

# Implication of Sustainable Waste Management

Debashree Mohanty<sup>1</sup>, Pradeep Kumar Mohanty<sup>2</sup>, Dr. Manmath Kumar Biswal<sup>3</sup>, Dr. Uttam Panda<sup>4</sup>  
<sup>1,2</sup>*Department of Mechanical Engineering, Balasore College of Engineering and Technology, Sergarh, Balasore–756060, Odisha, India (Affiliated to Biju Patnaik University of Technology, Rourkela, Odisha)*  
<sup>3</sup>*Honorable Chairman of Balasore College of Engineering and Technology, Sergarh, Balasore–756060, Odisha, India (Affiliated to Biju Patnaik University of Technology, Rourkela, Odisha)*  
<sup>4</sup>*Department of Chemistry, Balasore College of Engineering and Technology, Sergarh, Balasore–756060, Odisha, India (Affiliated to Biju Patnaik University of Technology, Rourkela, Odisha)*

**Abstract**—The idea of sustainability is associated with the persistence of various facets of society, such as the institutional, social, economic, and environmental spheres. In response to the damaging social and environmental impacts of the economic progress model. The machining sector studies innovative techniques to improve process efficiency and lower manufacturing costs. It also looks into how best to apply these techniques while also addressing the mounting environmental issues. Stakeholders are pushing companies to be more environmentally conscious in their operations and product development for a variety of reasons, including legal obligations, product stewardship, public perception, and possible competitive benefits. This study examines the relationships between particular environmentally friendly manufacturing techniques and particular competitive results in the commercial carpet sector in the United States, an industry that is significant for the environment but has received little attention. Empirical study on how environmental practices affect organizational outcomes is generally equivocal, in part because of the shortcomings of previous investigations. This study analyses the whole commercial carpet market in the United States and tackles some of these issues; the respondents account for 84 percent of the market. Results point to a potential benefit of environmentally friendly manufacturing techniques for competitive outcomes. Specifically, several forms of environmentally friendly production methods (like pollution avoidance and product stewardship) are linked to various competitive results (like production costs and product quality). Engineering and operations managers can benefit from these particular discoveries as they adapt to changing market and environmental demands.

**Index Terms**—analysis pollution, avoidance production, carpet sector, empirical study, public stewardship.

## I. INTRODUCTION

Waste is produced by human activity and is managed, stored, collected, and disposed of in a way that may be harmful to the environment and public health. India's fast industrialization and urbanization have put an excessive amount of strain on the country's urban infrastructure services, particularly those related to municipal solid waste (MSW). India's rapidly increasing urbanization and industrialization has placed an undue burden on the nation's urban infrastructure services, especially those pertaining to municipal solid waste (MSW). Because there aren't enough facilities to handle and dispose of the growing quantity of MSW produced every day in urban areas, the management of MSW is entering a crucial phase.

As the nation works to become an industrialized nation by 2020, there will likely be a large increase in the volume of MSW in the near future. India's metropolitan areas are mostly to blame for the solid waste management (SWM) issue.

Unscientific disposal has a negative effect on human health and other aspects of the environment. Effective SWM systems are required to improve human health and safety; these systems should also be economically and environmentally sustainable.

## II. LITERATURE REVIEW

### A. Literary Sources

Secondary data was used by Nitish Bagdi et al. (2013)[1] to apply waste management strategies in the Indian construction sector. Information derived from shareholder interviews that addressed some of the major concerns advantages for recycled materials for India's construction sector. By using appropriate construction and demolition techniques, the amount of C&D waste generated can be reduced to some extent. According to Shishir Bansal et al.

(2014)[2], as there are less natural resources available for construction, the construction industry must decrease the quantity of C&D waste it produces and boost reuse and recycling. Given global experiences and the fact that natural source aggregate is becoming scarce in many regions of the nation, recycled aggregate is now suitable for use in construction operations. Government municipal trash legislation must be updated, effective strategies must be prepared, and stringent guidelines and restrictions are essential to. According to Abhijith Harikumaret al. (2014)[3]. When waste materials are properly reduced, reused, and recycled, they won't end up added to the waste at disposal and dumping sites. Some waste minimization elements that are useful for the construction industry's deployment of construction waste management systems were found by Rawshan Ara Beguma et al. (2007)[4]. The most important, as well as the maximum construction practiced, less practiced waste minimization factors in Malaysia's construction industry, are indicated by the weighted average model of factors and minimization and practiced index value of factors and analysis. Effie Papargyropoulou et al. (2011)[5] examined attitudes and responses of Malaysian contractors towards waste management by conducting interviews with Malaysian contractors. The study focused on the current status of waste management in the construction sector in Malaysia as well as the degree of sustainable practices on construction sites. concluded that the industry's commitment to the level of awareness of waste management is very low and discouraging. Al- Hajj A. et al. (2012)[6] found through a review of the literature that construction strategies to lower the generation of construction waste in UAE building sites were identified from data collection. They came to the conclusion that individuals are unaware of the need for waste management on construction sites, give it less importance, and believe it will add to project costs. In order to reduce the costs associated with Indian construction projects, Mansi Jain et al. (2012)[7] concentrated on the financial elements of waste minimization of construction waste materials.. They discovered the reasons of comprehensive procedure for calculating building and demolition waste management options using the Decision Matrix technique was created by Manal S. et al. (2014)[8]. Additionally, the introduced approach aids in the strategic consideration of the various influencing aspects by decision-makers such as C&D

