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Different Method to Handle Municipal Solid Wastes

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Abstract

Waste is a continually growing problem at global and regional as well as at local levels. Solid wastes arise from human and animal activities that are normally discarded as useless or unwanted. In other words, solid wastes may be defined as the organic and inorganic waste materials produced by various activities of the society and which have lost their value to the first user. As the result of rapid increase in production and consumption, urban society rejects and generates solid material regularly which leads to considerable increase in the volume of waste generated from several sources such as, domestic wastes, commercial wastes, institutional wastes and industrial wastes of most diverse categories. Management of solid waste may be defined as that discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations. In its scope, solid waste management includes all administrative, financial, legal, planning, and engineering functions involved in the whole spectrum of solutions to problems of solid wastes thrust upon the community by its inhabitants. Solid wastes have the potential to pollute all the vital components of living environment (i.e., air, land and water) at local and at global levels.

9.1 Solid Waste and Pollution

Introduction

The problem is compounded by trends in consumption and production patterns and by continuing urbanization of the world. The problem is more acute in developing nations than in developed nations as the economic growth as well as urbanization is more rapid. This issue has now received the attention by international and national policy making bodies and citizens. In the international level the awareness regarding waste began in 1992 with the Rio Conference, here waste was made one of the priorities of Agenda 21[1] was given to the environmentally sound management of solid wastes. The Johannesburg World Summit on Sustainable development in 2002 focused on initiatives to accelerate the shift to sustainable consumption and production, and the reduction of resource degradation, pollution, and waste. The priority was given to waste minimization, recycle, and reuse followed by the safe disposal of waste to minimize pollution[2]

[1] https://steemit.com/conspiracy/@budz82/united-nations-agenda-21-and-sustainable-development-esoteric-agenda (last visited on July 17, 2019), Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally and it was adopted by more than 178 Governments at the UNConference in Rio de Janeiro.

[2]http://wgbis.ces.iisc.ernet.in/biodiversity/pubs/ces_tr/TR118_SPoonancha/Shruthi_report_12_TVR, (last visited on July 13, 2021).

9.2 Development of Waste Management Concept

Ancient societies produced minimal waste due to low population and less exploitation of natural resources. Common waste during pre-modern times consisted of ashes and biodegradable waste, which were released locally. Tools made from wood or metal were typically reused or passed down through generations. However, some civilizations were more profligate in their waste output, such as the Maya of Central America, who had a fixed monthly ritual of gathering and burning rubbish in large dumps.

The industrial revolution and urban growth have led to a rapid deterioration in sanitation and quality of life, resulting in increased municipal solid waste. In England, the lack of waste clearance regulations led to the establishment of a municipal authority with waste removal powers. In 1751, Corbyn Morris proposed a uniform public management of the city's cleanliness, which was later adopted in 1751. However, the first legislation on waste management emerged in the mid-19th century, driven by cholera outbreaks and public health debates. Edwin Chadwick's report "The Sanitary Condition of the Labouring Population" in 1842 emphasized the importance of adequate waste removal and management facilities for improving the health and wellbeing of the city's population. In the UK, the Nuisance Removal and Disease Prevention Act of 1846 began regulated waste management, while the Metropolitan Board of Works was the first city-wide authority to centralized sanitation regulation. The Public Health Act of 1875 made it compulsory for households to deposit their weekly waste in "moveable receptacles" for disposal, marking the first concept of a dust-bin.[3]

The rise in waste disposal led to the development of incineration plants, or "destructors," in 1874 in Nottingham. Despite facing opposition due to the large amounts of ash produced, similar municipal systems emerged in Europe and North America in the 20th century. New York City became the first U.S. city with public-sector garbage management in 1895.

Waste management encompasses all activities and actions required to manage waste from its inception to its final disposal, including collection, transport, treatment, and disposal. It includes monitoring and regulation, legal frameworks, and guidance on recycling. Waste management encompasses all types of waste, including municipal, agricultural, and special wastes. Its goal is to reduce the negative effects of waste on health, the environment, and aesthetics. Practices vary across countries, regions, and sectors, including residential and industrial sectors.

