A REVIEW ON EFFECTIVE PLASTIC WASTE MANAGEMENT AND SUSTAINABLE SOLUTIONS FOR ZERO WASTE

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Abstract

Plastic pollution is not ignorable because it is not only affecting environment but also living things e.g. human and animal on land and aquatic life in ocean due to micro-plastic. If aquatic life is affected then several other species will be affected including human because it is food-chain. It is surprising that plastic is still being burned in several countries. Management is lacking to tackle this issue. To recognize the magnitude of input of plastic materials to the environmental bodies and the global oceans, we should know several elements of the plastic production, circulation and waste management chain. Several methods have been implemented to tackle this issue including 5R. There should be new ways to solve this problem on large scale. This study reviewed several methods to tackle plastic pollution and highlighted their impact. This study also recommended sustainable solutions which need to be applied. One of the most important solutions is that waste has potential to recover energy with certain technologies such as biotechnology.

Keywords: Environment, Plastic Pollution, Food-chain, Recycling, Microorganisms, Energy.

INTRODUCTION

Plastic waste is has been declared as serious problem around the globe (Chawla et al., 2022; Cook and Halden, 2020). It has been affecting greatly to the water bodies, especially ocean micro plastic issues. If it is burn then it affects air and it also affects soil if dumped improperly. To recognize the magnitude of input of plastic materials to the environmental bodies and the global oceans, we should know several elements of the plastic production, circulation and waste management chain (Lee and Liew, 2021). Global plastic waste was 275 million tonnes before; it is being exceeded annual through wastage of plastic production every year. Waste generation quantity is different in lower-income and middle income countries (Chawla et al., 2022;Cook and Halden, 2020). Fig.1 shows countries list with ocean plastic pollution. Philippines is on the top (Wicaksono, 2023). If it continues, it is predictable that oceans will have more plastic than fish by 2050 (Cook and Halden, 2020; Hina et al., 2020). The awareness should be given regarding disposal of plastic wastes its serious environmental issues. It has been several years, scholars have been striving to tackle this difficult issue, particularly plastic and rubber wastes are thrown away in the environmental bodies (Alyousef et al., 2021; Sasaki, 2021). It is not only ocean problem. In several countries, plastic waste is burned and great threat to human health due to air pollution after burning (Kanellopoulos et al., 2021; Yusuf et al., 2022).

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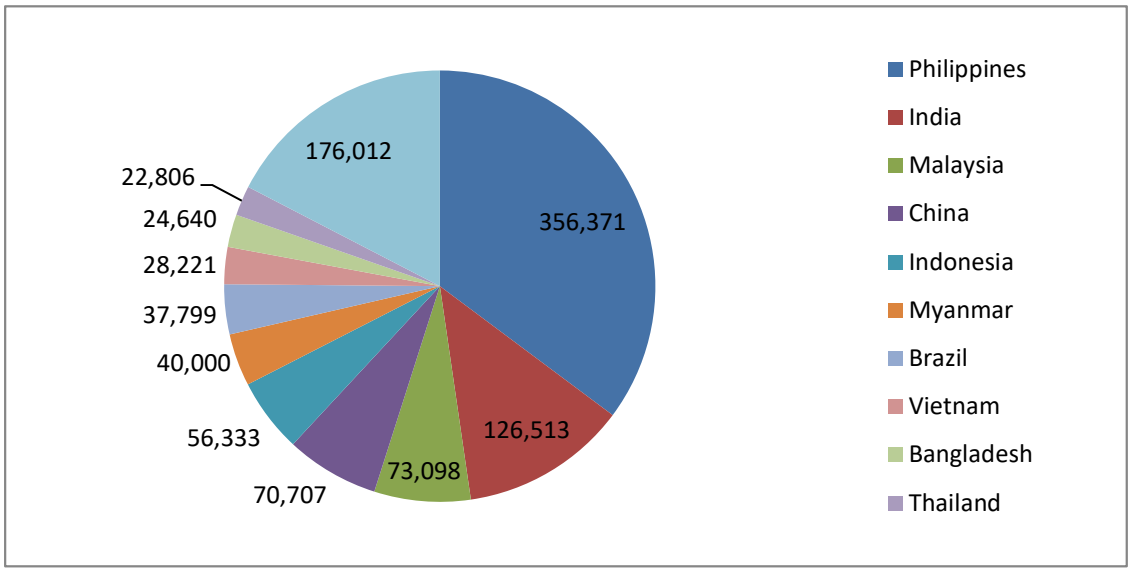

