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## **Waste material production and its management: A case study of Kalimpong municipality of Kalimpong District**

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### **Abstract**

Waste management is a crucial concern for public health. A poor waste management increases the morbidity and mortality in different ways. In many developing countries the development of waste management has not kept-up with the rapid urbanization and growing consumption and has therefore grown to a big problem.

Our study areas are Kalimpong municipality of Kalimpong district in the state of West Bengal of India. Our principle objective of this paper is to understand the impact on the economic & health condition of this area by the mismanagement of waste. The study is based on primary and secondary sources of data. Although there is a direct relation between the waste production and increase of population. So, we first show the increase of population with decades. And then unfold various types of waste, i.e. Solid Waste, Liquid Waste, and Semi-Liquid Waste. Among the various types of waste, market waste and domestic waste are predominant. Then with the field survey we tried to find out ward wise amount of domestic and commercial waste. Then our target was to search the methodology used to disposal of waste, container used to dispose it and the places where garbage unloaded. And finally impact of the mismanagement of the garbage over environment.

**Keywords:** Urbanization, liquid waste, mismanagement, container, garbage

### **Introduction**

In order to define the problems of waste management and in order to investigate its consequences for public health we have made a field study which has included interviews, observations and the study of documents. In an attempt to accelerate the pace of its industrial development an economically developing nation may fail to pay adequate attention to solid waste management, such a failure incurs a severe penalty at a later time, in the form of resources needlessly lost and a staggering adverse impact on the environment and public health and safety. The penalty is neither avoided not lessened by resolve to do something about the waste at a later time, when the country may be in a better position to take appropriate measures.

The town of Kalimpong has witnessed significantly high level of urbanisation during the past ten years, while the town has rapidly increased in terms of activities and population, the municipal services are yet to reach the adequate level. In the wake of fast growing environment consciousness and increasing public health problems, the concern in respect of inefficient waste management has metamorphosed into an alarming situation, which has inspired the urban local bodies to look for appropriate cost effective technology along with fiscal support.

### **Objective of the research**

- i) To study the types of waste and distribution in Kalimpong Municipality.
- ii) To find out the amount of waste production of Kalimpong Municipality.
- iii) To study the garbage disposal method used in Kalimpong Municipality.
- iv) To identify any potential environmental impact of waste at Kalimpong Municipality.
- v) Waste Management of the study area.
- vi) To categories waste material where practicable for disposal considerations, i.e. public filling areas/landfills.

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Contd. 2.

### A geographical outlook of the study area

Kalimpong district is a district in the state of West Bengal, India. It was formed in the 14th February, 2017 after splitting from the Darjeeling district as the 21st district of West Bengal. It consists of Kalimpong Municipality and three community development blocks-Kalimpong-, Kalimpong-II and Gorubathan. Kalimpong district lies exactly on the eastern part of Himalayan region. Kalimpong district located at 26°5'N to 27°11' N latitude and longitudinally it's extension is 88°24' E to 88°S3' E. The district covers an area of 1,053.60 sq. kms with Kalimpong-I Block having an area of 360.46 sq. kms, Kaliamong-II Block with an area of 241.26 sq. kms., Gorubathan-442.72 sq. kms and Kalimpong Municipality with an area of 9.16 sq. kms.

To the North it is surrounded by Sikkim State and to the East there has an international boundary with Bhutan and to the south it is Alipurduar district and to the West it is Darjeeling district.

Kalimpong Municipality was established in 1945. Initially with a total of 15 wards and gradually it the year 1999 due to de-limitation it was increased into 23 wards and remains the same till date. Kalimpong is a hill station in the State of West Bengal, India. The latitude of Kalimpong, West Bengal, India is 27°06 N and longitude is 88°46'E. Kalimpong Municipality has an area of 9.168 sq. kms with an elevation of 1,247 m. Kalimpong town bearing its proud title-“Queen of hills”.

### Data base and research methodology

The survey was done by both primary and secondary sources of data. Primary data have been collected through intensive ward survey, household survey, municipality base map and commercial area survey. A systematic and planned procedure was followed to fulfill the objectives of the research project. In prefield we collected the map of our study area. The field survey has done with the help of scheduled questionnaire by door to door random sampling survey where questions were focussed mainly on the type of waste, the amount of waste, disposal method, environmental impact etc.

And secondary data are collected from the municipality office of Kalimpong town and Govt. reports magazine, journal, research paper, news papers etc.

