Plant Sci. Arc.
Plant Science Archives
An International Journal of Plant Biology

Research Article
ISSN 2518-6965
www.plantarc.com

Solid Waste Issues: Generation Composition and Disposal of Municipal Solid Waste in District REWA (Madhya Pradesh)

Rayees Ahmad Ganaie[1], Shama Ansari[1], Sartaj A Ganie*[2]

[1]*School of Environmental Biology Awadash Pratap Singh University University Rewa, 486003 India*
[2]*Division of Environmental Sciences, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, India*

Citation: Rayees Ahmad Ganaie, Shama Ansari, Sartaj A Ganie (2023). Solid Waste Issues: Generation Composition and Disposal of Municipal Solid Waste in District REWA (Madhya Pradesh). *Plant Science Archives.* **14-19. DOI: https://doi.org/10.51470/PSA.2023.8.4.14**

Corresponding Author: **Sartaj A Ganie** | E-Mail: **(sartajsultan@gmail.com)**

Received 16 September 2023 | Revised 29 November 2023 | Accepted 16 December 2023 | Available Online December 22 2023

ABSTRACT

Solid waste disposal is a significant and pervasive issue in many industrialized and developing nations, including India, in both urban and rural areas. The collection and disposal of municipal solid waste (MSW) is one of the main issues facing the urban environment in the majority of the world's countries today. Solutions for MSW management need to be technically sound, socially and legally acceptable, environmentally benign, and financially viable. The largest problem facing the authorities of both large and small cities is solid waste management. Conventional landfills, incinerators, composting, and methods of managing solid wastes are typical examples of established technology for disposing of garbage. Anaerobic digestion (AD) and composting have historically been the most widely utilized procedures for the treatment and valuation of the organic part of MSW.The amount of organic solid waste (OSW) produced annually is rising sharply on a global scale. Agricultural waste, home food waste, human and animal wastes, etc. make up the majority of OSWs. Usually, they are burned, disposed of in landfills, or used as animal feed. Rich in proteins, minerals, and carbohydrates, OAWs can be utilized as raw materials or substrates in several processes. There are negative effects on the environment, the economy, and social life as a result of the high rates of organic waste generation and their open disposal in landfills. One of the greener methods for keeping organic contaminants out of landfills is composting. As to the latest statistics of CPCB, India generated approximately160.03 tons of municipal garbage per day.Rewa district of Madhya Preadesh along with 27 other ULBs generate an average MSW of 340 TPD.

Keywords: *Municipal solid waste, Landfill, Composting, Central Pollution control board etc*

INTRODUCTION

Solid waste management has emerged as a critical issue in urban areas worldwide, particularly in rapidly developing regions. In India, the burgeoning population and urbanization have led to an unprecedented increase in the generation of municipal solid waste (MSW). Effective management of this waste is essential to mitigate environmental degradation, public health risks, and resource inefficiencies [1-2]. Rewa, a district in the state of Madhya Pradesh, exemplifies the challenges faced by many Indian municipalities in managing MSW. The district, characterized by its growing urban population and expanding economic activities, has witnessed a significant rise in waste generation. This article delves into the generation, composition, and disposal of MSW in Rewa, highlighting the existing issues and potential strategies for improvement [3-4].