contractors. It is also advised to perform a cost and benefit analysis for each CDW M system stakeholder, taking into account the advantages and disadvantages of each strategy that have been presented. According to Sumit Arora et al. (2015)[9], natural resources are finite and will eventually run out. Restrictions and regulations on needless waste of natural resources are important to preserve them. C&D waste can be reduced by developing and implementing an appropriate waste management plan that is followed throughout the project's life cycle. According to Harish P. Gayakwad et al. (2015)[10], managing garbage from construction and demolition projects. Waste from construction and demolition is separated. In order to put the fundamental ideas of Reduce, Reuse, and Recycle into practice, Sadhan K. Ghosha et al. (2015)[11] created a model for recyclable material transit rates and resale value that utilizes readily available data

#### *B. Definition of Waste Management*

Traditionally waste management refers to three waste management methods. Collecting, transporting and disposing of waste materials. Traditionally voices generated is collected and set off to landfill sites or incineration facilities. However, this method mainly deals with the. Aftermath of waste generation rarely addressing the root cause of the problem. Sustainable waste management takes things a step further than getting rid of waste. It's not just about removing the waste from a facility but about achieving sustainable waste management aims, such as :

- reducing the amount of waste generated in the first place
- reusing where possible
- recycling what can't be reused
- selling what we can ('one man's waste is another man's treasure)
- only then, disposing of what's left

Sustainable waste management looks for solutions that don't harm the environment or human health and focus on reducing natural resource consumption.

The process of sustainable waste management encompasses a few key steps:

1. Collection of waste
2. Sorting and processing
3. Recovery of materials or energy from waste.
4. Recycling into new products



Fig1. Sustainable utilization of raw materials

### III. THE IMPORTANCE OF IMPLICATION OF SUSTAINABLE WASTE MANAGEMENT

Primarily, sustainable waste management aids in reducing pollution and conserving natural resources. It also yields substantial economic and social benefits.

Let's explore further the reasons why it's not just beneficial but an essential practice for industrial and commercial waste management.

Grasping the significance of sustainable waste management isn't solely about recognize its benefits but also observing its practical implications. let's consider the environmental Implications, economic benefits, and social benefits , Resources conversation, Pollution reduction, Green house reduction, Energy reduction , Landfill implications are implications of sustainable waste management.



Fig 2: environmental implication

#### A. ENVIRONMENTAL IMPLICATION:

One of the most significant implications of sustainable waste management is its positive impact on the environment. Human activities have long exerted pressure on natural ecosystems, leading to the degradation of air, land, and water resources. **Air Quality Improvement:** Traditional waste management practices, such as incineration, can release harmful pollutants into the atmosphere, contributing to air pollution and associated health problems. For instance, recycling aluminum cans saves up to 95% of the energy required to produce

new aluminum from raw materials.

**B. WATER QUALITY PROTECTION:** Improper waste disposal can lead to the contamination of water bodies through the leaching of hazardous chemicals. Traditional land filling methods are particularly concerning, as they can result in the seepage of toxic substances into groundwater.

**C. LAND CONSERVATION:** Landfills occupy vast tracts of land, often rendering it unusable for other purposes. Additionally, landfills are significant sources of methane, a potent greenhouse gas that contributes to climate change. Sustainable waste management reduces the reliance on landfills by promoting waste reduction, recycling, and composting. By diverting waste away from landfills,

#### D. ECONOMIC BENEFITS:

Sustainable waste management also has profound economic implications, offering benefits such as job creation, cost savings, and the development of new industries. These economic opportunities are essential for driving sustainable growth and improving the efficiency of waste management systems.



Fig 3: economic implication

**Job Creation:** The shift towards sustainable waste management requires the establishment and expansion of industries related to recycling, waste-to-energy, and sustainable product design. The recycling industry, for example, is a significant employer in many countries, providing jobs in collection, sorting, processing, and resale of recyclable materials.

