



A STUDY OF MUNICIPAL SOLID WASTE MANAGEMENT IN DIFFERENT LOCATIONS OF LUCKNOW CITY

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Abstract

The present scenario of Municipal Solid Waste Management (MSWM) is highlighted comparing technical, economic, and health issues. An overview of various aspects of the Municipal Solid Waste (MSW) is provided comprising all domestic and non-hazardous wastes in the urban areas with emphasis on the generation and composition of MSW, management needs, collection systems practiced, transportation and disposal systems used. The collections systems and their recycling practiced with respect to the involvement of the government and the private sectors are underlined. The emerging trends with respect to the MSWM have been discussed. The objective of this review paper to discuss the estimating growth of MSW, various disposal methods and management techniques of MSW.

Keywords: Municipal Solid Waste, Recycling Practiced, Disposal Methods, Management techniques

I. Introduction

There has been a significant increase in MSW (municipal solid waste) generation in India in the last few decades. This is largely because of rapid population growth and economic development in the country. Solid waste management has become a major environmental issue in India. The per capita of MSW generated daily, in India ranges from about 100 g in small towns to 500 g in large towns. The rapid growth of population clearly indicates that the growth in MSW also increased in recent years. This trend can be ascribed to our changing lifestyles, food habits, and change in living standards. MSW in Lucknow city is collected by respective municipalities and transported to designated disposal sites, which are normally low laying areas on the outskirts of the city. MSW creates different problems and which are directly and indirectly affected on environment and human health so the management of MSW is very necessary for the environmental protection through the proper management of municipal solid waste.

Due to population growth, industrialization, urbanization, and economic growth a trend of significant increase in municipal solid waste (MSW) generation has been recorded worldwide. Municipal solid waste is one of the problems for environment and society. Improper disposal of solid waste pollutes all the vital component of the living environment as like air, land and water. Most of the environmental problem caused by improper disposal of solid waste which damaged the natural resource as like flora and fauna and caused hazards to the society. Most of the people migrate from village to cities due to

rapid growth of industrialization and population explosion. Thousand tons of municipal solid waste generates per day. These solid wastes collect and controlled by the municipality and local authority. These include monitoring, collection, transportation, processing, recycling and disposal. The municipal solid waste amount is expected to increase significantly in the near future as the country strives to attain industrialization nation status by the years 2020. Solid waste management has become a global issue and it is may or concern for developing countries due to various environmental problem. In the last few decades municipal solid waste generation is increase in India and management of solid waste is a complex problem for the society and its improper management affects the public health and degrades environment. The environment (protection) Act, 1986(EP Act)



enacted by the GoI Provides for the protection and improvement of environment and prevention of hazards to human beings and other living creature and property. Municipal solid waste (Management and Handling) Rules 2000 have made it mandatory for the administrative authority of any area to undertaken responsibility for all activities except generation. In 1947 solid waste estimate the 6 million tones which increased in 1997 approximately 48 million tons (CPCB 2000). CPCB estimate of the growth rate for total urban municipal solid waste generation of 4.2% is likely to based on the urban population growth rate per capita MSW generation rate.

Municipal solid waste is disposed of low-lying areas without taking proper precaution. Therefore MSWM is major environmental problems for megacities in India. Rapid urbanization process create many challenges before planning authorities .Government and local administration is trying their level best to provide all basic requirement to this population. While providing basic facilities to the urban population, the major challenge before administration, is to manage the waste generated by this population. Solid waste generation is a continually growing problem at global, regional and local levels. Solid waste management activities associate with generation, storage, and collection, transfer and transport treatment and disposal of solid waste. But in India most of the cities MSWM system comprises only treatment and disposal of solid waste.

Solid waste can be defined as the any solid or semi-solid substance arising from human and animal activity and these substances are discarded as useless or unwanted. Solid waste is generally biodegradable and non-biodegradable. Solid wastes originate from household, commercial industrial or agriculture activities. Solid waste can be classified in to following categories like municipal solid waste (MSW), Industrial waste (IW), Hazards waste (HW), Bio medical waste (BMW), Electronic waste (EW). These wastes are depend on their source and composition. Solid waste are those organic and inorganic waste material which produced by various activities of the society. Some product beings packed in cans, aluminium foils, plastic and non-biodegradable items harms the environment. Lucknow District's population constitutes 2.30 percent of the total Uttar Pradesh population (Census of India, 2011). Around 1,550,737 people are living in rural areas and 3,037,718 in urban areas. In Lucknow, the generation of waste quantity is approximately 1500 Metric/day Lucknow Nagar Nigam (LNN), 2011.