9.3 Concepts for sustainable waste management

Raw materials are becoming scarcer and energy more expensive, and all around the world, soil, and air and water pollution pose a risk to sustainable development. Waste management is closely associated with both these problems: waste disposal issues are exacerbated by changing patterns of consumption, industrial development and urbanization; this in turn means that traditional systems for solid waste disposal and recycling are no longer appropriate. This problem affects informal settlements in particular.[4]

a) Millenium Development Goals

The MDG (Millenium Development Goals) were eight international development goals for the year 2015 that had been established following the Millenium Summit of the U.N. in 2000, following the adoption of the United Nations Millenium Declaration. These were based on the OECD DAC

[3] See for reference htttp://en.m.wikipedia.org/wiki/waste_management (last visited on August 15, 2022).
[4] https://www.giz.de/en/worldwide/15109.html, (last visited on January 19, 2020).

International Development Goals agreed by Development Ministers in the "Shaping the 21st century Strategy". The Sustainable Development Goals (SDGs) succeeded the MDGs in 2016. All 191 U.N. member states, and at least 22 international organizations, committed to help achieve the following Millenium Development Goals by 2015.[5]

1. To eradicate extreme poverty and hunger.
2. To achieve universal primary education
3. To promote gender equality and empower women.
4. To reduce child mortality
5. To improve maternal health.
6. To combat HIV/AIDs, malaria and other diseases.
7. To ensure environmental sustainability.
8. To develop a global partnership for development.

The G8 finance ministers agreed in June 2005 to cancel $40 to $55 billion in debt owed by heavily indebted poor countries (HIPC) to redirect resources towards improving health, education, and poverty alleviation. The interventions evaluated included improving water supply, halving the proportion of those without access to safe drinking water by 2015, meeting the water MDG plus having adequate sanitation by 2015, increasing access to improved water and sanitation for everyone, providing disinfection at point of use, and providing regulated pipe water supply in house and sewage connections with partial sewerage for everyone. These interventions aimed to accelerate progress and improve the lives of those in need.[6]

b) Critics of the Millennium Development Goals (MDGs) argue that there is a lack of analysis and justification for chosen objectives, as well as uneven progress. Despite increased aid from developed countries, over half went towards debt relief, while the rest went towards natural disaster relief and military aid. In September 2010, a UN conference adopted a global plan to achieve the eight goals by their targets date. The plan focuses on women's and children's health, poverty, hunger, and disease, with non-governmental organizations like the United Nations Millennium Campaign, Millennium Promise Alliance, Global Poverty Project, Micah challenge, Youth in Action EU Programme, "Cartoons in Actions" video project, and the 8 Visions of Hope global art Project assisting.

c) Sustainable Development Goals

The United Nations (UN) established 17 interrelated goals to guide global development from 2015 to 2020. These goals have 169 targets and 232 indicators, aiding funders, investors, organizations, and the UN in assessing progress and completion of the Sustainable Development Goals (SDGs). The 2030 Agenda for Sustainable Development, adopted by all UN Member states in 2015, aims for peace and prosperity for people and the planet. The SDGs emphasize the need for poverty reduction, health and education improvements, inequality reduction, economic growth, climate change mitigation, and ocean and forest preservation. Despite decades of work by countries and the UN, the SDGs have not achieved the desired goal.[7]

In 1992, over 178 countries adopted Agenda 21, a plan for sustainable development to improve human lives and protect the environment. The Millennium Declaration was adopted in 2000, leading to the

[5] Ibid 4
[6] Hutton, G. Evaluation of the Cost and Benefits of Water and Sanitation Improvements at the Global Level, WHO-Geneva), 2004.
[7] https://www.givingcompass.org, (last visited on February 2, 2022)

Declaration of eight Millenium Development Goals (MDGS) to reduce extreme poverty by 2015. The Johannesburg Declaration on Sustainable Development and the World Summit on Sustainable Development in 2002 reaffirmed the global community's commitments to poverty eradication and the environment, emphasizing multilateral partnerships.

