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# Status and Challenges in Municipal Solid Waste (MSW) Management in Jaipur City

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## ABSTRACT

In developing countries, urbanization and rapid population growth has resulted in a substantial increase in generation of Municipal Solid Waste (MSW). Safe collection, transportation and treatment of MSW are among the major issues for Indian cities. Poor MSW management practices have negative impact on public health, environment and climate change. India currently only treats 21% of MSW while the remainder disposed in unsanitary landfill sites with no recycling and treatment technologies. This paper reviews the existing MSW management practices, challenges and provides recommendations for improving MSW management for the city of Jaipur in Rajasthan, India.

Despite being the state capital as well as the top tourist destination in northern part of India, there is no detailed study which reviews the waste management strategies of this city along with identifying the key challenges. The study reveals that the major challenges for MSW management in Jaipur include uncontrolled landfilling, inadequate public participation as well as failings of implementation of MSW legislation and waste conversion. Recommendations for improvement include public awareness campaigns, public-private partnership, investment in lined landfills, recycling and waste to energy techniques. Optimization models and life cycle assessment tools should be employed to minimize cost and the environmental impact of MSW management. This study will provide policy makers and private sector stakeholders to develop strategies for future planning, investment and execution of improved MSW management in Indian cities.

***KEYWORDS:*** *MSW, municipal, solid, waste, management, challenges, status, Jaipur*

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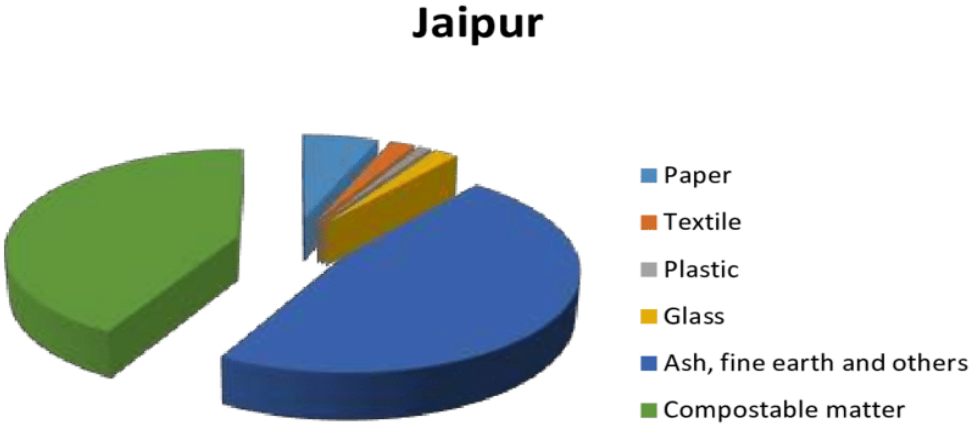
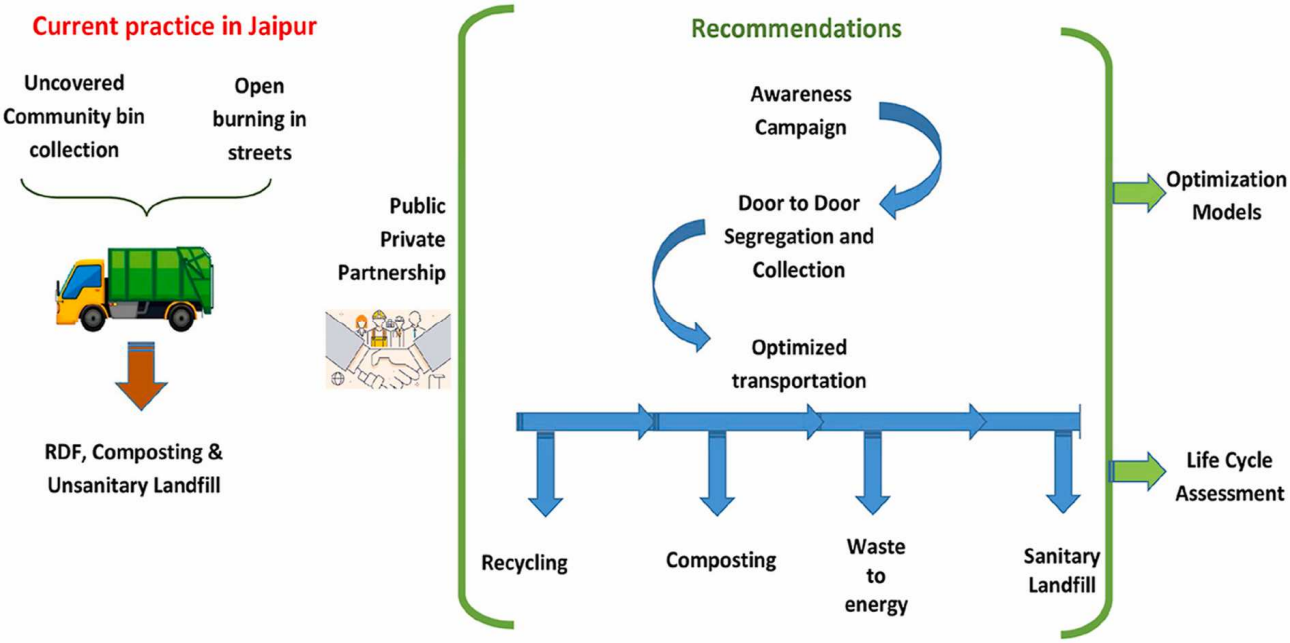
## INTRODUCTION

