A Study for utilization of plastic wastes in India

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Abstract- **This article examined the scope of the plastic waste management and housing problems in india. It made a case for plastic waste to be recycled into sustainable housing as a solution to both issues. For better understanding, it first analyses the scope of the plastic waste pollution and housing problems in developing countries. It then ascertains innovative ways waste managers, and planners have solved it in these nations. Thirdly, based on case studies in India, this study ascertained how using plastic waste in construction, is a potential solution for better waste management and better housing in every country.**

I. INTRODUCTION

In a world driven by consumerism and overproduction, the surplus of waste produced creates a significant waste management problem. Waste management in urban planning is becoming a critical issue, particularly in developing countries such as India, whose population keeps on increasing. Countries like the United States and Canada have so far managed their waste by outsourcing most of their recycling to other countries.

Adequate plastic waste management is challenging in developing countries, mainly due to their lack of infrastructure to accommodate their growing quantities of waste. The rapidly growing populations and rise in community living standards of urban cities of the developing world have increased the rate of their municipal solid waste, causing management to be a significant worldwide challenge. The collection of garbage causes an even bigger problem since, in many areas, municipal authorities of developing countries are either unwilling or unable to provide waste collection services to all residents in their jurisdiction[1].

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This amendment gives developing countries a fighting chance against their internal source of plastic waste. According to a new report released on march 7th of 2019th by gaia, filipinos use more than 163 million plastic packets, 48 million shopping bags, and 45 million thin-film bags daily[2]. India's per capita consumption of plastic is 11 kilograms, compared to the United States, where it is the world's highest at 109 kilograms, according to figures released by the federation of Indian chambers of commerce and industry in 2017. According to Ficci's data, the world average is about 28 kilograms, and consumption in India is projected by the government to increase to 20 kilograms by 2022 [3].

II. PLASTIC IN CONSTRUCTION

Plastic is a versatile material, most products today, likely have a plastic component to it. Plastics are being used today in the construction industry thanks to several of their properties. The wide variety of uses for plastic in the construction industry range from thermal insulation to plumbing, sinks, and baths to roof coverings. Plastic can be a chemically resistant, ductile, stable, and fire-resistant material. its shape shifting abilities allow it to be used in electric insulation, and wall finishing , suitable pigments can also be added in the process of manufacturing of plastic materials to get a more attractive result for a building structure [4].

Currently, plastic materials find use in buildings, mainly in thin coverings, panels, sheets, foams, pipes, etc. however, more skillful use of plastics can one day expand the usefulness and durability of conventional building materials and help them to function more efficiently and economically[4]. Plastic is even being used to reinforce concrete. The next evolution in the technology of cement and demands for 18 delivering more ecofriendly and sustainable construction projects paved the way to the idea of disposing of post-consumer waste plastics into structural concrete. the raw plastic granulate is used as a partial substitute for sand aggregate, which treats concrete as a medium for disposal of waste in the amounts that do not significantly affect its strength. Previous research has proven that concrete reinforced with plastic fibers is a more resilient building material than plain concrete, opening the door to the recycling of plastic to produce fibers to be used as secondary reinforcement for concrete along the traditional steel rebars [5].

III. PLASTIC WASTE MANAGEMENT IN INDIA

60% of the plastic waste collected in India gets recycled back into raw materials for further processing into consumer products, while the remaining is left unutilized. This is problematic since 1 to 4 percent of India's municipal solid waste by weight is made of plastic waste. The plastic waste that is generated is collected informally, traded, and reprocessed by known methods into useful products

[6].According to a primary survey done by the Tata energy research institute (teri) in 1996, plastics waste made up 4% to 9% of the waste across different income groups in india. in 1971, that percentage was only 0.7%. Almost all plastic wastes are sold to kabariwallahs (wealthy indians), who form the first link in the chain of plastics recycling. For the next step, small recycling companies recycle the solid waste, creating negative environmental impacts because of their use of outdated technology, the low quality of the raw material, and the absence of government support. This method of recycling, however, offer employment and help save the vast stretches of land needed for the disposal of wastes and the detrimental effects of landfills on the environment.

In 1995, Himachal Pradesh, a state in the northern part of India, introduced the "non-biodegradable garbage (control) act." the act's goal was to prohibit throwing or depositing of plastic articles in public places and facilitate their collection through identifiable and marked garbage receptacles for non-biodegradables, placed conveniently in public spaces. Haryana, another state in the northern part of India announced in 1997, a bill on non-biodegradable garbage like that of Himachal Pradesh. Following these two states example, the government of india recommended a strategy for plastics waste management that would cover the whole country. Some of these strategies included 27 various schemes to change the labeling of plastic products, and regulate the type of plastic that can be served with food items. The intention of these schemes, however, was not to reduce plastic waste but instead to minimize contamination, as well as the danger from the use of recycled plastic.