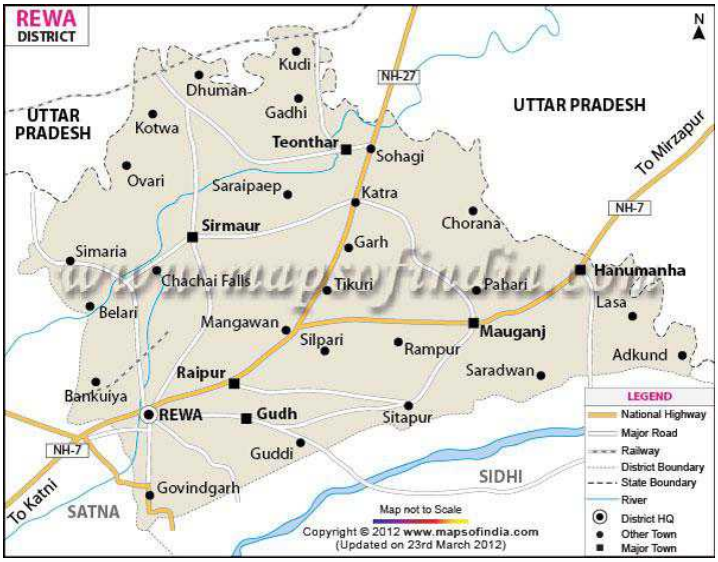
The study aims to provide a comprehensive overview of the current state of MSW management in Rewa, analyzing the types of waste generated, their sources, and the methods employed for their disposal. By examining these aspects, the article seeks to identify the key challenges and propose sustainable solutions that can enhance the efficiency and effectiveness of solid waste management practices in the district [5-6]. Understanding the composition of MSW is crucial for developing targeted waste management strategies. Different types of waste require specific handling and disposal methods to minimize their environmental impact. This article provides an in-depth analysis of the waste composition in Rewa, offering insights into the predominant types of waste and their respective proportions. Furthermore, the article explores the current disposal practices in Rewa, assessing their adequacy and environmental implications. It highlights the role of informal sectors, such as waste pickers and recyclers, in the waste management ecosystem and discusses the potential for integrating these stakeholders into formal waste management frameworks, this article aims to shed light on the pressing issues related to MSW management in Rewa and propose actionable recommendations for improving the system. By addressing the root causes and leveraging innovative solutions, Rewa can pave the way for a more sustainable and efficient waste management system, contributing to the overall well-being of its residents and the environment [7].

Study Area

Rewa is a prominent city and district located in the Indian state of Madhya Pradesh. Nestled in the Vindhya region, Rewa is situated approximately 140 kilometers south of Prayagraj. Known for its moderate level of industrial and economic development, Rewa district is home to a population of 2,365,106 people, comprising 1,225,100 males and 1,140,006 females [8-9]. Geographically, Rewa district is bounded by several neighbouring districts. To the north and northeast, it shares its borders with the Chitrakoot and Prayagraj districts of Uttar Pradesh, while Mirzapur lies to the east. Within Madhya Pradesh, Rewa is flanked by Satna district to the west, Sidhi to the south, and Singrauli to the southeast. The district spans an area of 6,240 square kilometres [8].

Historically, Rewa holds significant importance. It was once a large princely state known as Rewa Riyasat and served as the capital of the former Rewa kingdom in 1597 AD. The city later became the capital of the British Baghelkhand Agency. After India's independence and the subsequent formation of Madhya Pradesh in 1956, Rewa emerged as a separate district within the state.

Rewa is rich in natural resources, particularly its forests, which cover extensive areas of the Vindhyan ranges. These forests are not only a source of timber but also home to diverse wildlife, including the rare white tiger, which has been found exclusively in the forests of Rewa. The district is also inhabited by indigenous communities such as the Gond and Kol people, who reside in the mountainous regions. The strategic location, historical significance, and abundant natural resources make Rewa an important district in Madhya Pradesh. A map illustrating the major roads, places, and boundaries of the district is provided below for reference.



Source: Google Maps and Google Scholar

MATERIAL AND METHODS

The present study was conducted to understand the processes employed by the Rewa Municipal Corporation for managing solid waste, focusing on key activities such as segregation, collection, storage, transportation, treatment, and disposal. Data collection was carried out through a combination of primary and secondary sources, with significant information obtained from the district and tehsil administrations, particularly the Municipal Committee of Rewa. The research employed the following methods:

Sampling Method

During the study, municipal sweepers assisted in examining and evaluating waste from various sources including households, community bins, collection points, temporary dumping sites, and final landfill sites. The study focused on two main aspects:

1. Evaluating the existing management practices for Municipal Solid Waste (MSW), including collection, composition, segregation, transportation, impacts, and final disposal.
2. Assessing the knowledge, attitudes, and practices (KAP) of personnel involved in MSW management.

KAP Survey Procedure

A structured questionnaire was developed for the KAP survey to gather responses from municipal staff, waste sweepers, handlers, transporters, rag pickers, and residents living near landfill sites. The collected data was then compiled and analyzed.