Like many cities of India, Jaipur is undergoing rapid development. In Jaipur, the population was 2.34 million according to the 2001 census, and is now estimated to be over 3.5 million Solid waste management is an important part of urban and environmental management, like other infrastructural services has come under great stress, consider low priority areas, solid waste management was never taken up sincerely nor by public nor by concerned agency or authorities and in present time the solid waste is impacting our heath, environment and well-being. Waste minimization is a technique which is used for waste reduction, primarily through reduction at source, it also includes recycling and reuse of waste materials. The benefits of minimizing of waste is both environmental friendly and of less cost. To execute proper waste management, various points have to be considered such as: Source reduction, Onsite storage, Collection & transfer, Processing, and Disposal. Solid waste may be defined as production of unacceptable substances which is left after they are used once [1].With the increase in various sectors exponentially, more inputs are required. This necessarily means more output is also produced, and established itself in a large amount of waste. “Waste” is simply something that is no longer deemed useful and is dumped. However, a change in approach to view waste as a resource rather than as something useless

is the first step needed to decrease it. Waste can be divided into four categories: solid waste, hazardous waste, biomedical waste, and electronic waste. Municipal solid waste (MSW) includes what is thrown out by households and the commercial sector, such as food leftover, yard abstract, and construction debris. It is very important to consider because it is the waste that the normal public has the most contact with, and has a high political profile because the public is made up of voters. Also, MSW is one of the harder types of wastes to manage as it has many different elements, so if it can be managed efficiently, then management of other types of solid waste that are homogenous by nature will be easy to manage. Jaipur's daily production of solid waste is almost1150 MT/day.




Out of which around200-250 MT still remains on the streets and roads, that means lifting efficiency is around 80%. The per capita solid waste generation per day is around 450 gm, which with a family size of almost five, results in 1.75 kg/day. There is none of data published on the composition of waste in Jaipur, although the figures of India in generally are reasonably accurate depiction for Jaipur also. In India, the composition of waste is around 50% biodegradable, 25% inert waste 9% plastic, 8% paper, 4%scraps, and 1% glass. The composition of different wastes keeps varying from season to season. In the summer time there is more biodegradable waste produced because of more vegetation. The composition of plastic in waste has probably been decreasing due to the recent ban on plastic bags in Rajasthan from beginning August 2010[2].Solid waste management was selected as the topic of this study because it is a visible environmental sustainability issue that India is confronting, since Jaipur is a rapidly developing city, effective waste management practices is especially needed. The objective of the study was to learn as much as possible about Jaipur's SWM through a broad-based approach. Management of the transfer station or community bin. Secondary collection and transport to the waste disposal site. Waste disposal in landfill sites but in most of the Indian cities open dumping is the Common Practices which is polluting environment and Public health.[3,4]




