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"Small Changes, Big Impact: Strategies for Tracking, Reducing, and Reusing Plastic Waste in Everyday Life"

Mrs Pavani Cherukuru, Faculty, DSATM, Bengaluru

Dhanalakshmi G [1], K Sai Sharan Reddy [2], Balakrishna S [3] and Surya D V [4] Students,

DSATM, Bengaluru

Abstract: Plastic materials have revolutionized the modern world, leading to many technological advancements that have transformed our daily lives. However, the overuse and mismanagement of plastic waste have led to an environmental crisis that threatens the planet's health and sustainability. Since the center of the 20th century, Plastics have also played a vital role in food packaging, extending the shelf life of products and reducing food waste. In the electronics industry, plastic components have contributed to the development of smaller and more efficient devices, improving performance and reducing energy consumption. The versatility of plastic has made it a ubiquitous and indispensable component in many industries. However, the indiscriminate use of plastic, particularly single-use plastics, has led to severe environmental consequences, including pollution, habitat destruction, and climate change. Plastic waste poses a significant challenge to the environment, with millions of tons of plastic waste generated each year globally. The negative impact of plastic waste on the environment is a growing concern, leading to increasing efforts to find more sustainable and efficient solutions for plastic waste management.

Keywords: Tracking, Reusing, Plastic waste, Types

1. INTRODUCTION

Plastic waste has become a global environmental challenge that poses a significant threat to the health and sustainability of the planet. From the mid-20th century onwards, plastic materials have played a crucial role in the advancement of technology and have become indispensable in almost all facets of contemporary existence. However, the growing accumulation of plastic waste in landfills, oceans, and ecosystems has led to severe environmental consequences such as pollution, habitat destruction, and climate change. Over the past few years, there has been an increasing focus and funding towards discovering better and more eco-friendly methods to handle plastic waste. Tracking, reducing, and reusing plastic waste have emerged as promising approaches to addressing the plastic waste problem. The tracking of plastic waste involves monitoring and identifying sources, types, and quantities of plastic waste, providing valuable data to inform waste management strategies. Reducing plastic waste involves implementing measures to reduce plastic consumption, such as banning single-use plastics, promoting reusable products, and improving waste collection and recycling infrastructure. Reusing plastic waste involves repurposing plastic waste for alternative uses, such as building materials, furniture, and clothing, creating a more sustainable and circular economy. Innovative technologies, such as chemical recycling and pyrolysis, have also emerged as promising solutions for managing plastic waste, transforming plastic waste into valuable resources such as fuel and chemicals. However, there are significant challenges to the widespread adoption of sustainable waste management strategies, including technical and economic barriers, lack of public awareness and engagement, and regulatory hurdles. Moreover, addressing the plastic waste crisis requires global cooperation and coordination, as plastic waste knows no borders.

This paper will explore the tracking, reducing, and reusing of plastic waste as promising approaches to addressing the plastic waste problem. We will examine advanced technologies and innovative approaches to waste management, such as real-time monitoring, machine learning algorithms, and chemical recycling. We will also discuss the economic benefits of sustainable waste management strategies, such as cost savings and job creation in the recycling industry. Finally, we will highlight the challenges and barriers to implementing sustainable waste management strategies and the need for global cooperation and coordination to address the plastic waste crisis.

2. RELATED WORK

2.1 Plastic Waste Management: A Review of Existing Life Cycle Assessment Studies

Comparing different LCA studies is a challenging task, as most studies have specific objectives that may be limited to a particular region, company, or site. Even when project goals align, the use of different methodologies by LCA practitioners focusing on various impact categories can lead to varying results. Additionally, local factors such as waste composition, collection, and sorting practices, treatment options, government policies or incentives can influence waste management outcomes and further complicate comparative analysis. Therefore, any attempt to quantitively compare impact potentials across different LCA studies should be approached cautiously, with attention to differences in study methodologies. However, there is value in comparing general conclusions across similar LCA studies, even if the details differ. For instance, mechanical recycling emerged as an environmentally preferable option in most studies comparing waste treatment technologies, albeit with some caveats. Comparing LCAs can also help identify studies with different results and explore the reasons for such differences, thereby providing valuable insights into critical factors. For example, the variation in findings between Komly et al. and Chilton et al. regarding mechanical recycling of PET bottles can be attributed to the inclusion of transport-related impacts in Komly's study.