**Cost Savings:** Traditional waste disposal methods, such as land filling and incineration, are expensive and resource-intensive. The costs associated with waste collection, transportation, and disposal can be substantial for municipalities and businesses. Sustainable waste management practices, by reducing the volume of waste generated and promoting recycling and reuse, can lead to

significant cost savings.

**Development of a Circular Economy:** Sustainable waste management contributes to the development of a circular economy, where materials are continuously reused and recycled rather than being discarded after a single use. This approach conserves resources and creates new economic opportunities by turning waste into valuable products. For example, recycled materials like paper, plastic, and metals can be used to produce new goods.

#### E. SOCIAL IMPLICATION:

The social implications of sustainable waste management are often overlooked, but they are nonetheless significant. By reducing pollution, conserving resources, and promoting social equity, sustainable waste management practices can improve public health, enhance the quality of life, and foster community well-being.



*Fig 4: social implication*

**Improved Public Health:** Poor waste management practices, such as open dumping and uncontrolled burning, can release harmful pollutants into the environment, posing serious health risks to local communities. These risks include respiratory problems, waterborne diseases, and exposure to hazardous substances. Sustainable waste management practices, such as recycling, composting, and the safe disposal of hazardous waste.

**Enhanced Community Well-being:** Clean, well-maintained environments are essential for the well-being of residents, contributing to a sense of pride and community cohesion. Sustainable waste management practices, by reducing the amount of waste sent to landfills and incinerators, help create cleaner, more attractive living environments. This can lead to increased property values, improved community aesthetics, and greater social satisfaction.

**Social Equity:** In many parts of the world, marginalized communities are disproportionately affected by the negative impacts of waste disposal,

such as pollution and health risks. These communities often lack the resources to properly manage waste, leading to increased exposure to environmental hazards. Sustainable waste management practices help to address these disparities by ensuring that all communities have access to clean, healthy environments.

#### F. RESOURCE CONSERVATION:

Resource conservation is a central goal of sustainable waste management. By reducing waste production and promoting the efficient use of resources, sustainable waste management helps to preserve natural resources for future generations, ensuring that they can meet their own needs.



*Fig5: resource conservation*

**Reduction in Raw Material Demand:** The extraction and processing of raw materials, such as minerals, timber, and fossil fuels, have significant environmental impacts, including habitat destruction, soil degradation, and pollution. For example, recycling paper reduces the need for timber, helping to preserve forests and the biodiversity they support. Similarly, recycling metals like steel, copper, and aluminum

**Efficient Use of Resources:** Sustainable waste management promotes the efficient use of resources by encouraging the reuse of products and materials. This approach extends the life cycle of goods and reduces the overall consumption of resources. For example, reusing glass bottles, metal containers, and plastic products can reduce the need for new materials and the energy required to produce them. Additionally, sustainable product design, which prioritizes durability, reparability.

#### G. POLLUTION REDUCTION:

Sustainable waste management plays a crucial role in reducing pollution, which is essential for protecting the environment and public health. Traditional waste disposal methods, such as land filling and incineration, can release harmful pollutants into the air, water, and soil, leading to environmental degradation and health problems.

**Reduction of Air Pollution:** Incineration of waste can release harmful pollutants, such as dioxins, furans, and heavy metals, into the atmosphere. These pollutants can contribute to respiratory problems, cardiovascular diseases, and other health issues in exposed populations. By reducing the need for incineration through waste reduction, recycling, and composting, sustainable waste management helps to lower air pollution levels.

**Prevention of Water Pollution:** Landfills can produce leachate, a toxic liquid that can contaminate groundwater and surface water. This contamination poses significant risks to aquatic ecosystems and human health, particularly in areas where water resources are scarce. Sustainable waste management practices, such as the proper disposal of hazardous waste and the diversion of organic waste from landfills, help to prevent water pollution.

**Protection of Soil Quality:** Improper disposal of hazardous waste, such as chemicals, batteries, and electronic waste, can lead to soil contamination. Contaminated soil can harm plant and animal life, reduce agricultural productivity, and pose health risks to humans. Sustainable waste management practices ensure the safe collection, treatment, and disposal of hazardous waste, preventing soil contamination and protecting soil quality.

#### H. LANDFILL REDUCTION:

Landfill reduction focuses on minimizing the amount of waste that ends up in landfills to mitigate environmental impact and conserve resources. This approach involves several key strategies:

**Waste Diversion:** This includes recycling and composting. Recycling processes materials like paper, glass, and metals so they can be reused, while composting organic waste such as food scraps and yard waste transforms it into valuable compost for soil enrichment, reducing landfill volume.