**Discussion**

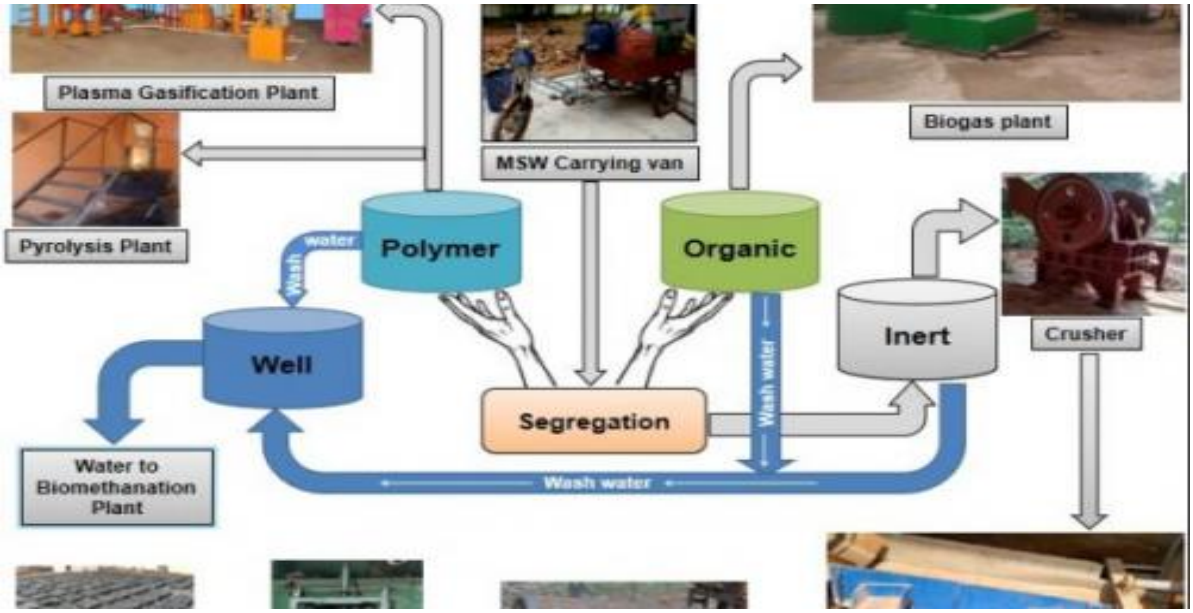
Solid waste management is one among the basic essential services provided by municipal authorities in the country to keep urban centers clean. However, it is among the most poorly rendered services in. the basket—the

systems applied are unscientific, out dated and inefficient; population coverage is low; and the poor are marginalized. India is the second most populated country in the world with 1.2 Billion populations and also the second fasted growing economy. For the first time since Independence, the absolute increase in population is more in urban areas that in rural areas. Rural – Urban distribution is 68.84% & 31.16%. Level of urbanization increased from 27.81% in 2001 Census to 31.16% in 2011 Census. The proportion of rural population declined from 72.19% to 68.84%. The decadal growth rate of population from 2001 to 2011 is 17.59% and at the same rate, the population will be approx. 1673.73 million in 2031, and urban population at the decadal growth rate 31.82%, will be approx. 665 million by 2031. There are total 423 class I cities in India which have population more than 100000. Class I cities include 7 mega cities (which have a population of more than 4 million), 28 metro cities (which have a population of more than 1 million), and 388 other towns (which have a population of more than 100,000). The class I cities alone contribute to more than 72.5 percent of the total municipal solid waste (MSW) generated in urban areas. [5,6]Per capita waste generation in India is about 0.46 kg and as a general assumption at present population, total waste generation in India is about 556600 MTpd, and this is expected to rise to 769916 MTpd by 2031. According to the report by World Bank, it will be 440,460 tonnes/day by the year 2026 .This high increase in the amount of Municipal Solid Waste generated is due to economic growth, changing lifestyles, food habits and living standards of the urban populatiori. The collection efficiency ranges between 70% and 90% in the major metro cities in India, whereas in several smaller cities, the collection efficiency is much below 50% .The major problem of the waste management is its disposal system and, it has been observed that Indian cities dispose of their waste in open dumps located in the outskirts of the city.