2.2 Roadmap for Circular Economy: Managing Plastic Waste in India

The article discusses the increasing problem of plastic waste in India, despite low consumption, and the need for effective waste management strategies to mitigate the crisis. The review analyzes data and information on current plastic production, consumption, and waste generation in India, highlighting critical issues such as reverse supply chain, effective management, source-specific recovery, and PW rules. The article aims to identify implementable strategies for policymakers and research opportunities for future researchers in holistic plastic waste management and recycling in India, focusing on the circular economy and sustainable development goals. And also, the article emphasizes the need for a circular economy approach, focusing on waste segregation, effective plastic waste management, and source-specific recovery. The reverse supply chain concept, which involves recovering plastic waste from consumers and bringing it back to the producers to be recycled, can also be implemented. Additionally, innovative technologies and business models can be developed to improve plastic waste recovery and recycling in India.

3. METHODOLOGY

Disposal of plastic has become a severe problem to the earth. These started affecting the landfill. When the waste plastic is filled on to land then it is neither absorbed into earth nor decomposed like any other wastes, which results landfill and any animals feeding on that will be affected with diseases. One another problem is caused due to the industries that use plastic, they burn the plastic after the use which causes many harmful gases released into air, and affecting living health, this can be referred to as **incineration**. The solution for all these problems could be **recycling** of plastic. The main benefit of recycling plastic could be we can reuse of plastic, in turn there would be no need of producing plastic. Environmental damage is also reduced due to this and bio-sources as well as fossil fuel sources could be used as an alternate.

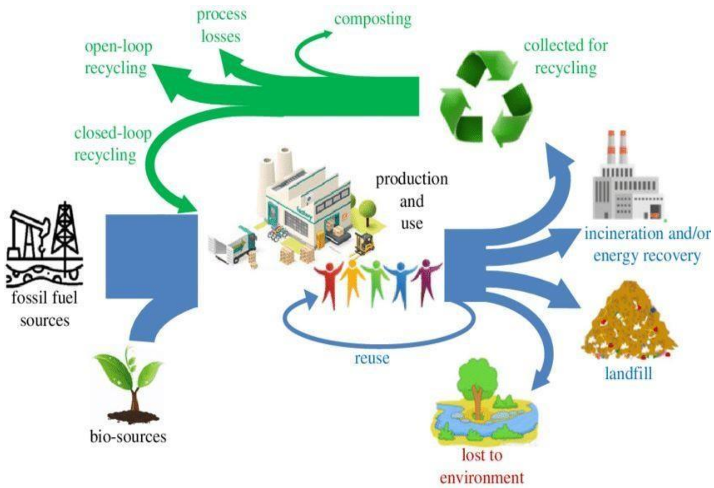

Figure 3.1: Schematic showing of life cycle of plastics

As our contribution to this great work, developed a web-application that tracks many other wastes like **paper, metal, glass, organic wastes** along with plastic waste and submitted to recycle and reuse of the wastes and thus reduce the wastes. The goal was to collect the information about these different wastes like where is it available and in what quantity from different sources and integrate with the industries and the companies that use these wastes for their productions and thus reduce the waste on Earth to some extent.

The web-application involves a total of 3 steps:

1. **Taking user waste collection**: Paper, Plastic, Organic, Glass, Metal makes up the first five categories of waste that are collected. Users may post trash.
2. **Transporting the user's garbage to the organization:** wherein the latter may order for the waste materials they wish to use or process.
3. **Utilization of Waste**: The organization now, uses the garbage by cautiously collecting it, processing it thoroughly and recycling it efficiently. (For example: A packaging organization may require old newspaper/books, an animal farm may require organic wastes and so on.)

The details need to be filled by the user include:
1.Contact
2.Community Name
3.Type of waste
4.Quantity of waste
5.Address

Details from company side include:
1.Type of waste Required
2.Address 3. Contact No.

A Total of 3 technologies in python environment and an algorithm is used in the development of the project. The A Star algorithm is used in the calculation of the distance.

1. **Django:** Django is a web framework based on Python, which provides an elevated approach to creating fast, secure, and sustainable websites. Crafted by experienced developers, Django simplifies many of the laborious tasks involved in web development, freeing up your time to focus on developing your application instead of rehashing pre-existing work.

2. **Google API:** Google Cloud APIs are instrumental in Google Cloud Platform as they offer programmable interfaces to its services, facilitating the effortless integration of computing, networking, storage, and data analysis abilities based on machine learning into your applications.

