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Review Article

REVIEW ARTICLE THE EFFECTS OF PLASTIC WASTE ON VARIOUS ENVIRONMENTAL SEGMENTS, ALONG WITH APPROPRIATE PLASTIC WASTE MANAGEMENT TECHNIQUES

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ABSTRACT

Plastics are synthetic organic compound-based materials that are widely used in a variety of applications, including water bottles, clothes, food packaging, medical supplies, electrical items, and construction materials. Plastics are synthetic organic molecules that are widely employed in a variety of applications, including water bottles, clothes, food packaging, and medical devices. Many scholars reported beside of their advantages they have many adverse effects of plastics in environmental segments and human health. The plastic materials as such at normal condition are not having substantial impacts on the environment. The major influence found in plastic, when the wastes are generated and after the disposal of it. This review article covers the impacts of the plastic waster in the environment and the effective management techniques of plastic wastes.

KEYWORDS: Plastic Waste, Waste Management.

1. INTRODUCTION

1.1. Background

The term "environment" refers to the collection of physical and biological elements that have a direct impact on organisms' survival, growth, development, and reproduction. The term "environment" refers to the intricate interactions of segments that take place between the terrestrial, atmospheric, aquatic, living, and anthropological environments (Manahan, S, 2008). In short, the environment is all biotic and abiotic things surrounding us, used to us and necessary for survival of human beings.

This environment is the source of many challenges to the world people. Natural occurrences, which people cannot control, and human components that relate local to global, short-term to long-term events, and individual behavior to collective action, are the major causes of environmental problems.(Nam, 2019). Because of the complexity of environmental issues, we must all work together to identify and execute solutions that will result in long-term environmental benefits. (Fisher, 2019). Additional hand environmental problems are the direct result of peoples' actions. The improper utilization of natural resources and indictable desire of the human being becomes the leading problem of today communities in the word. The long-term consequences on the environment, as well as more recent and critical issues, such as the possibility of toxic wastes and pollutants of anthropogenic origin (Manahan S. 2000). Occurrences and conditions in the environment that people cannot control are known as environmental hazards, or sources of danger. Heavy metal pollution, particularly for their use in industry and mining, is causing significant health problems in many countries of the globe. Incidents and disasters involving uncontrolled radioactive sources are on the rise, with the legacy of contaminated places left over from wartime actions using nuclear materials posing particular hazards.(Fisher, 2019). Environmental hazards can result in damage or loss of property, as well as loss of life.

These environmental problems are directly or indirectly influencing all the segments of environments. These segments of environments are an Atmosphere, Hydrosphere, Geosphere, Biosphere and Anthrosphere (Sparks, 2003). The hydrosphere contains Earth's water (chemical formula, H_2O) (Erik G. Søgaard, 2014). By far, the oceans contain the majority of the hydrosphere. Water cycles throughout the Earth's environment via the solar-powered hydrologic cycle, which starts with water evaporated into the atmosphere by solar energy. Water vapor and cloud droplets are moved through the

atmosphere and eventually descend to Earth as rain and some kind of frozen water.(Erik G. Søgaard, 2014). The majority of the hydrosphere is either on or beneath the geosphere's surface, and water's properties, particularly in subterranean aquifers, are greatly altered by interaction with minerals in the soil. (Manahan, 2013). Geosphere is largely composed of Solid Earth. Actually, Earth is not so solid because a few kilometers in depth below its surface, it becomes plastic and at greater depths liquid rock (Sparks, 2003). The gopher acts as a sink for atmospheric contaminants, especially particles, and emits gases to the atmosphere, especially sulfur dioxide (SO_2) and hydrogen sulfide (H_2S) from volcanoes (Manahan, 2013). The geosphere is a source of metals, other critical minerals, and fossil fuels required by the anthrosphere.

