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ABSTRACT

Waste and Environmental Justice: The Case of European Union Circular Economy Policy

The Circular Economy (CE) was a less known concept when it emerged in the 20th century, but later it is considered as a globally recognized trend especially after being endorsed by the European Union (EU). While adopting this special approach, the EU had high targets and expectations from it such as achieving more competitiveness, encouraging economic growth, and establishing more job opportunities while decreasing and controlling potential environmental influences and usage of resources. Considering the existing controversial body of knowledge and different views about circular economy, the adoption of it by the EU is a remarkable fact that has not been investigated properly in the literature. Therefore, the purpose of the current thesis study is to analyze the Circular Economy paradigm and the policies by the EU by addressing the available body of knowledge to investigate the sustainability implications from the critical point of view and offer policy recommendations accordingly. At the same time, the major aim of the thesis is to emphasize the role of power differential among countries in terms of circular economy. Within this framework, certain cases will be analyzed in terms of EU rules and regulations to be applied during the waste transfers. Firstly, the thesis explains the EU circular economy policy, then analyzes its circular economy policy and actions from the environmental justice perspective. According to the thesis findings, the solutions produced by the EU focus more on economical results and do not take into account the many justice and socio-ecological consequences of the actions taken by the EU countries.

Keywords: Circular Economy, Environmental Justice, European Union, Plastic Waste, Sustainability, Waste Management

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ÖZET

Atık ve Çevresel Adalet: Avrupa Birliği Döngüsel Ekonomi Politikası Örneği

Döngüsel Ekonomi (DE), 20. yüzyılda ortaya çıktığında daha az bilinen bir kavram iken, daha sonra özellikle Avrupa Birliği (AB) tarafından da kabul edilmesinin ardından küresel çapta tanınan bir trend olarak görülmeye başlanmıştır. AB'nin bu özel yaklaşımı benimserken, potansiyel çevresel etkileri ve kaynak kullanımını azaltırken ve kontrol ederken daha fazla rekabet gücü elde etmek, ekonomik büyümeyi teşvik etmek, daha fazla iş olanağı yaratmak gibi yüksek hedefleri ve beklentileri vardı. Döngüsel ekonomi ile ilgili mevcut tartışmalı bilgi birikimi ve farklı görüşler göz önüne alındığında, yaklaşımın AB tarafından güçlü bir şekilde benimsenmesi literatürde yeterince araştırılmamış olması dikkat çekici bir gerçektir. Bu nedenle, mevcut tez çalışmasının amacı, sürdürülebilirlik etkilerini eleştirel bir bakış açısıyla araştırmak ve buna göre politika önerileri sunmak için mevcut bilgi birikimini ele alarak döngüsel ekonomi paradigmasını ve AB politikalarını analiz etmektir. Aynı zamanda tezin temel amacı Döngüsel Ekonomi açısından ülkeler arasındaki güç farklılığının rolünü vurgulamaktır. Bu çerçevede AB'nin atıkların transferi ile ilgili kural ve düzenlemelerinin yarattığı sorunlar incelenecektir. Tez öncelikle AB döngüsel ekonomi politikasını açıklıyor, ardından bu politika ve eylemleri çevresel adalet perspektifinden analiz ediyor. Tez bulgularına göre, AB'nin ürettiği çözümler daha çok ekonomik sonuçlara odaklanmakta ve AB ülkelerinin gerçekleştirdiği eylemlerin sosyo-ekolojik ve adalet bağlantılı sonuçlarını dikkate almamaktadır.

Anahtar Kelimeler: Avrupa Birliği, Atık Yönetimi, Döngüsel Ekonomi, Çevresel Adalet, Plastik Atık, Sürdürülebilirlik

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Ulviyya Rasulzade
Istanbul, Türkiye, 2023

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ABBREVIATIONS

ABS	:	Acrylonitrile Butadiene Styrene
BFLLFEA	:	Bangladesh Finished Leather, Leather Goods and Footwear Exporters' Association
BTA	:	Bangladesh Tanners' Association
CAGR	:	Compound Annual Growth Rate
CE	:	Circular Economy
CEAP	:	Circular Economy Action Plan
CO2	:	Carbon Dioxide
COP	:	Conference of the Parties
COP27	:	27th Conference of the Parties
EEA	:	European Environment Agency
EGD	:	European Green Deal
EIA	:	Environmental Impact Assessment
EJ	:	Environmental Justice
EJ IWG	:	Interagency Working Group on Environmental Justice
EMS	:	Environmental Management Systems
EPA	:	Environmental Protection Agency
EPR	:	Extended Producer Responsibility
EU	:	European Union
GAIA	:	Global Alliance for Incinerator Alternatives
GDP	:	Gross Domestic Product
IEA	:	International Energy Agency
INC	:	International Negotiating Committee
LDPE	:	Low-density Polyethylene
LFMEAB	:	Leathergoods & Footwear Manufacturers & Exporters' Association of Bangladesh
MT	:	Metric Ton
NGO	:	Non-Governmental Organization

OECD	:	Organization for Economic Co-operation and Development
OEJ	:	The Office of Environmental Justice
PE-HD	:	High-density Polyethylene
PET	:	Polyethylene Terephthalate
PF	:	Phenol-formaldehyde
PP	:	Polypropylene
PS	:	Polystyrene
PUR	:	Polyurethane
PVC	:	Polyvinyl chloride
SCP	:	Sustainable Consumption and Production
SDG	:	Sustainable Development Goals
SME	:	Small and Medium-sized Enterprises
UN	:	United Nations
UNCTAD	:	United Nations Conference on Trade and Development
UNEA	:	United Nations Environment Assembly
UNEP	:	United Nations Environment Programme
UP	:	Unsaturated Polyester

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1. INTRODUCTION

1.1. Subject of the Study

Plastic materials are a significant part of modern society as almost everything used in daily life is made of plastic. However, it is an undeniable fact that plastic waste has created remarkable threats and damages for the living organisms, environment, climate and economy all around the world for many decades. The benefits derived from plastic use is remarkable to note about although due to the improper waste management and behaviors plastics have become one of the most significant damages to the environment. Marine pollution and environmental pollution are challenges that should be given special care and attention as the main destination for the great amount of plastic and other wastes are ending up in the seas and oceans. Every year approximately above 12 million tons of plastics are being disposed of by people to marine ecosystems. Every year, one million seabirds, 100,000 marine animals, and turtles are lost due to the enormous quantity of plastic pollution in marine life (WWF Australia, 2023). Additionally, while producing one ton of plastics, 2.5 tons of carbon dioxide (CO2) are generated which affect the environment and health significantly. Plastic production process is also linked to some illnesses observed in humans such as chronic asthma, pulmonary insufficiency, and cardiovascular diseases. It is estimated that if the use of plastics keeps going at the current level the amount of plastic in the oceans will be more than the number of all fishes in the sea by 2050 (Material Economics, n.d). This estimate is associated more closely with UNEP, which uses this estimate as a way of warning.

Plastic materials are classified as a big family consisting of various substances each one of them with unique features and characteristics. These features are important to know about in order to be able to prevent the possible damages properly. Plastics are materials composed of polymers which are light, cheap and at the same time strong and sustainable. Due to its feature of being suitable to manufacture a wide range of materials easily, the amount of the manufacturing and consumption of plastics is increasing despite their harms. Nevertheless, each plastic type has different compositions, all of them are based on carbon. Moreover, plastics are classified in different types based on their compositions such as natural and synthetic plastics, plastics that

can be remolded easily or not, can be recycled without leading to contamination or not. Researching about the types of plastics is important in the thesis because each type has its own contribution to the environmental pollution and for shifting to the circular economy (CE). For example, natural polymers such as rubbers do not persist in the environment for extended periods of time, thus they are not in the forefront when it comes to environmental pollution. Conversely, synthetic plastics contribute to environmental contamination since they are composed of non-biodegradable components and remain in the landfill sites or the marine environment for a long time. It is now widely acknowledged in most countries that over 50% of single-use plastics wind into the oceans and harm marine life rather than recycling facilities (Kibria, et al., 2023).

Despite the fact that most scientists and people are knowledgeable about the potential negative impacts, the amount of plastic use and waste keeps increasing overwhelmingly day by day. The most important point is that the production of plastic also did not decrease in a significant level in order to prevent the existing and expected harms and threats by the plastic waste. Since the 1950s the plastic production sector has been growing with its demand and supply level. In Europe only 1.6 million people are being employed in different sectors of the plastic industry starting from raw material producers to machinery manufacturers (Plastics Europe, 2019). Approximately, globally 4.6% per year growth in the production of plastic has been observed during the last 10 years which will be discussed in detail in the next sections of the thesis. By taking the current plastic production amount into consideration it is predicted to double until 2040 and grow 2.5 times until 2050 (European Environment Agency, 2021a). Nevertheless, various policies and measures were offered as a solution for the plastic problem. But some of these might be considered as a way to keep production of plastic business going, not a way to prevent damage by the plastic itself.

Due to their practical use, cheap price and flexibility in manufacturing, the production and consumption of plastic materials keep increasing to the rampant level in modern society. Starting from the 1950s until 2018 the global usage of plastic has increased almost from zero to 359 million tones. Along with that only in Europe the usage of plastic was reported as 61.8 million tones back to 2018 (Plastics Europe, 2019). Globally the use of plastic is 45 kg per person, this number is three times more in Western Europe which is reported as usage of 136 kg

per person. As reported by the Organization for Economic Co-operation and Development (OECD) (2022a), large amounts of plastics are being used every day, only 20% of that are ending up in the recycling centers, the other 80% are being discharged into the environment. This situation is called dysfunctional by the OECD as a great amount of the plastic is used but only a small amount of it is being recycled, and reused.

In their article Geyer, Jambeck & Law (2017) mention that since the 1950s more than 8 billion tons of plastics was manufactured, unfortunately 6.3 billion tons of that were classified as waste in 2015. The number of productions, usage and waste keeps increasing every day and leads to more harm, more danger for the environment, human health and significantly for marine life. The awareness about the threats by the plastic waste has increased promptly over the last few years. This awareness has paved the way for campaigns and efforts to fight plastic waste in many fronts from civil society groups to international organizations. Moreover, plastic waste has risen to the forefront of national environmental policies in recent years. For instance, almost 250 organizations came together with a commitment to decrease and prevent the amount of plastic waste and litter. With its different members this initiative is called New Plastic Economy Global commitment (UNEP, 2019a). The Ellen MacArthur Foundation is leading the Global Commitment which is collaborated with the United Nations. The main purpose behind the Commitment is to support the Circular Economy by making sure that plastic materials are being recycled and reused instead of being disposed of to the environment. Additionally, as a contribution to the prevention of harms by the plastic, various countries and subnational authorities prohibited the consumption of the single-use and lightweight plastics including Canada (2019), Peru (2019), San Diego (2019) banned the use of polystyrene and drink containers, the USA (2019) banned the use of plastic straw, last but not least the EU parliament (2018) adopted a Directive regarding both manufacturing and usage of the single- use plastics. By considering the environmental challenges and degradation by the plastic litter facing the world, significant steps have been taken by different organizations in order to overcome the potential threats by the plastic. Among the noteworthy solutions offered till now is a circular economy policy by the European Union (EU) which is the major concern area of the thesis.

This thesis focuses mainly on the EU circular economy (CE) policy which was first adopted in 2015. The thesis will analyze the EU policy documents, including the action plans, and strategies in terms of their goals and targets set to achieve a more circular economy instead of having a linear economy. The second Circular Economy Action Plan approved by the EU in 2020 was considered as one of the fundamental elements of the European Green Deal (EGD). The European Green Deal, which was announced in 2019 is, in short, a strategy that aims to benefit everyone and everywhere by creating a resource-efficient, stronger economy with zero emissions of greenhouse gasses (GHGs). In addition to the targets and plans set in the European Green Deal, the Circular Economy Action Plan set new and more competitive goals and targets. For the EU, the main purpose behind the transformation to the CE is to decrease the dependency on the resources, achieve a sustainable economy, and enhance the available job opportunities. Plastic pollution is one of the major concerns of the EU's CE policy. Both 2015 and 2020 Circular Economy Action Plans put considerable emphasis on the plastic waste issue (European Commission, 2020a).

For the purpose of strengthening and revising the existing waste legislation, after the 2015 CE Action Plan, the EU approved a new plastics strategy in 2018. The Single-Use Plastics Directive, which came into effect in 2019, is a new legislative initiative. There is still a significant quantity of plastic waste being sent to non-EU nations in spite of all these efforts to limit plastic waste. Statista (2021) indicates that the EU (EU-27) exported 1.1 million MT of plastic waste to non-EU nations in 2021. Developing nations receive a large portion of this plastic waste export. In 2021, the majority of the plastic waste exported from the EU member states went to Turkey, with an amount of 395,000 tonnes. In 2021, Malaysia ranked second in the EU with 133,517 tonnes of plastic waste (Statista, 2021).

Nevertheless, the CE is about the efficient use of resources and decreasing the amount of the product used, the thesis topic mainly focuses on the plastic in CE. The goal of the thesis is to explain and critically analyze the CE approach in general and EU Circular Economy policy in particular from the perspective of environmental justice as the shipment of plastic waste to poor countries is conceptualized as an environmental justice issue in the thesis. In its attempt to examine the EU's circular economy approach from an environmental justice perspective, the

thesis will focus on the EU's circularity efforts in plastics. Plastics and plastic waste take up a considerable place in EU's efforts towards circularity as plastics have a significant share in total EU waste and waste exports. There is a growing public concern over the environmental justice implications of the plastic waste. The issue is raised by social movements, international institutions and the research community. For example, Greenpeace calls plastic pollution an environmental justice issue. A UNEP report, prepared in collaboration with Azul, found that plastic pollution constitutes environmental injustice. As briefly explained above, plastic pollution poses a significant risk to human health but it also "disproportionately affects marginalized communities and communities living in close proximity to plastic production and waste sites" (UNEP, 2021).

In addition to these distributional aspects of environmental injustices, plastic pollution harms other living organisms and ecosystems, creating what is called interspecies injustice in the literature. Concerns about environmental justice are typically the consequence of wealthy nations—including those in the EU—exporting plastic waste to developing or underdeveloped nations. Drawing on existing research, this thesis views the export of plastic waste to developing nations as a matter of environmental justice. Environmental justice is defined by Owens and Conlon (2021) as an unequal allocation of environmental goods and bads depending on gender, class, and occasionally race. The idea of environmental justice, which deals with the unfair or uneven distribution of environmental benefits and drawbacks, is the subject of an expanding corpus of literature (Schlosberg, 2007, 10-13).

The EU CE Action plan relates to a broad policy area covering various sectors and waste types. This study, in its effort to look into how the notion of circularity is put into practice, will only focus on plastic waste. Therefore, the area of the study is limited to how the EU's circular economy approach is applied to plastic waste. Growing plastic waste and volume of trade in plastic waste in the international arena compounded with rising societal concern over the issue justify this delimitation of the research focus. For the purpose of describing the topic clearly, the thesis will start by defining and explaining more in detail about the circular economy applied by the other nations and by the EU and environmental justice separately which are the main components of the thesis. Moreover, the plastic waste problem observed in the EU and non- EU

countries will be explained and compared by demonstrating statistics and tables. Relatedly, plastic waste export and import within the EU member countries and between EU and non-EU countries will be discussed in detail by indicating certain statistics. Most but not least importantly the circular economy policy by the EU will be analyzed critically from the perspective of environmental justice theory which will help to answer the question focused in the thesis. Lastly, the results and conclusion derived in the thesis will be discussed in order to finalize the thesis.

Relatedly, the thesis will try to answer the question of "Is the EU circular economy a just policy?" by applying environmental justice theory. The thesis will argue that the EU circular economy can be considered as a trigger for power discrimination between rich and poor countries as the plastic waste export and import are also the main activities derived by it other than recycling itself. The study argues that CE by the EU may run the risk of giving more opportunity for the rich countries to get rid of their wastes by displacing them to the poor countries. Accordingly, it can be inserted that in actuality the circular economy does not only mean recycling the wastes and reusing them. Instead, it could become a way for circulating the wastes from developed countries to the developing or poor countries.

It is worth pointing out that there is a gap observed in the literature on this subject. Most of the literature has preferred to analyze the EU circular economy from the positive point of view or just theoretical applications of the circular economy. Nevertheless, this study will try to explore and analyze EU circular economy policy critically from the environmental justice perspective. Therefore, it can be true that the thesis will be a useful and informative body of knowledge for future research and investigations. It can be used as a guidance for the policymakers in order to take into consideration while making policies. This thesis will provide both theoretical and conceptual background for the EU and non - EU countries implementing the circular economy policy.

1.2. Conceptual Framework

Firstly, in the thesis the importance of plastic in people's daily life has been discussed in detail. Subtopics such as the history and evolution of plastic since the time it emerged (20th century) till

the present time has been mentioned explicitly. The characteristics of the plastic and its contributions for recycling has also been indicated in the thesis. In addition to that, the thesis will shed light on the harms and hazards caused by plastic manufacture and waste, as well as notable policies and initiatives presented as potential solutions.

To combat the inherent problems that plastic waste presents, several countries and organizations have taken some necessary steps to reduce and prevent plastic waste and litter. As part of its overarching Green Deal, the European Union has formally adopted the circular economy model which is the central topic of the thesis. The thesis provides an explanation of the strategies used by various NGOs and the EU's circular economy initiatives as well as those of the Ellen MacArthur Foundation and SWITCH-Asia program.

The thesis explains the historical origin of the circular economy to give a more clear overview about its evolution. The CE approach has a long history which has been impacted by various schools of thought such as Kenneth Boulding (1960), Club of Rome (1970s), Cradle-to-Cradle, Biomimicry, Industrial Ecology, Performance-based Economy, and Blue Economy. Later on certain countries started adopting it as a part of its environmental policies to achieve a more sustainable and circular economy. China was one of the first countries that issued and implemented CE as an environmental policy. The EU was the next to adopt CE. The EU has approved two Circular Economy Action Plans consisting of legislative and non- legislative initiatives, actions, targets and objectives which will be explored more in the upcoming paragraphs of the thesis.

Nevertheless, CE was adopted in order to combat current environmental threats and provide a better world for all, it violates environmental justice during certain policy implications. In order to be objective while evaluating the CE, the environmental justice theory will be used. The notion of environmental justice or "environmental racism" first appeared in the USA in 1982. It was a struggle of people of color for environmental rights. Later on this concept was observed in other regions as well in different versions of violation. According to Schlosberg (2007), justice is defined and understood in political practice as a balance of several interconnected components of distribution, recognition, participation, and capability from which four dimensions of environmental justice originate. These approaches will be discussed in detail in the further sections of the thesis.

However, evaluation is necessary to determine how much the EU's circular economy framework contributes to just results. The true definition of the CE has also altered as a result of the rise in plastic waste, from a more recyclable one. Due to the lack of capability to recycle the plastic waste, some countries export it to the countries that are not even responsible for the negative effects derived by it. It is where all the dimensions of environmental injustice are being observed. First of all, when the plastic waste is exported from one country to another, it should be ensured that all the materials are recyclable, do not contain any hazardous waste and the importing country has the capacity to recycle it in a safe manner. Nevertheless, all of these rules are somehow being violated, by causing health and environmental issues, where rights of those indigenous people to the safe and clean environment are not recognized, the unfair distribution of the environmental goods and bads is observed (marginalized, indigenous, people of color, poor people are usually suffering from the environmental bads). Later on the environmental injustices caused by humans are observed on other living organisms as well. For example, extreme levels of plastic pollution ends up in the oceans and seas which leads to the deaths of marine animals. When the plastic waste is being landfilled, it pollutes the air, water, soil which makes it hard for those living organisms as it is for humans. This form of environmental justice is referred to as Interspecies injustice (Menton, et al., 2020).

The thesis evaluates the circular economy policy of the European Union within the framework of environmental justice. The trade in plastic waste and the social difficulties it raises will be taken into consideration as the thesis explicitly looks at potential impacts of the circular economy on the handling of plastic waste inside the EU. In the thesis, the EU's circular economy strategy has been evaluated by looking at various situations such as the waste export from the EU countries to Malaysia and Türkiye. The reason to select these countries as a sample is because in 2021 they are ranked first (Türkiye) and second (Malaysia) in importing the most plastic waste from the EU.

In conclusion, the current section of the thesis tries to provide a complete description of the urgent issue, plastic waste, and explores the potential of the circular economy as a solution. The thesis highlights the urgent need to address plastic waste generation and emphasizes the importance of understanding the different types of plastics and their recyclability. Also it is necessary to emphasize the need for improved recycling rates to tackle the growing plastic waste

problem, instead of getting rid of them by exporting to the underdeveloped nations who do not even have the necessary tools to tackle it.

The thesis will also go into depth on the reasons why plastic waste trade under the name of circular economy is seen as an unfair policy by environmental justice theory. However, the review underscores the importance of examining the circular economy policy through the lens of environmental justice theory to ensure equitable outcomes and mitigate potential disparities. By critically evaluating and improving current policies and practices, it is possible to shift to a more sustainable and circular economy for the plastic waste management.

1.3. Methodology

By using descriptive and sample study techniques, in this thesis qualitative research method is used. The thesis tries to provide an overview of the EU's CE policy from the perspective of environmental justice. Therefore, current scientific findings specifically related to plastic are reviewed and discussed through secondary sources like academic articles, books, newspapers, blogs, and policy reports as well as official declarations and agreements and scientific reports.

By employing a qualitative research design, this study aims to go beyond surface-level analysis and delve into the underlying social, economic, and environmental aspects impacting the waste management practices and the distribution of pros and cons by the environment. The focus is on understanding how the CE policy impacts waste control practices and whether it leads to equitable outcomes in terms of environmental justice.

The research design also involves a systematic analysis of existing literature, policy documents, and relevant case studies. This literature review aims to provide a comprehensive understanding of the circular economy policy, its goals, strategies, and implementation processes. By analyzing the literature, the study can identify gaps, contradictions, and potential areas of environmental injustice within the policy framework.

Moreover, qualitative research design allows for the exploration of contextual factors that shape waste management practices and environmental justice outcomes. This includes examining socioeconomic disparities, power dynamics, and institutional barriers. By understanding these

contextual factors, the study can assess the success of circular economy policy in promoting environmental justice and identify potential areas for improvement. Moreover, various types of statistics from STATISTA, EuroSTAT, UNCTADstat have been used in the thesis to better analyze the increasing plastic production, usage and waste generated. As well as in the section of plastic waste trade from and to the EU countries statistics from various sources have been preferred to use.

1.4. Structure of the Thesis

By employing the qualitative research method, the thesis attempts to answer the question of "Is EU Circular Economy policy a Just policy?" from the perspective of four dimensions (distributive, recognitional, procedural, capability approach) of environmental justice. Regarding that, first of all, the thesis consists of four chapters. First section gives a brief explanation about the topic and describes the literature, methodology and subject of the study. The second chapter is named as "Plastic Waste, Circular economy and Environmental Justice" where the thesis explains and describes the historical evolution of plastic till now, plastic waste and problems derived by it. Then as a solution for the current plastic issue, circular economy and its implications in other countries and critical views about it have been explained in this chapter of the thesis. Additionally, this chapter analyzes the reasons whether circular economy should be considered as an environmental justice issue or not. The scientific and academic findings of this chapter relies upon the secondary sources of knowledge.

The third chapter of the thesis, particularly focuses on the circular economy by the EU, how it turns to be a global problem of plastic waste trade and its contribution to the violation of environmental justice. The thesis analyzes examples of plastic waste export to Türkiye and Malaysia from the EU countries to obtain a clear picture of the problem. By analyzing data and statistics from different reliable sources this chapter obtains the answer to the thesis questions.

The last chapter concludes the thesis findings and provides certain policy suggestions for the policymakers to consider for the further policy implications. This chapter gives a brief review of what has been done in the thesis, what the thesis tried to indicate and what it has found, whether

it has provided an answer to the question raised in the thesis or not, and what is suggested to the future researchers regarding this subject.

2. PLASTIC WASTE, CIRCULAR ECONOMY AND ENVIRONMENTAL JUSTICE

The circular economy idea has arisen as a potent tactic to solve problems with plastic waste while fostering environmental justice problems in an era characterized by increased environmental concerns. With a goal of reducing waste and fostering sustainable behaviors that benefit the environment and underserved areas, the circular economy offers a comprehensive approach to resource management. This section explores the complex connections between the circular economy, plastic waste, and environmental justice, demonstrating how these connections have the potential to build a more fair and sustainable society.

Firstly the section delves into the plastics and its historical evolution. Effect of the types of the plastics on its recyclability and environmental impacts have been emphasized clearly. The environmental threats derived by the plastic pollution, plastic waste trade and its relation with environmental justice, the international measures taken to combat the plastic waste trade and so on has been discussed in the plastic related part of the section. In the next section the circular economy has been discussed in more detail. Last but not least the relation of plastic and plastic pollution, circular economy and their relation to the environmental justice issue has been analyzed as well.