In 2012, the United Nations Conference on Sustainable Development (Rio+21) in Rio de Janeiro, Brazil, adopted the outcome document "The Future We Want." This document aimed to develop a set of Sustainable Development Goals (SDGs) to build upon the Millennium Development Goals (MDGs) and establish the UN+20 outcome. In 2013, the General Assembly established a 30-member Open Working Group to develop a proposal on SDGs. In 2015, the General Assembly began the post-2015 development Agenda process, leading to the adoption of the 2030 Agenda for Sustainable Development, which focuses on 17 SDGs. In 2015, significant agreements were adopted, marking a significant milestone in multilateralism and international policy shaping.

Sendai Framework for Disaster Risk Reduction (March 2015)

Addis Ababa Action Agenda on Financing for Development (July 2015)

Transforming our world: the 2030 Agenda for Sustainable Development with its 17 SDGs was adopted at the UN Sustainable Development Summit in New York in September 2015.

Paris Agreement on climate change (December 2015)

The annual High-level Political Forum on Sustainable Development serves as the central UN platform for the follow-up and review of the SDGs.

The DSDG in UNDESA supports and builds capacity for the Sustainable Development Goals (SDGs) and related issues, such as water, energy, climate, oceans, urbanization, transport, science, technology, the Global Sustainable Development Report, partnerships, and small island developing states. It plays a crucial role in evaluating the UN system's implementation of the 2030 Agenda, ensuring broad ownership and commitment from all stakeholders to achieve the global goals.[8]

The Sustainable Development Goals (SDGs) aim to achieve a better and more sustainable future for all by 2030. These goals include no poverty, zero hunger, good health, quality education, gender equality, clean water and sanitation, affordable energy, decent work and economic growth, industry innovation, infrastructure, reducing inequality, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, strong institutions, and partnerships for the goals. A UN Resolution adopted on July 6, 2017, made the SDGs more "actionable" by identifying specific targets and indicators for progress towards each goal. The target year is typically between 2020 and 2030.[9]

Europe is increasingly using waste for materials and energy production, with recycling saving more greenhouse gases than it generates. However, developing and emerging countries face the challenge of improving their inadequate waste management systems. Waste must no longer be deposited in residential areas, uncontrolled landfills, illegal rubbish tips, or waterways. Marine litter accumulates in oceans, and plastic waste, particularly plastic, damages flora and fauna and enters the human food chain as micro particles. Uncontrolled waste deposits in waterways and oceans are largely due to non-existent or inadequate waste management. Development cooperation projects are not adequately addressing technical, organizational, and financial strategies for sustainable waste and resource management. Waste

[8] https://sdgs.un.org.goals, (last visited on February 2, 2022

[9] https://education.nationalgeographic.org/resource/sustainable-development-goals/ (last visited on March 22, 2021)

management is connected to urban development, water, energy, and food security, which has been overlooked in the past.

Solid waste causes pollution to environment in following ways:

1) Untreated solid waste emits greenhouse gases
2) When burnt/unburnt solid waste emit toxic fumes and particular matters
3) When left unsegregated and disposed safely they accumulate in open landfills
4) They contaminate ground water by leaching of chemical and organic compositions
5) They pollute water bodies by rain water/flood water runoff when disposed carelessly.

9.4 Management of Municipal Solid Waste

India generates 62 million tonnes of waste, with plastic being the largest, followed by biomedical, hazardous, and e-waste. The OECD defines solid waste management as supervised handling from generation to disposal. The total collected waste is 43 million tones, with 11.9 million tones treated and 31 million tones dumped in landfills.

Municipal solid waste management (MSWM) involves controlling waste generation, storage, collection, transportation, processing, and disposal using principles of public health, economics, engineering, conservation, aesthetics, and environmental considerations. It involves multiple stakeholders, including government agencies, suppliers, consumers, treatment/recycle service providers, and transporters. The product prices and composition of generated MSW depend on factors like production location, season, and economic development. An optimal management strategy should consider uncertainties in the supply chain and multiple participants to create synergistic opportunities. This paper presents a multi-objective optimization approach for strategic planning of a municipal solid waste management system under uncertainty, considering tasks like recycle, reuse, transportation, separation, and distribution. The model considers financial risk and aims to maximize the benefit of all participants while ensuring a sustainable and realistic waste management system.