The atmosphere has a very important relationship with the hydrosphere as a conduit for water moving through the hydrologic cycle (Fisher, 2019). The atmosphere is crucial to the biosphere as a source of elemental oxygen for organisms requiring this element for their metabolism, as a reservoir of carbon dioxide, as a carbon source for plants performing photosynthesis, and as a source of nitrogen for organisms that fix this element as a key constituent of proteins (Manahan, 2013). The atmosphere provides the Anthrosphere with oxygen for combustion, argon as a non-reactive noble gas, elemental nitrogen for extremely cold liquid nitrogen and as a raw material for chemical synthesis of ammonia (NH3)(Sawyer, Clair N., *et al*, 2003). The atmosphere also serves the Anthrosphere as a sink for waste products, especially carbon dioxide from fossil fuel combustion (Birkett J.W., 2003)

The biosphere is strongly influenced by the other four environmental spheres and, in turn, strongly affects these spheres. Biosphere consists the diversified living organisms (Fisher, 2019). Organisms in the biosphere can be exposed to potentially toxic substances through the water they drink, the hydrosphere in which fish live, air from the atmosphere that animals must breathe, exposure of plant leaf surfaces to phytotoxic substances (those toxic to plants) carried by the atmosphere, uptake of toxic substances by plants growing in soil on the geosphere, and emissions released from the anthrosphere (Sawyer, Clair N., *et al*, 2003).

The anthrosphere, the part of the environment constructed and operated by humans. Meeting the material and energy needs of the anthrosphere and handling its waste products safely and sustainably is a major challenge(Manahan, 2013 and (Sawyer, Clair N., *et al*, 2003).

A majority of substances of concern for their toxicities are made in, processed by, or released from the anthrosphere. There are a variety of potential causes of anthropogenic contamination that could end up in the environment. Concorde, or stratospheric supersonic transport, was one of the first issues that scientists were concerned. On combustion of the fuel, aircraft engines emit enormous volumes of nitrogen oxides (Harrison, 2007). The other potential source of environmental problems of the current world is rapidly developing technologies. Technology refers to how humans use materials and energy to do and manufacture things. Technologies in the present period are mostly the result of engineering based on scientific concepts (Birkett J.W., 2003). Along with their huge impact on the environment, technology, and industrial activities must be included when studying environmental science (Sparks, 2003). Humans rely on technology to provide the food, shelter, and things they require for their existence and well-being. However, when technology is used wisely and with a strong environmental awareness, it may help solve problems like pollution and destruction of the environment.

Agricultural techniques that have resulted in extensive land cultivation, draining of wetlands, irrigation of desert lands, and application of herbicides and insecticides are some of the key ways in which modern technology has contributed to environmental change. Road development scars land surfaces as a result of modern transportation patterns, notably reliance on automobiles (Birkett J.W, 2003). This review focused on the Environmental problems raised through plastics that are recent technological products which dominantly used in this worldwide. The utilization of plastic materials in our everyday life makes the current era to be plastic era.

1.2. Plastic materials

Humans' material desires have evolved through millions of years, with ceramics, glass, wood, wicker, and textiles serving as the primary materials for storing and selling biological items and resources to the recent creation of plastics, which signaled the start of a new age. (Ejaz *et al.*, 2010). Plastics are polymers, which are huge molecules made up of smaller components called monomers that are linked together in a chain through a process known as polymerization (Kolapkar, 2018). Carbon and hydrogen are the most common constituents in polymers, however, additional elements such as oxygen, nitrogen, chlorine, and fluorine may also be included. Natural plastics exist, such as shellac, tortoise shell, horns, and a variety of resinous trees saps, but the term "plastic" is most generally used to refer to synthetically (synthetic or semi-synthetic) manufactured materials that we use in our daily lives (UNEP, 2009).

The rising of plastic materials in the world is due to its different properties. Thus properties are lowest cost rather than other materials, such as ceramics, glass and metals. They're also quite straightforward to process, making them suitable for a wide range of applications (Risch, 200 9).

Food and beverage storage and packaging are also common uses for plastics. They are practical, lightweight, indestructible, and reasonably priced (Wang *et al.*, 2019).

The extensive use of plastics, however, poses both environmental and health hazards. Plastics are a very well non-biodegradable materials (e.g., bottles, sheets, fishing gear, packing materials, and small pellets), although glass bottles, tin cans, and lumber are all non-biodegradable (Harrison, 2007).