2.1. Plastics: The Historical Evolution and Different Types of Plastics

Previously viewed as a revolutionary invention of the 20th century, plastic is now seen as a bane of the 21st century. However, the high production of plastic dates back to the 1950s by jumping from 2 Mt (metric ton) and reaching 381 Mt in 2015 (Geyer, Jambeck & Law, 2017). Because of its versatility and durability, this synthetic material is suitable for a variety of uses including the food sector. The single-use plastic helps to decrease food waste by prolonging product shelf life and ensuring food safety. Moreover, this effective, affordable product made it possible for an increasingly globalized market in which the manufacture of wrapping and packing materials took place farther from the final consumer (Freinkel, 2011, 9-12).

In the past, people have tried to make materials that offer benefits not found in naturally occurring compounds. Shellac and chewing gum are two examples of natural materials that were first used to make plastic because they naturally have plastic-like features. The process of turning natural materials like rubber, nitrocellulose, collagen, and galalite into plastics came next. Additionally, a broad range of totally synthetic materials known as modern plastics were developed about 100 years ago. Alexander Parkes, who gave his discovery the name Parkesine, developed one of the early prototypes of celluloid in 1855. Polyvinyl chloride (PVC) was first polymerized between the years of 1838 and 1872. Significantly, the first truly synthetic, mass-produced plastic, marked the beginning of the wide range of completely synthetic materials that are now known as modern plastics. This was known as the creation of Bakelite by the Belgian-American chemist Leo Baekeland in 1907. He combined the two chemicals, formaldehyde and phenol, under extreme heat and pressure to produce his own ground-breaking item, which he called Bakelite. Later, the appeal of affordable yet highly sought-after items soared. It was the primary option for popular design ideas like Art Deco because it was simple to manufacture in large quantities despite its dark brown color and wood-like appearance (Freinkel, 2011, 8-10).

Many new plastics have been realized and developed following Baekeland's invention, giving a wide range of desired features which can be found in every house, workplace, and industry. Plastic owns a polymeric substance with the potential of modeling or shaping that is typically obtained by using high temperatures and pressure. Due to its characteristics such as plasticity, low density, inadequate electrical conductivity, transparency, and durability, a wide range of products can be produced using plastic. It is a material that can be used in almost anything including many products used in daily life.

Plastics are produced via the polymerization or polycondensation method from natural resources such as cellulose, coal, natural gas, salt, and crude oil. Nowadays, plastic is mainly produced from oil. Crude oil is a complex mixture of hundreds of different components, thus it must be processed before it can be used. Additionally, the initial stage in the production of plastics in an oil refinery is the evaporation of crude oil. The crude oil separates into segments of lighter constituents during this process. Additionally, each component is made up of several

hydrocarbon chain reactions, which are chemicals made of carbon and hydrogen. These chains contain variously shaped and sized molecules. In relation to that, naphtha is one of the essential components used to make plastics (Hillmyer, 2017, 11-15).

The global oil consumption of the plastics sector will increase from its present 7% share to 20% by 2050. This is supposing that plastic production and consumption increase as projected. When oil and gas are extracted for the manufacturing of plastic, a wide range of pollutants, as well as significant amounts of waste water containing scattered oil, dangerous materials, and other toxic compounds, are discharged into the environment. Plastic use and production use a lot of resources, mostly fossil fuels, which has an effect on the climate and the environment (European Environment Agency, 2021a).

Most fossil fuels which are used to make plastics have been distilled to separate heavy crude oil into fractions, or groups of lighter components. Naphtha, one of these fractions, is a critical component in the production of plastics. According to Griffin (1994), two main polymer families are often used to create plastics:

• Thermoplastics, such as polyethylene, polyethylene terephthalate, polyvinyl chloride, polypropylene, and polystyrene, which soften at high temperatures and stiff at low temperatures;

• Thermosets like polyurethane (PUR), phenol-formaldehyde (PF), and unsaturated polyester resins (UP), which never soften after being molded.

The polymerization and polycondensation processes which are primarily used to make plastics call for unique accelerators. In a polymerization unit, long polymer chains are formed by the joining of monomers like ethylene and propylene. Each polymer has a unique form, size, and collection of properties that depend on the different types of basic monomers that are used to make it. Additionally, industrial fabricators frequently classify plastics as "commodity" or "specialty" resins. The most popular durable goods and low-cost throwaway items are made with commodity resins, which are low-cost polymers manufactured in enormous quantities. The most prevalent are polystyrene, polyethylene, polypropylene, and polyvinyl chloride. It is important to understand that plastics come in several varieties, and each type has distinct properties that affect how easily they may be recycled (Geyer, Jambeck & Law, 2017).

The polymers mentioned below are recyclable, according to their intended usage after recycling (Garcia, Robertson, 2017):

- Polyethylene terephthalate (PET) is a polymer with special qualities including its lightweight, flexibility, durability to high temperatures as well as to steam and other gasses. Transparency is also a significant feature of PET which makes it feasible for advertising and storing food. It is one of the most frequently used plastics.
- Stiff and hard polyvinyl chloride (PVC) is mostly preferred to safeguard materials by packaging them. It includes a toxin known as nonylphenol which is a poisonous chemical.
- High-density polyethylene (PE-HD) is quite robust and has high resistance to water. It is frequently utilized in the manufacturing of beverages and in the hygiene industry.
- Polypropylene (PP) is strong and flexible enough to create appliances for cooking or throwaway material.
- Polystyrene (PS), due to its moldability is mostly preferable in the electronics industry as well as in the production of packing foam, due to its moldability.
- Low-density polyethylene (LDPE) tolerates heat pretty easily and is quite elastic. It is a crucial component in the production of bags for the food business. However, its hazardous composition, including aldehydes, ketones, and carboxylic acids, is considered as one of its drawbacks.

Along with the recyclable plastics there is another group, officially denoted by the letter O, consisting of polymers that cannot be recycled, such as polycarbonates and acrylonitrile butadiene styrene (ABS).

According to their chemical composition, plastics may be further split into two types. The first category includes plastics made of polymers with just aliphatic (linear) carbon atoms in their core sequences, whereas the second category includes polymers with heterochains. These compounds have carbon in their core sequences as well as other elements like oxygen, nitrogen, or sulfur. Plastic is very strong and practical, but because of its chemical characteristics, it is also

challenging to discard, taking thousands of years to decompose in landfills (Freinkel, 2011, 70-80).

The industrial applications of plastics saw a new level of manufacturer interest during World War II. The military was able to manufacture body armor, ropes, helmet liners, and parachutes when Wallace Carothers invented nylon in 1935. The development of tough glass for airplanes was made possible by Plexiglas. During this time, there was a 300% increase in the manufacture of plastics in the US. The 1950s and 1960s saw a continuation of the industry's post-war growth. It was no longer necessary to use almost any natural substance in manufacture. Plastics were employed in many industries, from furniture and packaging to auto manufacture (Geyer, Jambeck & Law, 2017).

In the first half of the 20th century, companies like Dow Chemicals, ExxonMobil, DuPont, and BASF began creating alliances between the chemical and petroleum industries. These companies are still the leading producers of resins used as starting materials in the plastics industry. Plastic started to replace more costly materials like paper, glass, and metal used in throwaway items like consumer packaging after World War II when the material's mass production began (Science Museum, 2019).

Despite a number of policies and action plans, the plastic still keeps its popularity intact. There are many proofs indicating the disadvantages of plastic for human health, marine life and environment in general. Nevertheless, no decrease in its production has been observed yet. In 2021, the global plastics market was valued at $593 billion. The plastics industry is expected to expand during the succeeding years, with a CAGR of 3.7 percent from 2022 to 2030, reaching a value of more than 810 billion US dollars (Statista, 2023c). Since the 1950s, the manufacture of plastics has significantly increased. The adaptability of this category of materials allows for the annual increase in manufacturing. The high increase rate in the plastic production is followed by the increasing market value of it. The next part of this thesis will go into further depth explaining how much plastic is produced, used, and wasted by various nations in different time periods.

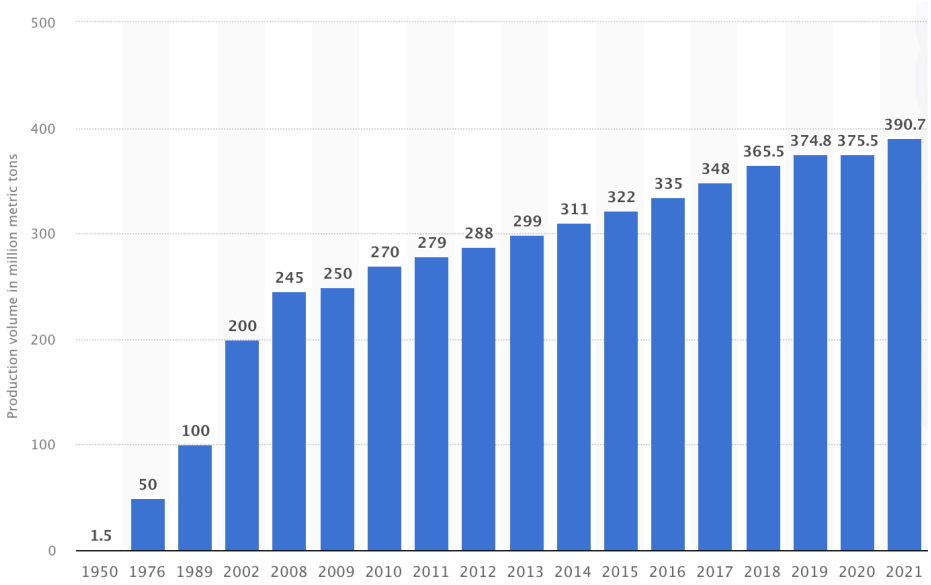
2.1.1. Production and Usage of Plastic: The Numbers Fueling Concerns

It is true to assert that plastic has become a dangerous preoccupation for humans. Over the past 70 years, people have used more than eight billion tonnes of plastic substances, yet barely any of it was appropriately recycled (Gerngross, et al., 2000, 37-39). The remaining waste is either disposed of, or is poisoning the environment, oceans and seas.

Although plastic is a relatively recent development, its adaptability and affordable manufacturing have made it one of the most commonly used materials in the contemporary era. A significant example of this is that on an average, the yearly plastic usage in western Europe is over 150 kg per person, which is more than twice the world average of 60 kg. The exponential rise in production of plastics over the past century demonstrates the success in the plastic industry. Worldwide production of plastics has increased 20 times since 1964, reaching 368 million tons in 2019. During the upcoming decades, these figures are highly anticipated to double even (Fact Sheet: Single Use Plastics, 2022). There are different numbers (figures) for plastic production, use and plastic waste in the literature by international organizations, NGOs and scientific papers. So it is difficult to give absolute numbers.

As indicated in **Figure 1** the annual production of plastic kept increasing drastically since 1950. 390.7 million MT of plastics have been produced globally in 2021, an increase of 4% annually. The world is expected to generate 445.25 million metric tons of thermoplastics in 2025. By 2050, it is predicted that annual plastic output would have increased to 590 million metric tons. This would represent a rise of more than 30% from 2025 (Statista, 2021).

Figure 1: The Global Plastic Manufacture from 1950 to 2021 (Per year)



Data: Statista, 2021

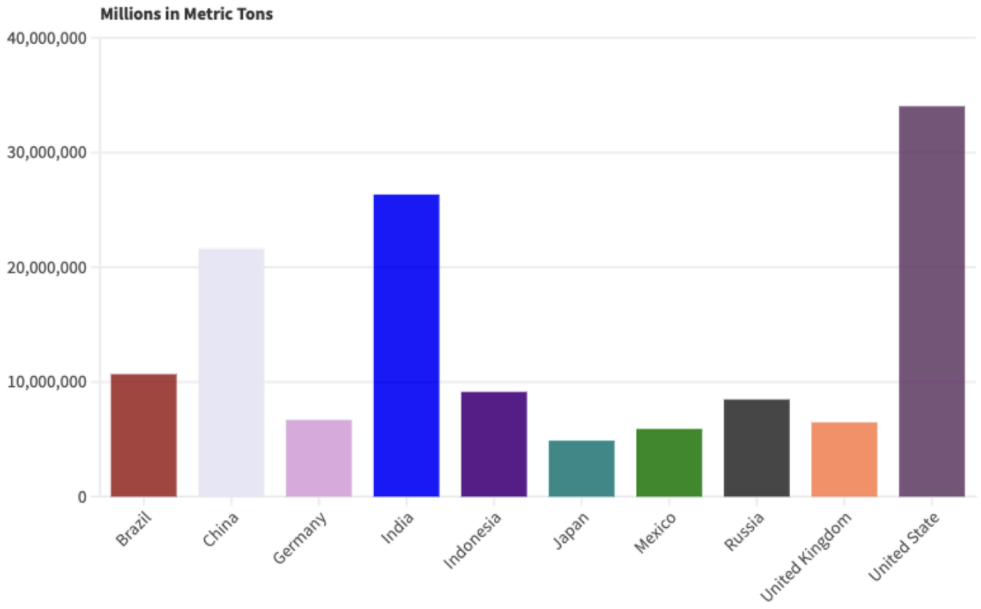
Today, the world's top manufacturer of plastics is Asia. In 2021, only 32% of the worldwide plastic production was done by China. Each month between six and twelve million metric tons of plastic items were manufactured in China recently (Luan, et al., 2022). With an 18% share of global plastic output in 2021, North America comes in second, while Europe ranked 4th with 15% global plastic production. The packaging industry accounts for around 40%, it is followed by the building and construction industry with its share of 20%, 10% by the automotive field, 6% by the electronics field, 4% by the homes and sports field, and the rest 20% by the others (Statista, n.d.a). Fossil fuels, mostly gas and oil are being used in order to produce approximately 99 percent of plastics. The plastic production process uses half of the oil needed to create it as fuel, while the other half is locked into the plastic goods as feedstock (European Environment Agency, 2020).

Based on the high level of production, also the great amount of the plastic waste generated every year. **Figure 2** below mentions some of the top plastic waste generating countries. For instance, Europe contributes significantly to the global issue of plastic waste pollution as one of the largest consumers of plastics in the world. Germany, the United Kingdom, and Italy are also among the leading producers of plastic waste in Europe. Each year, the United States generates more than 42 million MT of plastic waste, or around 130 kilograms of waste for every American. The rapid

expansion of American plastic production has not been matched by an infrastructure that can keep up (GreenMatch, 2023).

460 million metric tons of plastics were used over the world in 2019. In the same year China was dominating the plastics industry, accounting for almost 20% of worldwide consumption. However, the United States was at 18%. Within the span of 40 years, plastic use in the European Union has tripled. Moreover, the usage of plastic in EU member states jumped from 23 million MT in 1980 to 67 million MT in 2019. Nevertheless, the global financial crisis caused a major decline in plastic consumption in 2008, although the rising trend returned in 2010 (Statista, n.d.).

Figure 2: The Top Plastic Waste Producing Countries:



Source: GreenMatch, 2023

If plastics usage increases as predicted, it is predicted that by 2050 the plastic sector will consume 20% more oil than it does now (2018, 7%). Between 3.5 and 3.8 percent annually, plastic manufacturing is growing at a rate that is much higher than the need for oil. Despite the fact that fuels presently account for the bulk of oil consumption, this percentage is anticipated to decline over the next several years as cars become more and more electric, hence reducing the need for gasoline and diesel in developed nations. According to the International Energy Agency (2018), plastics and other petrochemicals will be the primary driver of rising oil demand until 2030.

Up to 2.2 million tons of plastic "leak" into the environment annually as a result of inadequate waste management, trash incineration, and inefficient waste disposal in landfills in India. Waste plastic is currently turning into a major issue for the country. The nation's massive plastic waste output is contributing to a rise in environmental concerns (UNEP, 2021). This issue, which causes congested landfills, dirty streets, and plastic waste poisoning water sources, is mostly caused by India's inadequate waste management system.

Indonesia generates 7.8 million metric tonnes of plastic waste annually, of which 4.9 million tonnes are improperly handled due to landfill leaks, uncollected debris, or dumping in open dumpsites. Türkiye produces 7.9 MT of plastic annually. Out of this, 5.8 MT is produced using virgin plastic imported from other countries, while 2.1 MT is produced using virgin plastic supplied domestically (Karasik, 2022). 9.54 million tonnes of plastic goods were produced in Türkiye in 2020, which resulted in an increase in this figure.

China is the world's greatest producer of plastic, producing over 60 million tonnes of waste annually, of which only 16 million tonnes are recycled. Plastic manufacturing has increased significantly worldwide, from 1.5 million tonnes in 1950 to 359 million tonnes in 2018, as has the quantity of plastic waste produced. 2020 production declined dramatically in the beginning of the year because of the Covid-19 epidemic, but it increased in the second half (Statista, n.d.). The OECD (2022b) study states that although plastic output fell by 2.2% during the Covid-19 pandemic, the quantity of plastic trash increased as a result of the usage of plastic packaging, gloves, masks, and other single-use medical equipment.

2.1.2. The Plastic Waste Problem

In 1960, scientists coincidentally stumbled upon the first incidence of plastic contamination. It was a plastic bag instead of a plankton. Plankton is a crucial species that shows the productivity of the ocean, especially the health of fisheries, and researchers were fishing for it using a form of equipment called CPR. The machine unexpectedly generated a record of plastic waste as well.

The purpose of CPRs are to be pulled behind the ships in order to collect plankton samples from the sea (Gill, 2019).

But when something got caught in the CPR, it had to be taken out and noted in a log. A plastic bag that had been caught was discovered in 1960 off the coast of Ireland. “We checked through those logs and realized we had some extremely early, historic entanglement incidents of plastics”, Dr. Clare Ostle, the researcher of Plymouth’s Marine Biological Association said. When the researchers went through their findings, they concluded that fishing gear was the source of the first plastic contamination incident in 1931. The first known incidence of marine debris in the oceans has been determined as this. Not only marine organisms, but all living organisms on the planet suffer greatly from the effects of plastic pollution and any material made of plastic. Numerous marine animals have been observed absorbing plastic since the 1990s, but experts believe that plastic debris has been contaminating marine stomachs ever since it was first introduced to the marine ecosystem (Gill, 2019).

Numerous species, water resources, and economies worldwide are all at risk from plastic pollution, according to decades of research. The pace of plastic contamination in the ocean is frightening, according to experts. Experts have categorized plastics as a contaminant on par with dangerous substances and have called for a stop to the consumption of single-use plastics. If present development rates continue, plastic manufacturers might use 20% of world oil output by 2050, and plastic waste production could increase by four times from where it is today. If current trends continue, a worldwide environmental issue caused by plastic waste will only become worse. In the environment significant concentrations of single-use plastics are being observed by the researchers as a result of the COVID-19 (Silva, et al., 2021).

However, the continued developments of packaging material provide clear paths along which around 14% of plastic is burned, 40% are waste dumps, and moreover, 32% enters the general environment as junk or waste. Only 2% (or a ratio of 1:1) of the 14% of collected plastic that was intended for reuse has been reused in a closed loop; 8% of it is reused, and on top of that, reuse results in a 4% deficit (Statista, 2022). A third of all plastic packaging ends up in places where it can survive for many years. The rest of, somewhere in the range of 80 and 120 billion tones yearly, is wasted after only one, brief utilization. This implies by 2050 there could be a bigger

number of plastics than fish in the ocean. Despite the fact that it is valuable for day to day exercises, it prompts extensively huge impacts on the climate and environment (Ellen MacArthur, n.d.).

Primarily, due to its current reliance on oil and gas, fossil fuels, plastic emits greenhouse gasses. Because it takes a lot of energy, the extraction of oil and gas is the first step in releasing greenhouse gasses into the atmosphere. In order to power drilling equipment, pumps, and compressor operations, natural gas and diesel are burned in turbines and engines, respectively (European Environment Agency, 2020). Also, the transportation of waste and water at the well sites necessitates a significant number of greenhouse gas-emitting trucks. Methane, the most prevalent greenhouse gas, is also heavily released during the process of extracting oil and gas. Methane emissions happen during the manufacture and distribution stages of the natural gas system. Gas engines and pipeline leaks, both deliberate and inadvertent, are two instances of actions that might release methane (Meys, et al., 2021. 29).

The environmental pollution is observed in all stages related to the plastics starting from the production until the waste generated by it. As mentioned above, in the plastic production process a lot of resources are used. For instance, the need for more energy to clean more polluted water or inject more water into the bedrock results in an increase in greenhouse gas emissions as oil and gas fields become older. Onshore oil and gas extraction affects the soil and inadvertently releases greenhouse gasses in certain regions when woods and farmland are destroyed to make space for oil fields. It takes a lot of energy to refine crude oil using steam to create oil products like naphtha, which are still the most popular method for making plastics in the EU (Plastics Europe, n.d).

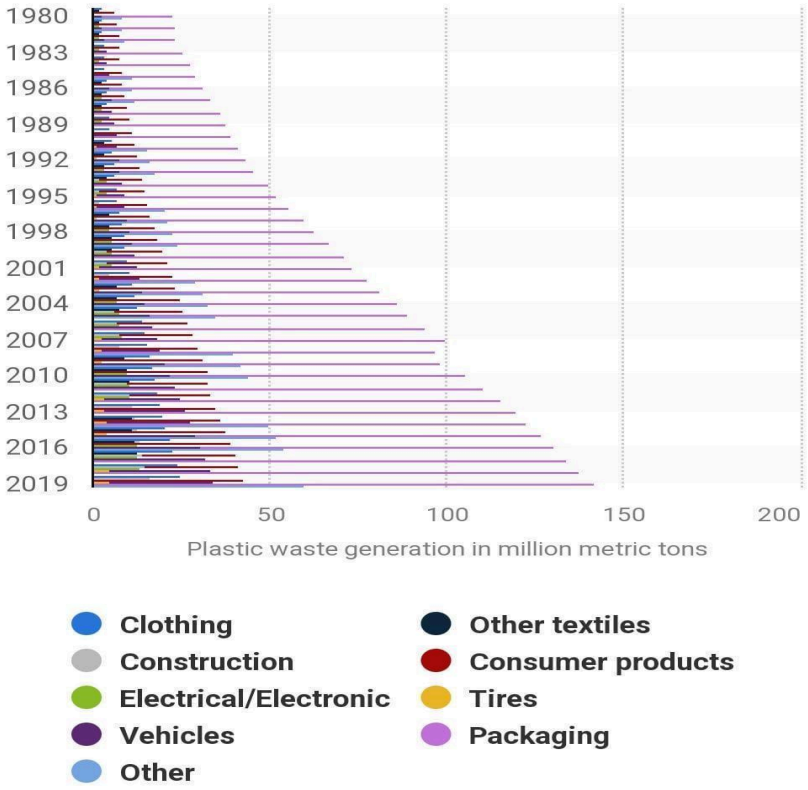
Another concern with the plastic waste is that it is difficult to classify plastic into distinct groups for recycling because there are countless varieties, each of which contains unique chemicals and colors that cannot be recycled together. For instance, green PET#1 bottles made of polyethylene terephthalate cannot be recycled with PET#1 clamshells made of a different kind of PET#1. For recycling, it is necessary to separate the following materials: low-density polyethylene (LDPE#4), polypropylene (PP#5), polystyrene (PS#6), polyvinyl chloride (PVC#3), high-density polyethylene (HDPE#2), and polyvinyl chloride (PVC#4) (Waste for Change, n.d).

However, according to **Figure 3** the amount of plastic waste produced globally between 1980 and 2019 rose sevenfold, reaching 353 million metric tons. Most plastic waste at this period came from packaging, with 142 million metric tons produced in 2019 (Statista, 2020). Plastic waste is a significant environmental issue everywhere in the globe, and much of it enters marine habitats.

The European Environment Agency (EEA) (2021b) has calculated that burning plastic waste yearly causes the emission of 400 million tons of carbon dioxide (CO2e), which is a huge environmental concern. More than 40% of the "miracle material" is only used once, despite being cheap and durable. When plastic products are discarded, they break down into tiny fragments, killing marine life and "choking our waterways" for millennia.

Figure 3: Plastic waste generation worldwide from 1980 to 2019

(in million metric tons)



Data: Statista, 2020

However, due to the fact that many products are only used once before being thrown away, the amount of plastic waste created on a yearly basis has increased dramatically. Frequently mismanaged, this waste pollutes the environment. In the European Union in 2019, around 15.4 million metric tons of waste from plastic packaging were produced. More plastic waste has been generated now than in 2005, a rise of more than 25%. The quantity of plastic packaging waste generated in the European Union has been increasing every year since the start of the decade. 2019 saw a 34.5 kilogram per person increase in plastic packaging waste in the EU. The number that was registered at this time was the highest ever. Germany was the leader in the EU-27 in terms of plastic packaging waste production in 2019 which was above 3.2 million metric tons created. With 2.4 and 2.3 million metric tons of plastic waste, France and Italy placed in second and third, respectively (Eurostat, 2022 a).