**Table 3:** Wardwise Residential Waste (Combined % of residential and commercial wastes)

Ward No.	Solid	Liquid	Semi-Liquid	Ward No.	Solid	Liquid	Semi-Liquid
01	44.53	9.72	-	13	14.00	25.00	-
02	25.89	4.31	-	14	75.00	-	25.00
03	45.00	18.00	-	15	78.57	21.43	-
04	15.00	-	5.00	16	88.96	13.04	-
05	40.00	5.00	-	17	43.59	56.41	-
06	80.00	20.00	-	18	46.67	40.00	-
07	40.00	10.00	-	19	34.88	37.21	-
08	30.00	14.00	4.00	20	54.39	35.09	7.07
09	10.84	16.87	8.92	21	74.32	13.33	-
10	10.82	8.73	3.09	22	44.44	5.65	-
11	32.26	6.75	-	23	60.00	40.00	-
12	55.00	2.05	-				

**Source:** Based On Field Survey

## Consequences and Discussions

### Demographic transition of the study area

According to Census of 2011 total number of population was 49,403 with a population density of 5400/sq. km. Among them 52% are male and remaining 48% are female. Literacy rate of Kalimpong city is 90.19% higher than state average of 76.26%. In Kalimpong male literacy rate is around 93.79% while female literacy rate is 86.49%.

**Table 1:** Population Growth

Census	Population	Rate of Increase
1991	38,832	-
2001	40,143	3.4%
2011	49,403	23.06%

**Source:** Municipal Office Kalimpong.

**Types of Waste:** Generally, waste could be classified into three basic types

- Solid Waste:** Solid waste pre-dominantly is any garbage, refuse or rubbish that we make in our homes and other places. These include old car tires, old newspapers, broken furnitures and even food waste.
- Liquid Waste:** It includes point source and non-point source discharge such as storm water and waste water. Example of liquid waste includes wash waters from homes, liquids used for cleaning in industry and waste detergents.
- Semi-Liquid Waste:** Wastes which are semi-liquids are those waste neither solid nor liquid form. As an example fire extinguishers, old propane tanks, pesticides, Mercury-containing equipments (e.g. thermostats) and lamps (e.g. fluorescent bulbs) and batteries.

**Table 2:** Various types of wastes

Waste Types	Quantity (Metric Ton)	Amount (in %)
Domestic	12	35.45
Market	19	56.12
Commercial	0.2	0.59
Agriculture	0.75	2.22
Hotel	0.4	1.18
Others	1.5	4.43

**Source:** Municipal Office Kalinpong.

**Interpretation:** In this table we found that domestic and market wastes are jointly more than 91% and remaining wastes are 9% only.

**Interpretation:** Table No. 3 shows ward wise residential waste of Kalimpong municipality. In this table we found three types of waste, i.e. Solid-waste, Liquid-waste and Semi-liquid waste. Residential waste is predominantly solid

waste. Ward No. 17 is the only ward in which liquid waste is main and remaining wards of the study area are predominantly found solid waste.

**Table 4:** Ward Wise Commercial Waste (Combined % of residential and commercial wastes)

Ward No.	Solid	Liquid	Semi-Liquid	Ward No.	Solid	Liquid	Semi-Liquid
01	45.75	-	-	13	15.00	30.00	16.00
02	19.80	50.00	-	14	-	-	-
03	37.00	-	-	15	-	-	-
04	60.00	20.00	-	16	-	-	-
05	55.00	-	-	17	-	-	-
06	-	-	-	18	13.33	-	-
07	35.00	15.00	-	19	27.91	-	-
08	40.00	-	12.00	20	3.45	-	-
09	40.00	23.57	-	21	12.35	-	-
10	50.00	26.55	-	22	22.22	27.78	-
11	31.00	20.00	10.29	23	-	-	-
12	12.50	30.00	-				

**Source:** Based on Field Survey

**Interpretation:** In Kalimpong municipality the most of the waste material is found in commercial sector. In commercial area we found three types of waste like-solid, liquid and semi-liquid. Mainly Ward No. 14, 15, 16, 17 has no

commercial waste found. Amount of Semi-liquid waste is highest in Ward No. 13. Liquid waste is found highest in Ward No. 2. Solid waste is found highest in Ward No. 4.

**Table 5:** Waste Disposal Method

Ward No.	Open Dumping	Sanitary Landfill	Incineration	Dumping Water body
01	32.50	-	67.50	-
02	45.00	-	20.00	35.00
03	-	-	66.67	33.33
04	-	35.00	65.00	-
05	-	55.00	45.00	-
06	25.00	-	37.50	37.50
07	33.34	-	-	66.66
08	75.00	-	10.00	15.00
09	14.30	-	42.90	42.90
10	50.00	-	25.00	25.00
11	70.00	-	-	30.00
12	50.00	-	50.00	-
13	60.00	-	20.00	20.00
14	25.00	-	75.00	-
15	50.00	-	50.00	-
16	50.00	-	50.00	-
17	50.00	-	25.00	25.00
18	70.00	-	30.00	-
19	57.14	-	42.86	-
20	50.00	-	40.00	10.00
21	50.00	-	50.00	-
22	-	-	100.00	-
23	50.00	-	50.00	-

**Source:** Based on Field Survey

**Interpretation:** Kalimpong municipality entertained various types of waste disposal methods. Open dumping, Sanitary Landfill, Incineration and Dumping water body are the major disposal methods of the study area. Open dumping are the major disposal method of Ward No. 2, 8, 10, 11, 12,

13, 15, 16, 18, 19 etc. Sanitary landfill are the major disposal method of Ward No. 5, Incineration are predominantly found in Ward No. 1, 3, 4, 12, 14, 22 etc. Dumping disposal method are predominantly found in Ward No. 7.

