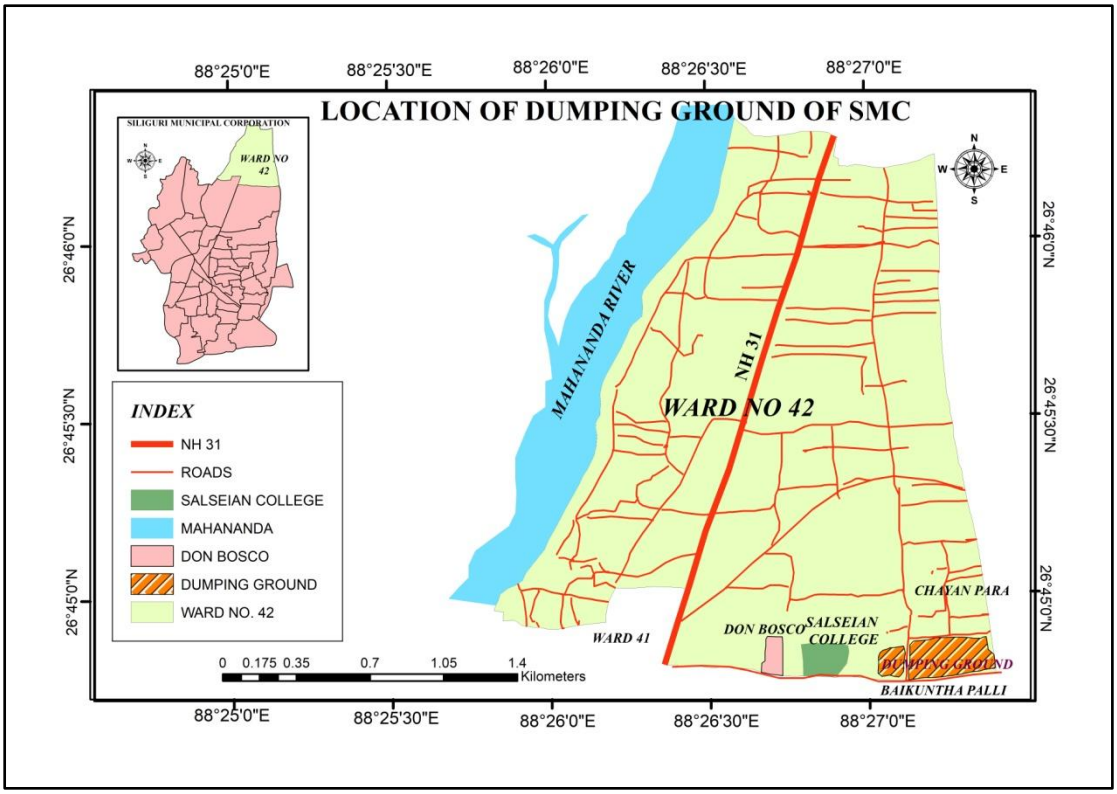


FIG.7: LOCATION OF DUMPING GROUND

PLATES 3: SHOWING CONDITION OF DUMPING GROUND NEAR DONBOSCO SCHOOL

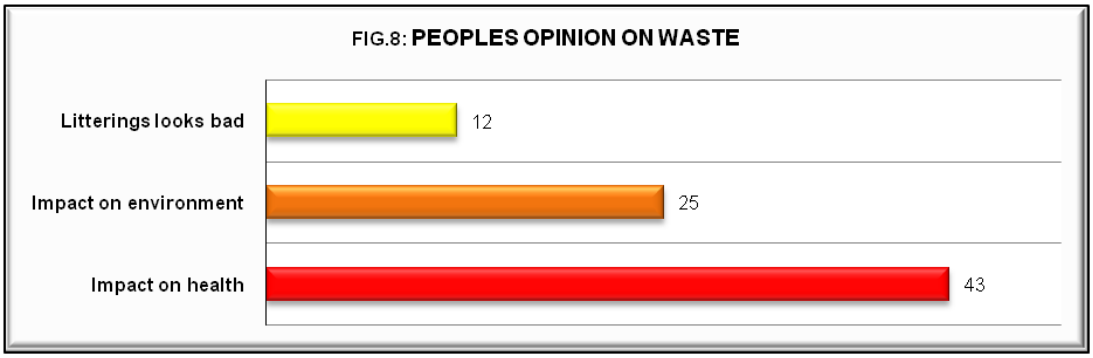
Bio-Medical Waste Handling:

Bio-medical waste is not handled by SMC. Entire operation from primary collection to treatment and disposal is given to Greenzen Bio Pvt. Ltd. since 2008. The Common Bio-medical Waste Treatment Facility is located at Mouza Binnaguri, the same Mouza where the new dumping ground of SMC is located (**CDP report of siliguri, 2015**).