In India, most of the waste collection is done by the informal sector. There are two kinds of informal collectors, the chugnewallah or scavenger, and the kabadiwallah or itinerant buyer). Chugnewallahs take wastes from open spaces such as parks or streets, and kabadiwallahs purchase waste from households and public or private institutions [7]. In tikri kalan, there are three distinct areas of plastic trading known under the name of pvc market, badi tikri and choti tikri. The PVC market is shown in red, badi tikri in yellow, and choti tikri in green.

The main players in these three areas are traders who import plastic scraps from kabadiwallahs, who then import them to recycling industries. PVC market is the biggest trading area (kroiss, 2016), its name is however just a name, that has nothing to do with the type of plastic traded there.PVC market and choti tikri get their plastic scraps from kabadiwallahs located inside or outside delhi. Badi tikri gets its plastic scraps only from pvc market [2]. Plastic scraps leaving the markets are sold depending on their quality. Good quality plastic scraps are sold to plastic recycling factories, and lowquality ones go to brick-kilns.

While India has detailed rules covering the disposal of municipal solid waste, the implementation lags far behind. non-recyclable waste is mostly disposed of in poorly designed and overburdened landfills (biplob, gaurav, & saryu, 2015). so far, mainly the garbage collectors involved in door-to-door-collection of waste and waste pickers have managed to very efficiently sort waste and recover all items with sufficient economic value from the mixed waste stream[8]. One private entity, the plastic India foundation, an organization dedicated to promoting responsible uses of plastics in India, created an environmental committee report for the years 2015 to 2018. This report is packed with awareness programs on plastic waste management practices, beach cleanup drives, rallies and marathons to spread awareness. The foundation initiated awareness drives at various places in India educating masses on how effectively they can separate plastic waste and use them effectively. Part of the awareness program included teaching school principals the correct ways to collect plastics to be sent for recycling. The principals were given cd's which they could show at the school, hence educating the students and the faculty on the correct ways to collect and recycle plastics. The foundation also works with municipalities. Officials in charge of small Indian towns like vellore & jaisalmer were taught how to separate plastics and were provided with proper tools for recycling plastics.

IV. PLASTIC WASTE FOR HOUSING IN INDIA

.Waste was directly collected from the households, then went through a separation process where organic scraps were composted, and the recyclable waste sold. The village's waste management methods also included an innovative way to store plastic waste. Plastic bottles were used to build low-income housing. The result of these ecofriendly structures shows the finished result covered in mud (figure 8), making it look indistinguishable from any regular mud structures. This method facilitated the collection of 50,000 plastic bottles from hotels in jaipur (plastindia foundation, 2019).

This method successfully supported 100 families and provided them with scientific and sustainable means of waste disposal. By creating dignified job opportunities, the program also helped increase worker income by 75%. Over ten months, 1000 kilos of plastic waste was kept away from the streets and sold to recycling companies, generating revenue of 40,000 indian rupees, an equivalent of 565 united states dollars per family. The program also had environmental advantages for the village, it eliminated open dumping spots, reduced soil and groundwater toxicity, eliminated carcinogenic emissions due to burning of plastics, protected the local fauna, and no water logging due to littered waste [2].

The foundation also found a way to create history by throwing an event open to the public, media, and environmentalists to raise public awareness of recycling. india made history on the 5th of january 2018 at the goregaon sports club in the city of mumbai, where the world's largest t-shirt made from 100% recycled plastic was unveiled. About 12 one-liter plastic bottles can make an adult t-shirt, and six bottles can make a child t-shirt [2, 9, 10]. the largest t-shirt measured 96.86 m long x 69.77 m in width and is made from 100 % recycled pet waste. to be built, 200,000 (1 liter) drinking water bottles were recycled

to create 4 tons of fabric. After the event, the large t-shirt was cut and converted to 10,000 child size t-shirts that were distributed amongst underprivileged children from different regions across India.

These foundations are planning several more initiatives for the future. They are planning to cover areas all over Gujarat, India's westernmost state for plastic waste management, and are engaging in active discussions with big Indian companies like Aditya Birla Group to construct roads using plastic waste. They are also planning on replicating the program on the village of chhota narerna in many other Indians villages, 34 build more small collection centers for plastics waste, and work out a better remuneration system for plastic waste recyclers.

V. CONCLUSIONS

The case studies of this article are showed how waste managers and planners in India have managed their plastic waste. Most of the government's efforts in these two countries have only been through policies. Two private companies, however, have taken a more proactive approach to the problems of plastic waste management and housing. The indian foundation, plastic India foundation, has managed to turn the small village of chhota narerna into a zero-waste village, all through a community-led program. Through waste collection and a method that used plastic bottles to build low-income housing, the village was able to recycle plastic bottles, provided employment and supplemental income to the families in the village.

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