**Jaipur municipal corporation**

This creates major problems to environment and public health. Further, the financial and infrastructural constraints, which includes, non-availability of land for sanitary landfill sites, and the lack of awareness to public as well as the municipal employees also creates major hurdles in safe waste management system. Jaipur better known as the 'Pink City', is the capital and largest city of the Indian state of Rajasthan. The city was founded in 1727 by Maharaja Sawai Jai Singh for the population of approx 50000 and now it accommodates more than 3 million people. According to National Urban Sanitation Policy- xv 2008, Jaipur is ranked at 230th position out of total 423 cities surveyed in sanitation condition. The worst affected urban service in the city is the solid waste management.. Solid waste management is one-of the major headaches for any municipal corporation in India and Jaipur is also one of the examples of most neglected waste management system. [7,8]The waste generation in Jaipur city is around 1200 MTpd and the collection efficiency is about 80% (JMC), which is projected to rise 3643 MTpd by 2021 (CDP, 2006) . Development research group also figured out the waste generation around 1740 MTpd and collection efficiency to only 50%. There is one treatment plant also, with private sector partnership (Grasim Industries) a new refuse derived fuel paletization unit has been set up Lengriya was sanitary landfill site with 500mtpd capacity. Due to poor collection of MSW and several operational problems, this plant is not able to run its full capacity. Most of the waste is disposed in three uncontrolled open landfills sites at the

outskirts of the city. In absence of proper sanitary landfill sites, these landfills are a major source of groundwater contamination and air pollution. In this report, author tried to figure out this most neglected system in India and carried out a special study of waste management in Jaipur city. The report compiled with the study of different types of waste, waste generation phenomenon in different countries, the differences in the waste generation rates and common waste management practice in India and abroad. The report has general introduction to Jaipur city with its geography, demography, climate, economy and infrastructures. The national urban sanitation policy has mentioned Jaipur as the worst sanitized city in India which also mentioned in the report with all the details of the policy. A detailed study has been carried out to understand the real situation of solid waste management in Jaipur city and current scenario with every stage of the system. The current waste management system in Jaipur and its effects has been discussed and finally the guidelines and proposals for better waste management system with special considerations to walled city have been given in the last section of the report.[9,10]




Jaipur is one of the best planned cities in the world, but it is also a sour truth that the city is one of the worst managed cities in the world. The worst affected urban service in the city is the solid waste management. Solid waste management is a worldwide phenomenon. It is a big challenge all over the world for human beings. Solid waste. management.is also one of the most ignored services in Indian cities. Jaipur is one of the top city in terms of per capita waste generation in India.-Some of these wastes have been proved to be extremely toxic and infectious. One of the worst about Jaipur's waste management is its open dump phenomenon. The uncontrolled and unscientific dumping of such wastes has brought about a rising number of incidents of hazards to human health. The city also generates lots of commercial waste which includes hazardous waste also. The management is not following strict rules and regulations for segregation and disposal of these wastes. More serious xvi risk to human health is envisaged due to contamination of surface and ground water. The problem of municipal solid waste management (MSWM) is also prevailing throughout the urban environment of Jaipur and need to improve at the large scale. The old city, one of the Heritage structure on Indian urban environment is worst affected area of negligence. The city is one of the best commercial hub in the state but it has worst affected area due to negligence of proper management. Therefore the present study was taken to find out the problems and prospects of Municipal solid waste in Jaipur city. [11]This study examined the present status of waste management in India, Waste management practices in India and abroad, legal frameworks applicable in waste management in India, plastic nightmare and its effects on public health and the environment, and the prospects of introducing improved means of disposing municipal solid waste (MSW) in India. This report is the result of one year of research and includes data collected from the literature, communication with professionals in India, and field investigations by the author in Jaipur.

**Jaipur one of the cleanest railway stations in India**

One field visit in Jaipur over a period of one week covered waste management practice in Jaipur city and disposal site assessment. The visit included travelling to informal recycling hubs, waste dealers shops, composting facilities, unsanitary landfills, and Jaipur municipal corporation office. The visit provided the opportunity to closely observe the impact of waste management initiatives, or lack thereof, on the public in Jaipur. The main objective of the study was to find out the current situation of waste management practice in Jaipur and compare it with the legal framework in India. The guiding principle of this study is that "responsible management of wastes must be based on Solid Waste Management and Handling rules 2000". The Solid waste management handling rules 2000. Municipal Corporations in India are far behind from implementing the regulations and Jaipur is also one of these. In the final section of the report, a proposal for municipal solid waste management has been given with special consideration to walled city. A proposed locations of community bins (which include three colours bins for collection of biodegradable, non-biodegradable and recyclable materials) and vehicles routes to collect the waste from these bins have been marked. The proposal includes both the general guidelines for solid waste management practices and a specific planning for the waste management in walled city Jaipur.[12]