The production of plastic waste has been an overwhelmingly growing domain as a direct consequence of the unprecedented development of industrial society, so it is reasonable to find that increasing research focus has been drawn to post consumer plastic products such as thermoplastics such as polypropylene, polyethylene, polyethylene terephthalate, and high density polyethylene (Wang *et al.*, 2019). The burgeoning use of single-use plastics in developing countries is part of a larger waste crisis: rising rubbish generation in countries where waste management systems are inadequate or nonexistent (and both are part of the bigger crisis of overconsumption) (Mari W*. et al*, 2019).

Plastic solid waste is becoming more prevalent, which can lead to a variety of environmental issues, including pollution as a carrier of persistent organic pollutants which can be transmitted to aquatic organisms (Harrison, 2007). In many countries across the world, particularly in underdeveloped countries like Ethiopia, dealing with this plastic solid waste remains a difficult issue.

1.3. The objective of the review

The objective of this article review is to know about some of the influence of plastic wastes in the environment through improper use and dispose plastic materials. The objective of the second part is to identify encouraging techniques of solid plastic waste management techniques and to recommend to the community.

1.4. 3.4. The Environment impacts of plastic wastes

When plastics are used, recycled, disposed of, or left in the environment as litter, they decompose and release harmful chemicals into the environment. These chemicals and plastic residues pollute the environment. Heavy metals like cadmium and lead, as well as compounds like benzene, dioxins, and other pollutants, all come from plastics and unleash hazardous toxins into our environment (Mankidy *et al.*, 2013).

According to study conducted by (Berg *et al.*, 2008), Plastics can be classified into three types based on their size: micro debris, plastic, mega debris plastic, and macro debris plastic. Mega- and micro-plastics are commonly utilized in the production of packaging materials (such as plastic bottles, bags, and other household products), footwear, and other household items (Thushari and Senevirathna, 2020). Many plastic products, such as plastic bottles and bags, are used for packaging, but when they are used, it is discovered that they are disposed carelessly without regard for the consequences. When not properly discarded/disposed of, these plastic wastes litter the environment, harming wildlife, wildlife habitat, and humans, as well as causing choking hazards (UNEP, 2009).

1.5. Plastics and Atmosphere

As indicated in the introduction of this article, the atmosphere is segment of environment, which most probably influenced by gaseous wastes.

Source: (Cook *et al.*, 2019)

Black carbon, dioxins, furans, mercury, and polychlorinated biphenyls are all released into the atmosphere when plastic garbage is burned in the open air. All of these plastics-burning byproducts pose a direct threat to human health (Williams M, *et al,* 2019).

The studies around the world reveal that dioxins can be produced by burning polymeric materials containing chlorine, such as plastics, pentachlorophenol (PCP), pesticide-treated wastes, other compounds like polychlorinated bisphenol (PCBs), and even bleached paper. (ATSDR, 1998). The most often used plastic in medical treatment is polyvinyl chloride, which is made up of chlorine and is responsible for dioxins (Cook *et al.*, 2019). The formation of dioxins, furans, and other dangerous organochlorine chemicals during the manufacture and combustion of Polyvinyl chlorides was a major source of worry (Wendy L. and Thompson, R., 2001**).**

The results of several studies show that there is strong evidence that plastic contributes significantly to the risks connected with garbage burning(Rajagopalan V., 2004). They raise the risk of diseases, including heart disease and cancer, as well as respiratory problems like asthma and emphysema, skin and eye problems, nausea and migraines, and reproductive and neurological system harm. (Reyna‐Bensusan N., *et al,* 2018)

According to a study (UN‐HABITAT, 2008), in Ethiopia, children living in slums with uncollected waste were six times more likely to get acute respiratory infections than those who lived in areas where waste was collected on a regular basis. Burning plastic in incinerators produces harmful heavy metals and chemicals, as well as being a substantial source of strong pollutants such as dioxin and other chlorinated organic compounds, according to research. (Pavani P., and Raja Rajeswari T., 2014).