Figure 1 : Annual Ocean Plastic Waste (Metric tons), Source: Visual Capitalist, 2023

In addition, plastic waste has toxic chemical (Noh et al., 2022) including endocrine disrupting chemicals (EDCs), which are associated to obesity, infertility, diabetes, breast cancer, etc. (Cook and Halden, 2020; Cook et al., 2023; Sharma et al., 2022). Other health issues such as reproductive, growth, and cognitive impairment and neurodevelopment disorders are also linked with these toxic chemicals present in plastic (Kanellopoulos et al., 2021; Rustagi et al., 2011). Developed countries or the countries with high economy use the most plastics but their waste management systems and regulations limit the release of plastics into the environmental bodies to some extent. But in other countries, there is no rule and regulation. This study is focused to plastic waste issues including environmental or human health issues. This study also reviewed several methods to tackle plastic pollution and recommended sustainable solutions which need to be applied. One of the most important solutions is that waste has potential to recover energy with certain technologies such as biotechnology.

Waste Generation and Its Management around the World

It is reported that worldwide waste is estimated to increase to 3.40 billion tonnes by 2050 (Jerin et al., 2022; Rado, 2022; Wowrzeczka, 2021). Waste generation quantity is different in lower-income and middle income countries, it will vary in 2030 and 2050 (Statista, 2022). In lower-income countries, the total quantity of waste generated is estimated to rise by more than three times by 2050 because more than 50% of waste is openly discarded in these regions at this time (Gómez-Sanabria et al., 2022). The solid waste management methods may be generally classified into six fragments, spanning from the generating, collecting of waste from different sources, storage, processing/recovery in different units, transporting and finally to the disposal stage (Adeniran et al., 2017). Many developing states are still unsuccessful to pay the obligatory concentration to manage its own produced solid-waste. There is a reason behind it, they are unfocused by the pace of an boosting economic and industrial growth (Ugwu et al., 2021). In the US regions, several proactive approaches have been taken to tackle this problem. Establishing of pilot-scale use of MSW has been promoted. In this regard, several industries are being set up to create bio-based things from the segregated MSW (Kaur et al., 2021; Tumolo et al., 2020). Those materials must be

environmental friendly to avoid environmental problems (secondary pollution) in the future.

Sub-Saharan Africa is generating waste about 62 m tonnes per year. In this region, per capita waste production is relatively not higher, range from 0.09 to 3.0 kg per person/day, with an average of 0.65 kg/capita/day. Those regions with islands have the higher per capita values for waste generation and it is because of the tourism industry (Muheirwe et al., 2022; Orhorhoro and Oghoghorie, 2019). Latin America and the Caribbean have wide-ranging and reliable data. In this region, whole waste generation per year is 160 million tonnes. Waste generation is ranging per capita 0.1 to 14 kg/capita/day, and an average should be 1.1 kg/capita/day. Alike to the high per capita rates of waste production is on islands in Africa and the islands of the Caribbean have been documented as the leading per-capita producer of solid waste production (Aguilar et al., 2022; Ferronato et al., 2021; Ita-Nagy et al., 2022; Silva-Martínez et al., 2020).