Total Waste generation 1365 TPD, Per capita waste generation: 480gm Door to door waste collection: 57 wards by a private concessionaire, Rest of the 53 wards: no door-to-door collection, Segregation of waste: no happening, Waste dumping at the open dumpsite (LNN, 2015).

Table 1: Sources of Municipal Solid Waste

Percentage Households	Percentage (%)
Restaurants	42
Street Sweeping	28
Market	6.8
Shops	8.3
Workshop	7.5
Offices	4.2
Hospitals	1.7
Hotels	1.5
Total	100

Source: LNN,2015

Rawat et al (2022) discussed Municipal Solid Waste Characterization and Management in Lucknow – Capital city of Uttar Pradesh, India. She explained that Lucknow cleaning and collection process includes a solid waste collection from the road with a barrow and then dumped at depots (52 depots). Solid waste is then loaded onto trucks, which transport waste to various landfills each year and LMC spends an average of 21% of its total waste management budget. Waste disposal and management can be helpful in reducing land use in the vicinity of the city.



Archana *et al*, studied the status of municipal solid waste management (MSWM) in Lucknow – Capital city of Uttar Pradesh, India. She explained that Lucknow city is one of the most densely populated, commercialized and urbanized city of India. This city is also adding on commercial centres and new urban extensions which are providing additional housing services and employment opportunities to increasing population resulting into generation of huge quantity of MSW. The inhabitants of Lucknow presently generate approximately 1500 tonnes of MSW every day. In the absence of sanitary landfills or other protected and lined dumping places, the MSW is transported to the various dumpsites, near fun republic mall Gomti Nagar, Telibagh Bhattha Maidan, Dubbga Hardoi-Kanpur Ring Road and Ramdashkeda, Kursi Road. Such open dumping poses environmental and health hazards as leachate from open dumps are becoming major sources of groundwater contamination in the subsequent years of dumping MSW. Keywords: Solid waste, sanitary landfills, leachate, groundwater pollution, Lucknow, Uttar Pradesh.

Agarwal *et al* (2012) presented an overview on analyze of solid waste management in developing country. Municipal solid waste disposed unscientifically in most of the urban Indian cities. Solid waste management is poor with respect to collection efficiency and segregation of waste.

Dimpal (2012) discussed a study on solid waste management in India. In her study she describe how the urbanization and increasing population growth, declining opportunities in rural areas and shift from stagnant and low paying agriculture sector to more paying urban occupations, largely contribute to urbanization. The unexpected immigration has also caused the burgeoning of slums and the growth of squatters and informal housing all around the rapidly expanding cities of the developing world. Urbanization directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environment degradation. Solid Waste Management which is already a mammoth task in India is going to be more complicated with the increase in urbanization, changing lifestyles and increase in consumerism. Financial constraints, institutional weaknesses, improper choice of technology and public apathy towards Municipal Solid Waste (MSW) have made this situation worse. At her report evaluates the current practices prevalent in India to deal with this solid waste and problems associated with it. It also provides the measures to deal this waste in healthy and environment friendly manner so that it may prove a resource instead of waste.

Badie 2011 presented an overview on solid waste management one of the most challenging issues in Malaysia. Due to an increase in population economic growth, inadequate enforcement of waste legislation, infrastructure and public attitude among other solid waste management is considered a crucial issues in Malaysia. **Badie 2011)** stated that solid waste management in Malaysian with the aim of presenting the state of waste generation, composition management practices and problem with regards to environmental economic and other ramification from previous records. The total waste generated in Malaysia is estimate to be 7 million.

Methodology

In the present study, “A Study of Municipal Solid Waste Management in Different Locations of Lucknow city” the material and method or research design adopted in the present study is described briefly in this chapter. Lucknow is one of districts of Uttar Pradesh in India, Lucknow District population in 2022 is 5,178,766 (estimates as per aadhar uidai.gov.in Dec 2020 data). As per 2011 census of India, Lucknow District has a population of 4,589,838 in 2011 out of which 2,394,476 are male and 2,195,362 are female. Literate people are 3,127,260 out of 1,742,440 are male and 1,384,820 are female. People living in Lucknow District depend on multiple skills, total workers are 1,542,806 out of which men are 1,226,399 and women are 316,407. Total 136,454 Cultivators are depended on agriculture farming out of 117,331 are cultivated by men and 19,123 are women. 102,508 people works in agricultural land as labor, men are 82,782 and 19,726 are women. Lucknow



District sex ratio is 917 females per 1000 of males. Next Lucknow District Census will be in 2022-2023.