1.5.1. The Black carbon's effects in the Atmospheric sphere

Black carbon (BC) is the collective term for a variety of carbon compounds ranging from partially charred plant leftovers to highly graphitized soot produced by incomplete combustion of biomass and fossil fuels in the absence of oxygen(Lali Z, 2018). Black carbon can have a variety of effects on the ecosystem of local, regional, and global scales, depending on its type, condition of origin and storage, and surrounding environmental circumstances (Shrestha G., et al., 2010). The recently completed Black Carbon Report to Congress, US EPA , 2012)defines it as the "carbonaceous component of PM that absorbs all wavelengths of solar radiation". Additionally, in 2012 report of the Joint World Health Organization (WHO)/Convention Task Force on Health Aspects of Air Pollution similarly describes black carbon as "an operationally defined term which describes carbon as measured by light absorption" (Janssen *et al.*, 2012).

According to study showed by (Abdullah *et al.*, 2017 and Deborah Buckley-Golder *et al*, 1999)) Carbon black is a powdery mass of fine black particles made up of impure carbon that forms as a result of incomplete hydrocarbon burning.

According descriptions of study of (Affairs, 2020) the combustion of fossil-based fuels and biomass, such as coal, charred wood, petroleum coke, and tars, is the primary source of environmental carbon black. (Haryono and Utami, 2001).

The major problem associate with carbon back are premature human mortality and disability (Alemayehu, 2004), respiratory and cardiovascular disease, cancer, and even birth defects (Version, 2017) and because of its ability to absorb light as heat, it also contributes to climate change (EPA, 2011). Pollution exposure has been linked to a higher risk of death in persons with heart or lung disease, as well as a variety of chronic and acute cardiovascular and respiratory effects, such as nonfatal heart attacks, asthma, chronic bronchitis, decreased lung function, and irregular pulse.

Black carbon is a powerful, short-lived climate-forcing agent that is thought to constitute the second or third largest contributor to global warming, behind carbon dioxide and potentially methane (Ramanathan and Carmichael 2008; Bond and Sun 2005). Finally, the findings of researches described above clearly show that, the carbon black arises from burning of plastic products build up negative influence over the environment particularly on atmosphere.

1.5.2. The impacts of dioxins, furans and polychlorinated biphenyls

Polyvinyl chloride is a major source of dioxins around the world. Dioxin is the common term for a group of 75 hazardous compounds that bioaccumulate in the environment and are particularly strong and persistent (Wendy L. Thompson, 2001). When PVC plastic is burned in incinerators, household stoves, trash burning, and unintentional fires in buildings and cars, dioxins are produced. Dioxins and furans are not developed or produced on purpose; instead, they are created when other chemicals or the goods are manufactured. The health consequences that may be produced by exposure to phthalates vary by chemical and are dependent on the timing and size of the dose (Rukavina, 2010). Adults are more susceptible to phthalates than young, developing organisms (Earl Gray, 2002). These chemical compounds can be produced by forest or home rubbish burning, chlorine bleaching of pulp and paper, or the manufacturing or processing of specific chemicals like insecticides.

According to (UNEP, 1999) description, dioxin is especially harmful to the growing immune system, producing immunosuppression and immunological-depression, lowering a person's tolerance to bacterial, fungal, and other infectious pathogens. The immunosuppression can also make a person more vulnerable to malignancy(Cook *et al.*, 2019). When dioxins are discharged into the environment, they cling to dust particles and rainfall and fall to the ground, coating vegetation (Wendy L. Thompson, 2001). They have the potential to accumulate in humans and are fat-soluble. As they progress up the

food chain, their concentrations rise. As a result, the largest concentration of dioxins will be found in the crater at the top of the food chain (humans).

The study conducted in Lancaster University in 1998, illustrates that, dioxins, furans, and polychlorinated biphenyls (PCBs) concentrations in ambient air are increasing from remote to rural to the urban industrial centers. Then this study drew the conclusion that the combustible and chemical usage is the principal source of PCDDFs to the atmosphere (Lehmann R and Jones K., 1998).