3. **Google Dialog flow:** Dialog flow is a platform for Natural Language Processing (NLP) that is specifically designed to develop applications catering to customer conversations and experiences across various languages and multiple platforms. Its primary purpose is to create actions for Google Assistant devices, and an example of this application is the development of a chatbot named Samarth Assistant using Dialog flow.

3.1 A Star Algorithm

The A* ("A-star") algorithm is utilized for graph traversal and path searching and is widely used in various fields of computer science due to its completeness, optimality, and optimal efficiency. However, it has a significant practical disadvantage in terms of space complexity since it stores all generated nodes in memory. As a result, in practical travel-routing systems, other algorithms that can pre-process the graph to achieve better performance and memory-bounded approaches are often more effective than A*. Nonetheless, A* remains the best solution for many cases.

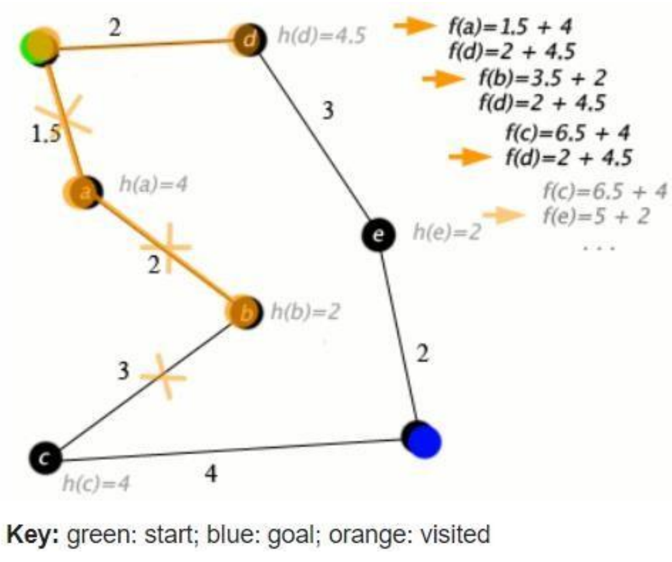

Figure 3.2: A-Star Algorithm

4. RESULTS AND DISCUSSION

The A Star algorithm is employed to measure the distance between available waste and required waste, and the methodology involves collecting information on various waste types that are represented graphically. The analytics are displayed in the figure below, which demonstrates the different reusable sectors identified in Figure 3. Additionally, Figure 4 presents a bar graph that shows the quantity of waste in kilograms for each reusable sector, providing insight into plastic consumption performance. Overall, this method allows for a quantitative analysis of waste management practices and highlights opportunities for improving sustainability efforts in various sectors.

Figure 4.1: Consumption of plastic in different sectors

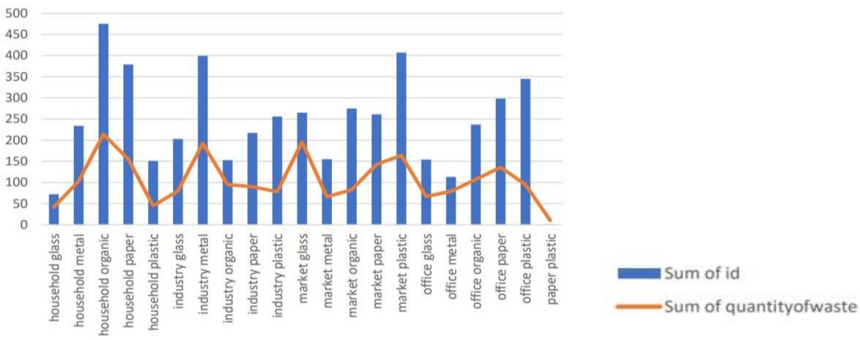

Figure 4.2: Performance of plastic Consumption in Quantity(kg)

5. CONCLUSION

In summary, reducing plastic waste requires a comprehensive approach that involves reducing plastic consumption, reusing plastic items, and recycling what is possible. By incorporating these practices into our daily lives, we can protect our planet and create a more sustainable future. To promote the wellbeing of our planet and its inhabitants, it is crucial to decrease plastic waste. To attain this goal, one practical approach is to adhere to the three R's: reduce, reuse, and recycle. To reduce plastic usage, individuals can opt for substitutes to disposable plastic products like reusable shopping bags, water bottles, and food containers. Supporting companies that use sustainable packaging materials is also essential. Reusing plastic items like bags and containers can further decrease waste by extending their usefulness and reducing the need for new plastic products. Recycling is another important method to lessen plastic waste. However, not all plastic materials can be recycled, and inadequate infrastructure and contamination can hinder the process. Therefore, prioritizing reducing and reusing plastic before recycling is critical. Overall, reducing plastic waste requires a comprehensive approach that involves lessening plastic usage, reusing plastic items, and recycling when possible. By integrating these practices into our daily lives, we can safeguard our planet and create a sustainable future.