In our present study we concentrate on the area, belongs to Lucknow city. The solid wastes were collected from the different selected areas of Lucknow city.

First of all we were selected some areas in Lucknow city for sampling.

- Gomti Nagar
- Southcity & Sainik Nagar
- Rajnikhand
- Ruchikhand

A solid waste study survey would normally be administered via questionnaires for each and every household and door to door surveys which are presented verbally by a interviewer, who records the responses in a standard format. If a sample or indicator survey is required the target population would be reduced, and might even be interviewed through group discussions. In these areas door to door surveys of house were carried out to find out amount of biodegradable and non-biodegradable waste generated and per person waste generated and was measured through weighing machine.

During this survey obtain data through standard questioners and household House were placed in groups on the basis of income as A is high income group, B is medium income group and C is a low income group. In brief, the procedure used in this study is as follows:

- People were given two poly bags of capacity 5kg. named A and B during this work.
- Poly bag A for collection of biodegradable waste (such as kitchen waste and other organic waste)
- Poly bag B for collection of non-biodegradable waste (such as paper, plastics, metal scraps, glass etc)
- People were asked to collect waste 24 hrs according to given poly bag.
- After 24 hrs each poly bag were collected from house and weight A and B poly bag respectively.
- The weight of A+ weight of B gives total quantity of solid waste.
- The weight was taken by using simple weighing machine.
- After this the percentage (%) of different class of waste was calculate using this formula:

$$\text{Amount of solid waste} = \frac{(\text{A or B}) \times 100}{\text{Total weight}}$$

Treatment of MSW

Composting

In the current MSW management system, 91% of the collected MSW is disposed in landfills and 9% is composted at three existing plants (Kumar et al., 2002). Composting of bio-degradable waste can be done in two ways – Mechanical Composting and Vermi-composting. In the mechanical composting method, organic waste is converted into compost with the help of microbial activity under controlled condition of temperature, moisture, and air. The resultant soil becomes rich in nutrients such as nitrogen, phosphorus, and potassium which enhance plant growth. The vermin-composting method involves using earthworms for conversion of organic waste into Compost. Earthworms promote bacterial growth, enhance soil structure, and hasten decomposing of organic matter, thereby turning it into nutrient rich soil.

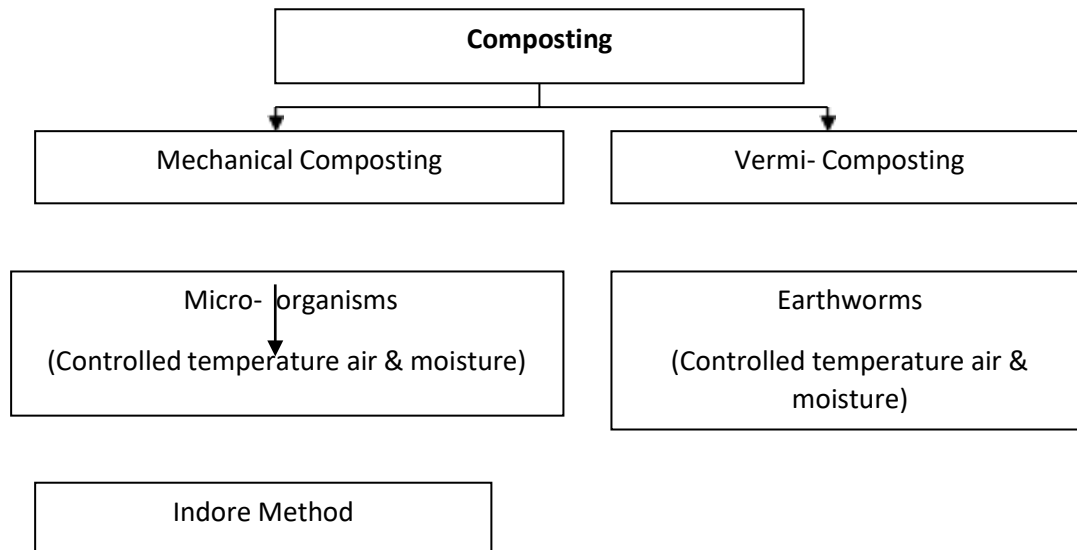


Figure.1 Flow Diagram of Composting Process

Incineration

The state of Delhi has also tried treatment of waste using incineration technology. The Ministry of Non-conventional Energy Sources (MNES), GoI in collaboration with the Government of Denmark, set up an incinerator and power generation plant at Timarpur in the year 1989. The plant was designed to incinerate 300 tonnes/day of MSW to generate 3.7 MW of electric power. (http://mnes.nic.in/tender_notice/information.pdf).