Data Processing

Data gathered from various sources in Rewa district was analyzed and compiled using the following methods:

1. Combustible and Non-Combustible Substances:

The weight percentages of combustible and non-combustible substances were computed using standard methods (Ahmed Bhat, 2007; US EPA, 2008):
Combustible Material (%) = Plastic (%) + Paper (%) + Textile (%)
Non-Combustible Material (%) = Metal (%) + Glass (%)

2. Net Weight Composition (%):
The net weight composition of waste constituents was calculated using the formula:
{Net weight composition (%) } = \left(\frac{\text{Weight of constituent of solid waste}}{\text{Total weight of constituents}} \right) \times 100 \]

3. Generation Rate (GR):
A weight-volume analysis was used to determine the waste generation rate (GR), which is the weight of waste produced per person per unit time. This was calculated using the formula:

GR} = \frac{\text{Weight of Solid Waste (g)}}{\text{Population} \times \text{Duration (day)}}
The purpose of GR measurement was to estimate the total amount of waste requiring management. Weight-volume data, obtained by weighing and measuring each load, provided insights into the density of different types of solid waste at specific locations. The data was averaged for the entire municipality based on the population of various areas.

4. Net Weight (kg) or Dried Weight (kg):
The net weight or dried weight of waste was also calculated using the following formula:
Net weight (kg)} = W_w - \left(\frac{\text{Moisture content} \times W_w}{100} \right)
This methodology provided a comprehensive understanding of the solid waste management practices in Rewa, enabling the identification of key challenges and the formulation of strategies for improvement.

RESULT AND DISCUSSION

The Municipal Committee of Rewa is responsible for the collection, transportation, and disposal of waste in Rewa district, Madhya Pradesh. Municipal solid waste in Rewa is categorized into biodegradable and non-biodegradable wastes based on their degradation properties. Biodegradable wastes, including leftover foodstuffs and kitchen waste like fruit and vegetable peels, decompose naturally through microbial action, turning into compost that enriches the soil. In contrast, non-biodegradable wastes, such as plastic bags, cans, bottles, and chemicals, do not easily break down and persist in the environment, contributing to pollution. These materials require specialized handling and disposal methods to mitigate their environmental impact [8-12].

Effective waste management in Rewa relies on the segregation of these waste types at the source, underscoring the importance of public awareness and cooperation to maintain a sustainable system. During the study period it was observed that the main sources of municipal solid wastes in Rewa district are domestic wastes, market or commercial wastes, horticulture wastes, animal wastes, and institutional wastes. According to the Municipal Committee Rewa, the solid waste generation in Rewa city is about 0.35 kg per capita daily. The present waste generated in the city is of 86 tonnes per day. Out of this 45 TPD is collected and transported to the sanitary landfill site In Rewa Sanitary landfill site is at Kostha [13-13]. The construction of the compost plant has been recently completed. The Residential residual waste from the plant is dumped at a distance of 9 km, in Kostha, on a land that is proposed to be developed as a sanitary landfill site.however most of them affects the common life. The waste generation has increased in the rewa district due to a number of factors like increase in population and an increase in per capita generation. The per capita generation recommended by IS 12647-1989 is 0.4 Kgs/Capita/Day whereas it is 0.2 to 0.5 Kgs/Capita/Day as per CPHEEO Manual. NEERI recommends it to be 0.1 to 0.6 Kgs/Capita/Day depending on the type of place, habits of people and life style. There is also a seasonal variation in solid waste quantity generated. The quantity is more during the marriage or festival seasons, which are mostly in August, September and October. Keeping all these factors into consideration and from observations, a value of 0.4Kgs/Capita/ Day seems appropriate [15].