**Results**

As per observation about 1500 to 1800 tonnes per day of municipal waste is generated in the city including of C&D waste, out of which 900 T per day are being processed by way of wet & dry processing, centralized and decentralized system and remaining 600-800 MT are directly being deposited in open dump. According to observation the waste generated varies month to month due to lack of supervision as waste collected company is transported the waste with malba and mitti and also industrial waste (which is violation of RFP condition).
The usage of plastics is despoiling the landscape, blocking drainage systems, and affecting health of animals. There is a need to ensure proper collection, segregation, processing and disposal of solid waste. There is a need to develop and implement viable PPP models for setting-up and operating secure landfills, composting plants, waste to energy projects and other appropriate techniques for MSW treatment. Segregation of waste needs to be enhanced to improve efficiencies at the processing levels. Construction and demolition wastes should be segregated (collected separately) and recycled. Supply of compost produced through composting of MSW to be mandated with the sale of agricultural inputs.

**Smart city project in Jaipur**

Informal sector system of collection and recycling of various materials needs to be strengthened by giving them legal recognition and enhancing their access to institutional finance and relevant technologies. There is a need to review the municipal laws and policies to enable registration of societies of recyclers to operate within the framework of law. Municipal Corporation need to play an important role in proper implementation of the "Recycled Plastics Manufacture and Usage Rules". Municipal Corporation will be required to create a general public awareness for reducing, reusing and recycling of the wastes. RECOMMENDATIONS Ways of Improvemant in Generation and Segregation of Waste (a) For collection mechanism To make the process smooth and hygienic, municipal authority should: Organize awareness programmes. Promote reduction and recycling or reuse of segregated waste. Involve communities in waste management and promotion of home composting, bio-gas generation, decentralised processing of waste at community level subject to control of odour and maintenance of hygienic conditions around the facility; Create public awareness through information, education and communication campaign and educate the waste generators on the following; namely:- (i) not to litter; (ii) minimise generation of waste;

(iii) reuse the waste to the extent possible; (iv) practice segregation of waste into bio–degradable, non-biodegradable (recyclable and combustible), sanitary waste and domestic hazardous wastes at source; (v) practice home composting, vermicomposting, bio-gas generation or community level composting; (vi) wrap securely used sanitary waste as and when generated in the pouches provided by the brand owners or a suitable wrapping as prescribed by the local body and place the same in the bin meant for non- biodegradable waste; (vii) storage of segregated waste at source in different bins; (viii) handover segregated waste to waste pickers, waste collectors, recyclers or waste collection agencies; and (ix) pay monthly user fee or charges to waste collectors or local bodies or any other person authorised by the local body for sustainability of solid waste management.

Garbage must be picked up from every door step in an organized manner. Waste must be collected at pre-informed timings. [13] The arrival of waste collectors should be announced through methods such as ringing a bell. Waste can be kept inside or outside the house. Different bins for different varieties of wastes must be kept so that each category of waste will follow a different path. For the collection of wastes at door to door level, the following implements may be required:

Increased the number of hand driven carts like wheel barrow. Gloves which do not cause excessive sweating. Bell, horn or any other device to announce arrival for collection. (b) Transportation Mechanism This step refers to the transport of large quantities of waste to treatment sites or the final disposal site. The transport of waste is the bottleneck of efficiency in most Indian cities. In Jaipur also the transport capacity is bound by lengthy loading times (manual loading) from storage areas. Additionally, long distances limit vehicle crews to one or two trips per day, which can be inefficient if the transport volume is small. The longer the distance to the landfill site, the more volume should be transported with each load. In case of long haul distances to the landfill site, transfer stations are found to be most efficient. Vehicles should be selected according to capital costs, carrying capacity, life expectancy, loading speed, local spare part availability, speed, fuel consumption, and maintenance costs. Some general considerations for improvement could be followed:

The establishment of more intermediate transfer stations is required (The establishment of intermediate transfer stations is determined by the distance between secondary waste collection points and the final treatment and disposal point. If the distance from the city jurisdiction to the final treatment and disposal points exceeds 15 km, transfer stations may be established.) Setup material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorised waste pickers and waste collectors to separate recyclables from the waste and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste such as paper, plastic, metal, glass, textile from the source of generation or from material recovery facilities; Bins for storage of bio-degradable wastes shall be painted green,[14] those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black; (c) Processing of MSW

Investigate and analyse all old open dumpsites and existing operational dumpsites for their potential of biomining and bio-remediation and wheresoever feasible, take necessary actions to bio-mine or bio-remediate the sites; In absence of the potential of bio-mining and bioremediation of dumpsite, it shall be scientifically capped as per landfill capping norms to prevent further damage to the environment.