Disposal of MSW

In India, MSW from the urban areas is commonly disposed in the nearest available low lying areas and wastelands on the outskirts of the city. Selection of these disposal sites depend solely on availability and not on scientific and socio-environmental criteria for a landfill. MSW is disposed in an uncontrolled manner and the daily cover material is not applied regularly, although it is known that daily cover is necessary to abate odor, rodents and birds and to decrease site litter. These landfills are devoid of landfill gas (LFG) and leachate collection and treatment systems. Poor maintenance of these landfills renders them a threat to health and the environment rather than a solution to the problem of MSW management (V. Talyan et al, 2008).

Recycling

In India, recycling of MSW is a widely prevalent activity involving both the formal and informal sectors. The informal recycling sector refers to the waste recycling activities of waste pickers and waste collectors, paid mainly by the sale of collected materials. The informal sector has a hierarchical structure constituting recyclers (waste pickers and collectors) at the bottom, dealers (small, medium and large) and finally the recycling units (RUs) at subsequent levels (Agarwal et al., 2005; Hayami et al., 2006).

Result and Discussion

In this Study, scholar was conduct a door to door survey for MSW collection from 102 houses of selected sites of Lucknow City. This survey estimated that about 65% of waste generated is biodegradable, 35 % waste generated is non-biodegradable, therefore if proper segregation of waste is done at household level this problem of can be easily solved.

Table 2: Amount of biodegradable and non- biodegradable waste generated in the study areas of



Lucknow city.

S.No.	Name of the Area	Group	Daily load of capita biodegradable waste (gm)	Daily load of capita non biodegradable waste (gm)	Daily load of per capita total waste (gm)
1	Southcity and sainiknagar	A	67.161	32.838	133.468
2	Ruchikhand	B	71.709	28.290	116.373
3	Gomtinagar	B	70.617	29.382	137.673
4	Rajnikhand	C	71.150	28.849	106.319

Note – A –High income group, B -Medium income group, C-Low income group.

Above table.2 shows that maximum load of per capita total waste (gm.) was generated in Gomtinagar and minimum load in Rajnikhand Area. The reason for this difference may be due to high income and low income group living in these respective areas. The solid waste generation depends on the economy of the people and per capita generation increase with level of income of the family.