A recent Statista analysis claims that together, less than one-third of the plastic that European countries discard is recycled. This implies that the waste is handled properly and removed, but not added back into the manufacturing process. The primary offenders are packaging and single-use plastics, including crisp packs, drink bottles, and carrying bags. Plastic production in Europe totals 60 million metric tons. Despite the European Environmental Agency's (EEA) attempts to reduce rubbish levels throughout the continent, just 30% of waste was documented as being recycled (European Environment Agency, 2021a). Each European country has a unique system for managing waste. In Spain, landfills get 38.2 percent of the plastic packaging that is disposed of each year, compared to only 0.1 percent in Germany (Statista, n.d.).

According to Parker (2023) these microplastics could then enter the human body through the consumption of fish and shellfish, posing potential health risks. From coastal areas, anywhere from five million to fourteen million tons enter our oceans each year. This material is broken down by the sun, wind, waves, and heat into smaller pieces that plankton, bivalves, fish, and even whales think of as food.

Southeast Asia has turned into a plastic pollution hotspot as a result of its quick urbanization, growing middle class, and inadequate waste management infrastructure. The usage of throwaway materials like masks, sanitizer bottles, online delivery packaging, and other items has also significantly impacted by the COVID-19 (Shams, Mahbub., 2021. 28-33). Because of this, the

worth of plastic packaging is projected to increase by 95% annually, costing between US $80 billion ($112 billion) and US $120 billion.

In 2020, the amount of consumer plastic waste collected by the European Union, Norway, Switzerland, and the United Kingdom was anticipated to be 29.5 million metric tons. This was recycled to a degree of 35%. Landfilling made up approximately a quarter of post-consumer treatment, with energy recovery making up the majority (Statista, n.d.). In 2020, it is anticipated that the European Union would gather 29.5 million metric tons of post-consumer plastic waste. 12.4 million metric tons of this amount were recycled. Post-consumer plastic waste has been gradually increasing throughout the EU-27. The quantity of plastic waste dumped in landfills, on the other hand, has decreased (Statista, 2019).

From more than 15 million MT in 2006 to around 17.9 million MT in 2020, plastic packaging waste was gathered for treatment in Europe (Eurostat, 2022c). While waste disposed of in landfills decreased, the amount of plastic packaging waste collected for recycling more than doubled over the relevant period. In 2019, the European Union's rate of recycling plastic packaging dropped from the previous year to 40.6%. Recycling rates for plastic packaging waste in the EU peaked in 2016 at 42.4%, but they have subsequently declined. In the EU-27, Lithuania has the greatest recycling rate for packaging waste with a 69.6% rate in 2019 (European Commission, 2020c).

In addition, It is estimated that single-use plastic waste, which amounts to $6 billion annually in Malaysia, the Philippines, and Thailand, is discarded rather than collected and recycled, losing more than 75% of the material value of recyclable plastic. In order to prioritize plastics-related policies and investments in important industries and regions, Southeast Asian countries have developed action plans and circular economy road maps (Kwakwa, Mora, 2021). However, due to the shared rivers, coasts, and regional markets for plastic waste and goods, nations are unable to tackle this problem on their own. Borders must not limit solutions.

Additionally, the impacts of today's culture of single-use, throwaway plastic may be observed on seashores and in oceans all around the world. By 2050, more plastic by weight than fish may be present in the oceans (Foekema, et al., 2013). Ocean pollution from plastic waste is becoming worse. In addition to harming the environment by clogging up the coastline, plastic also

entangles larger marine animals and fools smaller ones into thinking they are food. If they ingest plastic particles, they may draw harmful chemical contaminants to their bodies and be unable to digest regular food. Humans are the top predators to devour plastic. The impact on their health is unclear (European Commission, 2020c).

Furthermore, sea pollution costs manufacturers, as well as companies and communities that depend on the sea. Given that just 5% of the economic value of plastic packaging is kept and the remainder is effectively thrown away, it is obvious that a strategy that emphasizes recycling and material reuse is required. The most typical kind of waste seen around coastlines is single-use plastic. According to Bergman, et al., (2017), over half of all maritime litter consists of objects like cotton buds, plastic drink bottles, cutlery, and cigarette butts.
The health of European and global marine ecosystems is at risk from rising pollution, including marine litter, which has costly effects on the environment, society, and economy. The blue economy's resilience and that of our society as a whole are put in jeopardy by climate change, biodiversity loss, resource overexploitation, and habitat destruction. Instead, by using or producing renewable resources, preserving marine ecosystems, reducing pollution, and improving resilience to climate change, a sustainable economy can provide opportunities for new businesses and jobs (European Commission, 2020c).

It is worth mentioning that global mismanagement is becoming a severe issue as a result of the various ways that plastic waste interacts with animals. It can directly harm the ecosystem by covering coral reefs, preventing light penetration, or decreasing ocean oxygenation. It can also trap animals or be consumed. Due to its resistance, it cannot be broken down or can only be done so very slowly; instead, it fragments into tiny particles that can be easily transferred into aquatic habitats. Plastic buildup and pollution are seldom ever included in research of infectious illnesses. However, by creating favorable environments for their vectors, such pollution might directly affect diseases carried by arthropods.

The most prominent examples are the mosquitoes Aedes aegypti and Aedes albopictus, which furthermore to the chikungunya, dengue, yellow fever, and Zika viruses also transmit a wide range of other arboviruses. Both species are known to grow in plastic buckets, teacups, and bottles and typically dwell nearby homes. They are also both known to be very anthropomorphic.

In consequence, the development of these species in plastic waste and their widespread distribution, particularly across tropical regions with ineffective plastic waste management systems, it is now thought that above half of the world's population is vulnerable to Aedes-borne viruses where plastic waste could affect transmission (Williams, et al., 2019).

To sum up, in order to overcome the current global plastic waste issue and its negative impacts, strategies for reducing plastic waste need to be expanded all over the world in order to reduce the problem and promote recycling. Although plastic is currently a waste stream with high priority, according to the European Environment Agency (2020), more can be done. Countries could "diversify their implemented measures", for instance, as levies on plastic carrying bags have "borne impressive results". Europe's handling of plastic waste differs from nation to nation. OECD countries of the European Union recycled 14% of plastic waste in 2019 while throwing away 37% of it in landfills. Contrarily, the bulk of plastic waste is dumped in landfills in non-OECD countries, where just 6% of plastic waste is recycled.

The majority of European Union member nations have experienced a growth in plastic packaging that is recycled since 2010, although a handful have witnessed a drop. For instance, Germany routinely boasts one of the greatest rates of plastic package recycling in all of Europe. But compared to 2010, its recycling rate was lower in 2019 (Statista, n.d.).

The process of reducing plastic waste production and moving toward a more circular economy are both being slowed down, according to the Eurostat (2023) research, by a few specific challenges. Cost and product quality differences between recycled and non-recycled plastic products are the primary barriers to plastic recycling. Plastic processors require a lot of recycled plastic that is produced to strict standards and delivered for a reasonable price. Also, the variety of the raw materials makes recycling more complex, more expensive, and affects the quality of the finished product because plastics are simple to adapt to match the demands of each producer, whether they be functional or aesthetic. Even if recycled plastics only made up 6% of the plastics demanded in Europe in 2018, this need is growing.

2.1.3. Plastic Waste Trade

Because each plastic component contains a chemical substance that undergoes a distinct decomposition process, recycling plastics can only be done in a very limited and intricate manner. It is a fact that the plastics of high quality and clean can be recycled. Occasionally a recycling facility might do the washing as well, but most of the time the plastic is judged worthless and burned, if it is not fulfilling the requirement of recycling. Recycling is costly to operate and gets more expensive as more processes are added like washing (Garcia, 2017. 5-9). Due to the competitiveness created by the lower production costs of new plastic, recycled plastic is now much more expensive than the new plastic. Additionally, in societies with high power costs, incineration rather than recycling can be economically more advantageous.

Plastics have been deemed a pollutant on par with hazardous waste by scientists, and they have also advocated for the prohibition of single-use plastics. Experts have known for a long time that the condition of the marine environment will get worse, if more plastic is made and used, but the global plastic industry keeps making more. For instance, in 2018 merely 30% of the 25.8 million plastic waste tons produced annually in Europe are gathered for recycling, while 31% are disposed of in landfills and 39% are burned (Drzyzga & Prieto, 2018).

The question can come to mind about the fate of the rest of the plastics which are not recycled. Ultimately the plastics which are not suitable to recycle or intentionally are not recycled are ending up in nature. Over the next 40 years, landfilling is anticipated to be the primary method of waste management, with 174 million MT of waste being disposed of in 2019 and more than half a billion MT by 2060. By 2060, 176 million MT of plastic waste will have been recycled, which will make up around 17% of the world's waste management (Statista, 2023d). How much plastic used generally speaking has expanded quickly, from close to zero of each 1950 to 359 million tons in 2018. Each individual on the planet utilizes 45 kilograms of plastic consistently overall (European Environment Agency, 2021b). It is an unfortunate fact that plastics later on come back to us either directly as a harmful chemical through the water or food that we consume, or as a form of polluted environment, polluted air, spoiled marine life, unhealthy or dead animals, various types of health issues and so on.

Recycling plastic is a complex topic that needs a certain level of classification in order to prevent contamination. This step is challenging because contamination should be seen as a combination of several components that have access to the plastic, either in the form of chemical residues or other things that differ from the rest of the plastic. Rich industrial countries often export the plastic waste that is produced on their land since doing so will be less expensive than recycling it domestically (Hsu, et al., 2021).

A few effects of the over consumption of plastic and improper management becoming a worldwide issue include overflowing landfills, clogged river lines, and endangered biological systems. With detrimental effects on businesses including tourism, merchant ships, and fishing, developing nations are mostly bearing the brunt of this suffering. According to a 2018 UNEP research, plastic litter alone costs the tourism, fishing, and merchant marine sectors of the Asia-Pacific region 1.3 billion dollars yearly. According to the same estimate, cleanup of the shoreline and beaches costs Europe approximately in the neighborhood of 630 million euros yearly. China, with 25.36 metric tons (MT), is the world's largest producer of SUP (single-use plastic), followed by the United States with 17.19 MT (Plastic Waste Makers Index, 2023)

Plastic waste is one of the waste sources that is growing in municipal waste the fastest. Waste plastics have posed a serious hazard to the environment due to their abundance and challenges associated with disposal. Instead of decomposing through biodegradation in landfills, plastic waste is photodegraded into plastic dust, which can enter the food chain and pose serious health risks for all living beings.

Trade in plastic waste and waste can make it easier to transport resources to nations that have a competitive advantage in recycling plastic. Trade’s ability to create economies of scale is anticipated to be a crucial weapon for boosting secondary plastic markets and boosting plastics circularity. But in recent years, several export destinations have seen an increase in plastic waste and scrap, some of which was toxic or highly polluted, raising questions about these nations’ ability to manage this material in an environmentally responsible way.

Around 4.45 million metric tons of plastics were shipped globally in 2021, a decrease from the almost 15 million tons documented in 2010. The “National Sword” strategy of China is largely

responsible for the decline in shipments of plastic waste worldwide. China was the primary recipient of the majority of the plastic waste produced in the globe for many years, but starting in 2017, it started to restrict the import of some solid waste products until outlawing most plastics completely in 2018. The biggest exporters of plastic waste to China at the time were Japan, the U.S, and Hong Kong (UNCTAD, 2022a).

About 45% of the plastic waste generated worldwide has been imported to China since 1992. Before China's 2018 ban, the United States and other developed nations like the Netherlands and the United Kingdom were the origin of 72.4% of the plastic waste produced globally, which was imported by China and Hong Kong. The items that China exports to the US are the contents of containers that are sent back to China empty. China makes use of an empty container system. The backfill is subsequently delivered in these containers as waste (Brooks, Wang & Jambeck, 2018). This shows that China has been the world's top supporter of the recycling of plastic for many years, and based on this, a connection starts that is advantageous to both sides in a waste trade.

China was the primary place of origin for the majority of the plastic waste imported into Sri Lanka in 2022. The majority of waste trade movements are intraregional, with Türkiye serving as the primary market for EU waste exports and Canada and Mexico receiving more than half of the United States' plastic waste exports. Thousands of ships loaded with illegal waste had to be sent back to their place of origin when numerous nations, including Malaysia, followed China's lead and drastically reduced their imports of waste. Frequently, contaminated waste that cannot be recycled is shipped illegally in containers with fake labels (Brooks, Wang & Jambeck, 2018).

An estimated US$ 4.3 billion worth of plastic waste, parings, and scrap was exported in 2017 (excluding re-exports), with 71% of that coming from industrialized nations, namely the European Union (40%), the United States (15%), and Japan (12%). 75 percent of imports were made in nations that are developing, mostly in China (64%) (EIA, 2021).

Plastic waste export is primarily driven by two factors: First and foremost, the nation's area can no longer support the expanding amount of waste produced. This is a result of the country's various physical features; nations with small or constrained territories cannot offer a lot of room for waste collection in a single place. Second, the waste management system of a nation is now

ineffective. This encourages such countries to choose selling waste for a low cost and a high return rather than self-processing, which requires sorting waste to prevent contamination (EIA, n.d.).

Most of the labor needed for the lower-paying sorting is accessible in underdeveloped countries. China has been importing plastics for manufacture for about 25 years, but eventually it is unable to regulate the volume of plastic waste it creates. Workers sorting waste by hand end up with a number of chronic diseases because of the contaminated environment when domestic production and consumption of plastic waste are coupled with imported plastics. Certain health issues happen for the plastic sector workers as sometimes there is hazardous waste among the imported plastics.

The UNCTADstat dataset on plastics trade enables in-depth analysis of trade throughout the life cycle of plastics, including trade in raw materials, finished goods, and plastic waste, by product type, destination, and source. Transparency is increased and baselines for policy commitments are set with the help of a life cycle analysis. For instance, the data by the UNCTADstat indicates that developed economies will continue to be the net exporters and will account for nearly 80% of the global trade in plastic waste in 2021. However, they are making efforts to reduce their exports. The bulk of plastic waste is transferred to underdeveloped countries, which lack the infrastructure needed to treat the material in an eco-friendly way. Although exporting plastic waste may be a solution for some countries to solve their inadequate recycling capacity (UNCTAD, 2022a).

Fossil fuels and chemicals are combined to create plastics, and many of the compounds in plastics have been linked to dangerous health issues. However, sometimes the amount of plastic waste that is sold internationally is underreported or hidden. Exports of plastic waste have been highlighted as a serious worldwide health and environmental issue.

In poorer nations, the unregulated waste management market may be enormous. The Chinese government authorized 857 recycling businesses to handle the recycling of imported plastic waste in 2015. Thousands more informal, and hence uncontrolled, recycling locations existed in contrast. These occupations need a lot of manual labor, simple tools, and sometimes lax safety

regulations. Recycling leftovers are typically burnt or discarded, causing wastewater contamination and the release of toxic substances including carbon monoxide, furans, and dioxins into the atmosphere (Olley, 2021).

IPEN collaborated with experts from the Swedish University of Gothenburg, Türkiye's Cukurova University, and the organization named the Last Beach Cleanup to draw attention to the flaws in the present system for monitoring the trade in plastic wastes. The group's report, "Plastic Waste Trade: the Hidden Numbers," emphasizes the substantial exports of plastic waste that are frequently hidden from view, with a special emphasis on shipments from Japan, the UK, the EU, and the US to non-OECD nations and Türkiye (IPEN, 2023).

The analysis indicates that when only two types of plastic wastes—those from textiles and those included in waste paper bales—are examined, they are both ignored by the existing system. According to the IPEN report (2023):

- The two categories of hidden plastic waste that the current methods miss might total up to 1.8 million tonnes.
- Exports to non-OECD nations might be more than expected when undetected plastic wastes are taken into account.
- Counting hidden plastics would result in an increase in UK exports of up to 18 times. The US and EU both have exports that are up to 4.2 times greater than average.
- The EU or the US would be the biggest exporters of plastic waste after accounting for these concealed plastic wastes, according to the range of estimations employed. When tracked by the existing method, Japan is the top exporter of plastic waste.

At a UNCTAD event at the climate summit, it was emphasized that ending the illegal trade in plastic waste and lowering the amount of traded plastic goods are crucial to tackling pollution, protecting our oceans, and combating climate change (UNCTAD, 2022b). Despite this and other international measures like the Basel Convention, the amount of plastic waste being traded is still high. There should be stricter rules and legislations, monitoring mechanisms on an international level in order to control the waste trade in a more effective way.

2.1.4. Managing Plastic Waste Trade: International Responses

Waste shipments have two drawbacks. They may offer resources to industries that require them when properly executed and done so in an ecologically responsible manner. But insufficient waste treatment can seriously harm both the environment and people's health. Over many years, this has been thoroughly documented. The World Health Organization (2019) states that while the scientific data on waste-related health consequences is inconclusive, it does point to the possibility of major negative effects, such as cancer, death, reproductive health issues, and milder effects impacting well-being. If dangerous pollutants build up in ecosystems, food crops, livestock, and eventually people, incorrect waste handling can also pose indirect health problems.

Since waste trading has such a negative influence on the planet, especially in nations without adequate waste treatment facilities it has become a worldwide issue. International solutions have been sought as a result of the rise of this subject on the international agenda to deal with the problems brought on by the trade in plastic waste. However, there is yet no international agreement directly addressing this problem.

Under the Basel Convention, a first move was taken in 2019 to address the issue, at least in part. Adopted in 1989, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal came into force in 1992. It is the biggest environmental pact on hazardous and other wastes ever achieved. As of October 2023, it had 191 Parties, almost all of whom are located around the world. Protecting human health and the environment from the harmful impacts of producing, transporting, and managing hazardous and other wastes across international borders is the primary objective of the Convention (UNEP, 2019b).

According to Article 6 of the Basel Convention of 1989, the importer must have complete knowledge of the imported goods when moving transboundary waste shipments. Additionally, exporting countries are obligated by this agreement to guarantee the safe and accurate delivery of waste. Article 8 of the Basel Convention mandates that whenever harmful wastes or other wastes are transported over national boundaries in contravention of the earlier agreement, the exporting party must send the waste back to the sending nation. There is no need for any country to

continue smuggling waste paper and other harmful materials to different countries in the future because it is one of the prohibited activities included in this treaty (UNEP, 2019b).

According to Article 9 of the Convention, waste that the importing nation determines to be waste and does not meet export requirements must either be disposed of in accordance with the Convention's rules or returned to the nation that exported it within 30 (thirty) days of the importing nation's notification to take the waste back. The exporting nation must nevertheless keep an eye on the process to make sure it does not take longer than the convention permits, even if it has the authority to forbid re-export. The Basel Ban Amendment, which forbade the export of any kind of hazardous waste from the Organization for Economic Cooperation and Development (OECD) to non-OECD countries, was approved by 66 countries at the Second Conference of the Parties to the Basel Convention (COP2) on March 22, 1994, in Geneva (UNEP, n.d).

Norway proposed changing the Basel Convention's Annexes in June 2018 to particularly address plastic waste in order to stop the flow of plastic waste to nations without enough facilities for the ecologically sound handling of plastic waste. The Basel Convention's Plastic Waste Amendments were unanimously approved by the Conference of the Parties in May 2019. These amendments add more classifications for plastic waste to Annex II, Annex VIII, and Annex IX. As a result, the Basel Convention is the only international law that is currently and particularly applicable to plastic waste. The amendments took effect in 2021 and applied to 186 States as well as the EU (ArcGIS StoryMaps, 2021).

The Convention distinguishes between three types of waste when it comes to international waste transfers. To each of the impacted Annexes, the Plastic Waste Amendments included additional entries:

- Lists of waste categories needing particular treatment are provided in Annex II. The new entry includes all plastic waste, notably plastic waste mixes, with the exception of those that are included in other Annexes.
- Wastes that are categorized as dangerous are included in Annex VIII. The updated entry deals with toxic plastic waste.

- Annex IX contains a list of wastes that are not regarded as dangerous. The new item includes waste that is made of plastic that is not dangerous as long as it is intended to be recycled in a way that is not harmful to the environment and is nearly devoid of pollution and other wastes (UNEP, n.d)

Annex II: Modified to include entry Y48, which refers to plastic waste, such as mixtures of that waste, except in the following cases:

a) Hazardous plastic waste (i.e., plastic waste that exhibits characteristics of Annex III and has been polluted with constituents of Annex I, thus being classified as entry A3210 in Annex VIII).
b) Non-hazardous plastic waste (entry B3011 in Annex IX), which is approximately free of contamination and other waste kinds and intended for recycling in an ecologically responsible way .

Particular attention must be given to Y48 plastic waste, and the importing state's "prior informed consent" (PIC) is needed for its commerce. As a result, the Basel Convention's (PIC) method applies to it (ArcGIS StoryMaps, 2021).

Annex VIII: Modified to include entry A3210, which is plastic waste, including combinations of this kind of waste that meet the criteria for hazardous waste because they contain or are contaminated with materials from Annex I and exhibit traits from Annex III. The importing state's "prior informed consent" (PIC) is necessary for the A3210 plastic waste trade. In this regard, it is governed by the Basel Convention's PIC method (Basel Convention, n.d).

The entry B3011, containing plastic waste and mixes of plastic waste (described in the bullets below) that are nearly free of contamination and other forms of waste and intended for distinct recycling in an ecologically sound way, has been added to Annex IX. Within this group of plastics include polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), perfluoroethylene/fluorinated ethylene propylene (FEP), and polyvinyl fluoride (PVF). The Basel Convention's "prior informed consent" (PIC) mechanism does not apply to B3011 plastic waste, meaning it is not subject to it (UNEP, n.d).

The Amendment's main goal, according to the United Nations Environment Programme (2019), is to make it illegal to transport hazardous waste and other forms of it from rich nations to underdeveloped countries. This is done due to probable long-term impacts as well as the fact that impoverished countries are currently unable to establish efficient waste management and recycling in their regions.

The Ban Amendment has an impact on the export of "hazardous wastes" from parties included in the Convention's Annex VII to those not included in that list. Parties that are members of the European Community (now the European Union), Liechtenstein, and the Organization for Economic Cooperation and Development (OECD) are classified as parties mentioned in Annex VII (UNEP, n.d).

The following exports from Annex VII nations are prohibited under the Ban Amendment:

- All exports of "hazardous wastes," as defined broadly by the Convention and encompassing everything harmful in the country of import or export, to non-Annex VII nations for ultimate disposal (i.e., activities included in Annex IV A of the Convention).

- All exports of a subset of hazardous wastes (those listed in Article 1(1)(a) of the Convention) to nations outside of Annex VII for the purposes of recycling and other recovery processes as outlined in Annex IV B of the Convention (UNEP, n.d)

Upon the Ban Amendment's worldwide entry into effect, the nations mentioned in Annex VII that have ratified it will need to put laws or other mechanisms in place to carry out the need to halt exports. This duty will be applicable to all "states" that are not included in Annex VII and to parties who are mentioned in Annex VII who have signed the agreement, irrespective of whether the destination nation is a party to the Basel Convention or the Ban Amendment.

Numerous developing nations have also signed the Ban Amendment, and it is expected that they, along with others, will enact laws in their home countries that forbid the import of hazardous waste from nations that are mentioned in Annex VII, regardless of whether or not those nations adopted the Ban Amendment. In fact, a lot of non-OECD nations have already taken this action by enacting import prohibitions or by withholding approval for specific goods (UNEP, n.d).

Due to the US's non-party status to the Basel Convention, trade of wastes (both "hazardous" and "other") covered by the Convention are already forbidden under the Convention's trade embargo with individuals who are not parties unless the shipment is covered by a different "Article 11" agreement permitting the movement. Likewise, commerce amongst Annex VII nations, trade between non-Annex VII nations, and the transportation of toxic waste from a non-Annex VII nation to an Annex VII nation will not be impacted by the Ban Amendment (UNEP, n.d).

One of the relatively few environmental accords that designates a forbidden conduct as "criminal" is the Basel Convention. The fact that illegal movement is regarded as a crime that Parties are required to prohibit and punish reveals a lot regarding the dedication of the worldwide community to the ecologically sound handling of toxic and other types of waste. Unfortunately, there is still a significant amount of illegal toxic waste smuggling occurring everywhere (UNEP, n.d).