Table 1. Breakup of Municipal Solid Waste Generation in Rewa District (M.P)

S.No.	Sources of MSW Generation	Percent	Quantity of Waste Generated (TPD)
1	Households	55	10.17
2	Commercial places(shops,Markets etc.)	24%	4.44
3	Street sweeping	8	1.48
4	Waterbodies	1	0.18
5	Restaurants/Hotels	10	1.85
6	Others	2	0.37
		100	18.5

It has been observed that the major share to solid waste generation in Rewa district is from households (55%). Commercial places like markets generate 24% of MSW, Street sweeping generates 8%, water bodies generatesgenerate 1% of solid wastes, Restaurants generate 10% waste and other sources like horticulture etc generate 2% of municipal solid waste in Rewa district. So the households in Rewa district town generate 10.17 tons of MSW per day ,commercial places generate 4.44 tons, street sweeping generate 1.48 tons, water bodies 0.18 tons and restaurants generate 1.85 tons of municipal wastes. During the study period it was noticed that sweeping operation which includes collection of waste from roads/streets is carried out in certain areas roads and markets on daily basis. Some areas are swept on alternate days twice a week , while others are swept occasionally or not at all. In Rewa district at present 10 percent of population is attended to under street sweeping and collection of solid waste, leaving 20% of the population unattended especially in outside the urban fringes which are part of Rewa municipal limits. In these areas certain heaps of stinking solid waste at number of places which remains unattended and is removed only when situation deteriorates. Street sweeping in is done in one shift from 6 am to 2 pm in the morning hours, sweeping on streets and roads is carried on as per the work assigned to each sweeper. In the afternoon, most streets in Rewa remain unswept, leading to widespread littering and highlighting the need for shift-based sweeping [16]. The concept of group sweeping is also largely absent, except during occasional sanitation drives. Collected solid waste is transported in specialized vehicles from streets, homes, and community bins to final disposal sites. To reduce transportation costs, area-specific vehicles, such as tractors with trolleys, are used to gather waste from various collection points. The staff responsible for transportation maintain records of waste collection and transport activities. Given that waste is generated from diverse sources—including households, markets, commercial areas, hotels, restaurants, educational institutions, and small-scale industrial units—located across the city, including narrow lanes, a variety of vehicles are required to efficiently collect waste from different storage bins. However, current facilities and resources are reported to be insufficient to meet these needs. To comply with the "Solid Waste Management Rules, 2016," the current Municipal Solid Waste (MSW) management system in Rewa and 27 neighboring urban local bodies (ULBs) requires significant improvement. Recognizing the need for an effective waste management system, the Government of Madhya Pradesh has initiated a Regional Integrated Solid Waste Management (ISWM) Project on a Public-Private Partnership (PPP) basis. This project aims to manage the MSW generated in Rewa Town and the surrounding 27 ULBs, which include Rewa Town and 11 additional ULBs from Rewa District, 12 ULBs from Satna District, and 4 ULBs from Sidhi District [17].

The proposed ISWM Facility, to be located approximately 9 kilometers from Rewa town in Pahadiya Village, will cover an area of roughly 18.35 hectares (45.34 acres). Rewa Town currently generates an average of 340 tons per day (TPD) of MSW, and the 27 other ULBs contribute additional waste. Each participating ULB is situated within 83 kilometers of Rewa. The project proponent plans to establish a 700 TPD Integrated SWM Project, taking into account future population projections. This facility will manage various types of waste, including non-hazardous construction and demolition waste, residential and commercial waste, expired or rejected branded products, and waste from institutions, hotels, restaurants, markets, marriage halls, gardens, and parks.

The ISWM Project will include several key components: a Construction and Demolition Waste Management Facility (100 TPD), an Animal Carcass Digester (200 kg/hr), a Compost Plant (300 TPD), an RDF Processing Plant (500 TPD), Waste-to-Energy Plants (2 x 6 MW, with Phase I at 6 MW and Phase II at an additional 6 MW), and a Sanitary Landfill (175 TPD). The facility will require an estimated 200 kiloliters per day (KLD) of water for operations, with an additional 120 KLD needed when the second waste-to-energy plant is added. Water will be sourced from the Rewa Municipal Corporation, bore wells, or tankers. Approximately 18% of the total power produced by the facility will be used to operate the ISWM complex, with MPTRANSCO supplying electricity in emergencies.

For power backup, DG Sets with a 500 KVA capacity are proposed.
The ISWM Facility project is expected to take up to 18 months to complete, encompassing all proposed facilities and ensuring comprehensive waste management for the region.