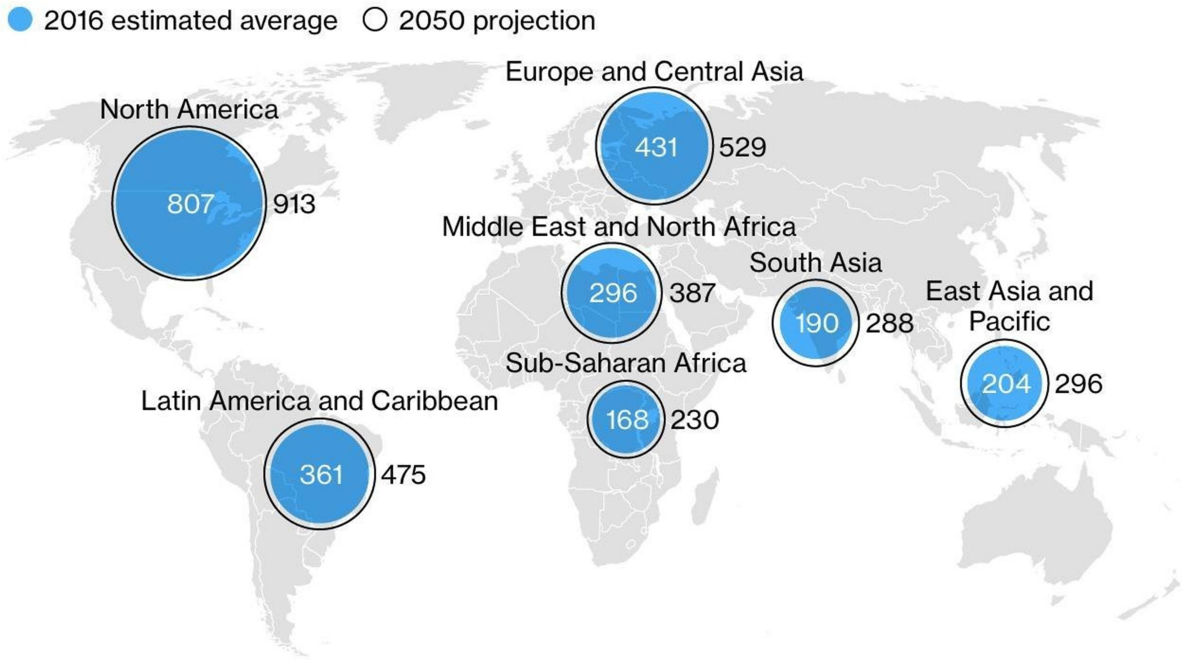

Figure 2 : Comparison of waste generation around the world 2016 and 2050
Source: Weforum (Sousa, 2019)

The yearly waste production in East-Asia and the Pacific-Region is around 270 m tonnes per year or more. This amount is generally impacted by waste production in China; it counts 70% of the all waste (Finnegan and Gouramanis, 2021; Shittu et al., 2021; Tun et al., 2020). The waste generation per-year is at least 93 m tonnes in Eastern and Central Asia. In the literature, some states in this area have no documented info on waste production. The waste production per capita ranges from 0.29 to 2.1 kg per person per day, with an average of 1.1 kg/capita per day (Benson et al., 2021; Shekdar, 2009; Shittu et al., 2021; Wang et al., 2021). The OECD states produce 572 m tonnes of solid waste every year. In South Asia, about 70 m tonnes of waste is produced every year, with per capita rates ranging from 0.12 to 5.1 kg/person per day and an average of 0.45 kg per capita per day (Awasthi et al., 2019; Goorhuis, 2014; Makarichi et al., 2018). Fig.2 shows residential, commercial and institutional waste around the world and it has been compared 2016 to 2050 (Sousa, 2019).

An inefficient disposal of municipal solid waste can make unsanitary surroundings (Ogundele et al., 2018). It may create severe negative environmental impacts like water and land pollution (Open dumping

of wastes pollutes nearby water-bodies with inorganic and organic contaminants) (Abdel-Shafy and Mansour, 2018). It also brings infectious diseases (diseases spread by rodents and insects). In higher-income regions, daily per-capita generated of waste is estimated to rise more by 2050, around by 19%, paralleled to middle- and low-income regions where it is predictable to grow by approximately 40% or more (Ncube et al., 2021). In addition, it brings obstruction of drains and loss of biodiversity (Doble and Kumar, 2005; Nandy et al., 2022). One is a lack of awareness about hazardous waste; some people don't understand hazardous products and their effects. Even some people don't know how to dispose them properly (Bhutta et al., 2011).

