

# SUSTAINABLE WASTE MANAGEMENT: AN APPROACH TOWARDS SUSTAINABILITY

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**Abstract :** Waste management is considered to be closely associated with sustainable development. This paper highlights that traditional systems for waste disposal and recycling are no longer appropriate. Many developing and emerging countries are facing major challenge in improving their inadequate and unsustainable waste management systems. Soil, air and water pollution are continuously posing risk to sustainable development. The paper emphasized that waste must no longer be deposited in residential areas and uncontrolled landfills. Waste management hierarchy has been described in the present study to deal with waste disposal problems. Further, benefits of opting sustainable waste management strategies as well as challenges in the area of waste disposal are also covered by the authors. It is identified that sustainable waste management provides a suitable decision in adopting a methodology for reducing waste with the involvement of all stakeholders in a community.

**Key words:** Sustainability, Sustainable Development, Waste Management Hierarchy

## I. INTRODUCTION

Waste management is the collection, transport, processing, recycling, treatment and disposal, managing, monitoring, regulating of waste materials. The term usually relates to the management of waste materials produced by human activity, and the process of reducing the effect of waste on human health and the environment. Waste materials can either be solid, liquid, gaseous or radioactive. Waste management practices may differ in developed and developing nations and for residential and industrial waste producers. Management of non-hazardous waste residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator subjected to local, national or international controls.

Sustainability takes into account all recourses available on planet like plants, water, minerals, land space etc and manage them in a way that these recourses always exist in the future. For a sustainably responsive world, waste management is essential. Waste management not only includes dispose of garbage in landfill, or recycling of waste but also it deals with how to not create waste.

## II. SUSTAINABLE WASTE MANAGEMENT

**Sustainable development** was defined in Brundtland Report of the World Commission on Environment and Development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This definition implies that actions of present practices should not threaten the cultures or living standards of societies. The degree to which sustainable development can be achieved by countries varies, since countries differ in size, wealth, living standards, culture, and political and administrative systems. Wealth and advanced technology may make it easier for industrialized countries to strive for sustainable development, but this is not always the case.

One way of having **Sustainable Waste Management** is to use material resources efficiently and reduce the waste production and deal in a way that actively contributes to the economic, social and environmental goals of sustainable development. Sustainable waste management can be actively addressed through the process planning in the following ways:

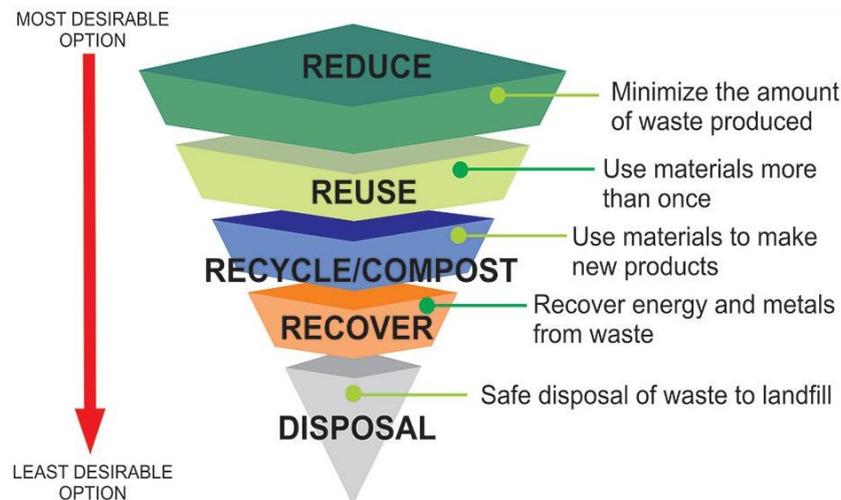
1. Optimum utilization of materials required for the building.
2. Reducing the amount of waste generated.
3. Management of construction and demolition wastes.
4. Materials specifications (e.g. use of reclaimed and recycled materials).
5. Provision of recycling space/facilities.

The different waste management options can be availed in an order known as the **Waste Management Hierarchy** that reflects the relative sustainability.

## III. SUSTAINABLE WASTE MANAGEMENT PRINCIPLES

One of the key principles underlying sustainable waste management is to ensure that waste should be dealt with waste hierarchy as much as possible. Since all waste disposal options have some impact on the environment, the only way to avoid impact is not to produce waste in the first place, and waste prevention is therefore at the top of the hierarchy. Then it is reuse of materials followed by recovery techniques (recycling, composting and generating energy from waste). Disposal to landfill or by incineration, is considered as the worst option, and kept at the bottom of the hierarchy.

**WASTE MANAGEMENT HIERARCHY:** The framework or approach for achieving reductions in waste in sustainable waste management is the Waste Hierarchy. The waste hierarchy provides a framework where waste management options are set out in priority in order to enable the correct choice to be made while assessing “how to deal with waste”. In the hierarchy, waste prevention is the most environmental friendly and disposal the least desirable option. The hierarchy applies to almost all waste streams.



**Fig. 1: Waste Management Hierarchy**

### 3.1 WASTE PREVENTION / REDUCTION

Prevention is associated with product design and manufacturing phase. It also aims to help consumers in keeping products longer life and reuse them by preventing waste before it occurs. Money can be saved in the collection, treatment or disposals of waste. It also reduces the environmental impact and costs of extracting more raw materials, production and use. This is a critical point as it aims to minimise waste before that is even generated by improving product design and packaging. Promoting waste prevention by using targets or other means could help in reducing over packaging in supermarket goods. Household packaging waste makes up a substantial amount of overall household and municipal waste.