Modern Methods of Solid Waste Management & Treatment of Solid Waste
After the collection and preparation separation of municipal solid waste, some common and most recognized methods used for solid waste disposal are as

Methods of disposal of municipal solid waste

Landfill
A landfill is a designated site for the disposal of waste material through burial, representing the oldest and most widely used form of waste treatment. Historically, landfills have been the predominant method of organized waste disposal and continue to be widely used globally. Besides serving as final disposal sites, landfills are also utilized for waste management activities such as temporary storage, consolidation, transfer, sorting, treatment, or recycling of waste material. Modern landfills are engineered systems designed to manage large volumes of waste while minimizing environmental impact. One significant byproduct of landfills is landfill gas, produced through anaerobic digestion by microbes, containing approximately 45-55% methane. This gas can be captured via a network of gas collection pipes and used as an energy source. The production of landfill gas typically begins within a few months after waste disposal and can continue for over a decade. Modern landfills are constructed to prevent the escape of leachate and gases into the surrounding environment, thereby protecting the ecosystem. The primary advantage of landfilling is the potential to generate energy from methane conversion. To support effective waste management in Rewa district, the district administration should allocate suitable land for a landfill site, facilitating organized waste disposal and energy production.

Composting
Due to the shortage of landfill space in larger cities, biodegradable yard waste, kept separate from municipal waste, is allowed to degrade in a controlled medium, resulting in the production of high-quality, nutrient-rich, and environmentally friendly manure that enhances soil condition and fertility. Organic matter constitutes 35%-40% of the municipal solid waste generated in India, which can be effectively recycled through composting, one of the oldest waste disposal methods. Composting is a natural decomposition process where microorganisms, primarily fungi and bacteria, convert degradable organic waste into humus or compost, rich in nutrients. This compost, resembling soil, is high in carbon and nitrogen, making it an excellent medium for plant growth. Vermicomposting, a method that has gained popularity in recent years, involves adding worms to the compost. The worms help break down the waste, and their excreta further enrich the compost with nutrients, resulting in an even more beneficial product for soil enrichment.

Recycling
Recycling is the process of converting waste materials into reusable objects, helping to prevent the waste of potentially useful materials and reducing the consumption of fresh raw materials.
This process lowers energy usage, decreases air pollution from incineration, and minimizes water pollution from landfilling by reducing the need for conventional waste disposal. Additionally, recycling lowers greenhouse gas emissions compared to plastic production. It is a critical component of modern waste reduction and represents the third element of the "Reduce, Reuse, and Recycle" waste hierarchy. Recyclable materials include various types of glass, paper, metal, plastic, tires, textiles, and electronics. Beyond recycling, several other methods are employed for solid waste management, including incineration, bio-drying, pyrolysis, and the plasma arc process, each offering distinct advantages for waste disposal and management.

Incineration
In simple terms, incineration is the process of burning solid waste at extremely high temperatures until it reduces to ashes. Modern incinerators are designed to minimize the release of heat energy, and there are now recycling incinerators that convert the heat energy generated into boiler fuel, known as waste-to-energy plants. However, these plants are costly to build and operate. While incineration reduces the volume of solid waste to 20-30% of its original volume, it also emits gaseous pollutants through the smoke, posing environmental concerns. Additionally, there is a risk of fires associated with the process [18].

Pyrolysis: Pyrolysis is a chemical decomposition process where solid wastes are heated up to 430 degrees Celsius under specific pressure and in the absence of oxygen. During pyrolysis, the waste is converted into solid residue, ash, carbon, and some liquid products. While pyrolysis can be effective for managing solid waste, there is a risk of incomplete combustion, which can lead to the production of toxicants that require proper treatment. This method holds promise for converting waste into useful products, but careful management and monitoring are necessary to mitigate environmental impacts and ensure the safety of theprocess [12].

Pictures showing temporary dumping site in rewa district

The suggestions and recommendations for sustainable municipal solid waste management in Rewa District are as follows;
1. REWA Municipal Corporation's annual budget should be increased but is not enough to manage the solid waste properly.
2. The availability of land is not enough it reduces soil fertility and causes soil pollution. The district administration should identify some more barren land for the disposal of solid waste.
3. The practice of segregation of sewage from the source is not currently being adopted by R.M.C properly.
4. Rewa Municipal Corporation is lacking in vehicles for proper disposal of solid waste.
5. At present only the open dumping method of solid waste disposal is adopted by R.M.C, hence it exerts a tremendous load

on disposal and makes it more critical.