Collect waste from vegetable, fruit, flower, meat, poultry and fish market on day to day basis and promote setting up of decentralised compost plant or biomethanation plant at suitable locations in the markets or in the vicinity of markets ensuring hygienic conditions; JMC is expected to set up a plant for composting waste or to adopt waste-to-energy technology as may be appropriate. Currently, private entrepreneurs are advocating several technologies for the processing and treatment of organic MSW. Some of the technologies have been used in India in the past, such as microbial composting and vermin-composting, whereas some are based on applications used in foreign countries that have yet to be tried in India or that have failed in India. The issue of suitability to local conditions, including local technical knowledge, operation capacity and cost of maintenance. JMC should also consider seeking expert opinion from outside the municipality. (d) Digital Solutions by ICT Intervention Installation of GPRS or RFID systems is required, GIS provides real-time data on vehicles, collection of waste, bin pickup, and transportation of waste to treatment or disposal facilities. These systems are now being suitably adopted by cities to improve service efficiency of MSWM. These system will help in monitor the actual movement and real time position of the vehicle; Monitor the movement of collection vehicles; Improve the service delivery mechanism and achieve better information management; Ensure citizens' participation in governance mechanism for overall improvements in collection efficiency; Reduce unwanted trips, detours, or stoppages, thereby enhancing the productivity or utilisation of the fleet; Generate

management information system (MIS) report daily to take informed decision; and publish the "Bin Pickup Status" on their website to inform citizens and encourage them to monitor bin pickup status in their localities. (e) Disposal of Waste The Plant of waste to energy having capacity of 700 TPD should start as soon as possible as NNJ has processing capacity of 600 tons more than 700 ton is being dumped at dumpsites of sewapura and Mathuradaspura. Landfill site should be developed for disposal of inerts materials generated through the processing units at sewapura compost plant and langariya was RDF plant. Make adequate provision of funds for capital investments as well as operation and maintenance of solid waste management services in the annual budget ensuring that funds for discretionary functions of the local body have been allocated only after meeting the requirement of necessary funds for solid waste management and other obligatory functions of the local body as per these rules; (e) Hazardous Waste, e-Waste and Bio-Medical Waste Establish waste deposition centres for domestic hazardous waste and give direction for waste generators to deposit domestic hazardous wastes at this centre for its safe disposal. Such facility shall be established in a city or town in a manner that one centre is set up for the area of twenty square kilometers or part thereof and notify the timings of receiving domestic hazardous waste at such centres; Ensure safe storage and transportation of the domestic hazardous waste to the hazardous waste disposal facility or as may be directed by the State Pollution Control Board or the Pollution Control Committee[15]

## Conclusions

The solid waste has to be disposed of scientifically through sanitary landfill and recyclable portion of the waste should be salvaged. Segregation of recyclable material would also leads to reduction in quantity of solid waste for final disposal. A system approach needs to be adopted for optimizing the entire operation of SWM encompassing segregation at source, timely and proper collection, transportation routes and types of vehicles and development and proper operation of sanitary landfill site. More emphasis needs to be laid on segregation and collection of waste at door step. Segregation of recyclable material from mixed waste not only is Tedious but also wasteful, therefore the residents should be sensitized towards the importance of segregation of wastes at source. Rather than considering the solid waste simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the techno-economic viability, local condition and sustainability of the project on long term basis. A better management for recyclable and biodegradable waste utilization provides the facility to reduce the waste disposal up to 60-70 % of the total waste dispose at present.

**Suggestions:-**

1) To use Three bin system different for biodegradable waste, recyclable waste and deposition waste. 2) To use Trolleys for the collection of road side waste and collection of residential waste. 3) Provide dustbins at different locations along side of road to collect the road side waste. 4) To use the biodegradable waste for the land filling or running of Biogas plant Existing in MNIT campus or as vermi-composting. 5) To create three partitions in cemented Bins for separated disposal of different type of waste at the source level. To suggested the sweepers to segregate the different type of waste at the collection site before final transfer for the disposal[16]

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