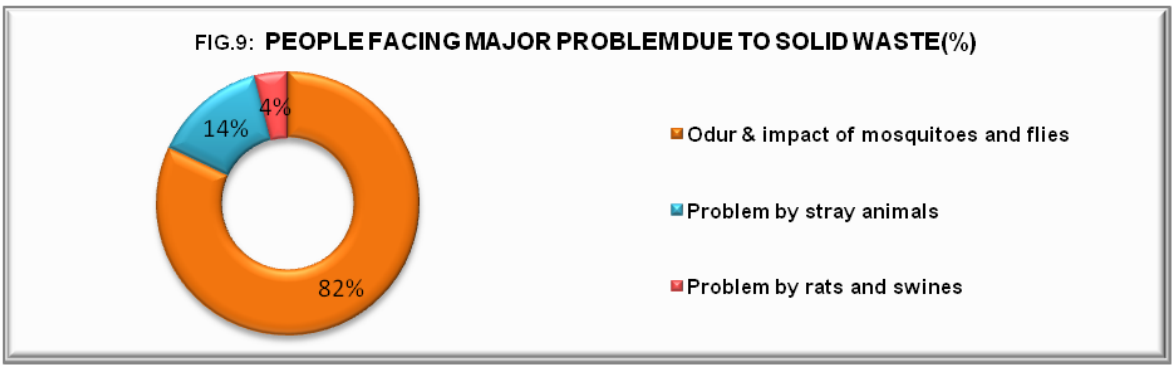
Solid Waste: How Its Affecting Environment & Health:

According to our primary survey of 80 households that was conducted mainly near the localities of dumping ground like Chayanpara, Jyotinagar, Baikanthapalli etc, the major findings & observed problems are mentioned below;

1. Improper disposal of solid waste near Don Bosco, school contaminates the natural resources like air, water and land and deteriorates the quality of life and human health.
2. According to primary survey, based on interview & questionnaire method major concern of people near dumping site are, 43% people reported direct impact of health due to improper dumping, followed by 25% people reported impact on environment and 12% people reported littering look bad i.e. dumping distorted the surrounding beauty (fig.8)



3. The burning of the solid waste at the disposal site causes air pollution and consequently spread the diseases and deteriorates health condition of surrounding people.
4. Breathing problem is another main concern due to air pollution.
5. Out of 100 % sample, more than 80% people near dumping ground reported obnoxious odor and huge impacts of mosquitoes and flies creating aesthetic nuisance due to improper dumping. Even at summer time the localities near dumping ground cannot able to eat food properly due to awful smell. Remaining 14% people noticed problem due to stray animals likes pigs and dogs carrying waste here & there creating situation more vulnerable, as open waste attract stray and domestic cattle more and 4% faced problems due to rats & swine's.(fig.9)



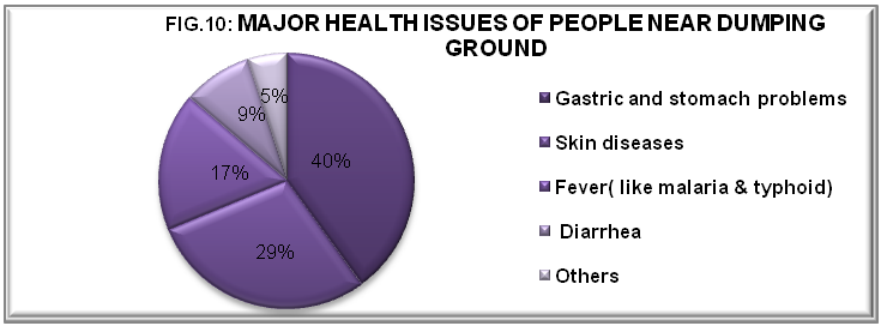
6. Huge Mosquitoes & flies breed due to blocked drains (as majority of people reported drains cleared only once in a month or even after long intervals by municipality) and also due to rainwater that is stored in discarded cans, tire and other objects.