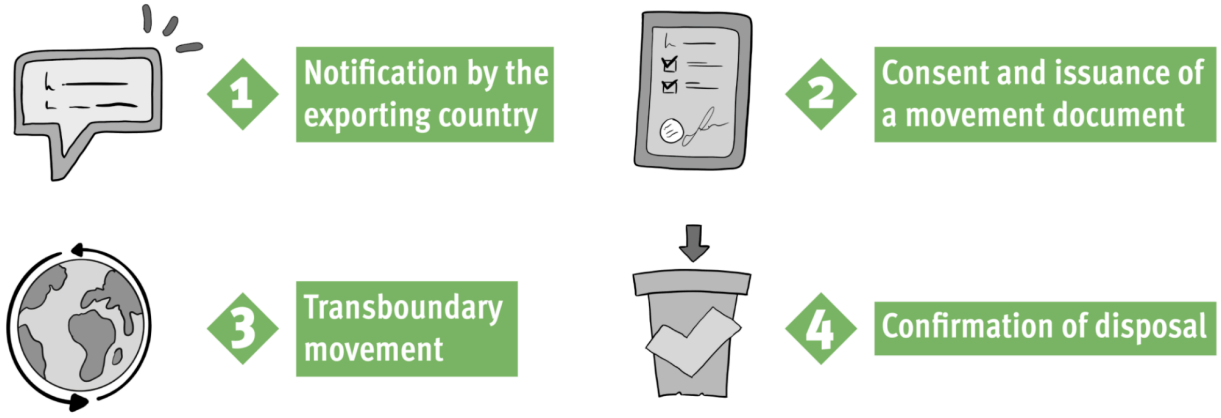
There is no explicit restriction under the Convention for the movement of non-hazardous plastic waste, which are specified in Annex IX. For example, waste from polyethylene with a low density as well as other plastics utilized for packaging is regarded as not dangerous and is exempt from special controls given that it is free of pollution and intended for environmentally friendly recycling.

The prior informed consent (PIC) process as described in **Table 1** is used when dealing with hazardous waste or waste that needs particular consideration, particularly the plastic waste kinds mentioned in Annex II and Annex VIII. An international transfer of toxic waste is referred to as illegal trade under the Basel Convention:

- without giving all States involved notice in accordance with the Convention's obligations;
- without the approval of a relevant State;
- via permission gained through deception, deceit, or fabrication;
- that is materially non-conforming to the documents; or
- that leads to the intentional discharge (such as landfill) of hazardous substances against the international law conventions and general principles.

False statements, hiding, combining, or double stacking the items in a cargo, as well as mislabeling particular packaging, are all common ways of conducting illegal activity. Due to the fact that these techniques aim to falsify the true contents of a cargo, it is necessary for national enforcement officials to conduct a comprehensive and in-depth examination in order to find instances of illegal trade (UNEP, n.d).

Table 1: The Stages of Prior Informed Consent Process:



Source: ArcGIS StoryMaps, 2021

There are certain advantages derived as a result of the Plastic Waste Amendments which are mentioned below:

- More focus on ecologically sound management (ESM) Enhancing national infrastructures for the collection, recycling, and final disposal of plastic waste is strongly encouraged by the Amendments, which retain that the Convention's ESM requirements presently apply to certain categories of plastic waste.
- Increased waste reduction and minimization: The Amendments will support the development of jobs and economic benefits by promoting innovation in the design of plastic substitutes and the phase-out of toxic ingredients, among other things, through the incorporation of the aforementioned categories of plastic waste under the Convention's guidelines for waste prevention and reduction (UNEP, n.d).

As Basel Convention provisions apply to OECD countries, the OECD adopted its own decisions accordingly. The OECD Control System for Waste Recovery, as represented in the OECD

Decision of the Council on the Control of Transboundary Movements of Wastes Destined for Recovery Operations, uses a risk-based approach to identify the appropriate level of control for materials and a simpler process to facilitate the trade of waste intended for recovery which can be treated in an environmentally friendly and cost-effective way (OECD, n.d).

This integrated regulatory approach does not apply to wastes exported for recycling or ultimate disposal outside of the OECD area. Instead, it is expected that the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal will regulate the transboundary movement of such wastes. The waste lists in the Basel Convention's annexes are in line with the waste categorizations under the OECD Decision, and the two international accords are closely related (UNEP, n.d).

Nevertheless, the OECD's incapacity to agree upon incorporating the majority of the Basel Plastic Amendments into the OECD Wastes Trade Decision on the regulation of the international movement of wastes intended for recovery operations is claimed in the CIEL (Center for International Environmental Law) report (2021). A multinational agreement known as the OECD Wastes Trade Decision regulates the exchange of specific hazardous and other wastes among OECD countries in order to promote recovery. In order for OECD members to continue trading without violating their obligations, the agreement, which governs trade in hazardous waste between parties to the Basel Convention and non-parties, must include rules regulating the environmentally friendly handling of waste that are at least as strong as those in the Basel Convention (CIEL, 2021, 6-8).

According to the same report, the amendment falls short of covering all plastic and additives. The plastic wastes classified as "other wastes" under the Basel Convention are no longer included in the purview of the OECD Wastes Trade Decision due to the group's inability to come to an agreement. The applicable Basel control and prohibition procedures must thus be used to trade in these wastes with Basel parties and non-parties by OECD nations that are Basel parties and have not opposed the Basel Plastic Amendments. The study indicates that these accords are unlawful under Article 11 agreements because they do not provide control levels that are comparable to those of Basel. Rather than ignoring their legally obligated duties, the parties must implement Basel control measures (CIEL, 2021, 7-9).

The Stockholm Convention (2001) is yet another vital instrument in defending both human health and the environment in light of the potential danger that toxic compounds in plastic may present. The Stockholm Convention, which is legally binding for 184 Parties, regulates a variety of persistent organic pollutants (POPs), which are substances added to, employed as oil repellents, plasticizers, or as flame retardants in plastics, among other applications. Currently, the POPs Review Committee is examining additional plastic additives for possible inclusion in the Convention (Lallas, 2001, 694-697).

The most important step to address the growing concern over plastic pollution came in 2022.
The UN member states at UNEA 5.2 in March 2022 took a resolution to establish a mandate for an International Negotiating Committee (INC) to develop a UN Treaty against plastic pollution that is legally binding. With a goal of finishing it by the end of 2024, the INC began negotiating the treaty in the second part of 2022 (UNEP, 2022).

The resolution proposal by UN:

- explains in specific terms the circular economy, life cycle, and sustainable manufacturing and consumption.
- emphasizes how important it is to promote circular design in the creation of goods and materials so that they may be reused, recycled, or manufactured again, lasting as long as possible in the economy alongside the resources used to make them and producing as little waste as possible.
- encourages all UN members to continue and enhance existing initiatives, particularly those that involve the private sector, in light of the significant role that employees in cooperative and informal settings play in the gathering, sorting, and recycling of plastics in many nations.
- supports collaboration at the international, regional, national, and local levels and acknowledges the need for better global coordination and governance so that prompt action may be taken (The Ellen MacArthur Foundation, n.d).

Despite being significant, the UNEA 5.2 resolution is still considered as a beginning. The negotiating process must take into consideration important goals in order to capitalize on this

historic choice and produce a treaty that can have a genuine and ambitious influence on a circular economy for plastics (Vanapalli, et al., 2021)

According to UNEP (2022), the new treaty ought to:

- Ensure a level playing field, incorporate legally obligatory provisions to prevent a patchwork of unconnected solutions, and create the ideal enabling circumstances for the global scaling up of circular economy solutions.
- In order to keep plastics out of the environment and the economy, there are a few things that may be done. These include reducing the manufacture and use of virgin plastic, separating the creation of plastic from the use of scarce resources, and taking the whole life cycle of plastics into account, including product design.
- Stakeholders could unite behind a single perspective and plan to decrease plastic pollution if there is an international common vision and harmonized criteria.
- Recognize that cooperative and unorganized workers are crucial to the collecting, sorting, and recycling of plastics in many nations and that these workers must be recognized as key participants in the negotiations around the UN convention on plastic pollution (UNEP, 2022).

INC held its second session in March 2023 in Paris and the third session will be held in Nairobi in November 2023. However, there are considerable disagreements among the negotiating states about the provisions of the prospect treaty. Some countries, especially oil producing countries, have objections to any treaty that would introduce limits on plastic production.

Despite the international measures, there are certain complexities and drawbacks preventing the full control over the plastic waste trade. For instance, even in spite of existing global accords, some nations may emphasize financial priorities over ecological obligations, resulting in uneven implementation. Without a uniform strategy, the trade in plastic waste can still take place through gaps and unmanaged avenues. On the other hand, although laws may exist, monitoring and enforcement systems frequently do not, especially in developing countries. The anticipated advantages of multilateral solutions may be undermined if imported plastic waste is improperly disposed of or managed.

It is a challenging task to control the trade in plastic waste through global reactions. Although these reactions emphasize crucial moves in the right direction, their success depends on the consistency of their execution, close monitoring, and international cooperation. A comprehensive solution is necessary to address the growing trade in plastic waste because it must strike a balance among commercial motivations, environmental concerns, and universal justice. To provide a comprehensive and sustainable strategy to resolving this urgent global crisis, international activities must change to adapt to the shifting dynamics of the plastic waste trade.

2.2. Circular Economy

Each day, the global oceans, rivers, and lakes get an average of 2,000 waste trucks' worth of plastic waste. Pollution from plastic is a global issue. Lakes, rivers, and oceans are contaminated by the 19–23 million tons of plastic waste that leak into aquatic environments each year. Because plastic pollution alters natural processes and habitats, it can reduce ecosystems' capacity to adjust to climate change. This directly affects millions of people's livelihoods, social well-being, and food production (UNEP, n.d). Various solutions, including the circular economy, have evolved in response to the growing challenges caused by plastic pollution. The EU is one of the main supporters of the CE idea by adapting and implementing different policies and regulations respectively. Therefore, in this part of the thesis, CE will be discussed in detail.

The "circular economy" is a corporate and industrial model that seeks to improve resource efficiency and decrease waste. It aims to break away from the traditional linear economic approach, sometimes referred to as the "take-make-dispose" paradigm, which is based on the harvesting, conversion into commodities, use, and eventual disposal as waste of resources. In contrast, the circular economy seeks to create a closed-loop system in which products, materials, and resources are recycled, repaired, and reused in order to increase their useful life. Environmental impacts, pollution, and resource depletion have increased the general understanding of sustainable practices.

The historical foundations of the circular economy, its various interpretations, implementation in some pioneering countries, and its critiques are discussed in the part that follows.

2.2.1. Historical Roots of the Circular Economy Approach

The circular economy has a long history. It is hard to pick out one author or historical period since it draws inspiration from so many different schools of thinking. The term “closed spaceship” was used by British economist Kenneth Boulding to describe the Earth in his 1966 article Economics of the Coming Spaceship Earth. He believes that the Earth is a tiny, sealed compartment, similar to a spaceship, with a finite amount of resources and a low tolerance for pollution and resource depletion. The conclusion, he claimed, is that people must learn how to reuse resources and cooperate with the planet's natural cycles (Boulding, 1966, 123- 125). According to the first rule of thermodynamics, the amount of resources utilized in manufacturing and consuming goods is equal to the amount of waste that is discarded into the environment and cannot be retrieved. Humanity can only live by limiting output and consumption, according to the "Limits to Growth" report, which was developed by the Club of Rome in the late 1970s (Vieille Blanchard, 2010, 29-35). Along with the previously mentioned ideas, Cradle-to-Cradle, Biomimicry, Industrial Ecology, Performance-based Economy, and Blue Economy have all contributed to the growth of the circular economy idea since the 1960s (Murray, Skene & Haynes., 2017, 29-31).

Industrial ecology, or the study of material and energy flows via industrial processes, is the cornerstone of the circular economy. Biomimicry is the process of building systems for humans based on the well-established patterns and techniques found in nature. Cradle-to-cradle design considers a system’s whole life cycle, from raw material extraction to end-of-life disposal, in an effort to reduce waste and maximize resource efficiency. The circular economy is promoted by these related concepts (Winans, Kendall, & Deng, 2017, 17–22).

The general systems theory, which Ludwig von Bertalanffy developed, takes into account energy and development for both open and closed systems of states. This idea was then applied to other disciplines, such as economics and the circular economy. In their book *The Potential for Substituting Manpower for Energy*, Stahel (2016) described how raising labor productivity may result in a decrease in the demand for energy-intensive processes, which laid the groundwork for the concept of the circular economy (Bassi, et al., 2021, 23-25). Simple economic models have ignored how the economy and environment interact. Resources are not always replenishable, as

Allan Kneese discusses in "The Economics of Natural Resources" from 1988, where he also first uses the term "circular economy" (Murray, Skene & Haynes., 2017, 29-31).

In their book *Economics of Natural Resources and the Environment*, Pearce and Turner (1990) examine the transition from the conventional linear economy to the circular economic model (Andersen, 2007, 135-138). They present an economic model where waste is converted to inputs during the process of extraction, manufacturing, and consumption stages. They describe the natural resource economics ideas that exist across disciplines as well as their relationships and theoretical consequences. The environment is described as a source and a recipient of the waste by Turner and Pearce. They indicate how disregarding the environment results in disregarding the economy because this is a linear system without an inherent recycling system. Boulding adds to Pearce and Turner's (1990) economics and environmental relationship model by taking into consideration the ability of the environment to absorb waste, dispose of non-recyclable materials and use non-renewable materials (Andersen, 2007).

Moreover, William McDonough and Michael Braungart came up with another Circular idea in the late 20th century by introducing “Cradle to Cradle” design theory. This strategy promoted the use of materials during the production that can be constantly recycled or put back into the environment. Its main idea was redesigning the whole product lifecycle and changing the way of thinking. Since the 1990s, economic growth has become more and more dependent on resource exploitation, which has increased environmental damage. As a result, people need the circular economy especially for the following purposes: (1) developing policy tools and implementation plans; (2) controlling the logistics and value chains of some industries; and (3) fostering social, institutional, and technological advancement (George, et al., 2015, 29-34).

Some nations have taken steps to adopt laws and regulations that support the ideas of a circular economy, with a particular emphasis on recycling. Germany has been a pioneer in this trend ever since it started its initiatives to promote the circular economy in 1996. Concurrently, the “Closed Substance Cycle and Waste Management Act”, which creates a framework for putting into reality effective waste management procedures that support closed-loop systems and environmentally sound waste disposal, was passed (Giesberts, 1996, 67-70).

The circular economy is highly valued in Japan, which is a second country that embraces it. To monitor the country's transition to a society that places a high priority on recycling, the Japanese government has constructed a comprehensive regulatory framework. In Japan, the “Basic Law for Establishing a Recycling-Based Society” was put into effect in 2002, and it establishes clear objectives for material consumption reduction over the long term and recycling rates.

China began incorporating the concept to its economic and environmental strategies in the beginning of the twenty-first century, transforming them into resource, production, waste, use, and life cycle-oriented approaches. Other countries, like Sweden, have developed diverse incentive schemes throughout time slowly but progressively. Additionally, they have tried to create the optimum conditions through public education for a continuous rise in recycling. Sweden, Germany, and other European countries have been able to start a circular economy by incorporating green coalitions into their political systems and decision-making processes. The approach later became extensively adopted throughout Europe as well, which will be covered in length in the thesis’ remaining sections.

2.2.2. Circular Economy: Definition, Concept, and Policy

Due to the potential damages by plastics production and use, recently it has been the center of the attention and focus of many people and scientists. The reason for gaining so much attention is the spread and persistence of the plastics everywhere all around the world such as parks, beaches, roads, seas, oceans, mountains, even in human bodies. The expanse of plastic waste in the environment creates a compelling threat for the future generations and unfortunately there is a lack of adequate knowledge and a massive level of ignorance in terms of the harms done by plastics (Evode, et al., 2021, 45-47). By considering the current and expected potential harms by the plastic production and use, it is necessary to take an immediate and collective action to overcome it. One of the main actions that need to be highlighted is the circular economy, the central topic of the thesis.

The circular economy concept is frequently promoted as an appropriate method to overcome linear tendencies in production and consumption as a solution to global concerns. This business

strategy involves diverting these flows into international supply chains in order to create new economic advantages in different sectors in addition to supporting environmental preservation.

According to Stahel (2016), the definition of this idea may be summed up as follows: “a circular economy would complete loops in industrial ecosystems and eliminate waste by converting items that have reached the end of their useful life into resources for others”. Recycling what is recyclable, mending what is broken, and remanufacturing what cannot be repaired would alter economic logic since they supply sufficiency in place of production.

Another definition of circular economy by The Ellen MacArthur Foundation includes three main components: waste and pollution removal, product and material reuse, and natural system restoration. The systemic nature of this approach to economic development is highlighted as it may benefit enterprises, society, and the environment while decreasing the use of scarce resources. The circular economy is a strategy for implementing more sustainable development, which addresses the rising problem of resource scarcity and environmental challenges. Reusing products, recycling, and utilizing energy from sustainable sources are all encouraged. Additionally, the CE seeks to improve society's health and the environment (The Ellen MacArthur, n.d.).

The efforts done by the Ellen MacArthur Foundation must also be acknowledged. The fastest ever solo round-the-world journey was completed by Ellen MacArthur in 2005. With fresh insights into how the world works as a system of interconnected cycles and finite resources, where the choices we make today affect what is left for tomorrow, she returned from her round-the-world journey.

The shift to the circular economy is being accelerated by the Ellen MacArthur Foundation. The Foundation works in partnership with organizations, companies, academic institutions, and legislators to scale up solutions for global systems. Through this, the circular economy idea is also propagated and encouraged. In order to solve some of the most important global concerns, such as climate change and the loss of biodiversity, systemic change in how commodities and food are produced and consumed across sectors and industries on a wide scale is required.

To show what is possible, the Foundation concentrated its efforts on places where moving to a CE may have the biggest impact. Plastics are one of the sectors where the circular economy is focusing. From manufacture to sale, the circular economy considers all aspects of a product's lifecycle. Apart from being crucial in the battle against the pollution caused by plastic, this approach offers noteworthy benefits in terms of the economy, society, and environment. The Ellen MacArthur Foundation states that by 2040, the circular economy is expected to achieve the following goals:

- 80% less plastic will enter our seas annually;
- 25% less greenhouse gas will be released;
- $200 billion will be saved annually;
- and 700,000 net new employment will be created (Ellen MacArthur Foundation, n.d.).

Three actions need to be completed to create a circular economy for plastic:

- Develop new technologies to make sure the plastics are reusable, recyclable, or biodegradable;
- Get rid of any plastic products that are troublesome and useless;
- Keep all of the plastic goods we use out of the environment and into the economy by circulating them.

According to the Ellen MacArthur Foundation (2013), there are six essential components to the CE for plastic packaging:

- **Vision point 1**: A top aim is to get rid of harmful or pointless plastic packaging through redesign, invention, and new distribution methods. Eliminating unnecessary plastic packaging is the most straightforward strategy to prevent plastic packaging waste. It will not be able to keep all of the plastic in circulation, if demand rises as predicted. The pace at which infrastructure can grow realistically prevents universal collection and recycling. Between today and 2040, more than 500,000 individuals would have to use official collection methods daily. Recycling is essential, but it will not allow us to eliminate all plastic pollution without risking unforeseen effects. First and foremost, packing should be eliminated, and plenty of current plastic packaging may be recycled

while still serving their intended purpose. Elimination should go much beyond just getting rid of straws and single-use bags. By reevaluating the product's or system's packaging, there is a significant possibility for innovation. While still providing consumers with top-notch user experiences and products, many things may be supplied without ever creating packaging waste.

- **Vision point 2**: Where applicable, reuse models are used to cut down on the requirement for single-use packaging. Reusable packaging should be investigated where we do use it as a means to plan out waste from the start. Reusable packaging is made to serve the same purpose repeatedly and, more crucially, as a component of a system specifically for reuse. Reuse models, as opposed to recycling, preserve the complete package with its embedded energy and value as well as the material in the economy. Therefore, switching from single-use to reuse models helps minimize pollution and plastic waste while also lowering greenhouse gas emissions. Significant financial advantages might also be unlocked through inventive reuse models. Reusable containers may:

- provide clients with more quality and functionality while spreading out the initial manufacturing expense over a variety of usage;
- reduce costs associated with manufacturing and shipping by standardizing package types and by offering transportable refills for reusable containers;
- increase brand loyalty by allowing customers to personalize items or packaging and by implementing deposit and reward systems.

- **Vision point 3**: In a circular economy, every piece of plastic packaging we use is made to be 100 percent reusable, recyclable, or compostable. It is not enough for packaging to be technically or theoretically reusable, recyclable, or biodegradable; it also needs to be practical and feasible on a large scale. A system in the actual world should be able to accommodate the packaging. Packaging design includes all the elements that determine how easily it may be gathered, sorted, used again, recycled, or composted by existing infrastructure. It is not simply about the format and material choices. Redesigning and innovating business structures, materials, package design, and reprocessing technologies are all necessary to make all packaging reusable, recyclable, or compostable.

- **Vision point 4:** In actuality, every piece of plastic packaging is recycled, composted, or repurposed. In the environment, there should be no plastic. Waste incineration, disposal in landfills, and conversion of waste to electricity are all linear. They are excluded from the plastic CE. In order to effectively reuse, recycle, or compost all used plastics, we must first gather them. Worldwide infrastructure must be improved and expanded to support this. The building of this infrastructure and the associated self-sustaining finance methods depend on the government's regulations that allow for its development. Businesses also have a duty to contribute to the collection of packaging and to its reuse, recycling, or composting in addition to their duties for the design and usage of their packaging. Every piece of plastic packaging in a CE for plastic is effectively reused, repurposed, or composted, remaining in the economy and out of the environment.

- **Vision point 5**: In a circular economy, the use of plastic and the use of scarce resources have nothing to do with one another. To considerably reduce the requirement for virgin plastics, we must first stop using the plastic we do not need and utilize recycled plastics more often in its place. Moreover, any virgin plastic that is still utilized throughout time should be manufactured from renewable resources rather than finite fossil ones to ensure that they are ethically handled and helpful to the environment. Additionally, all system manufacturing, transportation, cleaning, and recycling should be powered totally by renewable energy in order to completely disconnect the entire plastic system from finite resources.

- **Vision point 6:** There are no harmful chemicals or other health risks in any plastic container. Respect is shown for everyone's rights and safety. Beyond the plastic polymers, plastic comprises a variety of substances. Others accidentally develop during the production process, while some are added on purpose, for example, to increase flexibility or durability. Several of these compounds, as we are aware, are of concern due to potential risks to human health and the environment. We urgently need to look into and expand our disclosure of the chemicals utilized in plastics and their effects. All plastic packaging in CE is devoid of harmful chemicals, and it is essential to safeguard the welfare, rights, and health of everyone involved in the plastics industry, even those

who serve as unofficial waste collectors. The new plastics project of the Ellen McArthur foundation is advancing this vision for the CE for plastic through its global commitment and the plastic pack network, which consists of more than 1,000 organizations. The program also has attainable 2025 goals that may be achieved.

Based on the situation of the industry (take-make-dispose), there was an urgent need to put sustainable development concepts into practice. The most recent effort to envision a long-lasting fusion of economic activity and sustainability is the circular economy. Even if there is not a single agreed upon definition of a circular economy that is now recognised worldwide, the UN Environmental Assembly's resolution on the topic (UNEP/EA.4/ Res.1) gives a basic explanation of some of its core concepts (UNEP, 2019b).

The 4-R methods by the circular economy, is a modern sustainable economic model that places an emphasis on developing products for reuse, reproduction, recycling, and recovery. This strategy tries to reduce the production of waste, while preserving the economic viability of goods and the resources used to produce them. It also emphasizes preventing or lowering emissions of greenhouse gasses. This idea emphasizes the function of the 4-R framework in enabling a circular economy, which is done via resource-efficient practices that consider a product's whole life cycle and avoid planned obsolescence. The classic "take-make-waste" linear paradigm is thus challenged by the circular economy (The UN, 2023).

Globally, the shift to a CE may have significant legislative and economic consequences. Both local and global level, over 520 rules and regulations already support circular economy objectives (Barrie et al., 2022), with approximately half of them focusing on enhancing waste management and recycling operations. This pattern demonstrates how many countries are becoming more conscious of the need to shift to a circular economy. Overall, an increasing number of nations are putting up circular economy legislation to handle the transition away from a typical industrial economy. Each nation may, in fact, have a unique interpretation of the circular economy idea, which may then be applied to policy implementation in a variety of ways.

Examples include China's and the EU's policy directions for the circular economy. The 11th and 12th "Five Year Plans" both incorporate this set of ideals, which China has accepted as the foundation for its economic development (McDowall, Geng, Huang, 2017). The EU policies

seek to boost economic competitiveness and innovation while pursuing environmental aims. However, Chinese policies focus largely on better balancing industrial expansion with social and environmental issues.

Later, some other nations embraced the circular economy strategy to follow a more sustainable and resource-efficient economy, including Sweden and certain Asian nations. Contrary to conventional wisdom, the circular economy offers a novel perspective that connects long-term sustainability with economic progress by acknowledging the limited nature of our planet's resources. While there are obstacles to overcome in order to put this model into practice, such as the need for changes in consumer behavior, policy modifications, and technological advancements, the idea shows an encouraging path towards a future that is resilient, effective in managing resources, and environmentally friendly. Hence, the circular economy is considered as the ability to spark positive transformation at the local, and international levels. Despite the fact that the idea of Circular economy has been popularized so much, its success rate should be critically evaluated to obtain more fair results.