Impact of Plastic Waste on Health and Environment

Plastic waste is dangerous to environmental bodies and human health. It disturbs ecology and biodiversity in water bodies. There is no proper facility for waste disposal in the several countries. These non-biodegradable shoppers are nearly impossible to recycle and they do not decompose. As a result, they become a threat to the environment (Chawla et al., 2022). Presently, people just organize wastes by throwing away materials such as wrappers, plastic bags, cigarette butts, fruit peels, etc. in public places (Schanes et al., 2018). It brings air pollution due to not proper system. Open dump is not having proper system so it also impact on soil and groundwater (Singh et al., 2021). Awareness program should be conducted in developing countries. Depending on the type of plastic, it may take anywhere between 100 and 600 years to decompose, which means every product of plastic will ultimately add to the waste for centuries to come (Chawla et al., 2022). By 2050, the amount of plastic will exceed the number of marine life in the sea in terms of weight (Kumar et al., 2023). Fish and other sea creatures consume this plastic and are then eaten by human, thus becoming part of the food cycle and cancerous for people.

Water Pollution

The most significant environmental issue is groundwater contamination. Around 70% of this plastic waste (2600000000 kg) is mismanaged, left to landfills, unmanaged dumps, or strewn about land and water bodies across the country (Gupta and Nath, 2020). Once waste is dumped along with other discarded materials at the landfill, it creates a chemical (leachate). Effect of toxic material can rise from the percolation of leachate to the porous ground surface and leaks down to water reservoirs in the rocks. Groundwater contamination by such leachate condenses it and the associated aquifer is affected for local water supply and other uses (Abiriga et al., 2020). As water filters by any substantial, a process called leaching started where elements in the substantial may dissolve in the water (Gupta and Nath, 2020). As water permeates by municipal solid waste (MSW), it creates a leachate that decompose organic materials with several elements such as mercury, iron, zinc, lead, and other metals from rusting cans, unwanted batteries and other appliances (Ankit et al., 2021). Others may also comprise pesticides, paints, newspaper inks, cleaning fluids, and some other elements. Polluted water effects all living-things in an ecosystem (Sasakova et al., 2018). In addition, the contaminated water is consumed by animal, plants and humans, which again end up in the food cycle. It also impact on human health because a significant chunk of this plastic ends up in rivers and oceans through different channels, which adversely affects the marine life (Ankit et al., 2021; Gupta and Nath, 2020). Water bodies' pollution has several reasons but waste is also a main factor, if it is not managed properly.

Air Pollution

In several countries, the waste is just burnt or melt plastic in open burners, which cause air pollution

(Desk, 2019). and then heavy metals such as lead, several poisonous gases, and smoke blowout over inhabited areas leading to air pollution (Abdurrahman et al., 2020; Gangwar et al., 2019), which can cause serious illnesses (Akram et al., 2022; Ankit et al., 2021). It is reported that about 40 to 50 percent of the garbage is composed of carbon, as it burns; carbon dioxide gas is emitted to the atmosphere. Those emissions are as much as higher; on the global scale its only 5%, if compare to others sources such as cars and power plants (Sonibare et al., 2019; Vallero, 2011). Burning of different types of plastics produce particles of variable sizes and bring different diseases. Such suspended particles produced different ill effects in lungs and may enter the circulatory system and combustion from e-waste burning generate very fine particulates, which are linked to health problems such as pulmonary and cardiovascular disease (Du et al., 2016). The VOC's emitted from the recycling units increase nasal congestion and cause mucocutaneous and respiratory problems. Birds inhale particles and also eat micro beads and nurdles and fly with plastics in their stomach needing excess energy for the flight when already feeble with digestive problem. In addition, the wind also brings waste, gases and dust caused by decomposition. During daytime, putrefaction of waste in sunlight domino effect in bad odors and decreased visibility (Sharma et al., 2022). The decomposition rate of plastic typically ranges from 500 to 600 years, depending on the type. According to the EPA (Environmental Protection Agency) (EPA, 2022), every bit of plastic that ever made and sent to landfills or dumped in the environment still exists. All those countries where waste is not managed properly, they should take steps to solve these issues to avoid environmental and health problems.