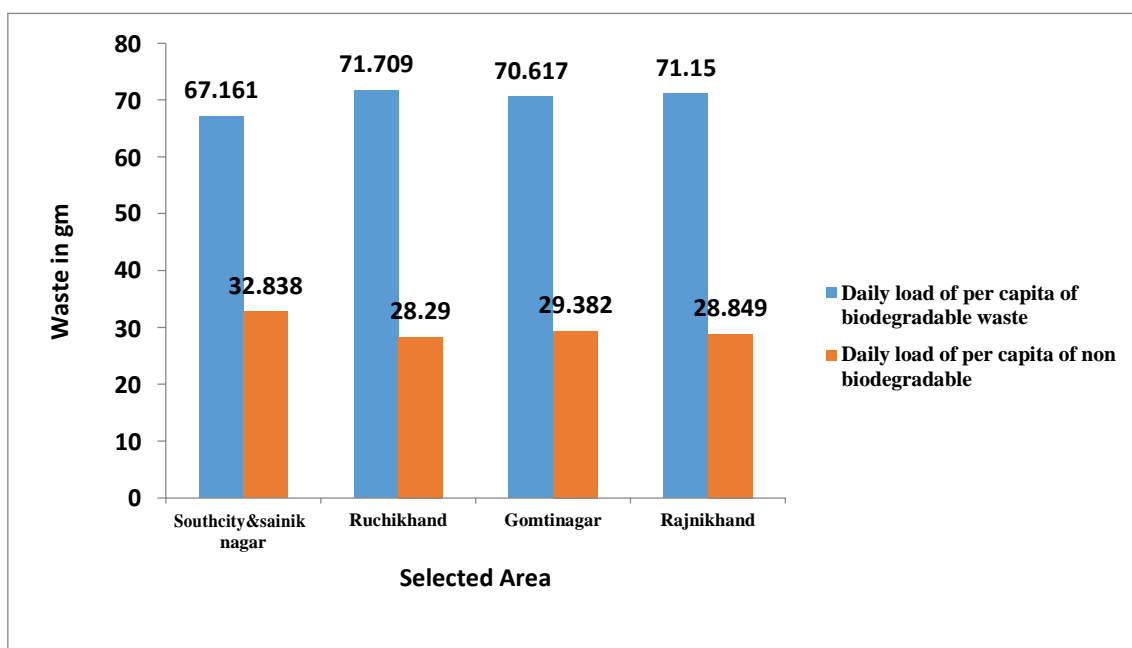


Figure 2: Daily per capita load of biodegradable and non-biodegradable waste of selected sites of Lucknow city.

Table 3: Different income group with non-biodegradable waste per capita generated

GROUPS	Non-biodegradable waste per capita (gm)	Percentage of non biodegradable waste generated
A (High income group),	32.83	36 %
B (Medium income group)	28.76	31%

C (Low income group)	28.84	32%
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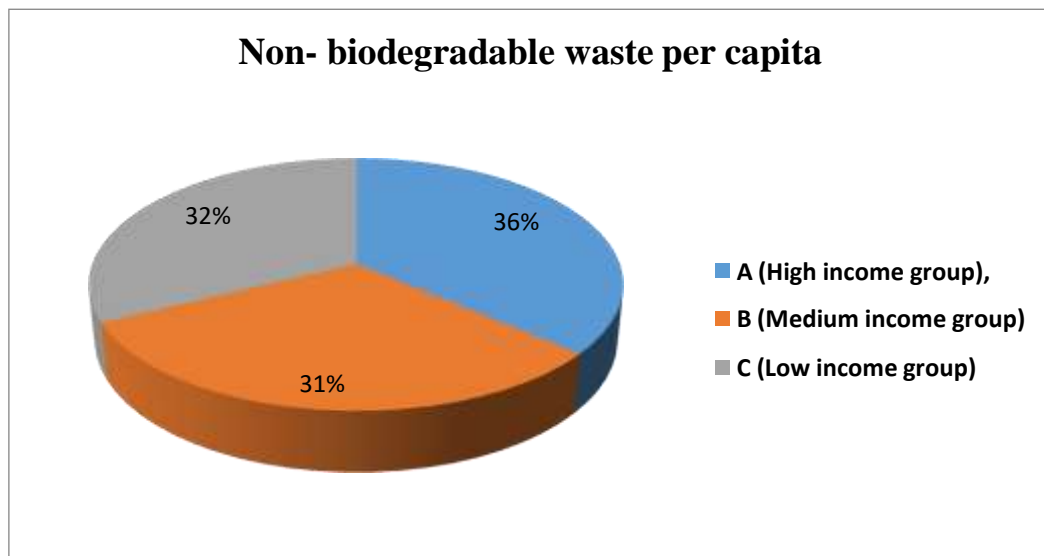


Figure 3: Different income group with non-biodegradable waste per capita generated

From the figure above, the highest non-biodegradable waste is generated from the high income group and low non-biodegradable waste generate from the medium income group.

Table 4: Different income group with biodegradable waste per capita generated

GROUPS	Biodegradable waste per capita (gm)	Percentage of biodegradable waste generated
A (High income group),	67.16	32.06
B (Medium income group)	71.16	33.97
C (Low income group)	71.15	33.96

Biodegradable waste per capita

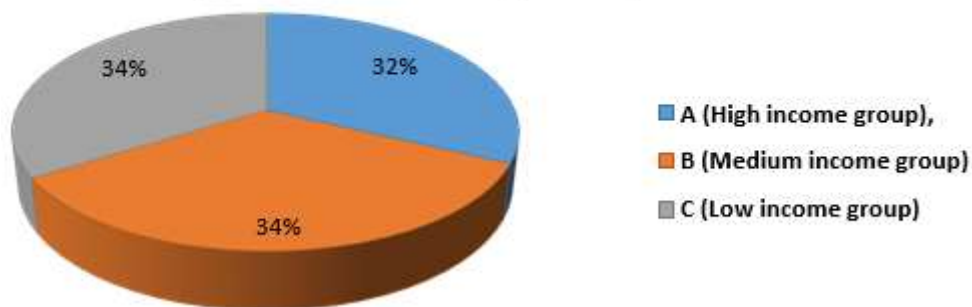


Figure 4: Different income groups with biodegradable waste per capita generated

From the figure above, the highest biodegradable waste is generated from the medium income group and low biodegradable waste generate from the high income group.