6. As the population of REWA increases by 25% in every 10 years, the waste generation will also increase. In consideration with this, the land required for open dumping will be insufficient in future. So there is need of finding proper disposal techniques of solid wastes.

Suggestions

1. Provision of dustbin in all public places such as bus stand, stations, hospitals etc.

2. Separation of wet and dry waste should be done at the source.

3. As biodegradable and recyclable waste constitute the maximum amount of solid waste generated from R.M.C. open dumping is not appropriate method of disposal for it.

4. Land filling with composting should be adapted for biodegradable waste.

5. For disposal of recyclable waste method of recycling should be adapted.

6. Recycling plant should be established in place of the open dumping method and remaining land should be used for land filling technique of disposal.

7. Application of used of new methods in place of open dumping will reduce the problem of pollution and soil fertility. It also reduces the fear of diseases cause due to improper solid waste management.

8. Separate provisions should be done for waste generated from hotels and restaurants.

9. Municipal Solid Waste shall be collected, stored, segregated, transported, and disposed separately without mixing with biomedical, slaughter and hazardous wastes. Separate landfill sites should be made for disposal of hazardous wastes.

10. The number of community waste bins should be increased in the town.

11. Vehicles used for transportation of waste in Rewa district from collection points to landfill site shall be covered. Wastes should not be visible to the public, nor exposed to open environment to prevent their scattering and unpleasant smell.

Conclusion

This study was conducted in the Rewa district of Madhya Pradesh India. Rewa is a city & District in the Indian State of Madhya Pradesh. It is a prominent City in the Vindhya Region located approx. 140 kms. south of Prayagraj. Rewa district has a Moderate level of Industrial & Economic Development. Municipal Committee Rewa has per capita generation recommended by IS1 2647-1989 is 0.4Kgs/Capita/Day whereas it is 0.2 to 0.5 Kgs/Capita/Day as per CPHEEO Manual. NEERI recommends it to be 0.1 to 0.6 Kgs/ Capita/Day depending on the type of place, habits of people and lifestyle. In town sweeping operation which includes collection of waste from roads/streets is carried out in certain areas, important roads, and markets daily. Some areas are swept on alternate days or twice a week, while others are swept occasionally or not at all. In the rewa district, at present about eighty percent population is attended to regularly under street sweeping and collection of solid waste, leaving 20% of the population unattended especially outside the urban fringes which are part of Rewa municipal limits. In the morning hours, sweeping on streets and roads is carried on as per the work assigned to each sweeper. In the afternoon, most of the streets are not swept as a result the solid waste is seen littered at most places which warrants the introduction of shift sweeping. The collected solid waste is carried in using different kinds of vehicles to the community bins; some of these have very small capacity and ill designed as they have to upturn for unloading the waste on the ground. Rewa Municipal Committee has installed 300 waste bins throughout the town for collection of waste and there are almost 100 plus municipal staff that has been employed in the town for the collection and disposal of waste. During the study period, it has been observed that the waste is collected from the streets and waste bins and then transported in different types of vehicles for final disposal at the rewa dumping site. The improper dumping of solid waste by the Rewa Municipality at temporary dumping sites with the least concern to the location of water resources, either surface or underground, results in leachate action or contamination of water resources. Day by day it is becoming difficult for municipal committee Rewa to dump the huge quantity of waste in these dump sites. From past few years municipal committee along with the district administration rewa has been looking for suitable land for the dump site but to date remained unsuccessful? The dumping site must necessarily be away from the inhabited area but needs to be easily accessible and approachable. The dumping sites of Rewa town are located within residential areas. Rewa dumping sites can not called landfill sites because no periodic soil cover is being spread to the waste. At both the dumping sites, separation and shredding are not being practiced. Unauthorized rag pickers are in the activity for personal gains and are collecting heaps of few reusable items, spoiling the surroundings and risking life. Rewa dumping sites present very poor aesthetics. Overall view of the site is highly disturbing. The site presents a picture of heaps of waste with stray animals, birds, and unauthorized rag pickers moving over these heaps. The rag pickers set fires to garbage to enable them to recover scrap material which fetches some value in the market. Also, odor from the site invades inhabited areas, and dust/smoke flying from the site often engulfs large areas around it causing danger of some health, disorders and damage to the standing crops.