**Table 6:** Infill of Garbage

Ward No.	% of Drainage	% of Surrounding area	% of Municipal Disposal	Ward No.	% of Drainage	% of Surrounding area	% of Municipal Disposal
01	-	100.00	-	13	-	100.00	-
02	50.00	30.00	20.00	14	-	100.00	-
03	-	70.00	30.00	15	50.00	25.00	25.00
04	-	65.00	35.00	16	50.00	50.00	-

05	25.00	50.00	25.00	17	55.00	45.00	-
06	43.00	29.00	28.00	18	60.00	40.00	-
07	-	100.00	-	19	58.00	42.00	-
08	25.00	75.00	-	20	45.00	55.55	-
09	33.33	33.33	33.33	21	-	100.00	-
10	30.00	30.00	40.00	22	-	100.00	-
11	50.00	-	50.00	23	-	100.00	-
12	20.00	20.00	60.00				

**Source:** Based on Field Survey

**Interpretation:** In Kalimpong municipality there are three types of infill garbage found like drainage infill, surrounding area infill and municipal disposal. We have found that Ward No. 1, 3, 4, 5, 7, 8, 13, 14, 16, 21, 22, 23

are mainly infilled in surrounding area. Wards like 2, 6, 11, 15, 16, 17, 18, 19 are the infilling wards of drainage system. And remaining wards entertained municipal disposal system.

**Table 7:** Tabulation for residential types of container used for dustbin

Ward No.	Metal Bin	Plastic Bin	Plastic Bag	Oil Drum	Others
01	-	33.33	33.33	-	33.33
02	20.00	-	40.00	40.00	-
03	-	40.00	40.00	-	20.00
04	25.00	-	50.00	-	25.00
05	14.29	28.57	28.57	-	28.57
06	14.29	42.86	28.57	14.28	-
07	25.00	-	50.00	-	25.00
08	26.67	26.67	26.67	-	19.99
09	33.33	-	33.33	16.67	16.67
10	17.00	33.00	33.33	-	16.67
11	41.00	-	39.00	-	20.00
12	-	55.00	45.00	-	-
13	-	-	54.00	49.00	-
14	20.00	40.00	-	40.00	-
15	-	66.67	33.00	-	-
16	20.00	50.00	30.00	-	-
17	45.00	35.00	30.00	-	-
18	-	50.00	50.00	-	-
19	20.00	20.00	40.00	-	20.00
20	11.11	22.22	44.44	11.11	11.11
21	-	33.33	33.33	-	33.33
22	-	33.33	33.33	-	33.33
23	33.33	33.33	-	-	33.33

**Source:** Based on Field Survey

**Interpretation:** In Kalimpong municipality people are used different types of container like oil drum, plastic bag, plastic bin, metal bin and others. In Ward No. 3, 6, 12, 15, 16, 18 there are mostly used Plastic Bin to unload its more than 40% garbage. The garbage of Ward No. 3, 4, 7, 13, 18, 19,

20 are mostly contained by Plastic Bags. There are a number of wards where garbage are equally distributed among all the mentioned type of containers, as Ward No. 21, 22 and 23 waste are equally deposited among Metal Bin, Plastic Bin, Plastic Bag and other types of dustbin.

**Table 8:** Garbage Unloading

Ward No	Surrounding Centre	Municipal Centre	Ward No -	Surrounding Centre	Municipal Centre
01	30.00	70.00	13	90.91	09.09
02	15.00	85.00	14	14.28	85.72
03	20.00	80.00	15	100.00	-
04	14.29	85.71	16	100.00	-
05	11.11	88.89	17	100.00	-
06	11.11	88.89	18	14.29	85.71
07	23.00	77.00	19	100.00	-
08	09.00	91.00	20	20.00	80.00
09	15.00	85.00	21	7.69	92.31
10	14.29	85.70	22	21.69	78.31
11	14.29	85.70	23	87.75	12.25
12	19.00	81.00			

**Source:** Based on Field Survey

**Interpretation:** In Kalimpong municipality garbage unload in two different areas. One is own area of municipality and

another is surrounding areas. Here the waste of Ward No. 13, 15, 16, 17 are mainly deposited in the surrounding areas

and the waste of remaining wards unloads in the own area of municipality, i.e. within the area of concerned wards.