Waste in Britain is primarily deposited in large holes in the ground, often in old quarries. The House of Commons Environment Committee reported on toxic waste and contaminated land in 1989 and 1990, revealing the extent of problems. Estimates range from 10,000 hectares to 100,000 hectares of contaminated land. The dangers of waste disposal sites have already been experienced in Britain, with examples of abandoned housing estates, polluted water supplies, deaths due to indiscriminate waste dumping, and unusable areas due to long-term pollution problems.[10]

9.5 Treatment & Disposal of Solid Waste

The Municipal Solid Waste can be disposed off in the following ways and a little discussion about the process of disposing the waste is mentioned below.

1. Open Dumps
2. Landfills
3. Sanitary landfills
4. Incineration Plants
5. Pyrolysis
6. Composting

[10] BALL SIMOND AND BELL STUART ENVIRONMENTAL LAW, P. 305, 2nd edi. Universal Law Publishing Co. Pvt. Ltd. (1996).

7. Vermiculture
8. Bioremediation
9. Phytoremediation
10. Micoremediation
11. Mycofiltration

Waste handling practices

Pyrolysis is a waste disposal method that can produce recovered fuels, steel, and heat, and can also be used for cement manufacturing. Pyrolysis plants are operational in various countries, including the USA, California, Australia, Greece, Mexico, the UK, and Israel. In some jurisdictions, unsegregated waste is collected at curb-side or waste transfer stations and sorted into recyclables and unusable waste. San Francisco has implemented a Mandatory, Recycling, and Composting Ordinance to achieve zero waste by 2020. The city collects recyclables and compostable waste using a curbside "Fantastic 3" bin system, which is provided to residents and businesses. The city's "Pay-As-You-Throw" system charges customers by the volume of landfill-bound materials, providing a financial incentive to separate recyclables and compostable waste from other discards. The Department of the Environment's Zero Waste Program has led to 80% diversion, the highest diversion rate in North America.[11]

DISPOSAL SOLUTIONS

Disposal of waste in a landfill involves burying the waste and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, miming, and voids or borrow pits. A properly designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly designed or poorly managed landfills and open dumps can create a number of adverse environmental impacts such as wind-blown litter, attraction of vermin and generation of liquid leachate. Another common product of landfills is gas (mostly composed of methane and carbon dioxide, which is produced from anaerobic breakdown of organic waste. This gas can create odor problems, kill surface vegetation and is a greenhouse gas.

Design characteristics of a modern landfill include methods to contain leachate such as clay or plastic lining material. Deposited waste is normally compacted to increase its density and stability and covered to prevent attracting vermin (such as mice or rats). Many landfills also have landfill gas extraction systems installed to extract the landfill gas. Gas is pumped out of the landfill using perforated pipes and flared off or burnt in a gas engine to generate electricity.

a) INCINERATION

Incineration is a waste disposal method that converts solid organic waste into residue and gaseous products. It is useful for solid waste management and waste water management, reducing waste volumes by 20-30%. Incinerators convert waste materials into heat, gas, steam, and ash. Incineration is used by individuals and industries on a small scale and is recognized as a practical method for disposing hazardous waste materials, such as biological medical waste. However, it is controversial due to concerns about gaseous pollutant emissions. Incineration is common in countries like Japan due to limited land resources. Waste-to-energy (WtE) facilities burn waste in furnaces or boilers to generate heat, steam, or electricity. However, combustion in incinerators is not always perfect, and concerns have

[11] Ibid 3

been raised about pollutants in gaseous emissions. Persistent organic compounds like dioxins, furans, and PAHs may be created, potentially causing serious environmental consequences.[12]