Soil Pollution

Soil pollution or land pollution as a part of land degradation is typically initiated by industrial action, agricultural materials and improper or untreated disposal of industrial wastes (Abdel-Shafy and Mansour, 2018). When plastic is dumped in landfills, it interacts with water and forms hazardous chemicals. Landfill areas contain many different types of plastics (Wojnowska-Baryła et al., 2022). The presence of xenobiotic (human-made) chemicals which has high toxic contaminants or other adaptation in the natural soil environment also brings soil pollution (Senthilkumar and Naveen Kumar, 2020). Breakdown of biodegradable plastics releases methane, a very powerful greenhouse gas that contributes significantly to global warming (Atiwesh et al., 2021). In addition, other things such as dumping of plastics, several types of solid wastes and disposal of electrical items (such as batteries) cause hostile effect on the soil due to the presence of harmful chemicals (Chaine et al., 2022; Needhidasan et al., 2014). Diverse sources of plastics that contaminate environments have been reported. These include domestic sewage, containing fibers from clothing and micro plastic beads from personal care products, bio-solids, fertilizers, landfills from urban and industrial centers, irrigation with wastewater, lake water flooding, littering roads and illegal waste dumping, vinyl mulch used in agricultural activities, tire abrasion, and atmospheric particles transported over long distances. These various plastics enter the soil environment, settle on the surface, and penetrate into subsoil (Chang et al., 2022; Huang et al., 2022).

Marine Pollution

Plastic pollution, apart from other dangerous pollutions, is damaging major part of marine resources of water world. Oceanic marine plastic contamination was an increasingly global issue due to increased demand. This has a significant effect not only on marine biodiversity, but also on public safety and numerous infectious diseases found in both aquatic and human species (Bhuyan et al., 2021). Micro-and nano-plastics (MNPs) (size < 5 mm/<100 nm) epitomize one of the emergent environmental pollutants

with its existence all around the globe (Kumar et al., 2021). Southeast Asia is considered to have some of the highest levels of marine plastic pollution in the world (Omeyer et al., 2022). Micro plastics have ruined marine species this is the reason marine pollution especially due to micro-plastic has recently got great attention for the researchers and environmentalists. It greatly influences to marine wildlife and marine ecosystem (Dimassi et al., 2022).

In addition, plastic pollution affect several sectors including aquaculture, agriculture, fisheries, transportation, industrial sectors, power generation, tourism, and local authorities causing considerable economic losses. A detailed study is required in every town around sea. This can be minimized by identifying key sources of environmental plastic contamination and educating the public, thus reducing the transfer of micro- and nano-plastics into the environment (Mofijur et al., 2021). In the ocean, where plastic cannot be easily removed, it gets accumulated in organisms and sediments, and persists much longer than on land. Major increases in the fishing and tourism industry has been associated with the continuous disturbance of the marine species like turtles and birds, whales and dolphins, and finally entering to remote areas of the world and especially occupying the food chain (Dimassi et al., 2022). Several countries are trying to collect the material from the sea by ships. Before doing this, every city waste management has to control the waste not to touch the sea beach. Waste management policies should be followed by every person so that we may solve this issue.