1.6. Plastic wastes in the aquatic environment

Mismanaged plastic wastes also impart serious influence in the aquatic environment. According to the study conducted by (Jambel J. *Et al*, 2015) in their study on "plastic waste input from land to ocean" show that the plastic pollution threat the health and future of the aquatic environment. This study clearly shows two serious influence of plastic pollution in aquatic environments (Xanthos and Walker, 2017). These are plastic waste influence the health of human beings and other organisms, those accesses the polluted water and it has also a critical influence on the health of water itself. Similarly the study of (Da Nang, Viet Nam, 2018), confirm that the accumulation of plastic wastes affects the current condition of the hydrosphere. Other studies conducted on larger plastic debris, potentially far‑reaching impacts on coral reefs by (Lamb, J *et al,* 2018) and susceptibility to disease (Diez, S.M., *et al*, 2019), indicates that the plastic wastes have a potential effect on hydrosphere.

A Study conducted by (Jambeck, J., *et al*. 2020.), Exemplified that the source and th amount of plastic waste that enters the ocean each year is unclear. While certain sources, such as municipal garbage, have been estimated, there are many others that do not have current estimates. While many scientists believe that land is responsible for a major amount of unmanaged plastic, even the 80 percent figure is debatable because the real quantity from all sources is uncertain (Science, 2019).

The well-known phthalates include plastic additives which operate as endocrine-disrupting chemicals (EDCs), causing serious health effects and even having a long-term impact on the epigenome. Phthalates can alter an animal's (Amador *et al.*, 2021). The similar study conducted in Mexico entitled 'Phthalates affect the in vitro expansion of human hematopoietic stem cell' show that Phthalate has a divertible effect and can cause cell death and aging (Leo and Kalixto-sa, 2019), the Phthalates, which are common plastic additives that are discharged into the environment, have beneficial impacts(Earl Gray and Michael McCally, 2002).

Overhead scholar's study is the indication for plastic waste has adversely affected the aquatic environment. another study conducted by (Thevenon, F., *et al.,*2014), shows that plastic pollution has now become a global concern, with plastic garbage reaching all of the world's oceans, wreaking havoc on marine species and biodiversity, as well as human livelihoods and the economy. The main sources of plastic fragments in the ocean are wastewater and runoff water discharged by river systems, notably near wastewater treatment plant outfalls, and the fragmentation of discarded plastic objects from landfills (domestic and industrial wastes) (Morritt D., *et al*., 2014). According to study carried out Status of Plastic Waste Management in India(Debnath, 2018) , demonstrated that plastic contaminants were found in 83 percent of tap water samples conducted around the world. This was the first study to focus on worldwide plastic pollution of drinking water, and it found that tap water in the United States was the most polluted, with a contamination rate of 94 percent, followed by Lebanon and India.

Source: (Cook *et al.*, 2019)

The marine biota and wildlife are severely harmed by marine plastic trash, both directly and indirectly. Ingestion of specific plastic items by animals mistaking plastic waste for prey, and to a lesser extent consumption of pelagic fish and other prey with plastic particles in their intestines, are problems connected with absorption and entanglement of plastic debris (Obebe and Adamu, 2020). According to the study of (One, 2019), Plastic litter in the marine environment can degrade habitats, yet floating plastics create new habitats and allow for the migration of invasive (alien) species over great distances.

The physical effect of plastic wastes in aquatic animals associated with entanglement and ingestion (Thevenon, F., *et al,* 2014). Entanglement, which can cause suffocation or intestinal blockage, is underappreciated since most victims go unnoticed when sunk or consumed by predators over wide ocean expanses (Wolfe 1987). The second problem is that marine organisms are becoming increasingly exposed to toxic materials through the ingestion of plastics, leading in the entrance of hazardous pollutants into the food chain, either from the material itself (plastic additives) or from chemical pollutants that adsorb to it from polluted surrounding waters(Rochman, *et al*. 2013).

