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Waste to Wealth: Making of Plastic Bricks by Recycling Single use Plastics for Sustainable Plastic Waste Management

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Abstract: Plastic items have become a vital part of our daily lives, and as a result, polymers are produced on a vast scale around the world. Plastic began to be produced in large quantities after 1952. The annual manufacturing of plastic has expanded roughly 200 times since then. Global plastic output amounts to over 400 million tons on average. Of which sixty percentage, make their way into landfills or our natural surroundings. Globally, about 17% of plastic garbage is burned. Merely 15% of which is recycled. The creation of plastic garbage is a geographical issue since all plastic waste, whether it is on land or in the ocean, eventually finds its way into streams and rivers. According to various scientific studies, these wastes break down into micro-plastics, when these are exposed to sunlight, rain, sand, and sea salt. which once more enter the human body through the food chain. The "waste to wealth" effort has made it possible to recycle plastic garbage and create new goods. The current project is an inventive approach to managing plastic trash, involving attempts to turn single-use plastics into plastic bricks.

Keywords: Plastic pollution, plastic waste, waste to wealth.

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I. INTRODUCTION

Initiatives for environmental protection on World Environment Day (June 5) led to the decision to concentrate on plastic. 2023's World Environment Day emphasizes how crucial it is for each person to make a personal effort to reduce plastic pollution. Following the start of mass manufacture of plastic in 1952, yearly production has increased by around 200 times (EO Indexes, 2022). This spike demonstrates how public objectives influence business and governmental efforts to reduce plastic pollution (Smith, 2020). Several studies demonstrate how urgently action is needed to safeguard the earth, human society, and the ecosystem from the damaging impacts of plastic pollution (Brown & Williams, 2019). With billions of tonnes of plastic trash produced annually, one of the biggest worldwide issues at the moment is plastic garbage (World Bank, 2021). Hazardous gasses are released when plastic products are burned, harming food and water (United Nations Environment Programme, 2018). According to Geyer, Jambeck, and Law (2017), output is expected to treble by 2040 if strong efforts are not taken to reduce it. Plastic pollution is an international problem that keeps getting worse since it travels by air, rivers, and seas. For nano- and microplastics in particular, this is accurate (Thompson et al., 2009). Eighty-five percent of marine debris is made up of plastic, which is extremely dangerous for marine life (National Geographic, 2018). The World Bank (2021) reports that 46% of plastic waste is disposed of in land-based landfills as opposed to oceans. Approximately 17% of plastic waste is burned worldwide (United Nations Environment Programme, 2018). Just 15% of it gets recycled, according to Geyer, Jambeck, and Law (2017). Each of these processes leads to atmospheric pollution (Thompson et al., 2009). According to Smith (2020), a sustainable method involves gradually reducing plastic use. The long-term solution is to use materials other than plastic (Brown & Williams, 2019).

As everyone knows, it takes hundreds of years for plastic waste to decompose in the environment (Geyer, Jambeck, & Law, 2017). In the presence of sunlight, rain, wind, and sea salt, these waste materials break down into minute particles that transform into invisible fibers (Thompson et al., 2009). In addition to single-use plastic, there is also zero-use plastic produced (United Nations Environment Programme, 2018). Less plastic needs to be made and consumed. Waste can be reduced by using only what is necessary rather than covering everything with plastic (Smith, 2020). Public awareness must be raised about the fact that cutting back on plastic usage doesn't mean making major sacrifices.

With an emphasis on encouraging sustainable production and usage, a legally enforceable worldwide agreement on plastic pollution is urgently required. Brown and Williams (2019) suggest that the reduction of plastic waste generated can be achieved by using resource efficiency measures such as the circular economy.

There must be a change in waste management. The need for environmentally responsible plastic waste management is an essential element (UNEP, 2021). Public involvement will help the Global Plastics Agreement's decision-making process (World Bank, 2022). Making plastic bricks, tiles, and mats from single-use plastics is an inventive sustainable way of plastic waste management (National Geographic, 2023). Recycling and repurposing plastic trash into new products is the result of the "waste to wealth" campaign (Smith, 2023). By using this method, collected plastic can be used to make specific, reusable products that won't harm the environment. According to the World Economic Forum (2023), the government ought to offer appropriate incentives and allocate funds towards substitute plastic products whenever possible. India's handloom industry can lead the charge in lowering plastic consumption. This strategy will help the nation's economy, reduce pollution, and create more jobs (Indian Ministry

of Textiles, 2023). The current project intends to transform plastic garbage into plastic tiles, bricks, and carpets in order to minimize the enormous amount of waste into manageable chunks at Suryapet municipality.

II. METHODOLOGY

Steps involved in plastic road construction:

Step 1: The Dry Resource Collection Center (DRC) gathers, separates, and cleans plastic waste, where the gathered plastic debris is dried and cleaned in preparation for processing.



Figure 2.1: Showing plastic waste separated, collected and deposited in dumper machine.

Step 2: After cleaning, the plastic will be sent for Granule machine processing. Plastic comes out as granules or plastic chips.



Figure 2.2: Granule machine or also called polythene chips maker machine

Step 3: Plastic waste turns into granules that are supplied to plastic manufacturers after being heated to higher temperatures. Granules are shaped and utilized as bricks and tiles for various applications. The heated plastic granules are formed using iron frames, which then transforms them back into usable plastic.