6. REFERENCES

[1] ASTM D883-17 (2017) Standard terminology relating to plastics, ASTM International, West Conshohocken,PA. www.astm.org

[2] Environmentally Sustainable Management of Used Personal Protective Equipment [2] Narendra Singh, Yuanyuan Tang, and Oladele

[3] Hui Ling Chen1. Tappan Kumar Nath1. "The plastic waste problem in Malaysia": management, recycling and disposal of local and global plastic waste

[4] Shanker, R., et al. "Plastic waste recycling: existing Indian scenario and future opportunities." International Journal of Environmental Science and Technology (2022): 1-18

[5] The plastic waste problem in Malaysia: management, recycling and disposal of local and global plastic waste, Hui Ling Chen1 · Tapan Kumar Nath1 · Siewhui Chong2 · Vernon Foo3 · Chris Gibbins1 ·Alex M. Lechner1,4

[6] Plastic waste recycling via pyrolysis: A bibliometric survey and literature review, Sabino Armenise a , Wong SyieLuing a,b ,Jos´e M. RamírezVel´ asquez c

[7] Plastic waste recycling: existing Indian scenario and future opportunities, R. Shanker2 D. Khan2 · R. Hossain1 · Md. T. Islam1 · K. Locock3 · A. Ghose1 · V. Sahajwalla1 · H. Schandl3 · R. Dhodapkar2

[8] Adrados A, de Marco I, Caballero B, LÃpez A, Laresgoiti M, Torres A (2012) Pyrolysis of plastic packaging waste: a comparison of plastic residuals from material recovery facilities with simulated plastic waste. J Waste Manag 32(5):826–832

[9] Alam O, Billah M, Yajie D (2018) Characteristics of plastic bags and their potential environmental hazards. Resour Conserv Recycl 132:121–129.

[10] Lungu M (2004) Electrical separation of plastic materials using the triboelectric effect. Miner Eng 17:69–75

[11] Lebreton L, van der Zwet J, Damsteeg JW, Slat B, Andrady A, Reisser J (2017) River plastic Emissions to the world's oceans. Nat Commun 8:15611

[12] Assis G, Skovroinski E, Leite V, Rodrigues M, Galembeck A, Alves M, Eastoe J, Oliveira R (2018) Conversion of "Waste Plastic" into photocatalytic nanofoams for environmental remediation. ACS Appl Mater Interfaces 10(9):8077–8085

[13] Dayana S, Sharuddin A, Abnisa F, Daud W, Aroua M (2017) Energy recovery from pyrolysis of plastic waste: study on non-recycled plastics (NRP) data as the real measure of plastic waste. Energy Convers Manag 148:925–934

[14] Mason SA, Garneau D, Sutton R, Chu Y, Ehmann K, Barnes J, Fink P, Papazissimos D, Rogers DL (2016) Microplastic pollution is widely detected in US municipal wastewater treatment plant effluent. Environ Pollut 218:1045–1054

[15] Gu F, Guo J, Zhang W, Summers PA, Hall P (2017) From waste plastics to industrial raw materials: a lifecycle assessment of mechanical plastic recycling practice based on a real word case study.

[16] Hartulistiyoso E, Sigiro F, Yulianto M (2015) Temperature distribution of the plastics pyrolysis process to produce fuel at 450°C. Proced Environ Sci 28:234–241

[17] Kalogerakis N, Karkanorachaki K, Kalogerakis G, Triantafyllidi EI, Gotsis AD, Partsinevelos P, Fava FH (2017) Microplastics generation: onset of fragmentation of polyethylene films in marine environment mesocosms.

[18] Lei J, Yuan G, Weerachanchai P, Lee S, Li K, Wang J, Yang Y (2018) Investigation on thermal dechlorination and catalytic pyrolysis in a continuous process for liquid fuel recovery from mixed plastic wastes. J Mater Cycles Waste Manag 20:137–146

[19] Avio C, Gorbi S, Regoli F (2017) Plastics and microplastics in the oceans: from emerging pollutants to emerged threat.

[20] Benedetti M, Cafiero L, De Angelis D et al (2017) Front pyrolysis of WEEE plastics using catalysts produced from fly ash of coal gasification. Environ Sci Eng 11:11