



International Journal of Introspections on Sustainable Development Goals

IJISDG Vol. 02 (Issue 01), March 2023,
Paper 03, pg. 21-25



Waste Plastic Used In Building Construction.

Sub theme: Goal 11- Sustainable Cities and Communities

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Abstract

In this upgrading world, day-to-day life has become fast and the increased speed of life has created a need of using items which are easy to handle and easily available. This need has given rise to an extremely feasible and easily available material known as plastic. Similarly, plastic being an easily available material brings drawbacks like disposal of plastic. This has become a global issue that is worsening nowadays and needs to be handled with multiple measures to save ecosystem. Different efforts and approaches are getting evolved resolve this issue. The paper focuses on the need for disposal of waste plastic after its useful lifespan. Plastic as material can be disposed in various ways but it may take 100, of years to get disposed of. And thus, in this paper one of the way to recycle plastic is discussed elaborately. This analytical research is based on secondary data and studies. The waste plastic can be used as an alternative for some of construction materials. As materials like bricks, aggregate can be replaced in some amount by processing this waste plastic and altering its properties. This process of alteration includes changing properties of plastic like carbon emission, which is most important while using plastic as, construction material. Plastic can be used for making bricks with method that includes collection, burning, batching, mixing, molding, curing. This research helps author to understand significance of plastic used in construction in form of bricks. Plastic bricks prove to be light weight and water tight. Construction from these bricks reduces the plastic waste, makes the structure light weight, eco-friendly to some extent and earthquake resistant.

Keywords

Upgrading life, Waste plastic, Disposal, Construction material, Carbon emission, Bricks

1. Synopsis

1.1 Aim-

To reduce the waste plastic by recycling it in form of construction Material.

1.2 Objective-

- To understand the generation rate of waste plastic .
- To study the harmful effects of waste plastic on the environment.
- To study the process for recycling waste plastic in form of construction material.

2. Introduction

The has changed lifestyle and continuous increasing population has resulted in a major rise in the quantity of plastic waste generation. The world's annual consumption of plastic materials has increased from 5 million tons (1950's) to 100 million tons nowadays, resulting in a consequential increase in the quantity of plastic waste generation. From this plastic waste, some part is recycled but the major part of plastic wastes, like shampoo packets, carry-bags, , milk packets , plastic bottles and water bottles etc is dumped in landfills . The main problem with plastic is its decomposition. Plastic is made of fossil fuels, chemicals which are non-biodegradable which means that plastic will not decompose when it is dumped in landfills. However plastic is very useful material that becomes waste after its useful life span which pollute environment followed by air and land. Recycling is process of converting used plastic waste into new products to prevent the pollution. Nowadays use of eco-friendly and natural products has increased, may it be household items or materials in construction. Thus, it has given rise to think for recycling of products like plastic which produced extensively but decomposed in very small quantity due its chemical property limitations. Plastic can be best recycled in construction industry which is growing in today's world with huge development and techniques.

3. Literature Review

Today, a significant amount of plastic waste is discarded daily (PURANDARE, 2016). People dump plastic without taking into account the potential effects that it may have on the environment or humans. The goal of this paper is to look at the usage of plastic waste materials in the construction industry. One of the main benefits of using plastic waste materials in the construction industry is that they may be recycled to create valuable products. Additionally, it aims to contrast the qualities of some plastic waste products, such as shredded bottles, plastic packets, with some construction materials, including brick, ceramic, and concrete block.

4. Present scenario of India's plastic waste generation

In our daily lives, plastic and the things made from it are essential. According to a research by the UN Environment Programme, 400 million tonnes of single-use plastic waste are generated worldwide every year. (About 50% of total plastic waste) Only 9% of the total amount of plastic generated worldwide is projected to be recycled.

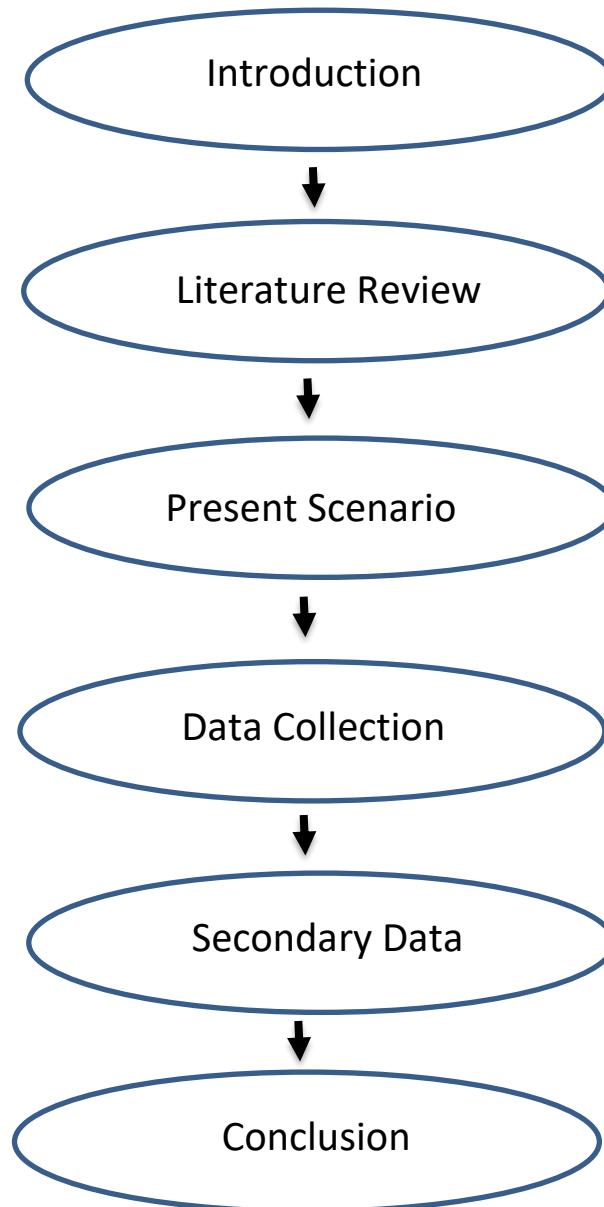
According to figures from the Federation of Indian Chambers of Commerce and Industry, India's per-capita plastic usage will rise from 11 kilogrammes in 2014–15 to 20 kg by 2022. It is termed useless after just one time use and is considered as plastic waste, which degrades very slowly in soil and remains the same over the time.