### **The environmental impact of urban waste**

Imagine we all throw garbage, junk and rubbish away anyhow. Imagine there was no authority to supervise waste management activities from all the sources mentioned earlier we all just sent our rubbish to the landfill or just dumped them in a nearby river.

### **Effects**

#### **A. Environmental effects**

- 1. Surface water contamination:** Waste that end up in waterbodies negatively change the chemical composition of the water. Technically this is called water pollution. This will affect all eco-system animals that drink from such polluted water.
- 2. Soil contamination:** Hazardous chemicals that get into the soil can harm plants when they take up contamination through their roots. If human eats plants and animals that have been in contact with such polluted soils, there can be negative impact on their health.
- 3. Pollution:** Bad waste management practices can result in land and air pollution and can cause respiratory problems and other adverse health effects as contaminants are absorbed from the lungs into other parts of the body.
- 4. Leachate:** Liquid that forms as water trickles through contaminated areas is called leachate. It forms very harmful mixture of chemicals that may result in hazardous substances entering surface water, ground water or soil.

#### **B. Economical effects**

- 1. Municipal wellbeing:** Everyone wants to live and visit places that are clean fresh and healthy. A city with poor sanitation smelly and with waste matter all over the places do not attract good people, investors and tourists, such cities tend to have poor living standards.
- 2. Recycling revenue:** Cities that do not invest in recycling and proper waste control miss out on revenue from recycling. They also miss out on job opportunities that come from recycling, composting and business that work with them.

### **Major findings of the research work**

Kalimpong is a small town located in Kalimpong district. It is a lovely hill station with beautiful natural beauty. The main economic base is tourism in this region. At present the Kalimpong municipal area is damaged by pollution. Garbage disposal, irregular municipal service, land slide etc. are the main problems. In this study we found the following outcomes:-

- i) We can identify various types of waste material, i.e. solid, liquid, semi-liquid from residential and commercial sector.
- ii) Unplanned throwing of waste material influence on drainage.
- iii) Landslide occurs in rainy seasons many places of the area for domestically garbage.
- iv) Construction of road and high rise building, tourist hotel hampered drainage and water scarcity.
- v) Plastic bags and the removal scatter in main tourist spots its impact on environment.

### **Suggestions**

After the observation of the study area and the examination of various data, the probable suggestions have to be adopted on this region.

1. Peoples have to use the dustbins.
2. In future time people will be increase consciousness about waste.
3. Government should take some policies to control the hazards of waste pollution.
4. Recycling process will be started of this area.
5. Proper waste disposal act will be started.
6. To control the dumping waste disposal here and there.
7. At last need for people awareness is the main thing to waste management.

### **Conclusion**

After studying the whole area (as well as Ward 1-23) in Kalimpong municipality, we can say that there are very graceful natural beauty of this Kalimpong town which take us to read its social cultural, environmental, economic condition in total area we are here to present the up to date of Kalimpong town - increase of the construction of multistoried building and the excessive growth of population and economic development. To give the better priority of the tourism industry, tea processing industry, food processing industry etc. in the Kalimpong municipality for work. Reduction of unscientific road construction on Kalimpong town and its allied areas. Increase of economic development and population effect the environmental condition of the town. Increasing rate of urbanisation increase the amount of waste. Basically its direct influence are found over the health and economic condition growth of plant, soil fertility of the study area. And indirect affect on economy.

### **References**

1. Limbu Dewki. Solid Waste Management in the town of Darjeeling, Environmental concern, International Journal of humanities and social science Invention. 2014;3(61):26-34.
2. Ackerman F. Waste Management and climate change local environment. 2000;5(2):223-229.
3. Borlaz M. Carbon storage during biodegradation of municipal solid waste components in laboratory scale land fill. Global Bio-geo-chemical cycles. 1998;12(2):373-380.
4. Berge ND Reinhart, Townsend T. Are view of the fate of nitrogen in bioreactor landfills, Critical review in environmental science and technology. 2005;35(4):365-399.
5. Bingemer HG, Crutzen PJ. The production of CH<sub>4</sub> from solid waste. Journal of Geophysical Research. 1987;92(D):2182-2187.
6. Binner E. The impact of mechanical-biological pretreatment on the landfill behavior of solid waste proceeding of workshop of Bio-waste, Brussels; c2002 April. p. 16.
7. Burnley S. The impact of the European landfill directive on waste management in the United Kingdom. Resource Conservation and Recycling 32; c2001. p. 349-358.
8. Bogner J, Spokas K. Landfill CH<sub>4</sub> rates, fates and role in global carbon cycle, chemosphere. 1993;26(1-4):366-386.

9. Borjesson Gand B Srensson: A Nitrous Oxide release from covering soil layers of landfills in Sweden, Tellus. 1997;49B:357-363.