Conclusions

A study of solid waste management in selected areas of Lucknow i.e Gomtinagar, Southcity, Sainiknagar, Ruchikhand & Rajnikhand was undertaken. During this survey we found that in many localities in Lucknow city, waste is not properly collected by Nagar Nigam or municipality. There is no community bins and all waste are dumped in open land area.



Finally it is concluded that the municipal solid waste management program cannot be successfully managed because most of the people dump the waste in open land area easily. There is also need of education awareness and management of MSWM. If we want to protect our environment and health of people, we must sense ourselves to this problem. There is need for strict implementation of legal provisions and development of a better environment management system for disposal of solid waste in the city of Lucknow.

Time has come to encourage technology-based entrepreneurship for effective SWM. Most of the populated areas show the picture of sadly managed and uncontrolled dumpsites. Absence of complete market makes use of alternative method essential to find solution for the environmental issues. In fact, implementation of environment laws is yet to impact on ecosystem and, therefore, on the health and living conditions of the citizens. With an ever-increasing population and a rapid pace of urbanization, the effects of poor waste management practices on human health and the environment have never been more pronounced. The review of study concludes that the present policy and infrastructure are inadequate in dealing with the enormous quantity of MSW generated by the city of Lucknow. With an almost increase in MSW generation by 2050, the situation may reach critical proportions. Lucknow Nagar Nigam and the Government of Uttar Pradesh have realized the seriousness of the situation and framed guidelines in the form of the Master Plan (2031) for disposal and treatment of MSW for the Lucknow.

About 70% of the waste generated in the Lucknow city .This problem can be solved by the proper segregation. If waste is collect separately in two different dustbins i.e. in one biodegradable and in other non biodegradable .Further in each locality two peoples should be appointed for collection of waste routinely. They should collect waste separately so, that biodegradable waste should be taken for composting and non biodegradable for recycling and rest of the waste for land filling. This method can be solved out much problems of waste and this will also help to keep our environmental clean. MSW can be can be managed and minimized by proper segregation methods, awareness programs of waste managements, use of different coloured dustbins for biodegradable, non-biodegradable, medical waste and other waste, transportation of SWM from transfer point to disposal site should be designed and well planned, Open waste collection should be stopped, land filling, incineration, composting should be next appropriate option.

References

- [1] Agarwal D., Gupta A. K. and Agarwal M. K., Analysis of Solid Waste Management Strategies in Major Cities of Uttar Pradesh in *India Journal of Pure and Applied Science & Technology* 2(1), 2012. pp. 66-74
- [2] Karte N.H and Pandey D. 2012 Municipal solid waste problem and management in gondia city in Indian perspective: a case study. *Int. J. LifeSc. Bt & Pharm. Res.* 1(1) pp 47- 57
- [3] Archana, Ali, D., Yunus, M.and Dutta, V. , An assessment the status of municipal solid waste management (MSWM) in Lucknow, *IOSR Journal of Environmental Science, Toxicology andFood Technology*. 2014.
- [4] Science, Toxicology and Food Technology 8(5), pp. 41-49
- [5] Aruna.D., Byragi reddy.T., Swamy A.V.V.S. 2013 .Study of Municipal Solid Waste Management Scenario of Kakinada City International Journal of Engineering
- [6] Research and Applications 3 pp.931-940
- [7] Bundela P.S., Gautam S.P., Pandey A.K., Awasthi M.K. and , Sarsaiya S. Municipal solid waste management in Indian cities – A review, 2010, Vol.4 (1) pp 591-605
- [8] Kansal, A. (2002), Solid waste management strategies for India, *Indian Journal of Environmental Protection*. 22(4), pp. 444–448.
- [9] Lucknow Municipal Corporation (LMC) of Lucknow City in 2015
- [10] Rawat, R., Kumar, Reetu. Sudhakar, S. (2022), Municipal Solid Waste Characterization and Management in Lucknow–Capital city of Uttar Pradesh, India, *International Research Journal of Engineering and Technology (IRJET)*, 9(3), pp. 1465-1470