2.2.3. Circular Economy in Practice: Implementation in Pioneering Countries

Because of how we utilize them, plastics are both immensely wasteful and adaptable materials. After just one use, the material value is reduced by 95%. The linear packing system has to be fixed. Due to the take-make-waste system that we use, lots of packaging wind up in landfills and incinerators, which is bad for the environment. If the way the economy is functioned stay the same, by 2040 the amount of plastic on the market will have doubled, the amount of plastic entering the ocean will have almost tripled, and the amount of plastic in the ocean will have quadrupled to over 600 million tons (OECD, n.d.).

Cleanup efforts and recycling efforts alone will not be enough to stop pollution and plastic waste. Our focus has to be redirected toward innovative business strategies and resource conservation that minimize waste and enhance environmental quality. In order to ensure that plastic never adds to trash or pollution, a circular economy is necessary. However the circular economy is about the general product use and waste, as per the current thesis topic the plastic strategy in the

CE will be discussed in detail. While the circular economy is taking off in rich countries, it is just now starting to spread to underdeveloped countries worldwide, including those in Asia (Advancing the Circular Economy in Asia, 2017).

By 2030, Asia is expected to have two-thirds of the world's 4.9 billion middle class people. These people will have more money to spend, and consumer spending is expected to reach 32 trillion dollars. There will be a further depletion of the planet's resources due to rising consumer demand and spending (Advancing the Circular Economy in Asia, 2017). This is because of growing populations, increasing incomes, and an increase in consumers leading unsustainable lifestyles based on "throwaway culture" or "fast fashion", for example. Instead of following a linear model of production and consumption that utilizes excessive natural resources and supports planned obsolescence, today's nations may achieve sustainable growth by embracing more sustainable principles, such as those of the circular economy.

Reduced use of resources, waste, and supply chain value capture are the goals of a circular economy, which turns every "waste" into a resource that may be used in an economic activity. In order to promote sustainable development, the circular economy is focused on developing sustainable patterns of production and consumption. It is an essential part of and a drawback from contemporary thinking about the identification of pathways resulting in an equitable green economy (Morseletto, 2020, 11-14). In an effort to reduce environmental pollution and promote a cleaner, more resource-efficient economy, certain Asian nations have also embraced the circular economy's tenets, much like the European Union.

Products have been reused, repaired, shared, and purchased in Asia for a long time in what are now considered advanced circular economy models. Numerous national development strategies are based on these resource-efficient philosophies and traditions (Halog, et al., 2021, 5-7). For instance, Thailand has since 1997 included a national sufficiency economic idea in its growth objectives. This idea, which was initially promoted by the late King Bhumibol in 1974, gained popularity when it was applied to a variety of industrial activities, including farming and cement manufacture (Kuah, Wang, 2020, 24). A circular economy and closed-loop systems are guaranteed by the legislative frameworks Asian nations have incorporated into their industrial policies.

As the main topic of the thesis is about CE in the EU, it does not describe the CE in other countries in more detail. In order to have a general understanding of the CE concept and policy implementations by different perspectives, certain countries will be explained in this section of the thesis. The circular economy model's promise to boost economic growth has already been understood by policymakers in Asia, who have incorporated it into regional national policy frameworks. Public policies have the power to spread or accelerate change, if they are implemented properly. The circular economy was first regulated in China (McDowall, Geng, Huang, 2017). The below **Table 2** indicates the CE policies in China.

After that, the 18th NCCCP elevated CE to a new strategic level by including the development of a complete system for resource recycling as part of creating a society that is moderately wealthy by the year 2020. The circularity of industrial systems has received more attention in later laws, including “the Revised Indicators of Circular Economy Promotion Law (2017)”. The relevance of CE as a national strategy and a key supporter of the economy was further confirmed by the 13th Five-Year Plan (2016-2020). The National Development and Reform Commission (NDRC) published the Circular Development Leading Action Plan (CDLAP) in 2016, which emphasizes potential in emerging digital solutions while addressing the causes of environmental and social externalities (Chen, 2023, 8-12).

The concept of a circular economy was further incorporated into Chinese law with the creation of the Circular Economy Development Strategies Action Plan on January 23, 2013. Within a firm, an industrial park, and a city or area, the strategy described three tiers of circular economies in China. The strategy lays out a number of goals between 2015 and 2020, when they are supposed to cover both the industrial and social sectors. By 2015, it was planned to have a sophisticated resource recycling technology that is used extensively to reuse 72% of industrial solid waste, implement a contemporary system for collecting at least 70% of waste, and enhance the preservation of valuable resources (Zhu, et al., 2019, 112-116).

Table 2: The Circular Economy Policies in China:

The 16th NCCCP :

The concept of CE wad formally introduced and considered as the guidance of future direction.

2002

2006/2010

The 11th FYDP :

In 2008, CEPL was published, with the focus of ressource productivity like energy as well as addressing water and air pollution.
CE initiated drom holistic approach to align environment and national development.

The 18th NCCCP :

CE was brought to a new strate- gic level by etablishing full-fledged resource recycling system, which was one of tasks for building a moderately prospe- rous society in all round way by 2020.

2012

2016/2020

The 13th FYDP :

In 2016, CDLAP was release by NDRC aiming to adress drivers of environmental and social externali- ties. Additionally, the opportunities in new digital solutions, the poten- tial to integrate CE principles at the design stage of products and new business models are stressed.

In 2017, CEPL was revised to em- phasized more on the circularity of industrial sytems.

In 2020, partly due to instability of international trade, «dual circula- tion» was evolved out of the tradi- tional CE strategy to prioritize the domestic consumption.

2021/2025

The 14th FYDP:

Objectives	Numerical targets	Key tasks
Content	01 Increasing resources productivity by 20 percent compared to 2020 levels. 02 Reducing energy consumption and water consumption per unit of GDP by 13,5 percent and 16 percent, respectively, compared to the 2020 levels. 03 Reaching a utilization rate of 86 percent for crop stalks, 60 percent for bulksolid waste, and 60 percent for construction waste. 04 Utilizing 60 million tons of waste paper and 320 million tons of scrap steel. 05 Producing 20 million tons of recycled non-ferrous metals 06 Increasing the output value of the resource recy- cling industry to RMB 5 trillion (US$773 billion)	01 Building a resource recycling industry system and improving resource utiliza- tion efficiency. 02 Building a recycling system for waste materials and fostering a recy- cling-oriented society. 03 Deepening the development of the agricultural circualr economy and eta- blishing circular agricultural production

Source: Chen, 2023

China has embraced the circular economy (CE) philosophy, which may be defined as an economy that maximizes reduce, reuse, recycle tactics to decrease resource inputs and pollutant discharges per unit of output. CE is also frequently referred to as a "recycling economy". The sustainable development plan in China is increasingly centered on CE (World Bank Group, 2021).

The circular economy concept was formally accepted by China in 2002 when the 16th National Congress of the Chinese Communist Party codified it as a national endeavor, despite the fact that other sustainability projects had been put in place throughout the years beginning in 1973. China established the circular economy in response to the resource and environmental devastation that its industrialisation process was causing. To boost the efficiency of its circular economy and environmental programs, China is continually drafting new regulations. A new five-year plan is unveiled by the Chinese administration every five years, including several sustainability objectives and objectives for the nation's economic development (Su, et al., 2013, 217-220).

At the NCCCP's 16th National Congress in 2002, an ambitious development program was promised. The release of “Opinions on Accelerating the Development of the Circular Economy” in 2005 was the first time that a legislative framework with guiding principles, major goals, and essential duties was suggested. The 11th Five-Year Development Plan (FYDP), which started CE implementation, trailed closely behind. Following publication and implementation, “The Circular Economy Promotion Law”" (CEPL) was released with an emphasis on the 3R strategies of Reduce, Reuse, and Recycling. The official interpretation of CE started out with a comprehensive strategy with the goal of coordinating national ecosystems and development while also taking lessons from Japan and European nations. China has been battling problems like water pollution and air pollution while European nations concentrated on the waste hierarchy and product laws (Chen, 2023, 5-6).

According to Wang et al. (2020), China's extensive CE regulations and implementation methodologies produced quantifiable results in resource productivity and circularity. Reviewing the statistics released by the NDRC allowed for a 26% improvement in resource productivity between 2015 and 2020. In general, water use per unit of gross domestic product (GDP) fell by 28%, while energy consumption per unit of GDP continued to fall sharply. Also much improved is the capacity to use renewable resources. Crop straw, bulk solid waste, and construction waste were all fully utilized in 2020, at rates of 86%, 56%, and 50%, respectively, in addition to the utilization of about 54.9 million tons of waste paper and 260 million pieces of scrap steel.

It is more important than ever for India to transition to a circular economy because of its booming economy, expanding population, effects of climate change, and growing environmental

degradation. This move is anticipated to enable a more structured shift towards the circular economy regime in India. The action plans created for eleven sectors—solid waste from towns, automobiles nearing the end of their useful lives, scrap metal, lithium-ion batteries, and electronic trash—are also acknowledged in the budget. These proposals emphasize tax benefits, the creation of a framework for enhanced consumer duties, and the utilization of recyclables recovered from waste. According to the circular economy in developing Asia and beyond, India has enacted an e-waste law that promotes the adoption of these strategies to solve the growing problem of electronic waste.

On March 23, 2016, the Indian Ministry of Environment, Forestry, and Climate Change passed this new law creating Extended Producer Responsibility (EPR) in the domain of electrical or electronic waste (e-waste). For those involved in the creation, sale, transfer, purchase, collection, storage, and processing of electronic waste, including producers, dealers, e-retailers, refurbishers, consumers, bulk consumers, dismantlers, and recyclers, this law imposes new and stricter regulations. It enables the collection and channelization of "end-of-life" product-generated e-waste as well as e-waste pre-treatment to immobilize mercury and minimize waste volume before disposal or storage. Consumers are now required to ensure that the electronic waste they generate is sent to the appropriate collection facilities, dealers, dismantlers, or recyclers in line with this new regulation (Asia Global Institute, n.d).

The necessity of sustainable growth was acknowledged in the budget for 2022–2023. "The Battery Waste Management Rules 2022", Plastic Waste Management Rules as revised in 2022, and "e-Waste Management Rules 2022" were created by the government in accordance with a circular economy. These regulations encourage the use of waste produced in accordance with the circular economy approach by defining target waste disposal standards for participants like manufacturers, producers, importers, and bulk consumers as well as by facilitating interactions between participants for increased producer accountability certificates.

One may claim that the WEEE Recycle initiative run by SWITCH-Asia was a major factor in motivating India to reform its laws (Advancing the Circular Economy in Asia, 2017). It is a circular economy project supported by the SWITCH-Asia Regional Policy Support Component (SWITCH-Asia RPSC) of the UN Environment Programme. The ASEAN Policy Roadmap for

Energy Efficient and Renewable Energy Technologies was published in December 2016. This policy roadmap calls for a number of actions, including the best regulation of product lifespan, a boost in public-private sector interest in renewable energy sources through a circular economy, and EPR for supply chains that are more focused on waste management (SWITCH-Asia, n.d).

But there hasn't been any really noteworthy progress as a result of the government's policy measures. Two of the key contributing factors are a lack of clarity on the ultimate goal of the mission and gaps in the actual implementation of the rules. The circular economy concept is not being embraced by industry because of supply chain limitations, insufficient investment incentives, complex recycling processes, and insufficient information to encourage reuse, recycling, and remaking practices. There is also the seeming issue of efforts being made at the very end of value chains, which negatively impacts both the economy and the environment.

These obstacles may be removed, among other ways, by creating unified legislation that addresses the circular economy from a regulatory standpoint and mandating the use of recycled or secondary raw materials in the first phases of the manufacturing cycle. Additionally, a simplified framework for reporting on the circular economy, clarification of the exchange process for certificates of expanded producer accountability, and financial incentives for companies to finish the supply chain are all beneficial. To profit from the circular economy, government objectives must be combined with actionable steps and business cooperation. Businesses will be more likely to embrace the circular model of production if the government's ongoing efforts are combined with proper execution tactics.

SWITCH-Asia is one of those initiatives which was launched in 2007 by Asian countries with the objective of advancing environmentally friendly manufacturing and consumption habits. The initiative's main objectives are to facilitate Asia's transition to a green economy, promote sustainable development, and enhance resource efficiency. It functions as a component of the EU's larger commitment to advancing sustainable development and resolving major environmental issues (SWITCH-Asia, n.d).

As shown by initiatives carried out under SWITCH-Asia, there are four stages at which a circular economy may be implemented in practice (Advancing the Circular Economy in Asia, 2017):

1. Improved Resource and Energy usage Efficiency: At this early stage, the emphasis is on enhancing the effectiveness of resource and energy usage within the current linear production and consumption systems.
2. Waste Reduction and Recovery: The focus here is on waste recovery, reuse, and recycling.
3. Value Chain Closing and Product Life Extension: The goal of this stage is to close the value chain and extend the life of the products. This entails making goods durable, upgradable, and repairable.
4. Innovative Business Strategies and Innovative Thinking: At the most advanced level, the circular economy is completely accepted and new business models are created. These models include cooperative consumption, sharing economy platforms, and cutting-edge ideas that place a stronger emphasis on service providing than product ownership.

The SWITCH-Asia RPSC has also included the notion of EPR into the current Environment Governance Reform that the Kingdom of Cambodia is putting into place to ensure enhanced take-back processes and resource recovery operations in environmental laws and regulations (SWITCH Asia, n.d.). The 10-Year Framework of Programmes on CIP (Consumer Information Programme) works with nations like Indonesia to push stricter circular economy rules in the plastics and packaging industries (Advancing the Circular Economy in Asia, 2017). By recovering resources, disclosing product information, and extending the lifespan of products, this is accomplished.

Indonesia's Act 18/2008, PP 81/2012 law supports the national and subnational adoption of concepts like 3R and EPR and strives to reduce waste, according to the SWITCH-Asia National Policy Support Component of Indonesia. Given that Indonesia is one of the top five Asian nations for plastic ocean pollution, this regulation now has to be more strictly applied and enforced, particularly with regard to plastic packaging (SWITCH Asia, n.d.).

Indonesia is making improvements to its economy to meet the problems that the globalization of the earth has brought about. By incorporating elements of the circular economy into the current system, the government is creating a more sustainable economy. The 2020-2024 Rencana Pembangunan Jangka Menengah (RPJMN), the country's medium-term development plan, recently declared that CE should be adopted, paying particular attention to the green economy.

The implementation of CE is anticipated to bring about a variety of advantages, including the creation of new jobs, a decrease in family expenses, and environmental preservation.

The situation affecting planet Earth is getting worse due to the linear consumption paradigm that has been widely adopted. As the frequency of hydrometeorological disasters rises in Indonesia, this reality is becoming more and more obvious. According to a research by the Ministry of National Development Planning (Kementerian Perencanaan Pembangunan Nasional Republik Indonesia/Badan Perencanaan Pembangunan Nasional, or BAPPENAS), the increasing headcount will cause the GDP to decline between 2020 and 2024. By altering the way people create and use things, the move to a CE represents a major step in tackling the climate catastrophe. Changing to a circular economy also has economic benefits including generating new jobs, lowering family spending, and preserving the environment (Advancing the Circular Economy in Asia, 2017).

The Indonesian government is creating a Roadmap for CE and has incorporated CE policies within its 2020–2024 RPJMN to help accomplish these goals. A green economy will be achieved by 2060 as the integration's intended result. The methods for conformity evaluation and accreditation are some of the most crucial elements in this respect. This was said by Mr. Kukuh S. Achmad, the head of the National Standardization Body (Badan Standardisasi Nasional - BSN), at the Conformity Assessment Agency Technical Meeting in 2022.

As mentioned in the RPJMN, Mr. Medrilzam further emphasized the significance of strengthening stakeholders' capacities in the circular economy. In order to further motivate stakeholders, he also underlined the need for incentives to be given out. The government is already putting measures in place to facilitate the adoption of a circular economy, according to the director of the environment. These regulations include the use of the Indonesia Ecolabel (Ekolabel Indonesia) and Green Industrial Standards (Standar Industri Hijau - SIH) (SWITCH Asia, n.d.).

The Indonesian Ministry of Industry (Kementerian Perindustrian Indonesia, or MoI), which is responsible for regulating the SIH. Building a green industry is SIH's primary objective in assisting the development of the economy toward sustainability. SIH standardizes waste

management, the manufacturing process, how much energy and resources are used to produce a product, and other elements of the green sector. All parties engaged in creating a green industry have agreed upon these requirements. The MoI designated 895 businesses as being in the green industry between 2010 and 2019. In 2019, records for energy and water conservation totaled 3.5 trillion and 228.9 billion Rupiahs, respectively (SWITCH Asia, n.d.).

Despite being a minor player in comparison to its neighbors, Cambodia is in a critical position to reduce its use of plastic bags and find appropriate disposal options because of its growing economy and limited capacity to manage plastic waste (Towards a Circular Economy in Asia Issues and Opportunities, n.d.). In the cities of Cambodia, the usage of plastic bags is particularly prevalent. According to the SWITCH-Asia project, "Reducing plastic bag waste," urban Cambodians use about 2158 plastic bags yearly per person, while housewives can use up to 2700 of them (Asia Global Institute, n.d). Plastic bags are used for a variety of tasks, including serving beverages with straws and shielding garments from wind and rain.

Cambodia produces a small amount of plastic bags. The absence of plastic bag manufacturing in Cambodia restricts the local impact that can be taken into account from production, despite the fact that measuring impact using a lifecycle approach necessitates estimates from beginning to end. The majority of the country's plastic bags come from Thailand and Vietnam. The issue of data availability regarding trade and other commercial activities is another obstacle. There is a recognized undocumented sector of the economy, and there have only been a few studies in Cambodia that have focused on plastic bags (Asia Global Institute, n.d).

To address this problem, Fondazione ACRA established the SWITCH-Asia project "Reducing Plastic Bag Waste in Major Cities of Cambodia," which is carried out in collaboration with the Royal University of Phnom Penh (RUPP) and the Phnom Penh Capital Department of Environment (DOEPP) (SWITCH Asia, n.d.). Following are the three main project pillars:

- Campaign for Behavioural Change (BCC): Develop a communication strategy to persuade residents of major Cambodian cities to use plastic bags responsibly;
- Create and supply ecologically friendly solutions that are practical, obvious, available, and competitively priced to meet the packaging needs of consumers and businesses in important Cambodian cities;

- Creating a policy to reduce the amount of waste generated by the production and use of plastic bags would assist the Ministry of the Environment in establishing the necessary statutory and regulatory framework (SWITCH Asia, n.d.).

In association with ACRA, the Royal University of Phnom Penh, the Phnom Penh Capital Department of Environment, and the Ministry of Environment, Cambodia (MoE), this project, titled "Towards a Circular Economy in Asia: Issues and Opportunities," is being carried out.
As a result of the extensive usage of plastic bags, the SWITCH-Asia project created a human-centered methodology to identify and address the most crucial focus locations, target demographics, and behavioral adjustments (Asia Global Institute, n.d). The goal of this technique was to handle all of the complex components of the issue.

ACRA developed a thorough communication campaign based on a human-centered design methodology in an effort to address the problem at its root. To encourage the consolidation of purchases into larger bags in order to decrease the usage of plastic bags, a series of initiatives dubbed "Combine in One" were tried and improved at the August 2016 trial market of Pshar Loo in Phnom Penh (Advancing the Circular Economy in Asia, 2017). Large branded bags were promoted as good behavior models, marketplaces were activated, incentives were given to both sellers and buyers, and merchants' capacity was increased.

The campaign was first tested in August 2016 at Psar Loo, a local market in Phnom Penh near the Olympic stadium. The initial evidence indicates promising results, despite the initial difficulties that necessitated more refined and tailored training and activation plans. Around 136 vendors in Psar Loo received training and responded positively to the messages and requests. The pilot reduced the use of plastic bags by an average of 20.8%, resulting in a daily weight loss of nearly 18.48 kg **(**SWITCH Asia, n.d.b). The results show that there has been a daily decline in the usage of plastic bags of 5940 bags, or 26.5 percent. BCC's initial aim was Phnom Penh's Orussey Market. In this regard, ACRA was successful in educating 137 vendors, which resulted in a 35.7 percent and 27% decrease in the quantity and weight of plastic bags used, respectively. According to research by Jang and Han (2015), 29.4% of all trained vendors decreased the weight and quantity of plastic bags used by 50%.

Bangladesh is also recognized as one of the countries that has made progress toward the conversion to a circular economy. Bangladesh's leather industry today brings in more money from exports than the ready-made garment industry. 2014 marked the first year that the leather industry's annual exports went above $1 billion (Paul, Antunes, 2013, 43-46). Therefore, it has a great potential to greatly raise Bangladeshi exports and diversify the export portfolio. However, the leather business generates a lot of pollutants and has a detrimental effect on both the environment and human health.

Due to unrestrained industrial growth and a lack of effective legislation, laws, or regulations aimed at controlling pollution, waste and effluent from the leather industry seriously harm urban land, water, and air. Moving the tannery industries from the severely polluted area of Hazaribagh, which lacked waste and effluent treatment facilities, to Savar, a new industrial park created especially to house the tannery industries, and offering better environmental facilities, including an Effluent Treatment Plant (ETP), was one of the most important decisions the Bangladeshi government made more than five years ago.

Eco-labelling is a technique of voluntary certification that assesses the environmental effect of an item or service. The International Standards Organization (ISO) categorized current environmental labels into three typologies in its ISO 14020 series: Type I, II, and III. The suggested guidelines and practices for each have been laid forth (SWITCH Asia, n.d).

Eco-labels help circular economies by promoting sustainable consumption and production and promoting the use of eco-labels. According to a scoping research conducted by the European Union in 2014, one of the educational resources supporting the circular economy that helps to identify possible activities, priority sectors, material flows, and value chains is the eco-label (SWITCH Asia, n.d.b). Because of eco-labeling, customers may make informed choices. Consumers both locally and abroad are increasingly choosing to buy goods that satisfy their criteria for quality, environmental friendliness, and sustainable manufacturing.

By improving resource efficiency and sustainability along the full value chain of leather-related products in Bangladesh, including footwear and other leather items, the SWITCH-Asia project ECOLEBAN (2014-2018) seeks to increase the number of SMEs that are less polluting. This

may be achieved through implementing environmental management systems (EMS), eco-labeling initiatives, and practices for sustainable consumption and production (SCP) in SMEs (SWITCH Asia, n.d.). In order to promote beneficial laws and make finance available to cleaner SMEs, ECOLEBAN also contacts financial institutions and lawmakers.

One of the main outcomes of ECOLEBAN and the preparation of 20 small and medium-sized businesses that manufacture leather footwear for a pilot program that will earn the eco-label is the creation of an eco-label program for the leather footwear industry in Bangladesh that is comparable to those in neighboring countries (such as the eco-mark in India, the eco-label in Korea, and so forth).

As a result of the introduction of eco-labeling initiatives, the businesses in the leather footwear sector in Bangladesh have seen a rise in visibility, exportability, and product penetration into domestic and international markets. The implementation of eco-labeling initiatives for leather footwear, the environmental reforms the leather industry started two years ago, and the development of the new industrial park in Savar offer a significant opportunity for the sector's growth as well as for the global recognition of environmentally friendly leather production (Moktadir, Rahman, 2018).

Additionally, important voluntary actions have been taken by numerous nations and businesses, laying the groundwork for extensive cooperation. Through the Global Commitment of the Ellen MacArthur Foundation and UNEP and the Foundation's Plastics Pact Network, over 1,000 organizations make substantial progress toward a circular economy for plastic. Governments and companies have vowed to change the production, usage, and recycling of plastic with precise objectives for the year 2025 and yearly reporting (Ellen MacArthur Foundation, n.d.).

However, voluntary agreements on their own are unable to scale up to the extent required to quickly resolve this crisis. In order to foster progress and create the ideal conditions, policymakers must play a crucial role. The next crucial step is to create a global treaty for a circular economy for plastics in order to expand the current successful voluntary agreements. The current initiatives must be amplified by immediate, collaborative action that takes advantage

of this momentum. Strengthening the current attempts would need a UN treaty on plastic pollution, which would adopt a more thorough and coordinated approach.

2.2.4. Critiques of Circular Economy

China, some Asian countries, a few African nations, and the European Union have all adopted the circular economy as a cornerstone concept for their own economic and environmental policies. Among the main advantages of CE are waste reduction, greenhouse gas emissions reduction, employment creation, and resource conservation. In light of this, the Circular Economy model seeks to reduce expenses, increase revenue, manage risks, and create avenues for the financial sector to assist sustainable development. The underlying presumptions, feasibility, and outcomes of the circular economy and circular business models are also up for question.