Siting a sanitary landfill involves a complex evaluation process that considers factors like distance to roads, habitation, infrastructure, and soil leach contaminants. This process requires processing large volumes of spatial data, regulations, and acceptance criteria, as well as efficient correlation between them. GIS plays a significant role in waste disposal site siting decisions, as it manages large volumes of spatial data from various sources. The integration of GIS and Analytical Hierarchy Process (AHP) is a powerful tool for solving landfill site selection problems. AHP is a systematic decision approach developed by Saaty (1980) that decomposes the problem into a hierarchy of sub-problems, making it easier to understand and subjectively evaluate. The subjective evaluations are converted into numerical values, ranked on a numerical scale. Overall, GIS and AHP are essential tools for determining the optimal disposal location for sanitary landfills.[13]

b) RECYCLING

Recycling is a resource recovery practice that involves collecting and reusing waste materials, such as empty beverage containers, to create new products. It can be collected separately from general waste using dedicated bins and collection vehicles, or in some communities, all recyclable materials are placed in a single bin for collection and sorting is handled at a central facility. Common consumer products recycled include aluminum, copper, steel, polyethylene, PET bottles, glass bottles, paperboard, newspapers, jars, paperboard magazines, light paper, corrugated fireboard boxes, and corrugated materials like PVC, LDPE, PP, and PS. These items are typically composed of a single type of material, making them relatively easy to recycle into new products. However, recycling complex products like computers and electronic equipment is more challenging due to the additional dismantling and separation required.[14]

c) RE-USE

Recoverable materials that are organic in nature, such as plant material, food scraps, and paper products, can be recovered through composting and digestion processes to decompose the organic matter. The resulting organic material is then recycled as much or compost for agricultural or landscaping purposes. In addition, waste gas from the process (such as methane) can be captured and used for generating electricity and heat (CHP/cogeneration) maximizing efficiencies. The intention of biological processing in waste management is to control and accelerate the natural process of decomposition of organic matter.[15]

ENERGY RECOVERY

Energy recovery from waste involves converting non-recyclable waste materials into heat, electricity, or fuel through processes like combustion, gasification, pyrolysis, anaerobic digestion, and landfill gas recovery. This non-hazardous waste management hierarchy generates renewable energy, reduces carbon

[12] https://www.sciencedirect.com/topics/chemistry/waste-incineration (last visited April 20, 2021)
[13] Volume 4, Number 1 Khan Debishree, Samaddar S.R., Application of GIS in Landfill Sitting for Municipal Solid Waste International Journal of Environmental Research and Development, P 37-40, ISSN 2249-3131, Research India Publication, http://www.ripublication.com/ijerd.htm (last visited on April 5, 2021).
[14] https://www.britannica.com/science/recycling (last visited on April 15, 2021)
[15] https://www.mdpi.com/2073-4395/10/11/1838 (last visited on August 20, 2020)

emissions, and accounts for 16% of global waste management. This process generates electricity and heat, generating renewable energy and reducing methane generation from landfills.[16]

Waste products can be harnessed for energy through direct combustion fuel or indirectly through thermal treatment. Thermal treatment includes cooking, heating, gas fuel, and steam and electricity generation in boilers. Pyrolysis and gasification are related forms of thermal treatment, where waste materials are heated to high temperatures with limited oxygen availability. Pyrolysis converts solid waste into solid, liquid, and gas products, which can be burned for energy or refined into other chemical products. The solid residue can be further refined into activated carbon.Gasification and advanced plasma convert organic materials into synthetic gas, composed of carbon monoxide and hydrogen, which is then burned to produce electricity and a stream. An alternative to pyrolysis is high temperature and pressure supercritical water decomposition (hydrothermal monophasic oxidation).

RESOURCE RECOVERY

Resource recovery involves systematically diversion of waste for specific uses, such as recycling, to extract materials and resources. This process is performed at a facility, reducing waste disposal, saving landfill space, and conserving natural resources. Resource recovery is environmentally important and cost-effective, reducing waste and conserving resources. Resource recovery, using LCA (life cycle analysis), offers alternatives to waste management. Studies suggest administration, source separation, collection, reuse and recycling of non-organic fractions, and energy and compost/fertilizer production of organic material via anaerobic digestion. Many items thrown away contain precious metals, which can be recycled for profit. Other industries can benefit from resource recycling, with wood chippings in pallets and other packaging materials being passed onto sectors like horticulture.[17]