Figure 2.3: Outcomes of plastic waste recycling

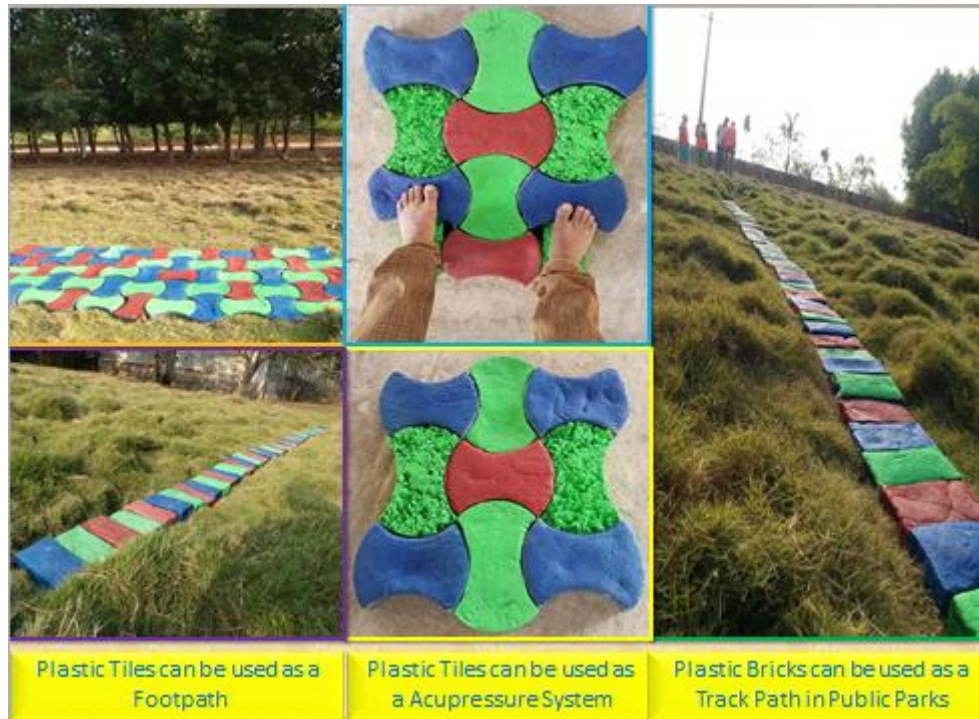


Figure 2.4: Applications of plastic waste

III. PLASTIC ROADS IN INDIA: STATUS

Plastic highway constructions prove as great example of converting trash into treasure! You might have noticed that plastic is utilized in many products, such as toys, bags, and bottles. However, from the literature we learnt that highways are being constructed with plastic collected from waste streams, that creates circular economy. Indeed, that is accurate! Nowadays, these roads are great places to recycle plastic (National Geographic, 2023). Dr. Rajagopalan Vasudevan, scientist from India, was the one who initially suggested the idea of road construction using waste plastic (The Hindu, 2023). This technology was adopted by Chennai for the first time in the world. A thousand kilometers of plastic roads were to be built, according to a 2004 municipality order (Times of India, 2023). Nonetheless, the directive from the Union Government to utilize waste

IV. RESULTS

The implementation of plastic highways has yielded significant positive outcomes. Utilizing plastic waste in road construction has proven as an effective method of recycling and that helps to reduce the burden of plastic pollution. The initiative, initially proposed by Indian scientist Dr. Rajagopalan Vasudevan, has seen practical application and success in various regions, particularly in India. Chennai, one of the pioneering cities, demonstrated the feasibility and benefits of this technology by issuing an order in 2004 for the construction of one thousand kilometers of plastic roads (Times of India, 2023). In 2015, the Union Government of India issued a directive to incorporate waste plastic into hot mixes for road construction, marking a significant milestone in the practical use of plastic in infrastructure (Indian Ministry of Environment, Forest and Climate Change, 2023). This directive has led to a substantial increase in the use of plastic for road construction, reducing the amount of plastic waste in the environment and providing a durable and cost-effective solution for road maintenance.

This innovative practice has contributed to environmental sustainability by reducing plastic pollution and promoting the recycling of plastic waste (Indian Ministry of Environment, Forest and Climate Change, 2023). Overall, the success of plastic highways in India serves as a model for other countries to adopt similar practices, turning waste into a valuable resource and contributing to a cleaner, more sustainable environment. A Rs 25 lakh plastic brick manufacturing business has been developed by the Suryapet municipality in Telangana. As a result, according to Times of India (2023), Suryapet became the first city in India to build pavements out of plastic bricks. The development and beautifying work is finished, providing the city a fresh look, according to Perumalla Annapurnamma, Chairperson of Suryapet Municipality (The Hindu, 2023). Brick production can substitute one or more raw components entirely or partially with plastic waste. A deeper comprehension of the application of waste plastics in bricks and additional study based on current findings are required to make long-lasting, high-quality bricks and to strike the best possible balance in all areas, particularly in relation to cost and functionality.

V. CONCLUSION

Globally, only 9% of plastic waste is being recycled, while only 15% of it is being collected for recycling, with almost 40% of that being disposed as residue (World Economic Forum, 2023). Another 19% of plastic waste is incinerated, 50% ends up in landfills, and 22% escapes waste management systems entirely, ending up in uncontrolled dumpsites, open burning pits, or terrestrial and aquatic environments, particularly in poorer countries (UNEP, 2022).

We can conclude that using plastic waste for pavement construction represents a most effective method for the disposal of plastic waste. This innovative technology not only strengthens road construction but also makes it more efficient and extends the lifespan of roads (National Geographic, 2023). Different types of road construction method have their own advantages and disadvantages, and their choice depends on various factors such as local conditions, budget, and sustainability goals (Smith, 2023). However, due to the disadvantages of plastic roads and a general lack of awareness about their benefits, this technology has not been widely implemented across many states in India (The Hindu, 2022).

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