Health Threat

Not only human but several news have been there that birds and fish dying because of consuming plastic, likewise, there must be fish and crabs eating plastic, which we dine on. In this way, the plastic particles are being transferred to our body, because it is well proved that plastic does not decompose in few days. Health threat due to plastic pollution has been noticed, especially it is one of the reasons for cancer becoming so common around the world (Desk, 2019; Inam et al., 2019). In addition, we eat plastic-contaminated seafood. Scientists have found micro-plastics in 114 marine species, and around one-third of these end up on our plates (Pequeno et al.,2021). We consume plastic via packaging (Sobhani et al., 2020). BPAs present in many plastic objects that come in direct contact with food is metabolized in the liver to form Bisphenol A, and it remains in our body through our urine (Konieczna et al., 2015). We drink micro-plastics via bottled water (Sobhani et al., 2020). Some of the chemicals used in plastic production can cause dermatitis upon contact with human skin. In many plastics, these toxic chemicals are only used in trace amounts, but significant testing is often required to ensure that the toxic elements are contained within the plastic by inert material or polymer (Jadhav et al., 2021).

Sustainable Solutions to Decrease the Plastic Waste

The best way to promote SDG 12 is through an absolute reduction in plastics. The stimulation and improved effectiveness of recycling are not sufficient. There are several other factors such as production requirements, expected use, reusability, likelihood of littering, local waste management infrastructure and education. There is an urgent call for evidence-based frameworks that equip countries to regenerate the environment, while at the same time protecting the livelihoods of vulnerable communities and provide economic opportunities across the value chain (Khan, 2021). Currently, several studies have identified sustainable solutions to decrease plastic waste. Before implementing on solution framework, there should be the systemic studies to be identified by our solutions mapper to explore the entry of plastics back into the environmental channel. In addition, this can be channeled into the circular economy where the recycle, reuse and up cycle are the venues (Chawla et al., 2022).

Shop Friendly

Plastic bags were once a modern convenience but can be efficiently replaced by reusable bags. Due to plastic pollution, people should change their behavior to avoid this problem around the world. Pakistani government should take actions. In some countries, consumers are supposed to bring own shopping bags instead of using plastic bags (Nguyen, 2021). Consumers may understand the importance of sustainability and are willing to accept a greener option. Everyone just think about how many bags you typically carry out of a grocery store, and multiply that by the number of times you visit the grocery shop. That's a lot of plastic and it's destruction of environment and economy (Chang and Chou, 2018). It is recommended that everyone should carry a bag and always reuse plastic bags as much as possible if you have them. There are some other ways to adopt reduce and reuse policies.

Approach of 5-R

Approaches of 5 R including, refuse, reduce, reuse, recycle and recover energy. It's best practice to refuse the plastic when you shop.. Everyone has to reduce plastic materials in daily life. Plastic materials can be reused at home and also it can be done at large scale. Recycling plastic can be done in many ways. Either it can be recycled into other products or can be used directly. Recycling waste plastic and rubber and utilizing it as a sustainable aggregate in concrete would be a better strategy (Bulut and Şahin, 2017; Farooq et al., 2019; Hamsavathi et al., 2020; Malathy , 2014; Manjunath, 2016). However, it is critical to understand the various aspects of their implementation and the associated barriers (Alyousef et al., 2021). It can be recycled in other materials such as PET in bricks (Mondal et al., 2019), mortar (Makri et al., 2019), concrete (Al-Hadithi and Al-Ani, 2018; Almeshal et al., 2020; Hameed and Fatah Ahmed, 2019; Hossain et al., 2016; Saikia and Brito, 2013), paver block (Nivetha et al., 2016) and HDPE in brick (Ali et al., 2018), concrete (Habib et al., 2017; Nursyamsi et al., 2018; Rahim et al., 2013), paver block (Panimayam et al., 2017). Concrete with different materials such as PVC (Al-Azzawi, 2016) PP (Jalaluddin, 2017) and PS (Aslani et al., 2020; Cadere et al., 2018; Mbadike and G.C, 2014; Sayadi et al., 2016) also are sustainable. PP in bricks (Akinyele and Toriola, 2018), mortar (Coppola et al.,2016; Coppola et al., 2018; Hita et al., 2018; Záleská et al., 2018) and decorative materials (Jalaluddin, 2017) are also being utilized. Recycling is generally at the forefront, but now it is at the last minute. If feasible, four steps should have been completed before "recycling," as per the 5 R's: reject, reduce, reuse, repurpose, and recycle (Kumar et al., 2021). Recycling is best option.