Major Health Problems During Last Six Month Near Dumping Ground:

Unscientific disposal causes an adverse impact on all components of the environment and human health (**Sharholy et al., 2005**). (**Jordan and Wagner, 1993, p. 138**) strengthen this argument saying that diarrhea and other diseases which figure among leading causes of death in the world are associated with unsafe drinking water, improper disposal of wastewater and excreta.

According to our survey the major health related issues faced by people residing near dumping ground in last six months are as follows (fig.10);

- 40% people facing Gastritis and related intestinal infection ,
- followed by 29% faced skin diseases like infected wounds,
- 17% reported fever like malaria and typhoid mainly due to mosquitoes bite and flies and
- 9% report diarrhea in last six month.
- And 3 % people reported other problems like jaundice,. bronchitis, and headache



Key Issues:

After the overall discussion done above some of the major key obstacles observed are as follows;

Issues Related To Environment & Health

1. Methane is one of the major greenhouse gases and is the main component of open landfill, leading to total deterioration of surroundings of Siliguri.
2. The chemical reaction between the pathological, toxic and municipal solid waste components can have serious effects on public health and the environment as discussed above.
3. During rainy season, the polluted water from waste disposal sites contaminates the underground water resources directly i.e. well, tube wells, etc. These water resources contain chemicals they mix-up with the water bodies and cause serious health problems as reported by the localities.
4. Some items such as broken glass, blades, hypodermic needles, and blooded cotton may pose risks of injury to people who sort through the waste especially rag pickers.
5. Open burning of the solid waste at the landfill site causes air pollution and consequently spread the diseases and deteriorates health condition of surrounding people.
6. Two great institution of Siliguri i.e. Don Bosco School and Salsesian College are situated just few hundred meters away from the dumping sites and its really threatening conditions for the students.
7. The major river of Siliguri i.e. Mahananda was massively polluted mainly due to localities residing along the river, due to religious rituals and idol immersion. As this water used by many for various purposes result in direct impact on their health. Also, Kiran Chandra burning ghat which is attached with the river contaminates the water directly as after cremation ashes are immersed in river directly without any precautions.

Issues Related To Administration Framework & Peoples:

1. Unscientific disposal of solid waste is the major drawback of the Siliguri municipality administration.
2. Primary tricycles vans for solid waste collection are really less in numbers to cover 47 wards and population of over 5 Lakhs.
3. Lagging in collection and transportation of solid waste due to huge populations and improper management.
4. Improper segregation of solid waste is another major disadvantage of Siliguri municipality. As without proper segregation all type of waste get mixed which may result in leaching and contamination ground water.
5. The ward level performance was declined in last few years according to CDP report Siliguri, 2015.
6. Garbage's thrown directly to drains and streets, blocking drainage system and creates water logging problems results in breeding of mosquitoes and flies, especially in rainy seasons.
7. Also uncovered vans with bins of waste result in spilling while moving.
8. Lack of awareness among the peoples of Siliguri related to solid waste is another major drawback; as for example West Bengal Pollution Control Board (WBPCB) rules banned plastic carry bags in Siliguri since 2010. But the irony was it was just a rule on paper for the people of Siliguri and still at 2019 plastic carry bags are openly used in every corner of the city.