REFERENCES

1. Ashokan. P. Application of coal combustion residues for hazardous waste management. Third Annual PhD, Progress report. Indian Institute of Technology, Bombay, 2004.

2. Annepu, R.K., 2012. Sustainable Solid Waste Management in India. Accessed December 29, 2016.

3. Arti Pamnani et.al, "Solid Waste Management in India: A Review and Some New Results", International Journal of Civil Engineering and Technology, Volume 5,Issue 2, February (2014), pg. 01-08.

4. Bundela, P.S. et. al. 2011. Municipal Solid Waste Management in India Cities-A Review, International journal of Environmental Sciences, Vol 1, No. 4, pp. 591-606

5. Bai. R. & Sutanto, M., 2001.The Practice and Challenges of Solid Waste Management in Singapore. Journal of Waste Management. 22, 557-567.

6. Balwan, W.K., Rasool, N. & Saba, N., 2021. Study Of Characterizationation and. Quantification Of Municipal Solid Waste In Doda Town Of Jammu And Kashmir As A Measure Of Effective Management. Journal of Solid State Technology. 64(2), 78-83.

7. Balwan, W.K., Saba, N., Singh, N., Rasool, N., 2020.Solid Waste Management: First Report on Garbage Problem in Doda Region of Jammu And Kashmir, India. International Journal of Engineering Applied Sciences and Technology.5 (7): 157-173.

8. Chandrappa R. and Das BD. (2012). Solid Waste Management, Principles and Practice, Springer-Verlag Berlin Heidelberg

9. K. L. Hyde, A. Miller, Smith and J. Tolliday, "Minimizing waste in the food and drink sector: using the business club approacht of facilitate training and organisational development". Journal of Environmental Management -J ENVIRON MANAGE, vol 67 no. 4, 327-338, 2003.

10. M.ALone,HarisWajeeh,ShahiqAhmadWani(2018;"AStudyo fSolid Waste Management (SWM) Practices in the Capital City-Srinagar of J&K". International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue X, Oct 2018, 421-25.

11. Md. Lokman Hossain et.al,"Characteristics and Management of Institutional Solid Waste of Jamal khan Ward, Chittagong, Bangladesh", International Journal of Research in Management, Vol. 2, Issue 3, (March 2013) pg 155-162.MoEF, "Municipal Solid Waste Management and Handling Rules",Ministry of Environment and Forests, Government of India, New Delhi, 2000.

12. M.Sharholy,K.Ahmad,G.Mahmood,&R.C.Trivedi,".Municipal solid waste management in Indian cities-Are view". Waste management, vol 28, 459- 467, 2008.

13. Marshall,R.E.andK.Farahbakhsh,2013.Systemsapproaches tointegrated solid waste management in developing countries. Waste Manage. 33: 988-1003.

14. M. Z. Siddiqui, J. W. Everett and B, E. Vieux, "Landfill Siting Using Geographic Information Systems: A Demonstration", Journal of Environmental Engineering, vol. 122, no. 6, (1996), pp., 515-523.

15. Neha Gupta et.al," Are view on current status of solid waste managementin India", journal of environmental sciences Volume 3, Issue 7, (2015) 206- 217.

16. Niyaz Ahmad Khan et.al," Perspectives of Transport and Disposal of Solid. Waste in Srinagar City", International Journal of Engineering Research and General Science, Volume 2, Issue 4, June-July, 2014, pg 238- 251.

17. NEERI,1999.Reporton"strategy paper on solid waste management in India.

18. Nguyen, P.T., M. Yasuhiro and F. Takeshi, 2011. Assessment of plastic waste generation and its potential recycling of household solid waste in Can Tho City, Vietnam. Environ. Monit. Asses, 175: 23-35.