Table 1

Plastic Waste Used In Construction Materials

S.No	Plastic Type	Recycled production	References
1	E-plastic	Concrete	(Bulut and Şahin, 2017; Farooq et al., 2019; Hamsavathi et al., 2020; Malathy and Kothai, 2014; Manjunath, 2016)
2		Brick	(Mondal et al., 2019)
3		Mortar	(Makri et al., 2019)
4	PET	Concrete	(Al-Hadithi and Al-Ani, 2018; Almeshal et al., 2020; Hameed and Fatah Ahmed, 2019; Hossain et al., 2016; Saikia and Brito, 2013)
5		Brick	(Akinwumi et al., 2019; Azmi et al., 2018; Fai Chow and Khalili Rosidan, 2020; Lalzarliana Paihte et al., 2019; Suganya, 2015; Wahid et al., 2015)
6		Paver Block	(Nivetha et al., 2016)
7		Mortar	(Da Silva et al., 2014; Kaur and Pavia, 2020; Liguori et al ., 2014; Spósito et al., 2020)

8	HDPE	Concrete	(Habib et al., 2017; Nursyamsi et al., 2018; Rahim et al., 2013)
9		Brick	(Ali et al., 2018)
10		Paver Block	(Panimayam et al., 2017)
11	Plastic	Construction materials	(Alyousef et al., 2021)
12	PVC	Concrete	(Al-Azzawi, 2016)
13	PP	Concrete	(Jalaluddin, 2017)
14		Brick	(Akinyele and Toriola, 2018)
15		Mortar	(Coppola et al., 2016; Coppola et al., 2018; Hita et al., 2018; Záleská et al., 2018)
16		Decorative Materials	(Jalaluddin, 2017)
17	PS	Concrete	(Aslani et al., 2020; Cadere et al., 2018; Mbadike and G.C, 2014; Sayadi et al., 2016)
18		Building materials	(Sayadi et al., 2016)

Sustainable construction materials can be made by substituting recycled waste plastic and rubber for aggregate in concrete (Habib et al.,2017; Hameed and Fatah, 2019; Maitlo et al., 2022). Incorporating these recycled aggregates has a deleterious effect on the strength properties of composites (Saikia and Brito,2013). However, these recycled aggregates have the potential to improve various material properties (Almeshal et al.,2020) and can be employed in lightweight, thermal, and sound-insulating composites (Alyousef et al.,2021). Sustainable construction materials can be made by substituting recycled waste plastic and rubber for aggregate in concrete (Habib et al.,2017; Hameed and Fatah Ahmed, 2019; Maitlo et al., 2022). Incorporating these recycled aggregates has a deleterious effect on the strength properties of composites (Saikia and Brito, 2013). However, these recycled aggregates have the potential to improve various material properties (Almeshal et al.,2020) and can be employed in lightweight, thermal, and sound-insulating composites (Alyousef et al., 2021). In addition, waste can be more beneficial, if it is converted into energy. Population growth, economic development and industrialization increase electricity demand. The same factors cause rapid buildup of wastes such as industrial, municipal, animal and agricultural waste. In such a scenario, there is a need to dispose of wastes in a cost-effective way by utilizing them as sustainable energy sources. Waste-to-Energy technology such as anaerobic digestion (AD) is an effective way to decrease the dependency on fossil fuels and minimize environmental related issues.