Despite the fact that the UN Environment Program (UNEP) has identified plastic marine debris and its propensity to carry dangerous compounds as one of the most pressing concerns facing our planet, little is known about the impact of ingested plastics which may contain significant levels of harmful compounds on their surfaces, as well as the potential bioaccumulation of related contaminants and their interactions at the organism and ecosystem levels (Nizzetto *et al.*, 2016). Furthermore, because some additives (added to polymers during the manufacturing process) to which most people are exposed, such as phthalates or bisphenol (BPA), are not chemically bound to the plastic matrix and can easily leach into the surrounding environment, there is growing concern about their negative health effects (Manuela Kasper-Claridge, 2017). Experiments also show that when exposed to the salts in saltwater, hard plastic waste thrown in the oceans leaches BPA at a faster rate (Sajiki and Yonekubo, 2003) and BPA is released into seawater as a result of microbes biodegrading plastic polymers (Artham and Doble, 2009). Recent research have also found that BPA, which was manufactured by the medical sector to be a synthetic estrogen, leaches from the millions of gallons of epoxy plastic paint used to protect ship hulls from corrosion and fouling by barnacles and other deposits, according to recent studies(Saido *et al.,* 2010). Although major concerns remain about the unknown effects of plastic-leached chemicals on the marine food chain and potential human health risks, laboratory experiments with aquatic organisms (e.g. mollusks, crustaceans, and amphibians) show that most plasticizers appear to act by interfering with the functioning of various hormone systems.(Diez, S.M.,*et al*, 2019). There is also a dearth of understanding regarding the long-term effects of exposure to environmentally suitable plastic concentrations, as well as the ecotoxicity of the complex mixture of plastic elements (Oehlmann *et al.,* 2009), while a recent study suggests that micro plastic ingestion by aquatic organisms does not result in significant exposure to plastic additives. (Koelmans *et al*., 2014). Another major worry for marine creatures is that floating plastics in the ocean can act as transport vectors for POPs that collect on their surface (adsorption) over their long residence period in polluted surface water.(Vliet *et al.*, 2015). POPs are long-lasting, hydrophobic synthetic organic molecules that are chemically stable and difficult to breakdown in the environment. as a result of several factors (Ronkay *et al.*, 2021). depicts the composition of marine debris; plastic garbage accounts for 40–80 percent of overall marine rubbish, but it is only this that is in the spotlight because much of the plastic waste floats on the water's top, while the rest sinks to the sea's bottom.

1.7. The impact of plastic wastes on Geosphere

Despite the numerous advantages of the material, it is connected with high levels of waste and environmental leakage. The current study looked into the effects of plastic-enriched composting on soil structure, fertility, and plant growth(Atuanya E.I.*et al*, 2012) Single-use plastics applications, insufficient end-of-life treatment, low recyclability and reusability rates, and a high propensity for disintegration into micro plastics are the results (Singh and Sharma, 2016). Plastics in the environment, whether as macro plastic litter or micro plastics, have long been recognized as a global problem (Levitan and Ny, 2016). Due to potential entanglement and ingestion, it is one of the most challenging manmade phenomena that impacts our world and is one of the biggest dangers to biodiversity (Susanna G, 2018). As a result, land-based plastic pollution is a source of contamination and damage to terrestrial ecosystems (Ronkay *et al.*, 2021). The use of sewage sludge from municipal wastewater treatment plants as a fertilizer for agricultural land is a common practice that is a major source of primary micro plastics pollution in soil.

Source: Rodríguez-Eugenio, N., *et al.*, 2018, Rome

The study conducted in Rome (Rodríguez-Eugenio, N., *et al.*, 2018) demonstrated Plastic trash has three effects on soil: elemental contamination (e.g., As, Cd, Pb); organic chemical contamination (e.g., PCBs, PAHs, POPs); and pharmaceutical contamination (e.g., PCBs, PAHs, POPs) (e.g. estrogen, antibiotics). Soil pathogens including anthrax and prions, micronutrient deficiencies, and under nutrition owing to deteriorated soils are the other three dangers.

2. DMANAGEMENT OF PLASTIC WASTES

All measures aimed at reducing negative effects on health, the environment, and the economy is covered by solid waste management systems. According to the study of (Prata *et al.*, 2019), Mismanaged trash is a major land-based source of plastic pollution linked to modern society's usage and disposal of plastic products, endangering economies, ecosystems, and human health. Improper solid waste management has negative environmental consequences in developing countries: a case study of Rawalpindi City 2010). According to several research findings (Black and Epa, 2021), many countries throughout the world have implemented various plastic and solid waste management approaches. The increase of plastic garbage has become a huge concern for municipal governments in charge of solid waste management and sanitation (Munandar *et al.*, 2020) . Owing to lack of integrated solid waste management, most of the plastic waste is neither collected properly nor disposed of in appropriate manner to avoid its negative impacts on environment and public health and waste plastics are causing littering and choking of sewerage system(Bijsterveldt *et al.*, 2021). Due to extremely long periods required for natural decomposition, waste plastic is often the most visible component in waste dumps and open landfills(UNEP, 2009).