In addition to the advantages of a circular economy, there are certain disadvantages coming along with that. While there are more critiques about the CE, only the following points will be analyzed in the thesis:

The idea of the circular economy is frequently criticized as being too vague. The absence of an agreed-upon definition or structure for the circular economy is one of the main causes for its apparent ambiguity. It can be reasoned that the notion is interpreted and applied in varied ways by different entities, enterprises, and governments. Also, from product design and material recycling to consumer behavior and corporate structures, the circular economy comprises a wide range of tactics and behaviors. Finding particular acts or tactics that unquestionably come under its ambit is difficult due to its vast dimension (Corvellec, Stowell & Johansson, 2022).

The core tenet of the circular economy is the presumption that economic development may go on eternally, even when resource efficiency and waste reduction are practiced. Supporters contend that by severing the link between economic development and resource use, we may achieve environmental sustainability while preserving or even boosting overall economic success. This presumption, however, presents a number of serious issues, including ecological constraints. The

Earth’s resources are limited, and it has a small capacity to take in waste and pollution. Even if it is not linked to resource use, unrelenting economic expansion nevertheless puts a lot of strain on ecosystems and is a major factor in habitat loss, biodiversity loss, and climate change. According to the Jevons paradox, resource consumption may rise overall as efficiency rises (which is the circular economy's objective), contradicting the anticipated environmental gains. Moreover, endless economic expansion has a tendency to disproportionately favor the wealthy, increasing income inequality and social divides. It is possible that marginalized groups or the poor may not reap the advantages of the circular economy which is considered an environmental justice issue (Metic, 2022).

Along with its theoretical and ideological criticisms, there are practical ones as well which are mainly focusing on recycling as it is one of the major pillars of the circular economy. Some of these criticisms especially regarding the plastic recycling is analyzed below since it is the main topic of the thesis:

- **Not All Plastic Can Be Recycled**

Circularity is the process of designing closed-loop systems—that is, using resources in a way that reduces waste and the total environmental impact—that are consumed, recycled, and reused. This concept is especially relevant when discussing sustainability and environmental management. The circular economy's tenets have drawn a lot of attention from academics and policymakers as a means of addressing resource scarcity and waste management. For instance, the European Union has created a thorough Circular Economy Action Plan with a focus on recycling, waste reduction, and resource efficiency. The importance of recycling in attaining circularity is highlighted in several publications written by groups like the Ellen MacArthur Foundation. Nevertheless, plastic producers claim that there is no need to worry about plastic waste because they recycle. Recycling is a stronghold of circularity. But there are certain limits worth mentioning.

For example, there are many types of plastics and each of them has different chemical ingredients and characteristics. For instance, as mentioned in the previous sections of the thesis (2.1) only nine types of plastic can be recycled. The rest of the plastic types are not fulfilling the

recycling characteristics. Here the questions can arise: what happens with the plastics that cannot be recycled? If it cannot be recycled, then why is it still being produced? The current section of the thesis will try to answer the above questions by analyzing different reports and sources.

Since there are countless varieties of plastic, each containing different chemicals and colors that cannot be recycled together, it is challenging to categorize them into separate groups for recycling. For instance, green polyethylene terephthalate-based PET#1 bottles cannot be recycled with PET#1 clamshells, which are comprised of a different PET#1 material. High-density polyethylene (HDPE#2), polyvinyl chloride (PVC#3), low-density polyethylene (LDPE#4), polypropylene (PP#5), and polystyrene (PS#6) must all be separated for recycling (Hopewell, et al., 2009).

Despite the fact that they all look to be the same, different plastic kinds cannot be merged since each type has a different handling method. Effective waste management is crucial since different plastics have different numbers on their bottoms. Each number corresponds to a distinct resin, or chemical, that is used to make that specific type of plastic. Every resin has a certain melting temperature at which it must be melted in order for it to be usable when recycled into a new product. When plastics are melted down and made into new items, certain types of resin are only approved by certain companies. Due to the complexity of the process, most of the countries avoid recycling, choosing to dispose of the environment. Here is one part of the problem with CE, that although there are a set of rules and action plans, still there is a gap in the concept in terms of unrecyclable plastics treatment.

Significantly, there are some plastics that cannot even be recycled. Recycling plastics like cling film, plastic bags, and film lids is neither an environmentally or economically feasible option (Goodship, 2007, 12-18). These polymers have the potential to clog recycling facilities' processing equipment and obstruct the recycling process. It can be shown as one of the main drawbacks of CE advocacy. Since all plastics are shown as recyclable, despite the fact that they are not. Also it can be considered as an obstacle for CE since there is no effective solution for the non recyclable plastic problem yet.

In response to the earlier query, what happens to non-recyclable plastics after use? The fact that practically all non-recyclable plastics and a great amount of polluted recyclable packaging end up in landfills must be mentioned. This is a major problem as most plastic products take hundreds of years to disintegrate. The toxic substances that these materials emit back into the environment as they break down exacerbate the damaging effects these materials have on the ecosystem. Additionally, waste made of plastic makes its way into the oceans, severely affecting marine life (Benton, 2015). Even while lightweight things like plastic bags, straws, cotton buds, and food packaging are carried into the ocean by wastewater, wind, rain, and floods, around half of all pollution worldwide comes from boat waste. The worst scenario is to keep making something even if you know it can't be recycled.

- **Recycling is an Energy and Water Intensive Process**

Recycling has long been recognized as a crucial tenet of Circular economy which supports environmental sustainability due to its capacity to reduce waste, save resources, and mitigate the adverse effects of climate change. However, recycling requires a significant amount of energy, a lesser-known fact that lies underlying this admirable endeavor. Recycling enables us to use less virgin materials and emit fewer greenhouse gasses, but it is important to recognize and address the energy consumption associated with recycling activities.

Each stage in the recycling process needs energy to operate. Recycling materials requires a lot of energy resources to collect, transport, sort, clean, and process. For instance, gathering materials from different places and moving them to recycling facilities involves using fuel and producing pollutants. Electric-powered machinery is required for sorting materials into distinct kinds, colors, and grades (Nkwachukwu, et al., 2013). Energy-intensive techniques are also needed throughout the cleaning process to get rid of pollutants and remnants.

Additionally, recycling materials requires a lot of energy since it involves melting metals or degrading polymers. When materials need to be reshaped, high temperatures are frequently required, which can use a lot of energy, particularly when working with substances such as glass and aluminum. The energy cost cannot be ignored, even though recycling often uses less energy than collecting and processing raw materials for the production of new plastic (Wurlod, et al.,

2018).

By producing airborne contaminants, the trucks used to collect recyclables will also contribute to air pollution. Hence, even if it works to reduce pollution and save natural resources, it might still produce pollutants and need a lot of energy to operate. Additionally, pollutants like chemicals, affect the environment as recyclables degrade. Lead paint and other contaminants from the original product, such as spray cans, might have made it through the recycling procedure and ended up in the recycled product (Walker, et al, 2021, 45-48).

Recycling is still good for the environment, although it is occasionally seen as being economically wasteful. Up to three times as much money may be spent on recycling as on filling landfills with rubbish. A large amount of labor is needed for the process. There is a high need for workers in the recycling industry, however due to the nature of the work, living conditions may be subpar and pay may be insufficient. During the bleaching process, employees may be subjected to dangerous conditions that might be damaging to their health. Additionally, recycling that is done improperly harms both the environment and people. The environment can get contaminated by plastic waste if it is not properly managed (Hopewell, et al., 2009). Environmental effects might result from waste that is left behind after recycling companies stop using disposal facilities.

Moreover, several aspects of the recycling process and the composition of plastic materials can make it water-intensive to recycle plastic. A lot of plastic products, such as bottles, containers, and packaging, can be contaminated with impurities like residues, dirt, labels, and other contaminants. These items need to be carefully cleaned and washed before being ready for recycling. To eliminate pollutants, water is frequently needed in this process, which adds to the water intensity of recycling plastic. Additionally, some plastic recycling procedures employ density and water-based flotation methods to separate plastics from other materials. These techniques depend on the differing densities of the various materials to produce separation (Ruj, et al., 2015).

- **Plastic Recycling Can Be Toxic**

It is obvious that plastics contain a variety of compounds that give them desired features including flexibility, color, and durability against fire. Plastics are made up of polymers and additives. But the very substances that give plastics their versatility and usefulness may also make them dangerous. These compounds may leak out during the recycling of plastics, having a variety of detrimental impacts on human health and the environment.

The recycling of plastics really makes them more harmful, according to a recent study from Greenpeace, which supports this claim with a litany of national and international studies and peer-reviewed research. The danger that recycled plastics pose to both the health of recycling industry workers and residents of low-income areas is brought to light. More than 13,000 chemicals are included in plastics, more than 3,200 of which are recognized to be harmful to human health, as stated in the document "Forever Toxic: The Science of Health Threats from Plastic Recycling (Greenpeace, 2023). Many other compounds included in plastics that have not yet been well studied may be dangerous. Apart from harmful flame retardants, benzene and other carcinogens, environmental contaminants such as brominated and chlorinated dioxins, and an array of chemical compounds that can disrupt the body's natural hormone equilibrium, recycled plastics often have increased levels of chemicals that are harmful to human health and contribute to neighborhood pollution.

Additionally, plastic items are frequently burned down under the high temperature during recycling, which leads to release of harmful gasses. Moreover, the water utilized in recycling operations can be mixed up with the chemical contamination which endangers aquatic habitats and mostly makes its way into the food supply for humans. BPA (Bisphenol-A) is a well-known endocrine disruptor that is frequently found in polycarbonate plastics and has been a reason for a number of health problems in both people and wildlife (Walker, et al., 2020).

The plastics sector, which includes businesses involved in the production of fossil fuels, petrochemicals, and consumer products, continues to promote recycling of plastics as the answer to the problem of plastic contamination. However, this thesis demonstrates that recycling may actually make plastic more harmful. Plastic Recycling in CE is not a solution to the current

problem. Nevertheless, the problem can be addressed only if the production of plastic decreases drastically. In the same vein, an international group of experts in a letter published in journal *Science* also argued that restricting and subsequently reducing plastic manufacture must be given top priority at the Global Plastics Treaty talks in Paris (Dey, et al., 2022, 55-58).

- **Recycling Does not Mean Reducing Plastic Production**

It is commonly recognized that one of the main goals of the circular economy is to recycle plastic; nevertheless, this has had little effect on how much plastic is produced. Even though it is a big environmental problem and people are fully aware of it, the proliferation of this type of plastic continues to increase.

It is true to assert that the circular economy is doing its best to spread awareness about plastic recycling, however, the issue of excessive plastic production still needs to be highlighted. A "downcycling" effect, where the value of recycled plastic deteriorates with every cycle, might result from the processing of plastics. Moreover, in order to make sure that the quality of plastic meets the standards, more plastic must be produced (Syberg, et al, 2021, 17-20).

Plastic recycling is frequently cited by proponents of the circular economy as an excellent illustration of circularity. But plastic recycling rates are still too low. Because of poor infrastructure, limiting technology, and problems with economic viability, the majority of plastics are not recycled. As a result, the need for virgin plastics grows, which makes the issue of plastic production worse.

In 2021, it was anticipated that 390.7 million MT of plastics would be produced worldwide, representing a growth of 4% annually. Since the 1950s, plastics production has dramatically increased (Statista, n.d). The statistical numbers clearly indicated that even though there is a notion of a circular economy as a solution to the plastic problem, the numbers are growing instead of reducing. It is true to assert that the plastic manufacturers are using the circular economy to keep plastic production high and make profit, rather than attempting for a sustainable economy. This helps them to hide the main problem of high plastic production, just by using the name of recycling.

“The 100 largest polymer producers in the world continue to rely almost exclusively on “virgin” (fossil-fuel-based) feedstocks. In 2019, production of recycled polymers from plastic waste – a “circular” model – accounted for no more than 2% of total output. The 2060 OECD projection shows that primary plastics will continue to dominate the feedstock while recycled (secondary) plastics will only make up 12% of all plastics in 2060” (Nagtzaam, et al, 2023, 15).

Regarding that, the circular economy can be considered as a tool that businesses may use to boost consumer spending. For instance, organizations like Apple get “circular” certification to position themselves as morally and ecologically responsible. Customers may shop guilt-free thanks to this, which motivates them to buy more. Another method of boosting consumption that goes hand in hand with it is planned obsolescence (Korhonen,et al., 2018). Designing items with a short lifespan so that customers constantly buy new ones is known as planned obsolescence. Companies in the electronics sector who promote themselves as being circular are also renowned for artificially extending the lifespan of their products to boost sales (Barros & Dimla, 2021, 42-45).

Because they consume more natural resources and generate more greenhouse gasses, products with shorter lifespans are bad for the environment. The circular economy and the restriction of built-in obsolescence are commonly seen as remedies to today’s “throwaway society”. On the other hand, examining a mobile phone provider's marketing effort in Austria illustrates the significant disadvantages of both approaches. A circular economy model that considers both efficiency and sufficiency is required for a successful approach to promote extended product life spans beyond prohibiting built-in obsolescence (Wieser, 2016, 12-17).

As asserted by Boulding (1966), if something exists already, it cannot disappear totally. The polymer chain gets weaker as the plastic is recycled which lowers its quality. A piece of plastic can only be recycled the same way two or three times before losing enough quality to be unusable. When plastic cannot be recycled or utilized further, it must ultimately be dumped into the environment. Therefore, this idea runs counter to the CE concept since there is little benefit in recycling or even imagining more effective, sustainable development, if plastic production does not decline. Because ultimately, the amount of discarded plastic in the environment keeps growing. Owens (2021) expressed it best when she asked, “mopping up or turning off the tap?”.

It is accurate to say that there is no point in mopping up, until the tap is turned off, in light of the reasoning above.

2.3. Plastic Waste: An Environmental Justice Issue

2.3.1. Environmental Justice

Exporting waste to countries with less restrictive environmental regulations and lower labor costs is one of the consequences derived by the circular economy. China was the most widely used country in the world for recycling, reusing, and dumping of solid waste up to 2018. In 2016, it brought in a sizable portion of the world's scrap paper, scrap metal, and scrap textile waste, as well as two-thirds of the world's plastic waste. This worldwide plastic waste trade route, however, ran into a significant roadblock in January 2018 when China banned the import of plastic waste that did not adhere to new transparency criteria. Plastic waste shipments to China immediately fell by 99% (Grable, 2019, 17). The cases where underdeveloped countries are being exposed to the hazardous waste shipments by the rich countries link the topic with another important notion called environmental justice.

As mentioned in the previous sections of the thesis, the trade of hazardous and illegal wastes from developed countries to the underdeveloped countries with no capacity of handling those wastes is considered an environmental justice issue. For instance, the waste barrels, which weighed roughly 3800 tons, were discovered stored at a location in Koko, Nigeria, a port city with little under 5000 residents. “Later on discovered that this waste was containing toxic and hazardous particles inside” (Clapp, 2001). Five shipments of the cargo came from Italy between August 1987 and May 1988. Also, in 2021, France got the most containers with 43, followed by the United States with 42, 11 containers went to Canada, 10 containers went to Spain, and 17 containers were returned back to the United Kingdom from Malaysia because they contained hazardous waste (Reuters, 2021).

Due to its low cost, contribution to recycling goals, and reduction of local landfill space, many wealthy nations export their supposedly "recyclable" plastic. It is a simple approach to get money

for the underdeveloped countries that accept rubbish. However, illegal processing plants are frequently home to contaminated plastic that cannot be recycled. To now, a relatively modest amount of plastics have been produced by recycling, nevertheless. Non-recyclable plastics that are illegally burned, dumped in landfills, or dumped into bodies of water damage the environment and the general people. Nations throughout the world have taken steps in response to concerns about receiving such rubbish.

The plastic waste that was flowing into developing and underdeveloped countries and found plastic wastes that are supposed to be recycled but instead grow to heights of over ten feet, crops which were harmed, and open plastic consuming that had a significant negative impact on the local residents because harmful gasses are released into the atmosphere when plastic burns. These factors and more are the reason that plastic waste trade sometimes violates environmental justice.

The environmental justice movement originally appeared in the Indigenous environmental movement, with its origins in the more than 500 years of colonialism and steadfast struggles for independence and land rights. The terms "environmental justice" and "environmental racism" were first used in the United States in conjunction with the 1982 PCB demonstrations in Warren County, North Carolina. When PCB-contaminated earth primarily wound up in Afton, the community where the Black people were living, more than 500 persons were jailed.

The Commission for Racial Justice investigated where dangerous waste disposal plants were located in the US in reaction to these demonstrations and discovered that race was the primary determinant of where these facilities would be located. Widespread protests and legal actions against the placement of dangerous waste in indigenous land, mostly areas where the Blacks lived, occurred as a result of the first movement. The mainstream environmental movement came under scrutiny for its largely white, privileged authority and disregard for issues of social fairness (Taylor, 2000, 512-517).

Historically different environmental justice movements happened in various times and locations for the same purpose - equal sharing of environmental goods and bad. For instance, the environmental justice movement was started by people who wanted to change how

environmental protection was distributed in their communities, mostly by people of color (Taylor, 2000). “Communities of color in urban ghettos, in rural ‘poverty pockets’, or on economically impoverished Native-American reservations face some of the worst environmental devastation in the nation”, Professor Robert Bullard (1999) wrote. In the 1960s, the Civil Rights Movement raised awareness of the threats to public health that they, their families, and their communities faced (Arney, 2023).

The Memphis Sanitation Strike is yet another environmental justice movement. In Memphis, Tennessee, the Memphis Sanitation Strike was a protest against unfair attitudes and problems related to environmental justice. Rev. Dr. Martin Luther King, Jr, an activist and significant Civil Rights Movement leader, conducted the incident's investigation. Memphis waste workers wanted better pay and working conditions during the strike. It was whenever African Americans first prepared a public, wide based gathering to go against ecological treacheries (Arney, 2023).
Environmental justice (EJ) is the fight for access to resources needed for social reproduction, survival, and well-being as well as a clean, safe, and healthy environment (Sze & London, 2008). The idea of environmental justice first came into existence in the United States, but soon after, communities, activists, concerned citizens, religious figures, and academics joined forces to systematically document injustices and show that “pollution is not color blind” due to racial differences in environmental exposure. EJ immediately opposed the mainstream environmental movement's idea of nature and the environment, which placed a focus on the preservation of wilderness, the preservation of natural places like national parks, and the protection of endangered species (Figueroa, 2001).

The term environmental justice, or EJ, describes how everyone should be treated equally, regardless of their race, color, national origin, or income level, and how they should be actively involved in the creation, application, and enforcement of environmental laws. The negative environmental effects of business, government, and industry shouldn't be unfairly disproportionately borne by any one group.

Environmental justice, which concentrates on environmental issues that are caused by people and exacerbated by them, as well as issues that are protected and improved in the environment, is a field where the distribution of environmental quality is presently receiving attention.

"Environmental mental victims" are calling for justice in this instance. Victims of the environment are individuals who endure "natural processes, anthropogenic processes mediated by the natural environment, and restrictions on access to the environment" (Schlosberg, 2007). Justice, according to a more constrained meaning, has to do with how access to or the quality of the environment is distributed among various groups. Groups from all backgrounds may protest or oppose these distributions since they have an immediate impact on the people's quality of life and the environment in which they live. Political theorists have only recently begun to pay attention to the environmental issues that have long troubled politicians. According to environmental political theory, politics is now being enlarged to include the natural world and how we interact with it (Schlosberg, 2004).

According to Schlosberg (2007) there are four dimensions of the Environmental justice:

1. **Distributive Justice:** It is focused on the fair distribution of material goods like properties, income, and money as well as social standing and the benefits and drawbacks of the environment. This area includes the power, the distribution of labor, decision-making processes, and power in affecting EJ.

2. **Recognitional Justice:** It stands for recognition and respect for diversity. The acknowledgement of collective identities and their unique problems, demands, and ways of life in respect to the environment is more significant than just the individual right to self-identification.

3. **Procedural Justice:** It is concerned with a State's fair and equitable institutional procedures. People have historically been disenfranchised or marginalized by the institutions that decide how the environment is governed. Environmental decision-making is currently characterized by egregious disparities in political influence, power, and authority, which results in procedural unfairness.
4. **Capabilities Approach:** The capacities approach sees justice as being based not merely on the distribution of different factors such as natural resources or environmental advantages but also on how those goods relate to a person's potential to thrive.

When defining the environment, environmental justice recognizes that it includes "the places where people live, work, and play" and that it is integral to daily life. The concept of

environmental justice has evolved over time to address a number of racial and geographical injustices as well as a much larger range of problems that are considered to be environmental concerns. The indigenous, environmental, feminist, labor, and civil rights groups, as well as radical academics and others, came together to form a coalition of anti-toxics at the beginning of the twenty-first century. They both hold the belief that environmental problems are fundamentally political and structural in character, demanding a transformational approach and a reconsideration of prevailing economic models, social interactions, and institutional frameworks to solve them (Boone, 2008).

Environmental justice has been a focus point for action-research among a burgeoning community of activists, academics, and nonprofit groups in the early 21st century. It has also developed to embrace a wide range of themes, becoming more transnational and multidisciplinary. Environmental justice first put a heavy emphasis on the socio-spatial distribution of "bad" (emissions, toxins) and then "goods" (parks, green spaces, services, healthy food). Environmental justice is always changing and growing as a consequence of activist organizations, global alliances, and academics (Schlosberg, 2004).
People can participate meaningfully in activities that may have:

- an impact on their health and the environment;
- The regulatory body's decision may be influenced by suggestions from the public;
- When making choices, consideration will be given to the community's worries;
- Decision-makers shall also support and facilitate the engagement of individuals who could be affected (Schlosberg, 2007).

2.3.2. Environmental Justice on the Policy Level

In a time of interconnection and international problems, dealing with environmental problems crosses international borders. As a crucial element of global policy, environmental justice, a notion based on fairness and equity regarding the allocation of environmental benefits and responsibilities, has acquired considerable significance. Environmental dangers are already causing people to be marginalized in the race for sustainable peace and development, escalating

environmental injustices, and they will become one of the greatest threats to human rights in our time as they become more severe. This scenario has been made worse by the COVID-19 epidemic, which has also brought to light notable differences in the distribution of money and resources, the supply of essential services, the fairness of everyone's ability to obtain justice and security, and the advancement and protection of human rights. Despite the fact that environmental justice began and institutionalized in policy making in the USA, it has been known as a problem in other nations over the decades.

The US Environmental Protection Agency (EPA) has adopted EJ as a part of its justice measurements. The EPA (2018) seeks to create an environment where everyone has equal access to decision-making and benefits from equal protection against environmental and health concerns in order to preserve a safe environment in which to live, learn, and work.

The Environmental Protection Agency was created in 1970 as a result of a proposal for executive reform that President Richard Nixon approved. The EPA was created with the goal of integrating and coordinating government efforts to safeguard and enhance the nation's environment on December 2, 1970. A frenzy of legislative action and historic accomplishments characterized the early years of the EPA. As important pieces of legislation that gave the agency the authority to effectively control air and water pollution, the Clean Air Act of 1970 and the Clean Water Act of 1972 stand out. These laws created a framework for state implementation and enforcement of environmental legislation as well as national requirements.

The Resource Conservation and Recovery Act (RCRA) of 1976 gave the EPA the authority to regulate hazardous waste in addition to issues with air and water pollution. This was an important development in controlling the removal of hazardous waste and safeguarding local residents from the negative impacts of poor waste management.
Environmental justice is a requirement that applies to all EPA activity, which includes (Sherwin, 2019):

- establishing guidelines
- facilities for permitting
- giving out grants
- giving out license

- regulations
- assessing the federal agencies' proposed actions

The EPA works with all stakeholders to resolve environmental and public health problems and concerns in a constructive and cooperative way by establishing standards, licensing facilities, awarding grants, enforcing laws, and evaluating proposed actions by federal agencies. The responsibility of integrating environmental justice into all Agency policies, programs, and initiatives falls on the Office of Environmental Justice (OEJ). The goal of OEJ is to support Agency initiatives to safeguard the environment and public health in communities of color, low-income households, tribal territories, and other vulnerable places. To make this happen, environmental justice must be taken into account in all strategies, choices, and actions (Thomas-Burton, 2021).

Executive Order 1898's supporting Presidential Memorandum lists a few legislative requirements that can help guarantee that all communities and individuals in the country live in a safe and healthy environment. Assisting federal agencies in addressing the disproportionately severe and harmful environmental or human health consequences of their programs on low-income and minority communities is the requirement that they create environmental justice strategies (EPA, n.d).

A presidential directive also formed the Interagency Working Group on Environmental Justice (EJ IWG). Top representatives from 11 departments and agencies as well as other White House divisions made up the group, which was presided over by the EPA Administrator. The EJ IWG, which now includes 17 agencies, meets once a month to maintain its cooperation (Cavender & Austin, 2022, 290-295).

Environmental justice issues can be taken into account and addressed by the EPA thanks to the statutes it enacts. The entire scope of the Agency's operations is covered by these laws, which include (Villa, 2020, 308-312):

- setting requirements,
- providing licenses or rules,

- giving funds,
- approving facility permits,
- establishing standards,
- assessing the proposals put forth by other federal agencies.