Plastic Biodegradation

Rot is one the concept for plastic biodegradation. It means to undergo decomposition from the action of bacteria or fungi. In other words, when a substance such as food or wood rots or something rots, it softens and is gradually destroyed. It is also a helping way for eco-friendly environment. It is noted that the most important issue today is to protect the environment and leave it clean for future generations. For the development of the management practices of green entrepreneurial businesses, it is very much important that society's view of nature and green production changes should be promoted daily (Bajdor and Pawełoszek,2020; Faleye et al.,2018). Ultimately, this highlights the key issues such as energy conservation, ecology, increasing importance of recycling, promotion of reusability and economic development (Bux and Amicarelli,2022; Naderi et al.,2022; Piwowar-Sulej et al.,2021). Many researchers showed their keen interest in the microbial degradation of plastic as many organic and inorganic materials like lignin, starch cellulose and hemicelluloses are biodegraded by microbes.

Approximately 300 m tons of plastic are produced per year that is almost same to the weight of

the whole human population (Thompson et al., 2009). To address the plastic pollution problems, the scientists are trying to work with micro-remediation. It is the natural method where bacteria and fungi utilize their enzymes to breakdown environmental contaminants (Kumar et al., 2021; Schmaltz et al., 2020). Plastic degradation has been studied widely. In the landfills, there are many microorganisms which speed up the biodegradation of plastics. The microorganisms include bacteria such as Pseudomonas, nylon-eating bacteria, and Flavobacteria. These bacteria break down nylon through the activity of the nylonase enzyme. Microorganisms discharge many enzymes into soil water which start the breakdown of polymers (Chamas et al., 2020; Rhodes, 2018). It has been demonstrated that 90 genera of bacteria, fungi, and actinomycetes are confirmed to degrade the plastic in less time (North and Halden, 2013). Additional innovations have discovered that fungi can breakdown plastic in our houses (Hyde et al., 2019). Study has been conducted in Utrecht University in the Netherlands; the "Fungi Mutarium" has been created. It is a home-based system, in which plastic can be put in capsules with oyster mushrooms to be broken down and transformed into food (Harris, 2022). These inventions using Pestalotiopsis microspora and other plastic-degrading mushrooms may play a significant role to break down plastic in landfills, and bring a future without plastic pollution (Ru et al., 2020). A fungus has been discovered in a rubbish dump in Pakistan that could support to save the planet and it could potentially give benefit to us to get rid of the issues of plastics which are non-biodegradable (Nannan, 2017). The fungi are proficient to break down plastic waste few weeks that would otherwise stick for years in the environment (Kumari et al., 2022). Aspergillus tubingensis is generally found in soil (Barratt et al., 2003), but the study revealed that it can also grow on the surface of plastics (Kumari et al., 2022). New studies actually demonstrated that it was found on a rubbish dump in Islamabad, Pakistan (Nannan, 2017). It secretes enzymes which break down the molecules and then use its mycelia to break them apart. It is documented that all kinds of fungi have good properties that are not yet discovered. If deforestation and other human activities which continue to abolish habitats, then such species maybe destroyed and cannot be used for solving environmental issues (Nannan, 2017). The performances of fungus are affected by many environmental parameters such as pH, temperature and the type of culture medium used. It could cover the method for large-scale usage of the fungus in several treatment plants, such as, waste treatment plants, solid waste treatment plants. It is also utilized for application in soils already polluted by plastic waste (Nannan,2017).

CONCLUSION

This review study concluded that plastic pollution is serious issues around the globe. Special concern is for ocean plastic pollution, because it affects aquatic life and also human through food chain. Several diseases have been recognized due to plastic. Either it is burning or dumping, both methods are great threat to environment. To eliminate plastic pollution, banning plastic bags is not enough. There should be social awareness about its impact on environment and health. Creative solutions are needed to prevent and mitigate plastic waste and pollution. This study review several methods to manage plastic pollution. It is recommended that plastic should be recycled in concrete, it is best option. Another option is that plastic can be degraded by microorganisms. It should be in large scale to recover energy sources. It can boost economy and fulfill the energy needs of the country. There should be deep study for further faster methods and then it should be implemented on large scale for the society.

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