**Waste Minimization:** Strategies like source reduction involve designing products with less packaging or using fewer materials to generate less waste. Product redesign can also make items easier to repair or recycle.

**Waste-to-Energy Technologies:** Incineration and anaerobic digestion are methods to convert waste into energy. Incineration burns waste to produce electricity or heat, while anaerobic digestion processes organic waste to generate biogas, a renewable energy source.

**Extended Producer Responsibility (EPR):** EPR programs hold manufacturers accountable for the

lifecycle of their products, including take-back schemes to manage end-of-life disposal and recycling.



*Fig 6: land fill reduction*

#### V. CONCLUSION

Explosion in world population is changing the nature of WM from mainly a low priority, localized issue to an internationally pervasive social problem. Risks to public health and environment due to solid waste in large metropolitan areas are becoming uncontrollable. There is a pressing need for sustainable approaches for WM. Steps are being taken by the government, but still a more systematic approach is required along with the usage of latest and cost-effective technologies at various possible levels. Sustainable waste management fosters a circular economy, where materials are reused and repurposed, reducing the need for virgin resources and lowering environmental impact. It also enhances community health and quality of life by reducing exposure to harmful waste and fostering cleaner, greener environments.

Ultimately, adopting and advancing sustainable waste management practices not only addresses pressing environmental challenges but also supports long-term economic and social resilience. By integrating these approaches, societies can move towards a more sustainable future, balancing human needs with ecological stewardship.

#### VI. ACKNOWLEDGMENT

We thankfully acknowledge our honorable chairman of the institution Dr.M.K.Biswal for his continuous support and inspiration. Additionally we tribute respect all scientists and researchers for their dedication and contribution to enrich us. The authors have no conflict of interest.

#### REFERENCE

- [1] Nitish Bagdi. Vipin Aggarwal and Neetu

- Sherwala2013) •Management of Construction Waste in India: A Case of Green Technology" Global Journal of Management and Business Studies. ISSN 2248-987\* Volume 3. pp. 361-364.
- [2] Shishir Bansal. S K Singh, (2014), "A Sustainable Approach towards the Construction and Demolition Waste" International Journal of Innovative Research in Science, Engineering and Technology. Vol. 3. Issue 2, pp -9226-9235.
- [3] Abhiith Huikumar, Sreejith M El,priya A\_JacobAiswarya S; 121114/ •Minimizing Construction Wastes By Efficient sue WEAR vol. 4. spL-2, P-40-4S.
- [4] Rawshan Ara Beguma, Chamhuri Siwar a. Joy Jacqueline Pereira a, Abdul Hamid Jaafar b, (2007) "Implementation of waste management and minimization in the construction industry of Malaysia "Resources Conservation and Recy.ling.ELSEVIER.PP-190-202.
- [5] Effie papargyropoulou, Prof Dr Christopher preece, Dr Rory Padfield. AnisAdilaBt Abdullah, (201 1 ) "Sustainable Construction Waste Management In Malaysia: A Contractor's persvx•ctive" Management and Innovation for a Sustainable Built Environment. ISBN: 9789052693958. PP-I-IO.
- [6] Al-llajj X, Iskandarani T. (2012)." Reducing Waste Generation on the UAE Construction Sites." International Conference on Innovation in Architecture, Engineerang & Construction, PP. 1-13.
- [7] Jain Mansi, e012j "Economic Aspects of Construction Waste Materials in terms of cost savings — A case of Indian construction Industry" International Journal of Scientific and Research Publications, Volume 2, Issue 10. PP. 1-7.
- [8] Manal S. Abdel amid, (2014) "Assessment of different construction and demolition waste management approaches" Housing and Building National Research Center. IIBRC Journal. pp-31 S- 326.
- [9] Gaganl and Sumit Arora2.(2015), " Recycled Aggregates: A Sustainable Solution of Construction and Demolished Waste" IOSR Journal of Mechanical and Civil Engineering. e-ISSN: 2278-1684, p- ISSN: 2320-334X. pp 58-63.
- [10] Harish\_ Gayak•vad, Nehx E\_ Susanc, (211]5) and Ocnmltion Waste Minagement in India" Internati"nal R.s.ar"h J'.M.ur.al of Engilk"ing and T"hnology. Volume: 02 Issue: ?P-712-71 i.
- [11] Sadhan K Ghosha. ILS Haldarb, S. Chatterjeec, p. Ghosh.(2015). "An Optimization Model on Construction and Demolition Waste Quantification from Building" International Conference on Solid Waste 279 -Control practices: LegislatÅe and Waste Management perspective" 6th International Research Symposium in Service Management. Elsewier. pp- 276 — 283,