### 3.2 MATERIALS REUSE

This means different processes of checking, cleaning, repairing, refurbishing, whole items or spare parts that have become waste are prepared so that they can be re-used. Reusing products and materials for the same (or alternative) purpose is the next preference. Before a material can be reused it should be assessed for its quality as it may be necessary to make minor repairs or additions before the product can reach the required standard. According to recent estimates, one third of all material arriving at recycling centers and other sites can still be re-used; at least 25% of electronic waste still has significant re-use value. For example, Spain is the only country that has a separate preparation for re-use target to incentivize operators to extract materials that have been collected as waste but are useful and do not need to undergo further treatment processes such as recycling or energy recovery.

### 3.3 RECYCLING AND COMPOSTING

Recycling involves the collection, separation and process involves turning waste into a new substance or new products, e.g. newspapers are regularly recycled either to make new newspapers or eco-friendly home insulation. Composting is the same process but with organic wastes, e.g. food waste composted to make new fertilizer products. Recycling and composting processes usually require some energy to work well, however, the energy and cost to alternatively make new products from scratch are usually much greater. The economic viability of recycling/composting depends on factors such as the quality of the waste stream, the transport distances involved and the market price for the recycled materials which can fluctuate significantly. The aim should be to recycle construction wastes as close to their source as possible as they are typically heavy and bulky to transport.

Despite that most of us have easy access to recycling; the sobering truth is that over 60% of the trash that ends in the trash could be recycled. A UK study also found that almost 40% of the packaging found in a typical shopping basket cannot be easily recycled. So, both manufacturers and consumers need to step up efforts on recycling.

### 3.4 ENERGY RECOVERY

Energy from waste ignition recovers a proportion of energy from the waste stream; usually much less than by recycling/composting, reusing or reducing the waste generated in the first instance. Recovery includes processes of waste management such as anaerobic digestion, incineration, gasification or pyrolysis which produces energy (fuels, heat and power) and materials from waste. When recycling is not possible, other recovery options need to be identified so that the material does not end up in landfill.

### 3.5 LANDFILL DISPOSAL

Disposal is the last option in the waste hierarchy and therefore the aim is to divert waste from this end destination. The bottom tier of the EU's waste hierarchy for sustainable waste management involves landfill and incineration without energy recovery. This is the least favorable option of waste management systems.

## IV. PROXIMITY PRINCIPLE

Wherever possible the Proximity Principle should be applied transporting waste incur environmental, social and economic costs, therefore, waste should be dealt with as near to the place of production as possible. The transportation of waste causes significant environmental and nuisance impacts plus unwanted additional cost. Therefore, the proximity principle encourages processing, recycling, reuse or disposal of waste. This has the added benefit of raising awareness about waste and encouraging ownership of the problem at the local level. Both environmental and economic costs need to be considered while deciding the most appropriate route of waste disposal. This decision should take into account all the costs and impacts associated with waste disposal, including those associated with the movement of waste.

## V. BENEFITS OF SUSTAINABLE WASTE MANAGEMENT

Sustainable waste management delivers lots of benefits:

1. The greatest advantage of waste management is keeping the environment fresh and neat
2. Saves the Earth and conserves energy
3. Reduced waste disposal costs (especially Landfill and Aggregate taxes).
4. Reduced greenhouse gas emissions from landfill and incineration.
5. Reduced energy consumption from the manufacturing process.
6. Improving economic efficiency through the means of resource use, treatment and disposal and creating markets for recycled can lead to efficient practices in the production and consumption of products.
7. Reduced requirement for additional landfill capacity.
8. Reduced nuisance created by odor and visual intrusion from landfill sites.
9. Improved corporate reporting and green credentials for business.
10. Saves valuable time and resources during an incident
11. Allows more efficient and effective waste management decision-making during an incident
12. Encourages stakeholders (e.g., state, local, tribal and territorial governments; owners of private storage, treatment and disposal facilities; residents) to work together before an incident occurs
13. Minimally detracts from, or otherwise impacts, the broader response and recovery efforts due to the efficient implementation of waste management activities.

## VI. CHALLENGES TO DELIVERING SUSTAINABLE WASTE MANAGEMENT SYSTEMS

Limited environmental awareness along with low motivation has inhibited innovation and the adoption of new technologies that could transform waste management. Public attitudes to waste are also a major barrier to improving it. Following are some challenges for developing sustainable waste management -

1. lack of training in waste management and the availability of qualified waste management professionals is limited
2. High transportation cost
3. Uncontrolled scavenging
4. Inadequate budget
5. In efficient waste collection and transportation

6. Inadequate management and maintenance of equipments
7. Low public education and awareness of waste management issues
8. No alternative treatment strategy
9. Improper disposal method - Illegal burning & dumping
10. Aesthetic problem

## VII. CONCLUSION

Present lifestyle has placed pressure on the environment and caused imbalance in the eco systems by the producing, consuming and wastage of natural resources. Most countries evidently have major effects on the environment due to solid waste generation with economic development since the natural resources are used, and waste and pollution are produced. Therefore, the concern towards the management of solid waste as an integral part for sustainable development has increased. The most sustainable way to manage waste is to recycle and compost. The purpose of this paper is to propose a simple microeconomic framework for sustainable waste management that captures the increasing array of opportunities to approach waste residuals. This phase of the waste management cycle is still relatively under-discussed in the literature. The concept of sustainable waste management develops a suitable decision making methodology for sustainable waste management involving all stakeholders in a community. This methodology explains the development, evaluation and implementation of a waste management strategy. A hierarchy, whose levels operate in isolation of each other, serves to undermine the concept itself. Inherent in the hierarchy levels is that they are linked by way of preference and benefit, thus the importance of viewing the entire concept as a model for increasing resource use efficiency and reducing impacts associated with consumption.

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