Recent Concept & Proposals By SMC:

According to SMC report, in view of the present scenario SMC thinking about the small re-cycle unit at the source of the waste generator to reduce the waste and the measures they applied as follows;

- Top priority was given at segregation of domestic waste at the source by SWM Committee.
- According to SWM rules 2016 it is mandatory to set up one modernized mechanical waste to compost viable technology unit at market and land fill site as well as plastic re-cycling unit refuse derived fuel (RDF) immediately to maintain Zero waste zone to :
  1. Reduce waste at the generation point.
  2. Reduce cost expenditure for carrying of waste.
- Maintain possible route map to monitoring time table and disposal of the dumper bin from one monitoring unit including GPS.
- As SMC has already 899 self help group, SMC is able to introduce re-cycled paper unit among them.
- SMC is thinking about collection of house hold Bio-medical waste (napkins/papers etc) and which incinerate at the dumping site by incinerator.
- As SMC is collection waste from hotels/Bhawans and as well as kitchen waste from hospitals/Nursing homes' which can be reduce by adopting Acidification and Methanation Technology.
- Revised Solid Waste Management Rules-2016 identified the responsibilities of local authorities (Total 37 duties listed) which are to be adopted.

Work In Progress:

- Set up of 2 nos. Compact Station at 2 commercial areas within 2 or 3 months by concern departments.
- Renovation of Vehicles shed.
- Construction of 3 nos. road in and around dumping ground is ongoing.
- New 20 (twenty) nos. vehicles has purchased for better SWM and conservancy work which will be distributed among the Boroughs as per need based very soon.
- SMC has introduced SWACHH MAP. It is a Mobile App based smart cleanliness model for municipality citizen.

PLATE 4: INSTALLATION OF NEW COMPACT STATIONS FOR WASTE

PLATE 5: CONSTRUCTION OF NEW ROAD AROUND DUMPING GROUND

6. Recommendations For Effective Solid Waste Management

Being most populous city of North Bengal with rapid population growth and fastest economic development, it seems Siliguri is lagging behind effective solid waste management. The policy framework of SMC is available in pen and paper but the ground reality is alarming one.

At first immediate implementation of Revised Municipal solid waste rule-2016(that listed 37 duties) will required. Open and unscientific dumping must need to be shifted to scientific approach. Resident near dumping ground facing lot of problem related to health due to improper dumping, so administration must take strong action in order eliminate those problems due to waste. Two major elements of solid waste management i.e. waste collection and waste segregation need to give utmost priority. People's who manually deal with solid waste like, rag pickers, tricycle vans, should use protective measures to avoid direct contact with pathogens. Also, awareness among public is needed with full focus. In case of segregation of waste at household level Incentives and recognitions can be introduced.

"*I only feel angry when I see waste. When I see people throwing away things we could use*."**Mother Teresa** this quote indicate the importance of 3R's i.e. reduce, reuse and recycle. So administration of Siliguri and people must need to adopt the concept of 3R's in order to mitigate problems of waste.

However in recent years, administration and local authorities had accelerated waste management practices. Various Self-help groups and NGO's of Siliguri played a major role in managing solid waste till now. Initiatives like '***Clean India Mission'***, also called '***Swachchh Bharat Abhiyan***' were help to unite the people and spreading the awareness among the people for better waste management. The power of social media also help to share the awareness among the people related to SWM, for example recently at 2019 ***"#Trashtag challenge***" at social media like facebook and whatsapp goes viral and it inspires a huge people's especially students to participate in cleaning waste from various locations around their localities. However, not only students but also all citizens should need to take active engagement in these types of initiatives in order to eradicate solid waste totally from our society.

Besides all these, deficiency of administration, poor finance and lack of people awareness are major barriers to effective solid waste management. In this case local bodies should initiate support in terms of financial help and engagement in proper planning for effective SWM. Also public should be motivate through various means.

7. Conclusion

In present world scenario solid waste emerged as a major environmental degradation factors thus the significance of the study lies to analyze the role of local self governments in the management of waste. So time has arrived to adopt scientific and technology based management of solid waste. Various authorities should protect their fundamental rights of citizens by executing best practices and also it is responsibility of citizens to perform those fundamental duties related to management. An attempt has been made in this study to highlight some of the prominent shortcomings, developments and future challenges for the waste management in Siliguri.

Acknowledgement:

This paper is an effort to visualize the status of solid waste in Siliguri and without the help of Siliguri Municipality especially SMC Conservancy department it should be difficult for us to present the report. They proved us the required data without any hassle. Also, we would like to thanks all those kind hearted local respondents who gave their valuable time in order to interact with us. Finally, we thank the Lord Almighty for all his blessings and the ability that he had bestowed upon us to complete our paper.

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