AVOIDANCE AND REDUCTION METHODS

An important method of waste management is the prevention of waste material being created, also known as waste reduction. Methods of avoidance include reuse of second-hand products, repairing broken items instead of buying new, designing products to be refillable or reusable (such as cotton instead of plastic shopping bags), encouraging consumers to avoid using disposable products (such as disposable cutlery), removing any food/liquid remains from cans and packaging, and designing products that use less material to achieve the same purpose (for example, lightweighting of beverage cans).[18]

Waste hierarchy

The waste hierarchy refers to the “3 Rs” reduce, reuse and recycle and the “3 Rs" which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste. The waste hierarchy is represented as a pyramid because the basic premise is for policy to take action first and prevent the generation of waste. The next step or preferred action is to reduce the generation of waste i.e. by re-use. The next is recycling which would include composting. Following this

[16] https://www.epa.gov/smm/energy-recovery-combustion-municipal-solid-waste-msw (last visited on April 5, 2021)
[17] https://www.epa.gov/smm/managing-and-reducing-wastes-guide-commercial-buildings (last visited on May 20, 2021)
[18] Eco-friendly Waste Management - A proposal presented by Renu Sharma available at chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://mscw.ac.in/Documents/Waste%20Management.pdf (last visited on May 6, 2022)

step is material recovery and waste-to-energy. Energy can be recovered from processes i.e. landfill and combustion, at this level of the hierarchy. The final action is disposal, in landfills or through incineration without energy recovery. This last step is the final resort for waste which has not been prevented, diverted or recovered. The waste hierarchy represents the progression of a product or material through the sequential stages of the pyramid of waste management. The hierarchy represents the latter parts of the life-cycle for each product.[19]

9.6 Management of Solid Waste:

For waste management we stress on three R`s- Reduce, Reuse and Recycle before destruction and safe storage of wastes.[20]

1. Reduction in use of raw materials: Reduction in the use of raw materials will correspondingly decrease the production of waste. Reduce demand for any metallic product will decrease the mining of their metal and cause less production of waste.
2. Reuse of waste materials: The refillable containers which are discarded after use can be reused. Villagers make casseroles and silos from waste paper other waste materials. Making rubber rings from the discarded cycle tubes which are used by the newspaper vendors, instead of rubber bands. Because of financial constaints poor people reuse their materials to the maximum.
3. Recycling of materials: Recycling is the reprocessing of discarded materials into new useful products.
   i) Formation of some old type products e.g. old aluminium cans and glass bottles are melted and recast into new cans and bottles.
   ii) Formation of new products: Preparation of cellulose insulation from paper, preparation of fuel pellets from kitchen waste. Preparation of automobiles and construction materials from steel cans.

   The process of reducing, reusing and recycling saves money, energy, raw materials, land space and also reduces pollution. Recycling of paper will reduce cutting of trees for making fresh paper. Reuse of metals will reduce mining and melting of ores for recovery of metals from ores and prevent pollution.

   For discarding wastes the following methods can be adopted

   i) Sanitary landfill: In a sanitary landfill, garbage is spread out in thin layers, compacted and covered with clay or plastic foam.

      In the modern landfills the bottom is covered with an impermeable liner, usually several layers of clay, thick plastic and sand. The liner protects the ground water from bottom is pumped and sent for treatment. When landfill is full it is covered with clay, sand, gravel and top soil to prevent seepage of water. Several wells are drilled near the landfill site to monitor if any leakage is contaminating ground water. Methane produced by anaerobic decomposition is collected and brunt to produce electricity or heat.

[19] Doru Alexanderu Plesea and Smaranda Vison "Good Practices regarding Solid Waste Management Recycling", The Bucharest Academy of Economic Studies, Romania. Vol. XII, No. 27 (February 2010).