The study of (Kolapkar, 2018), indicate that waste treatment process based on the physical properties of the plastic. The physical properties of plastic waste are predominantly depends on properties of thermoplastics and thermoset. Thermoplastic is a type of plastic that can be recycled by reheating process while, thermoset are plastic that cannot be recycled or reprinted because the molecules in the plastic will be damaged if reheated(Obebe and Adamu, 2020). Furthermore, plastic reduction waste can be done in 4 ways which are reduction in use, destruction by landfilling/incineration, recycle and reuse(Levitan, 2016). Reduction in use means a reduction in the use of plastic by substituting the use of plastic with other materials.

2.1. Management of Plastics in aLlandfill

The majority of post-consumer plastic garbage was disposed of alongside municipal solid refuse. These plastic wastes have an impact on landfill capacity due to the huge and growing amount of plastic trash produced, rather than because the wastes are non-degradable. As a result, plastic wastes are destroyed and removed from the environment. Destruction is the process of destroying the structure of a plastic object, which can be accomplished through landfilling or incineration (Ossowski, 2020). The process of burning plastic garbage at a high temperature is known as incineration. On the other side, the landfilling procedure

is used to remove plastic garbage from the environment. Landfilling is the process of burying plastic garbage in the earth (Hidayat, Kiranamahsa and Zamal, 2019). Appropriate planning, the absence of legislation, bad technology, and a lack of economic investments to stimulate and support environmental development are all contributing factors in many cases. In the majority of situations, the study's outcome (Barros, 2003) research demonstrates that dumping is a complex environmental problem that is common in rural areas in many southern countries due to a lack of proper waste management services.

2.2. Management of plastics in an incinerator

With a heating value three times that of normal municipal waste, plastics make a considerable contribution to the heating value of municipal solid waste (Gupta, 2019).

Acid gas emissions and dioxin/furan emissions are of special importance. Heavy metal-containing plastic additives (e&, lead, and cadmium) contribute to the metal content and potentially hazardous nature of incinerator ash. More research is needed to establish the impact of plastic additives on the toxicity of incinerator ash with greater precision (Le., whether lead- and cadmium-based plastic additives contribute to leachable lead and cadmium in ash)(Jayant Singh, 2015).

2.3. Plastic Waste Recycling

Plastic garbage is recycled, which means it is processed and reused. Reuse is the technique of repurposing previously used plastic (Barros, 2003). This can be accomplished by utilizing plastic products that can be reused, such as refillable plastic bottles.

In terms of plastic waste, recycling solid plastic waste types is commonly done in three methods (Meys *et al.,* 2020) and (Drzyzga and Prieto, 2018) . After efficient production, decreasing wasted product consumption is beneficial, but it might be difficult to achieve due to food safety concerns and a lack of resources (Prata *et al.,* 2019), however, it is still possible to minimize superfluous packaging (e.g.,double-packaging) or to choose eco-friendly alternatives.

Mechanical recycling is the first way. Separating, sorting, baling, washing, grinding, compounding, and palletizing are all part of this process (PEW & SYSTEMIQ, 2020). Closed and open loops can be used to recycle utilizing this technique, with each loop providing a distinct end form of the recycled product. (Meys *et al.*, 2020). The closed loop process will produce products that have properties similar to the original material so they can be used as raw materials with high added value. The process carried out by a method of extrusion (JAIPUR, 2019). The open loop method creates products with higher labor qualities than the initial material, making them only appropriate for specialized applications like garbage bags and pipes. Cutting, washing, drying, and re-granulating are indeed the steps involved in this procedure. Chemical recycling seems to be the second method. The process of breaking the polymer structure (Sunita Narain, 2020). The goal is to obtain authentic monomers or other useful compounds (Bhawan and Nagar, 2015). Chemolysis, pyrolysis, fluid catalytic cracking (FCC), hydrogen technologies, Catalytic Pressure-less Depolymerization (KDV) method, and gasification combined with methanol synthesis are all options for chemical recycling. Energy recovery is the final option. Burning plastic garbage for electricity production and district heating with an efficiency of over 90% is used to recover energy. This procedure is typically used for non-recyclable plastic garbage (Ababa, 2005).