The Agency is generally required under these regulations to consider a number of variables, most commonly one or more of the following (Sherwin, 2019, 500-512):

- public health implications,
- long-term impacts,
- societal costs, and welfare

A number of legal regulations, like the Toxic Substances Control Act, also directly instruct the Agency to help persons in need. The Agency must take into account disadvantaged populations while developing standards, according to other statutes. The Agency's choice to exercise and uphold its jurisdiction in any situation might have a substantial influence on environmental justice for all communities. The EPA has put a lot of work towards integrating environmental justice into its everyday operations since the creation of the OEJ. Each organization's regional and corporate offices are coordinated by an environmental justice coordinator (Lado, 2019, 280-285).

Environmental justice concerns gained a place in international processes in recent decades as well. For example, some international environmental agreements contain provisions that try to ensure justice among Parties in terms of responsibilities and obligations. Whereas, some do have direct references to justice concerns some do this by formulating different obligations for different country groups. Basel Convention’s ban on hazardous waste trade to developing countries is an example.

The idea of equality and shared but distinct obligations is reflected in the Paris Agreement. Recognizing historical inequalities in emissions and capacity, developed countries pledge to assist poor countries in their efforts to reduce emissions and adapt to climate change. Also, environmental justice is significant, and the Basel Convention on harmful waste recognizes this by limiting the transportation of harmful waste internationally. By tackling the issue of

environmental justice—where underprivileged populations are frequently singled out for waste disposal—it aims to stop the dumping of dangerous waste in developing nations.

Additionally, by encouraging comprehensive urban planning, the EU's new urban policy agenda aims to uphold the ideals of environmental justice. In addition to taking infrastructure and economic growth into account, this strategy also takes community participation, public health, and equal access to green space into account. The issues of urbanization and affordable housing are also addressed by environmental justice. The EU wants to stop disadvantaged groups from being uprooted by urban regeneration initiatives by encouraging inclusive housing policy. Environmental justice significantly depends on having access to infrastructure and sustainable transportation choices. The policy agenda of the EU places a strong emphasis on improving public transportation networks and encouraging active forms of transportation, which lightens the burden of pollution on vulnerable urban populations (European Commission, n.d a).

UNEP as the principle UN body for the environment has also begun taking EJ into account. The United Nations Environment Programme (UNEP), although may not have a formal set of "environmental justice rules" per se, does stress concepts connected to environmental justice in its policies and actions as of September 2021. As an alternative, UNEP frequently incorporates environmental justice into its more general policy objectives. Within its policy domains, UNEP frequently addresses the following environmental justice issues.

UNEP emphasizes fair access to natural resources, advantages, and opportunities. It promotes making sure that environmental laws and practices don't disproportionately hurt marginalized populations and that everyone has an equal opportunity to enjoy a safe and healthy environment. UNEP often in its policy areas mentions open and inclusive environmental governance. This involves urging governments to incorporate all parties, including local communities, civil society organizations, and indigenous peoples in environmental decision-making processes.

UNEP's environmental activities are another illustration. It is in favor of the formulation and application of environmental laws and rules that advance environmental justice. To safeguard endangered populations and ecosystems, this may include arguing for stronger legal protections. Additionally, UNEP offers initiatives to help communities and nations strengthen their capacity

to better address environmental justice challenges. This covers instruction on environmental impact analyses and associated subjects (UNEP, 2023).

UNEP's work is governed by principles and actions that are in line with the objectives of environmental justice, even if it may not have a separate set of regulations referred to as "environmental justice rules." These ideas are part of UNEP's overarching objective, which is to advance environmental sustainability, conservation, and the health of both ecosystems and communities (UNEP, n.d).

Moreover, the Sustainable Development Goals (SDGs) of the United Nations recognize the significance of environmental justice by placing a strong emphasis on objectives including access to clean energy, inexpensive water, and sanitary conditions. All facets of society will benefit from environmental improvements thanks to the way these objectives are interwoven with social and economic concerns (UN, n.d.b).

2.3.3. Plastic Waste Trade and Environmental Justice

Most communities in the industrialized nations have regular waste pickup provided by municipal agencies. When consumers meticulously segregate recyclables from organic waste at the time of collection, their trust in their local recycling systems helps to alleviate a lot of their consumption-related emotional shame. This is when the worldwide breadth of the problem begins. Developed countries typically find it cheaper to ship containers of plastic waste halfway around the world to underdeveloped countries where it is “recycled” than to deal with the waste themselves.

China ceased to accept waste from the rest of the world, including plastic, paper, and textiles, from the beginning of 2018. Prior to this, in order to meet the need for materials in the country, Chinese recyclers have previously taken recyclable plastic waste from the major exporting countries such as the USA, UK, Germany, and Japan (Grable, 2019). In 2018, all of that essentially came to an end, as waste began to flow into Southeast Asia. It first traveled to Thailand, Malaysia, and Vietnam, all of which imposed limitations on the importation of plastic

waste. After some success was achieved in reducing the flow, it moved on to the next victim, in particular Indonesia (Landrigan, et al., 2023, 56-61).

Many rich countries export their so-called “recyclable” plastic to poor countries since it is cheap, by the help of the recycling objectives, and minimizes local landfill space. For the poor nations that accept waste, it is an easy way to generate money. But tainted plastic that cannot be recycled are commonly found in unlawful processing facilities. However, recycling only makes up a small portion of the total amount of plastics made up to this point. The environment and public health are endangered when non-recyclable plastics are unlawfully burnt, disposed of in landfills, or thrown into bodies of water. Concerns over receiving such waste have prompted action on the part of the world's nations (Geyer, Jambeck & Law, 2017).

Even though they are not directly responsible for the high amounts of pollution produced, disadvantaged groups frequently endure greater pollution levels in situations involving environmental injustice. Bullard (1999) defined environmental injustice as "(1) unequal enforcement of environmental, civil rights, and public health laws, (2) differential exposure of some populations to harmful chemicals...in the home, school, neighborhood, and workplace." (3) flawed risk calculation and assessment assumptions; (4) discriminatory zoning and land-use rules; and (5) exclusionary laws and practices that exclude particular people and groups from participating in decision-making.

Along with the social and ecological injustices that plastic pollution causes, it also displays the traits of “slow violence”, which is the “slow destruction of Environmental Justice” (Nixon, 2011). Moreover, the idea of “adaptive injustice” pertains to the global environmental justice problem around plastic waste, in which those who must adjust to increasing flows of plastic waste are not those who created it (Owens, Conlon, 2021). However, just by virtue of being citizens of an impoverished nation, those individuals are subject to the harmful effects of the trade in plastic waste.

There are a few factors that are seen in the majority of plastic situations that are considered as an environmental justice matter. First and foremost, social and environmental inequalities are caused by the generation, consumption, and disposal of plastic and chemical contaminants.

Climate change, dirty air and water pollution, biodiversity loss, and ecosystem collapse are all caused unequally by plastic and chemical emissions by it (Landrigan, et al., 2023). Some of the major harms caused by the plastic waste trade are mentioned below:

- **Air Pollution**

The effects of air pollution on human health and the ecosystem are catastrophic. While sectors like transportation and energy production are frequently in the news, the pernicious role that the trade in plastic waste plays in causing air pollution frequently goes unreported. The incineration of plastic waste is one of the most concerning effects of the worldwide plastic waste trade. In order to dispose of waste, many nations, especially those that import significant amounts of plastic waste, turn to incineration.

Heavy metals, dioxins, and greenhouse gasses (GHGs), among others, are released into the atmosphere during incineration. While dioxins and heavy metals have detrimental effects on health, GHGs like carbon dioxide (CO2) contribute to climate change. Dioxins are well-known to cause cancer, and exposure to heavy metals can cause neurological and respiratory issues. Therefore, the careless combustion of plastic waste directly contributes to air pollution (Kellenberg, 2015).

After joining the WTO in 2001, China saw a surge in imports of plastic waste, making it the biggest consumer in the early 2010s. Incorporating data on imports of plastic waste with city-level PM2.5 data for the years 2000 to 2011, it is discovered that plastic waste imports significantly boosted PM2.5 concentration. The impact is related to increasing burning and extended output in the waste processing industry. Accordingly (Brooks, Wang & Jambeck, 2018), as of 2016, China was the destination of 45.1% of all exported plastic waste worldwide. China's environmental standards rapidly declined throughout the exact same time period. Growing imports of plastic waste are also perhaps a significant driving force given the extreme expansion, even if this may be attributable to a number of factors, including an excessive dependence on fuel use and inadequate environmental restrictions (Unfried & Wang, 2022).

Additionally, large amounts of plastic waste are transported across great distances as part of the global plastic waste trade. Particularly in the case of shipping and trucks, this mode of transportation significantly relies on fossil fuels. Air quality is negatively impacted by these operations' large emissions of air pollutants, such as nitrogen oxides (NOx) and particulate matter (PM). Ground-level ozone and fine particulate matter, which are both associated with respiratory illnesses, cardiovascular issues, and early mortality, are created in part by NOx emissions. These emissions are directly attributed to the trade in plastic waste, which worsens air pollution in countries that import and export it (Walters, 2017).

Moreover, microplastics are created when plastic waste, particularly when exposed to environmental variables, degrades. Aerosolization is a procedure that can cause these tiny fragments to expand and become airborne. Once in the air, they are capable of being carried over great distances, settling in different ecosystems, and maybe even making their way into the respiratory system of people. Although the consequences of breathing in microplastics on health are not entirely known, preliminary study indicates that they may be harmful to the immune system and the health of the lungs. A Developing issue that requires attention is the dispersion of plastic microplastics in the atmosphere (Brooks, Wang & Jambeck, 2018).

- **Marine Pollution**

Oceans and coastlines across the world are increasingly at risk from marine waste, which is mostly made of plastic. Although the trade in plastic waste may not be the only factor contributing to marine litter, it does play a substantial role in this ecological disaster. Through the export of plastic waste, many industrialized nations have delegated their plastic waste issues to less industrialized nations. Large amounts of plastic waste are imported into these nations, which frequently lack the infrastructure for waste management and recycling. A large portion of this waste is improperly handled and contaminates the coastal areas of these nations. Some importing nations have loose rules, which makes it possible for plastic waste to be improperly disposed of, resulting in litter that eventually ends up in rivers and seas. Through this method, the responsibility of combating marine litter is efficiently transferred from exporting countries to importers (Barboza, et al., 2019).

Despite having the second-highest plastics output in Europe and the seventh-highest globally, Türkiye's present recycling and waste management systems are unable to keep up with the country's growing plastic waste stream. In Türkiye, landfills are the final destination of almost 90% of the municipal solid waste generated. When plastic waste is not properly managed, it leaks into the Mediterranean Sea, with Türkiye accounting for the largest percentage (16.8%) of the plastic pollution in the seas of Europe (Gundogdu & Walker, 2021).

There are several potential for loss and environmental leakage when moving plastic waste over vast distances. Particularly in poorly controlled waste export processes, plastic waste can escape from containers, vehicles, and ships. When these lost and leaky plastics are close to rivers or coasts, they frequently wash into the ocean after heavy rains, greatly increasing the amount of marine debris. A serious threat to marine life is posed by marine debris, notably plastic waste from international trade. Plastics are ingested or entangled by sea life, including small fish and huge animals, sometimes with tragic results. Coral reefs and seabird populations are both impacted by the disruption of ecosystems caused by plastic waste (Schnurr, 2018).

Furthermore, through a variety of channels, such as unlawful dumping and poor waste management, plastic waste that is not adequately handled may wind up in the seas. Plastic waste may linger in the water for decades or even centuries before disintegrating into tiny fragments known as microplastics. When marine species consume these microplastics, it may be harmful to both specific animals and entire ecosystems. Animals in the ocean frequently mistake plastic waste for food. Ingestion of plastic can cause intestinal obstructions, malnutrition, and even death in these animals. The toxins in plastic can also seep into the tissues of marine species, possibly injuring both the animal that consumed the plastic and any predator further up the food chain that eats polluted prey (Barboza, et al., 2019).

- **Health Issues**

Every stage of the plastic contamination process causes significant environmental impact. Premature birth, low birth weight, neurodevelopmental disorders, asthma, childhood leukemia, cardiovascular disease, chronic obstructive pulmonary disease, and lung cancer are among the

conditions that are frequently observed in people who work in or live near plastic production facilities and waste landfills (Ogunola, et al., 2018).

There are a number of health problems that can arise from the trade in plastic waste, both for the groups participating in the trade and for the people living in locations where plastic waste is not effectively managed. Flame retardants, plasticizers like phthalates, and additives used in plastic manufacture are just a few of the dangerous substances that plastic waste may include. These compounds may be discharged into the air, soil, and water when plastic waste is improperly treated or burned, perhaps exposing local communities to harmful materials (Shamim, 2015).

Risks to workers' health can be high while recycling and processing plastic waste, especially in unregulated or informal environments. They may be exposed to dangerous substances, get injuries from handling pointy or heavy objects, and experience lung problems as a result of unfavorable working circumstances. Additionally, waste made of plastic can serve as a breeding ground for insects that spread disease, including mosquitoes. For instance, stagnant water trapped in abandoned plastic containers might raise the risk of illnesses spread by vectors like dengue fever and malaria. Due to the environmental harm and pollution brought on by locations where plastic waste is discarded or processed, nearby communities may also face emotional stress and a decreased quality of life.

GAIA looked into the effects of the plastic waste that was streaming into the developing and underdeveloped nations and discovered plastic wastes which were supposed to be recycled but grew more than ten feet high, crops that were poisoned, and open plastic burning that had a significant negative impact on the nearby residents since harmful gasses emit into the atmosphere when the plastic burns (Irfan, 2021). Many exporting nations in North America and Europe have seen the waste accumulate domestically due to a lack of knowledge on where to export plastics. It accumulates in less wealthy and risky regions where there is not even enough equipment for recycling. Later on these activities are observed as a public health issue (Liebman, 2021, 89-93).

Additionally, the majority of the population in the developing or underdeveloped nations are subjected to unsafe working conditions, hazardous exposure, prenatal exposure, exacerbated

social injustices, loss of ecological services, and pollution of the land, air, and water. Pollution risks are particularly severe in tiny island nations, the Global South, and underdeveloped regions of the Global North. Residents in countries with lower costs of doing business, where regulation is typically weak or nonexistent, bear the brunt of the burden (Dillon, 2014, 1210-1215). A number of groups in the places mentioned above are particularly impacted by social and environmental inequality. Indigenous peoples, women, minorities, African Americans, residents of coastal communities (including those in small island states), workers in the fossil fuel extraction industry, and others included in this category (Owens, Conlon, 2021).

The plastics business, from manufacturing to recycling, is allegedly rife with various types of environmental injustice. Due to severe diseases including lung cancer, pneumoconiosis, silicosis, cardiovascular disease, and chronic obstructive pulmonary disease, workers who acquire fossil carbon feedstocks for the manufacture of plastics, such as coal, oil, and gas, have a higher death rate. Workers in the plastics sector are more likely to get neurotoxic damage, impaired fertility, leukemia, lymphoma, hepatic angiosarcoma, brain cancer, breast cancer, mesothelioma, and other cancers (Owens, Conlon, 2021).

Manufacturing plastic materials increases the risk of developing interstitial pulmonary disease, lung cancer, bladder cancer, and mesothelioma.Lung cancer, toxic metal poisoning, neuropathy, and cardiovascular disease are all more prevalent among plastic recycling industry workers. The risks of premature birth, low birth weight, asthma, pediatric leukemia, cardiovascular disease, chronic obstructive pulmonary disease, and lung cancer are higher for members of indigenous populations who live close to plastic manufacturing facilities and waste disposal sites (Landrigan, et al., 2023).

Table 3: The Tradable Plastic Specification by the Basel Convention:

B3010	Solid plastic waste: The following plastic or mixed plastic materials, provided they are not mixed with other wastes and are prepared to a specification: • Scrap plastic of non-halogenated polymers and co-polymers, including but not limited to the following[23] - ethylene - styrene - polypropylene - polyethylene terephthalate - acrylonitrile - butadiene - polyacetals - polyamides - polybutylene terephthalate - polycarbonates - polyethers - polyphenylene sulphides - acrylic polymers - alkanes C10-C13 (plasticiser) - polyurethane (not containing CFCs) - polysiloxanes - polymethyl methacrylate - polyvinyl alcohol - polyvinyl butyral - polyvinyl acetate

Source: UNEP, 2019b

Although the Basel Convention, the Rotterdam Convention (concerning hazardous substances and pesticides), and the Stockholm Convention (concerning persistent organic pollutants, or POPs), all offer rules for the international trade of hazardous materials, none of them were developed in recognition of the need to lessen the plastic contamination worldwide (Basel Convention, 2021; Rotterdam Convention on Waste). It is yet unknown how successfully the Basel Convention will function to lessen the negative consequences of plastic pollution, even though implementation of the amendments began in January 2021.

Preventing the transfer of harmful waste from rich to underdeveloped countries was the aim of the Basel Convention. The pact, which is significant, forbids exporting nations - typically affluent nations - from engaging in careless dumping abroad. However, the agreement permits

the export of all plastic waste since it makes no distinction between contaminated mixed plastic waste and recyclable plastic. According to Basel convention plastics can be traded, if they are not mixed with other wastes and fulfill the plastic specification in its annexes by the Basel convention mentioned in **Table 3**.

The negative consequences of plastics and waste generated by it on the ecosystem, and human health are not shared on an equal basis. It is observed more on disadvantaged, poor and marginalized groups which includes workers, racial and ethnic minorities, indigenous communities, women, and children. Nevertheless, these groups have little contribution to the unpleasant results derived by plastics, they do not have the political power or financial backing necessary to tackle it. According to the social and environmental justice principles to guarantee that no group pays an excessive part of the harmful effects of plastics and that those who profit financially from plastic face the externalized costs of it there should be modification to the current unequal burdens. It is clearly obvious that the way plastic is currently produced, used, and disposed of is unsustainable and that this has serious negative effects on global justice, the environment, and the economy.

3. EUROPEAN UNION CIRCULAR ECONOMY POLICY AND ENVIRONMENTAL JUSTICE

In an era of worsening environmental issues, the European Union (EU) has made progress in following a more sustainable route with its Circular Economy Policy. This policy framework strives to separate economic growth from resource usage while decreasing waste and pollution, resulting in a future that is both more ecologically friendly and economically feasible. However, in connection to this bold plan, thorough consideration must be given to the core concept of environmental justice. As the EU's Circular Economy Policy and its effects are examined from the standpoint of environmental justice, an intricate tangle will be uncovered where ecological, economic, and social threads are interlaced.

3.1. Circularity in the EU Environmental Policy

The world is using more resources than our planet can sustain. Current levels of global consumption suggest that there will be a need for three Earths by 2050 (Statista, n.d). The reason is that the great percentage of the current economic activities are featured as a linear model where products are made, consumed and disposed of in landfills or incinerated. In nature everything is recycled, there is no waste as everything is reused and the cycle of recycling continues automatically by nature. The only place the waste comes from is human beings as they have adopted a linear approach. In a linear model the approach is take- make-and-dispose. In producing a product a considerable amount of energy, land, material and water are used. It leads to a large amount of waste and mass use of resources (Hagelüken, et.al., 2016, 245-250). The linear economy and its propensity to squander important materials, to put it simply, are a significant problem for a planet with finite resources.

Due to its potential to foster economic development, lessen negative environmental effects, and improve resource security, the European Union (EU) has been a vocal supporter of the circular economy. The EU's Circular Economy Action Plan, initially unveiled in 2015 and renewed in 2020, lays out plans and actions to advance circular practices across several industries.

The Circular Economy Action Plan (CEAP), which includes both legislative and non-legislative efforts, was authorized in 2015 in order to adapt the circular model for the EU economy (European Commission, 2015a). Along with 54 measures, the action plan recommended four waste-related policies. Reuse and recycling targets for the years 2030 and 2035 were included in those legal suggestions, which the European Commission also included in the Action Plan. In order to promote systemic change, the European Commission developed a framework that takes into account the efficient use of resources and supply chains. It has made an attempt to encourage collaboration by bringing together decision-makers from all levels of government, several policy fields, and a wide range of stakeholders. The European Commission (n.d b) notes that the Directorate-General in charge of Industry & Enterprise and the Environment supplied the money for the implementation of the Action Plan.

The CE is also a fundamental element of the European Green Deal. The Von der Leyen Commission introduced the European Green Deal in December 2019 in an effort to reform the EU economy and make it more prosperous and sustainable. Everyone is planned to be included in the European Green Deal, which aims to make Europe the first continent to be carbon neutral. It was difficult to prepare this new development plan because it is a complete growth strategy. The European Green Deal is a result of the European Commission's evolving viewpoints since 2011 and many significant policy developments in various areas (European Commission, n.d b).

The circular economy is one of the methods that can address environmental issues. It is obvious that the linear paradigm, which is still in use in the majority of the globe, is unsustainable. A new Circular Economy Action Plan was released by the EU in 2020 to attain carbon neutrality by 2050 in accordance with its Green Deal objectives. That seeks to completely reorganize how the European economy operates. The new action plan from the EU sets an objective and emphasizes eco-design because of the significant change it will bring to how products are used and consumed (European Environment Agency, 2021b).

A shift toward the circular economy has taken place throughout the EU and the world as a result of the growing recognition that we have an immediate need to conserve our limited resources and cut emissions. In order to follow the natural cycles, the circular economy implements similar principles with that. The novel model requires us to completely reevaluate the existing approach

to products and services and our consumption habits (Mazur-Wierzbicka, 2021). The fundamental goals of the CE are to make better use of resources, eliminate waste and pollution through improved design, and close loops in the flow of resources by recovering as much as possible. In order to cut down on emissions, make better use of resources, and keep them in use for as long as possible, we are focusing on changing how we extract, make, use, and repurpose the materials in our products (OECD, 2021).

However, recycling is only one aspect of the circular economy, and while it is an important method for preserving resources in circulation. In addition to recovering and reusing resources, the circular economy pays attention to eliminating waste and pollution from the outset, developing novel retail and consumer ownership models, and developing systems for reusing products (OECD, 2021).

In the circular economy, products still have a life once they are produced, regardless of whether a component part fails, they fall out of style, or they are just no longer desired. Even if it has no future as that functional product, its constituent pieces can still be salvaged. Therefore, the EU CE emphasizes the importance of changing the traditional way of production. In order to shift to a circular economy, first of all the product design should completely change. It is mandatory to design the product the way that later on it will be suitable for recycling.

The worldwide shift toward recycling in recent decades is evidence of a fundamental understanding of circular economy principles. By design, each of these methods will contribute to the creation of an economic system that is both restorative and regenerative, an economic system that considers the value of resources on a planet where there are only so many of them and the population is growing.

The EU is implementing its regulations and partially accomplishing its goals. 2019 has seen the adoption or application of all 54 legislation. As a result, it could be true to claim that the EU is currently considered as a global leader in the creation of circular economy policies. For example, a new waste legislation package was enacted in 2018 after talks with the European Parliament and the Member States of the European Council. Circular economy model is also providing employment co-benefits for the EU. “According to Eurostat, jobs related to circular

economy activities have increased by 6% between 2012 and 2016 within the EU" (Ellen MacArthur Foundation, 2022). Between 2012 and 2018 "the number of jobs linked to the circular economy in the EU" reached "around 4 million" (European Commission, 2020b).

However, there are still certain drawbacks of the EU circular economy that need to be discussed. For instance, the circular economy goals of the EU gives economic development precedence over environmental preservation. It is correct to say that the approach lays a heavy focus on sustaining and even increasing economic production even though its goal is to separate economic development from the use of resources. This may result in circumstances in which immediate economic benefit is given priority over long-term environmental sustainability (Corvellec, Stowell & Johansson, 2022).

The EU circular economy policy also lacks uniform and transparent rules applied to all member states. Differing interpretations of laws governing waste management, recycling requirements, and extended producer responsibility can be confusing and result in a disorganized strategy. The success of CE would be better with a more uniform regulatory framework that allows less potential for ambiguity and differences in implementation (Valenzuela & Böhm, 2017, 25-31).

Moreover, the problem of consumption habits and their unequal distribution throughout society is not effectively tackled by the EU circular economy policy is another necessary point to mention. Due to a lack of funds or availability of sustainable goods, certain minority groups may encounter obstacles while attempting to participate in circular economy activities (Corvellec, Stowell & Johansson, 2022). As a result, this might cause an unequal treatment between advantageous and disadvantageous groups in the society.

Last but not least significantly, the interdependence of the global economy may cause environmental responsibilities to be transferred to other regions of the world, despite the strategy's goal of creating a closed-loop system inside the EU (Murray, Skene & Haynes., 2017, 29-31). The real meaning of circularity in the CE has been changed in such a way that, rather than recycling and long-term circulation of a product inside the economy, it now mostly involves waste circulation from rich to poor countries. The disregard for environmental justice can be observed in many of the waste shipment cases which will be discussed further in the thesis.