[20] A. Kaushik and C.P. Kaushik, Perspectives in Environmental Studies (New Age International (P) Limited, Publishers formerly Wiley Eastern Limited, Delhi 2nd edn., 2006).

ii) Composting: Due to shortage of space for landfill in bigger cities, the biodegradable yard waste (kept separate from the municipal waste) is allowed to degrade or decompose in an oxygen rich medium. A good quality nutrient rich and environmental friendly manure is formed which improves the soil conditions and fertility.

iii) Incineration: Incinerators are burning plants capable of burning a large number of incineration high levels of dioxins, furans, lead and cadmium may be emitted with the fly ash of incinerator. Dioxin level may reach many times more than in the ambient environment. For incineration of minerals, it is better to remove batteries containing heavy metals and plastic containing chlorine before burning the materials. Prior removal of plastics will reduce emissions of dioxins and polychlorinated biphenyls (PCBs)

9.7 BENEFITS

Waste is not something that should be discarded or disposed of with no regard for future use. It can be a valuable resource if addressed correctly, through policy and practice. With rational and consistent waste management practices there is an opportunity to reap a range of benefits. Those benefits include:[21]

1. Economic - Improving economic efficiency through the means of resource use, treatment and disposal and creating markets for recycles can lead to efficient practices in the production and consumption of products and materials resulting in valuable materials being recovered for reuse and the potential for new jobs and new business opportunities.
2. Social - By reducing adverse impacts on health by proper waste management practices, the resulting consequences are more appealing settlements. Better social advantages can lead to new sources of employment and potentially lifting communities out of poverty especially in some of the developing poorer countries and cities.
3. Environmental - Reducing or eliminating adverse impacts on the environmental through reducing, reusing and recycling, and minimizing resource extraction can provide improved air and water quality and help in the reduction of greenhouse emissions.
4. Inter-generational Equity - Following effective waste management practices can provide subsequent generations a more robust economy, a fairer and more inclusive society and a cleaner environment.

9.8 Green Tribunal

The environmental law at present era is very important in order to control air pollution, water pollution and land pollution. The rapid development in the human society through urbanization and industrialization generates various forms of waste in the society. So, in order to manage the waste, environmental law is needed and to see whether the laws have been followed as per direction a Tribunal is needed. The aim and objective of establishing Green Tribunal is that people have a platform where they can sought remedies for violations of environmental law.[22]

Waste refers to unwanted, useless, pejorative, or filthy items that are discarded after their utility has elapsed. The concept of waste is complex and subjective, with differing perceptions among societies, stakeholders, and individuals. In developing countries like India, waste disposal is a problematic task but also creates valuable treasures for millions of people involved. In industrialized countries, excessive solid waste generation poses a threat to society, and municipal authorities face difficulties disposing of

[21] Ibid 12
[22] https://www.greentribunal.gov.in/ (last visited Januar 20, 2023)

such waste. In developing countries, waste is often dumped as a treasure for these people. Wastes also serve as a means of survival for underprivileged individuals, ensuring their livelihood through waste collection and disposal. In urban India, waste collections are a significant source of livelihood for these people.Solid Waste Management in India, traditionally has been a neglected area of urban development and it often resulted in severe urban health problems in the past. In September 1994, Surat a part of Gujarat faced devasting plague. After this incident, the solid waste management has been reasonably discussed and put on the political agenda in India. This has made the government at centre, state and Municipal Corporation to pay more attention to the topic of solid waste management and now Non-Governmental Organisations (NGOs) and individuals are also engaging themselves in the waste management policies. But the common public apathy towards filth and garbage has stopped most of the waste management policies and programmes. As a result of the currently experienced rapid economic development and the immense industrial growth. Indian cities are now –a- days confronted with an unprecedented amount of waste and the consequential difficulties relating to waste collection difficulties relating to waste collection, and disposal.

9.9 Conclusion

Sustainable waste management is handling waste in a way that is technologically feasible, socially acceptable, and environmentally sound. Strategic planning, the development of institutional capacity, financial incentives, the use of technologically and economically feasible innovations, public-private partnerships, and community involvement are used to achieve minimum negative impact municipal solid waste have on environment. Waste management is all those activities and action required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling etc. Waste management practices are not uniform among countries developed and developing nations, regions urban and rural areas and sectors residential and industrial.