Its extensive range of appliances includes garments, toys, building supplies, packaging films, fluid, trash and shopping bags, containers, domestic and industrial products, and household and industrial products. Approximately 70% of plastic packaging products are thought to be quickly transformed into plastic waste.

The quantity of plastic waste produced annually in the nation is around 9.4 million tonnes, or 26,000 tonnes per day. Of this amount, about 5.6 million tonnes are recycled each year, while the other 3.8 million tonnes are left to be dumped or littered. India has a recycling rate that is significantly higher than the global average of 20%. Plastic typically requires 450 years to completely decompose. Despite all the reversible problems, it has a variety of benefits. Many of the methods we employ in our designs call for the utilisation of plastic materials.

5. Methodology

The study helps researchers to understand the amount of waste plastic generated and also major required for avoiding its harmful effects on ecosystem. The plastic can be recycled in various ways but this way of recycling plastic helps to gear up need of construction industry with reducing the plastic waste in a effective way. Waste plastic can be added to brick mixture by proper process which helps the bricks to become lighter and the structure made from the bricks is terms eco friendly.



Process of making bricks include the following:

- Collection
- Batching
- Burning
- Mixing
- Molding
- Curing

i. Collection:

The plastic should be collected from industrial, hospital, and industry waste as well as food packaging and plastic bottles. It can also be gathered from various institutions that are involved in such eco-friendly activities.

ii. Batching of plastic:

Batching refers to the measurement of brick-making materials. After gathering the materials, they sort them into different types of plastic, remove any additional debris that is included, and make sure that any samples having water are not burned.

iii. Burning of plastic:

After batching is finished, the plastic waste is taken for burning, where plastic waste is dropped into a container individually and left to melt. This is carried out in a closed vessel. So gas emission in air while burning plastic is avoided. Temperature at which this process is carried out is around 90 degree to 110 degree centigrade.

iv. Mixing of plastic:

Burned plastic debris must be mixed with other elements to create a consistent combination that will reinforce the brick. this process of mixing is done to ensure that the mass is homogeneous, color-uniform, and of the right consistency. The two main types of mixing are hand mixing and mechanical mixing. Before it solidifies, the plastic liquids (melted plastic from the burning process) should be carefully blended with a trowel. When river sand is added to melted waste plastic, the mixture takes relatively less time to set. Before the plastic solidifies, the sand is combined with the molten plastic. Therefore, the mixing process shouldn't take too long.

v. Molding:

The mixture is put into a mould once the necessary mixing process has been completed. Here, the mold is made of conventional brick sizes (19x9x9 cm). The brick is taken for curing and removed from the mold after two days.

vi. Curing:

After demolding, the brick is taken for curing. The brick must dry for 24 hours throughout this process. The bricks are placed in a curing tank after 24 hours and left there for 28 days to cure.

6. Construction Ability

As these recycled plastic bricks weigh less than regular red brick, they may be used to construct walls that are stronger than those made of regular brick and blocks, making structures more earthquake-resistant. By conserving energy and resources, recycling materials, reducing harmful gas emissions into the atmosphere, and providing large operational savings, plastic recycled bricks can contribute to green construction. They can also increase workplace productivity. These recycled plastic bricks can be used to build walls that are stronger than those built of conventional red brick and blocks, making constructions more earthquake-resistant, as they weigh less than regular red brick. Plastic recycled bricks can help reduce greenhouse gas emissions into the atmosphere by conserving energy and resources, reusing materials, and offering significant operational savings.

7. Conclusions

Be it plastic bottles or other plastic waste, plastic is regarded as an indecomposable waste type. Therefore, instead of using standard construction materials, this plastic trash might be used to alter this perception and foster a sustainable environment.

Utilizing cutting-edge materials with environmentally friendly applications, like plastic waste, can have a number of advantages, such as the best energy consumption optimization for the area, a reduction in environmental degradation, the establishment of appropriate structural behaviour in buildings, such as light weight structures, and it can also be used in projects where temporary structures are to be built.

Acknowledgement

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References

1. https://www.academia.edu/download/34286798/INNOVATIVE_TECHNIQUES_OF_WASTE_PLASTIC_USED_IN.pdf
2. <https://scholar.archive.org/work/5ilhq5k4mjhwvifpjwzz4fucta/access/wayback/https://www.civilejournal.org/index.php/cej/article/download/2401/pdf>
3. <https://www.academia.edu/download/59805157/IRJET-V6I423820190620-51995-1pt2dqs.pdf>
4. <https://www.sciencedirect.com/science/article/pii/S0956053X06002601>