The study conducted in Korea (Kyong shi S., 2020), plan for effective plastic waste management, shows that the Waste policy of Korea began with the basic concept of “safe disposal” (Bhawan and Nagar, 2015). The safe waste disposal method consists, landfill, incineration and recycling techniques. From these techniques recycling of plastic wastes accounts the highest rate up to 84.3%. The result of this study provides for the safe disposal of plastic wastes, recycling technique is the preferable one.

Another study conducted in New York (Saha, Sundriyal and Sundriyal, 2014) on agricultural plastics demonstrated that recycling improves environmental quality by reducing disposal issues such as open burning, which releases pollutants into the air that are harmful to human health; dumping, which can harm water quality and future farm operations; and random piles of used, partially degraded plastics, which are unsightly.(Arora, 2013). According to the World Economic Forum (2018), just 2% of plastic waste can be efficiently recycled, despite the fact that 16 percent of plastic garbage was recycled. Furthermore, 14% of plastic garbage was burned, 4% was buried at an End Disposal Site (EDS)/Temporary Disposal Site (TDS), and 32% poisoned the environment and disrupted the ecology.(Arora, 2013). We can see from the World Economic Forum's rationale that, while recycling plastic wastes protects the environment from pollution, it also has its own set of drawbacks. (Author and Holmberg, 2012). This disadvantage is that natural recycling of plastic garbage might take up to 600 years (Ababa, 2005). Only a small percentage of plastic waste treatment is genuinely effective, which is why industry contributions are required to assist in the best possible management of plastic rubbish.

Plastic products and packaging may contain elements that are dangerous to human health and the environment and are prohibited in some products, such as food packaging and children's toys. (Abdullah *et al.*, 2017). Flame retardants, pigments, fillers, UV-resistant compounds, plasticisers, and stabilisers are examples of these substances or additions that are used to achieve or improve the product's qualities while lowering costs. Even if these compounds aren't very hazardous to the

environment, they can stymie plastic recycling (Pew & Systemiq, 2020).

These toxic chemicals, as well as the restrictions on their usage, must be considered in order to ensure that attempts to increase the amount of plastic recycling do not result in unintended exposure through the use of secondary plastic materials in new products (Vegter *et al.*, 2014). For a circular economy based on high-quality resources and non-toxic material cycles, dealing with hazardous compounds is a big task. (Area, 2020).

3. CONCLUSION

Ethiopia is among the countries that seriously affected by plastic wastes. The problem of plastic waste arises from town to far villages' as well as from the hotels and burs to farm lands. Along within the increasing domestic wastes from each household, a large volume is accounted by plastic wastes. A vast percentage of Ethiopians are unaware of the dangers of environmental pollution, as well as the existing serious pollution issue, and this lack of awareness continues to exist among the multitudes. Garbage plastics have been piling up for a long time, producing breeding grounds for flies and mosquitoes, causing terrible odors, and destroying the beauty and environment, and this is no longer an unusual thing for many people (Danh N T and Hoi H T, 2019).

Therefore the management of solid plastic wastes, in Ethiopia is not the favorable strategy to build appearance but it is mandatory to sustain natural state environment. Inorder to prevent, control and reduce environmental pollution arise from plastics, it is obligatory to draw strategies to disseminate awareness about use and managements of plastics throughout the residence of country. The management of plastic wastes need cooperation of community, government and all concerned bodies in whole to conserve natural environment.

4. RECOMMENDATION

The various research findings above show that plastic waste can have an impact on every environment.

Therefore, I would like to convey that I believe it is important for anyone who uses plastic containers to keep the community and the environment clean, and to dispose of plastic waste properly.

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