3.2. EU Circular Economy Policy: Action Plans

The world is predicted to use twice as much biomass, fossil fuels, metals, and minerals during the next 40 years, and by 2050, there will be a 70% increase in yearly waste production (Haas, et al., 2015, 767). We cannot maintain the existing structure of world trade: Waste is expanding rapidly as a result of the economy's growth and people's ongoing consumption. The ecology is harmed and additional raw materials must be mined when waste is burned, buried, or dumped in the ocean. More raw resources are reused and fewer are discarded the less are removed. The new circular model guarantees to sustain output and consumption levels while doing so abiding by environmental restrictions and resource conservation (European Commission, 2021a). Therefore, it is necessary to follow the European Union's ambition to transition to a circular economy. It implies a fundamental move away from a linear growth paradigm (take, make, discard) and toward a sustainable alternative (recycle, reuse, recreate). By extending the time that goods, materials, and resources spend in the product cycle, the circular economy seeks to decrease waste.

As a part of its environmental strategies, the EU adopted 54 acts as elements of the 2015 circular economy package (CEAP 1) to be able to achieve the desired shift in culture and behavior (EU Council, 2020).

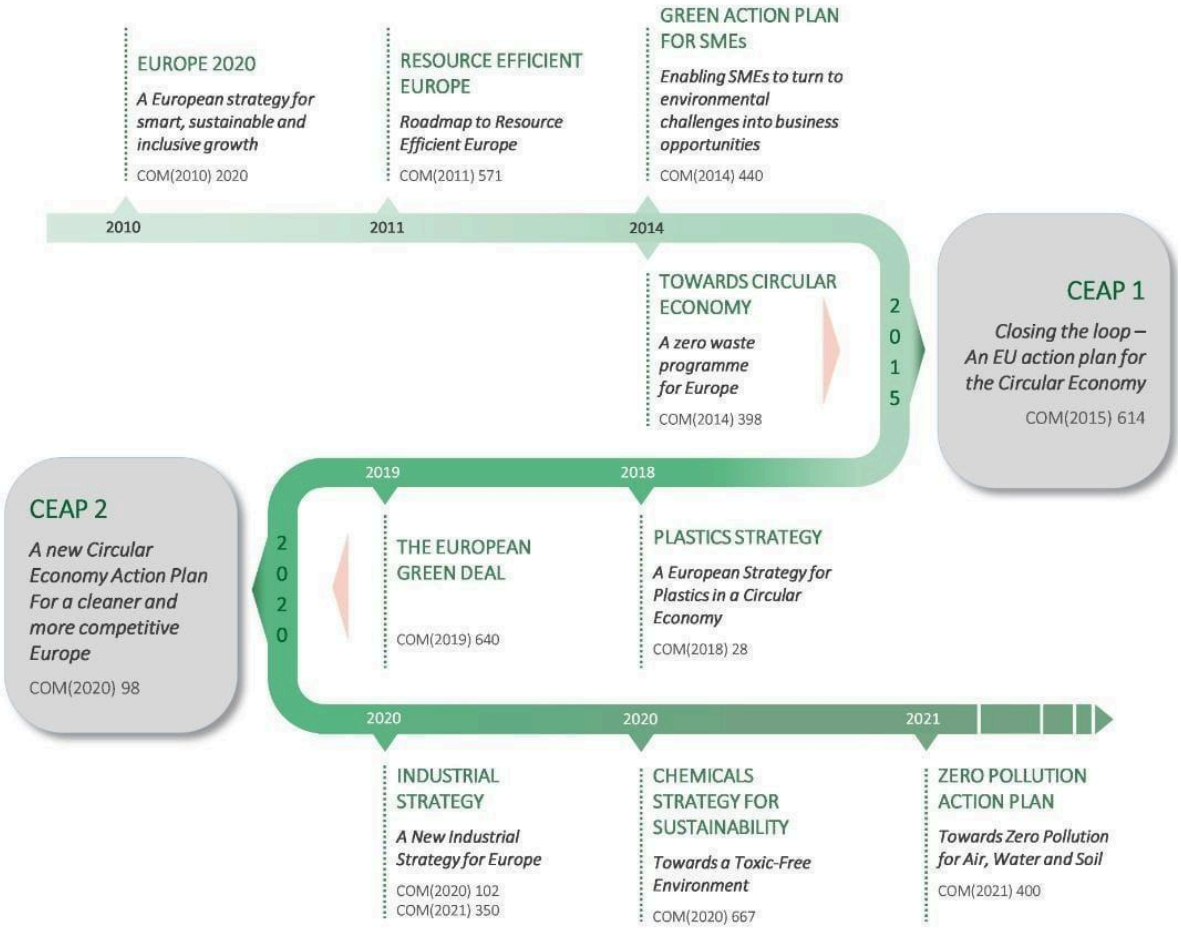
The Commission proposed a revised waste legislation with 2015 Circular Economy Action Plan that contained the following targets (European Commission, 2015b):

- Up until 2030, 65% of all municipal waste must be recycled;
- Recycling 75% of packaging waste by 2030
- Reduce landfill to maximum of 10% of municipal waste by 2030

As a part of CEAP 1, the EU has established a category of different types of treatment of waste. First target is recycling and recovering, the second one is incineration and the last one is landfill as it is the most damaging point for the earth (Ellen MacArthur Foundation, n.d). In 2019 the Commission delivered the 54 actions under the 2015 plan with less or more success which will be discussed later in this thesis (ECA, 2023).

The EU has adopted several different action plans and policies in order to prevent the alarming environmental issues. Some of these policies will be discussed in this part of the thesis. **Table 4** presents the environmental policies and actions taken by the EU towards the circular economy approach over time in different time periods.

Table 4: The Framework for the EU CE Strategies



Source: ECA, 2023

To establish a framework for sustainable goods both within the EU and outside of it is one of the main objectives of the Circular Economy Action Plan. This will open up new business opportunities. This slow but constant transition toward a sustainable economic structure is one of the cornerstones of the new EU industrial policy. McKinsey Sustainability (2015) estimated that by applying circular economy concepts across the whole EU economy by 2030, the GDP might

increase by 0.5% and 700,000 new jobs might be created. Each firm has its own unique economic rationale, and in the EU, industrial enterprises frequently spend 40% or more of their budgets on materials. By utilizing closed loop models, these businesses may be safeguarded against changes in resource costs and boost profitability (European Commission, 2020d).

A plastics policy was also formed by the European Union in January 2018. The EU's CEAP 1 included a component that built on current efforts to reduce plastic waste. The plastics strategy is an essential part of Europe's transition to a circular economy and one that is carbon-free. It will assist in achieving the Sustainable Development aims of 2030, the EU Industrial Strategy, and the aims of the Paris Climate Agreement. The development, production, usage, and recycling of plastic products in the EU are some of the objectives of the plastics policy. In the thesis's next part, these goals will be discussed in further detail.

Another necessary measure taken by the EU is the Green Deal adopted in 2019. The circular economy was given a lot of attention in the EGD. The European Commission released a statement on December 11, 2019. According to EU institutions, both the world and the continent of Europe are under existential threat from environmental deterioration and climate change (European Parliament, 2022). The EU presented the European Green Deal as “a response to these challenges” as argued that “it is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy” (European Commission, 2019a).

The Green Deal states that by 2050, there shall be no additional emissions of greenhouse gasses and economic growth should be resource-independent. In other words, the objective is to create a stronger EU economy. The following six components of the EGD were identified by Ursula Von Der Leyen, the president of the European Commission, in her declaration of the political objectives for the organization (European Commission, 2019b):

- An economy serves its citizens;
- Protecting the European way of life;
- Creating a Europe suitable for the digital age;
- Globally more powerful Europe;

- New efforts to advance European democracy;

By going beyond climate change, the Green Deal emphasizes sustainability in a broader way. The policy areas covered by the Green Deal include sustainable agriculture, sustainable biodiversity protection for the EU's environment, and sustainable rural and agricultural regions. The common agricultural policy (CAP) has benefited construction and renovation, the need for a cleaner construction industry, sustainable transport, promoting more environmentally friendly transportation, eradicating pollution, and actions to reduce pollution quickly and effectively, among other things. Climate action has defined objectives for the EU to achieve carbon neutrality by 2050. A crucial component of the Green Deal is support for transition, which effectively leaves no person behind the policy because no people, enterprises, or member states are equally well-positioned to transform to a sustainable economy (Hainsch, et al., 2022).

Those who would be most adversely affected by the transition to a green economy will also get monetary and technical help from the EU. These initiatives include a "Just Transition Fund", which is a fund of money, an investment of EU budgetary guarantee, and other financial tools besides a new government loan program from the European Investment Bank (European Commission, 2019b).

In addition to the CEAP 1, in 2020 the EU launched a new action plan (CEAP 2) titled as *A new Circular Economy Action Plan For a cleaner and more competitive Europe* with a clear set of 6 priorities (European Commission, 2020b):

- Making sustainable products the norm in the EU (how the product is being designed);
- Empowering consumers and public buyers (by public buyers it means public sector, the administration who spends around 90% of the public buying on public procurement, it is important to make sure that this money is used to buy the right products in order to behave circular);
- Focusing on sectors which use most resources and have higher circularity potential (specific sectors will be focused to see which sectors are easy to start the idea of CE than others; e.g. electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients);

- Ensuring less waste;
- Making circularity to work for people, regions and cities (people are provided with the good products, new jobs are created; local companies are functioning;
- Lead global efforts;

Also, the Action Plan has mentioned to provide citizens with high-quality, functioning items that are safe and secure. They will also be effective, inexpensive, durable, and built to long term reuse, repair, and recycling. The quality of life is expected to increase, new employment to be created, knowledge and skills to be advanced, a new range of sustainable services, and technological solutions to be available for everyone (European Environment Agency, 2021b).

The plan outlines many steps that work together to create a solid and trustworthy foundation for product policy. According to this paradigm, consumption habits must be changed in order to completely reduce waste and establish sustainable products, services, and business models as the standard. This framework for product policy is planned to be implemented gradually, with priority given to product design and production. Additional measures are also planned to be taken to assure that the EU's high-quality secondary raw materials is operational and is successful in reducing waste (European Commission, 2020d).

A broader industry transformation toward climate neutrality and sustainability necessitates circularity. It has the potential to generate additional value, open up economic opportunities, and result in significant material savings throughout production processes and value chains. The Commission intended to make it possible for more industry to be circular by (European Commission, 2021a):

- looking into potential ways to advance circularity in factories regarding the Industrial Emissions Directive, like incorporating circular economy principles into the expected Best Available Techniques reference documents, in accordance with the objectives stated in the Industrial Strategy;
- encouraging and enabling adoption of industrial symbiosis putting the Bioeconomy Action Plan into effect to support the circular and sustainable bio-based industry, and developing a reporting and certification system led by the sector;

- promoting the use of technology for resource localisation, tracking, and mapping;
- The EU Environmental Technology Verification system is being established in order to encourage the uptake of green technology through a trusted verification approach.

Through preparation, help from the Venture Europe Organization and information from the European Asset Productivity Information Center, the new SME Methodology is one of the goals to advance roundabout modern joint effort among SMEs (European Parliament, 2018).

The Commission controls the issues as a part of its regulative effort in terms of more efficient use of resources and, where reasonable, by supplemental legitimate measures. The Commission plans about making reasonability norms and other critical means to do in that capacity:

- mitigating dangerous chemical contamination and improving resource and energy efficiency in goods;
- improving the product's toughness, reusability, upgradeability, and repairability;
- assuring product safety and performance while boosting recycled content;
- enabling superior remanufacturing and recycling;
- reducing one's carbon and environmental footprint;
- preventing premature obsolescence and limiting single-use products;
- prohibiting the disposal of durable items that have not been sold;
- encouraging businesses in which manufacturers have the right to keep the ownership of the product or are accountable for its performance during its lifespan, such as product-as-a-service models;
- putting into practice techniques like digital passports, tagging, and watermarks that may be used to digitize product data;
- Rewarding items in line with their diverse sustainability performance, particularly by attaching incentives to high performance levels (European Commission, 2021a).

These initiatives were part of the EU Industrial Strategy, the forthcoming biodiversity, and forest programs, as well as the reaction to the climate threat. As part of the management of industrial initiatives, the Commission works closely with stakeholders in key value chains to identify

barriers impeding the growth of markets for circular goods and strategies for removing such barriers (European Commission, 2021a).

According to the EU's 2020 new Circular Economy Action Plan, there are a few requirements and guidelines for moving toward a circular economy, which are listed below:

- keeping commodities, raw materials, and resources economically valuable for as long as is practical;
- reducing the waste;
- boosting competitiveness with innovative products and services and new business endeavors;
- generating advantages for society, the environment, and economy.

In addition to the previous action plans, in the 2020 action plan, the EU focuses on different goods that would help to transform into the CE. One of those goods is Electronics and ICT as the waste streams of electronic equipment is huge. Electrical devices are one of the fastest-growing waste sources in the EU. If performance was not significantly affected Europeans prefer to use the same device as long as possible (European Council, n.d.). The products that are introduced to the EU market will be designed to be more durable, easier to repair and modify, recyclable, and reusable. While providing advantages for the product, businesses will maintain ownership and obligation for the product during its lifecycle (European Commission, 2021b).

The EU Circular Economy Action Plans serve as an outstanding instance of the transformational potential of innovative legislative frameworks. By adopting circularity, the EU adopts a proactive approach to solving some of the time's most urgent environmental and economic problems. The EU's dedication to circular economy principles offers an indication of hope and a realistic road map for positive transformation on an international level as the world progresses toward a more sustainable future.

To sum up, in general the EU Commission has adopted two CE action plans (2015; 2020). The main focus area of the CEAP adopted in 2015 was mainly focusing on the design and production stages of the plastic. These are necessary to be done according to the circularity measures, as the way the product is designed has an 80% contribution to the environmental pollution. By

releasing CEAP 2 in 2020, the Commission fulfilled its commitment to the European Green Deal. The "circular material use rate" for the EU, or the percentage of material recycled and contributed back to the economy, is an additional objective set forth in CEAP 2 until 2030. By fostering resource efficiency, sustainable production, and consumption, CEAPs 1 and 2 assist the transition to a more circular economy for the benefit of enterprises and society. The concentration of 21 of the 89 activities in each of the two action plans is on the design and manufacturing stages.

However, the Circular Economy Action Plans, particularly the initiatives connected to the circular design of goods and industrial processes, have not sufficiently influenced circularity activities in the member states, according to the European Court of Auditors' evaluation (ECA, 2023). Nevertheless, it is a good sign that member state governments have stepped up their circular economy initiatives since the first Action Plan's release. But things are still moving along very slowly. Reaching the 2030 target of doubling the amount of waste that is recycled and used in the economy would likely be difficult for the EU.

Figure 4: The CE Progress Rates in the EU Member States

Source: ECA, 2023

For instance, the average circularity rate for all EU member states (the "EU-27") rose by only 0.4 percentage points between 2015 and 2021, according to **Figure 4**. Although the CEAP 2 goal of the Commission is to double the circularity rate of 2020 by 2030, this has not been the case since

2019. The most recent worldwide circularity rate is 7.6%, down from 9.1% in 2018, whereas the 2021 EU circularity rate is higher at 11.7% (ECA, 2023).

Additionally, due to a lack of particular indicators pertaining to circular product design, the Commission's framework for tracking the EU's shift to a circular economy does not adequately capture all the important components. The Action Plan's enabling measures, which aimed to set policy orientation in areas like innovation and investment to help member states move to a circular economy, proved insufficient according to the European Court of Auditors' report (ECA, 2023).

Despite the fact that the design and production according to the circularity principles are the fundamental objectives both for CEAP 1 and CEAP 2, it can be true to assert that there is still very basic progress regarding that. Conversely, the great percentage of the funds allocated for the CE was concentrated on the waste management which has less environmental impact, rather than the design and production phases. It seems that both the EU Commission and the member states have chosen the ineffective funding method.

Last but not least, in none of the CE Action plans or other environmental strategies by the EU, there is not a specific or clear objective regarding reducing the amount of plastic production. Rather, in the whole action plans, the purpose of inventing new methods to support the plastic production is obviously indicated. There is no prohibition or effort toward limiting the amount of plastic in the economy, and finding any other material which is both alternative to the plastic and has less environmental damage comparatively. The circular economy is just a tool used by the European Union to cover up the amount of plastic production. The term recycling is used as if at the end those plastics will not end up in the environment. The CE policy would be considered more fair and successful, if there was a necessary effort to decrease the plastic production while supporting recycling.

3.3. Plastics in the EU Circular Economy Policy

Since the emergence of plastics, it has become an important part of humans' lives. Plastics are all around the world. All people benefit from them in most parts of their daily life. As it is used

more, it is created more as well. The European Environment Agency (2021c) notes that in 2018, just Europe used 61.8 million tons of plastic, yet various locales of the world are at this point using it rapidly and appear to have offset. Western Europe consumed three times as much as the rest of Europe, around 136 kilograms for every person. Packaging, which addresses practically 40% of European demand, is the single greatest end-use market for plastics. Although the official statistics for plastics also include plastic-based synthetic textile fibers.

In January 2018, the European Union adopted a strategy for plastics titled *A European Strategy for Plastics in a Circular Economy* (European Commission, 2018a). It is a part of the EU's 2015 Circular Economy Action Plan package and improves current efforts to reduce plastic waste. The Plastics Strategy is an essential part of Europe's shift to a sustainable and circular economy. The EU believes that it will have a favorable impact on the EU's efforts towards meeting the Paris Agreement's goals, the EU's industrial strategy, and the 2030 Sustainable Development Goals (SDG). It seeks to enhance the standard of living on Earth by lowering greenhouse gas emissions, marine pollution, and reliance on natural resources. The Plastics Strategy's goal is to develop safer processes for using and producing plastic. Furthermore, it concentrates on altering the entire process of creating, utilizing, and recycling plastic materials (European Commission, 2018b).

The *Directive on Single-Use Plastics* from 2019 is a major part of the EU's Plastics Strategy. Ten single-use plastic types, including cotton swabs, straws, and plastic cutlery—all of which are regularly seen on European beaches—are the target of the legislation, which intends to restrict their usage. To strengthen the accountability of producers and decrease the use of certain polymers, the directive imposes a restriction and stricter controls. With a goal of recycling 55% of plastic waste by 2030, the Directive on Single-use Plastics establishes high standards for plastic recycling (European Commission, n.d a). Additionally, the directive focuses on high use of recycled materials and implements extended rules on the member states for the effective plastic waste management.

In addition to boosting recycled content and reducing plastic waste exports outside of the EU, measures are planned for waste prevention and reduction. One of the key goals is to implement an EU model for the separate gathering and labeling of items. First, it starts with how they are

produced, then it moves on to what kind of primary or secondary materials are being utilized, then it moves on to consumption, which is where culture changes, and finally it moves on to waste management (European Council, n.d.).

The EU Strategy for Plastics also includes a number of projects that have already begun. The European Commission continues to support the coordinated global strategy described in Section 7 to combat plastic pollution and implements additional targeted actions to address the sustainability challenges posed by this pervasive material, despite predictions that plastic consumption will double in the ensuing 20 years (European Commission, 2021b).

In order to promote the use of recycled plastics and encourage the use of plastics that are more environmentally friendly, the Commission suggests necessary recycled content guidelines and decreased waste strategies for significant products like packaging, building materials, and vehicles (European Commission, 2021b).

The Commission targets the problem of microplastics in the ecosystem in addition to taking action to reduce plastic litter by:

- reducing the purposeful addition of microplastics and handling pellets in light of the European Chemicals Agency's assessment;
- establishing regulations, standards, labels, and certification procedures for inadvertent microplastic release, as well as steps to improve microplastics collection at all pertinent product lifecycle phases;
- providing uniform information on the levels of microplastics in marine and continuing to develop and harmonize techniques for monitoring microplastics accidentally released, notably from textiles and tires;
- addressing the gaps in information about the risks and incidence of microplastics in food, water, and the environment that exist in the scientific literature. (European Commission, 2021b)

Furthermore, the Commission develops a policy framework to address upcoming sustainability issues:

- Finding the areas where using bio-based feedstock delivers real environmental benefits, beyond a decrease in the use of fossil fuels, and using bio-based plastics;
- Using biodegradable or compostable plastics in line with a determination of the needs for such uses and their potential environmental benefits (European Commission, 2021b).

It works to make sure that a product's "biodegradable" or "compostable" label does not deceive customers into disposing of it in a way that damages the environment or litters with plastic because there is not enough time for it to degrade or the conditions are not right.

The plastic policy by the EU is a significant proof of its efforts to protect the environment and create more sustainable development. The EU is making necessary achievements toward lowering plastic pollution and promoting a circular economy by taking a holistic strategy that includes regulation, innovation, and public involvement. The EU's measures are also encouraging other countries to take similar steps and cooperate to secure a cleaner, healthier planet for future generations, as the entire world struggles with an urgency to address plastic pollution.

Nevertheless, as mentioned in the previous section as well, there is not any fundamental step taken to decrease the plastic production. Even the word "reducing" in the 3R of the CE refers to reducing the use of resources, not reducing the plastic production. Therefore, discarding the threat of plastic production should be considered as one of the major drawbacks of the EU CE.

3.4. **The EU Plastic Waste Trade**

The difficulties of handling plastic waste has just lately been acknowledged when compared to the management of commodities like paper, glass, and metals. The EU is searching for export prospects since it is still unable to recycle and recover all of its plastic waste. Waste is exported as a result of this capacity shortage since there is a demand for imports as well for financial purposes.

The environment now faces a serious danger from plastic. Mainly, the policies to manage the plastic waste are not sufficient. It is instead being disposed of, where it ends up in seas and oceans all around the world. Additionally, it is becoming more and more obvious that human activity has a significant impact on the environment. The total amount of plastic traded is more than 40% larger than previously estimated, and this number does not take into account the trade in plastic wastes and leftovers from the production of rubber, textiles, paper bales and so on (UNCTAD, 2021).

Marine ecosystems are polluted by plastic and microplastics, which fish and birds ingest or tangle in. Fish that commonly is consumed contains microplastics that are consumed by fish and end up in human bodies. Plastic waste exports to China increased in tandem with China's expanding capacity for producing plastic and its domestic market's need for plastic goods. Numerous tiny, unregistered facilities that used to produce and recycle plastic goods in China have been replaced by major production facilities that are now subject to more stringent quality and environmental standards (Brooks, Wang & Jambeck, 2018).

A number of environmental action plans and a legislative framework that strives to lessen detrimental effects on the environment and public health as well as develop an economy that is resource and energy efficient have helped shape EU waste policy during the past 30 years. Waste management and prevention were one of the four key goals of the EU's Sixth Environment Action Programme (2002–2012). Its main goal is to prevent economic expansion from resulting in an increase in waste (Plastics Europe, 2022).

This led to the creation of a long-term waste plan. As a consequence of the 2005 Thematic Strategy on Waste Prevention and Recycling, the Waste Framework Directive—the cornerstone of EU waste policy—was updated. As part of the European Green Deal and circular economy action plans, the Directive has also undergone revisions. With its overhaul, waste management will now take a more modern approach, marking a shift from seeing waste as an inconvenience to seeing it as a useful resource. With an emphasis on waste minimization, the Directive establishes new objectives that will help the EU realize its aim of becoming a recycling society. "By 2025, the preparation for re-use and the recycling of municipal waste shall be increased to a minimum of 55%, 60%, and 65% by weight by 2025, 2030, and 2035 respectively" (European

Commission, n.d. a) are the goals for recycling 50% of municipal waste and 70% of construction waste in EU Member States.

Figure 5 shows the five-step waste hierarchy established by the Directive, with landfill disposal as the last option. Reuse, recycling, and other forms of recovery come in order of preference, with prevention being the best course of action. Moving waste management up in the waste hierarchy is the aim of EU waste regulations. The Waste Framework Directive, revised in 2008, streamlines waste legislation by incorporating guidelines on several subjects, such as managing hazardous waste and waste oils (European Commission, n.d. a).

The essential concepts associated with waste management are established by the Waste Framework Directive, which contains descriptions of waste, recycling, and recovery. The Waste Framework Directive outlines a few basic waste management ideas. Management of waste is essential:

- without endangering human health or the environment
- without endangering the water, air, land, plants, or animals
- without creating a noxious odor or making noise that disturbs others
- without negatively affecting the landscape or any important places

The distinction between waste and byproducts is made clear, as is the point at which waste ceases to be waste and becomes a secondary raw resource. Other ideas proposed by the Directive include the "polluter pays principle" and "extended producer responsibility".

Because of the numerous possible negative effects it might have, landfills or disposal are the oldest method of waste management and the least preferable one. Environmental authorities are in charge of providing licenses, conducting inspections, and ensuring requirements are followed under EU regulation. By 2016, Member States must limit their landfilling of biodegradable waste to 35% of 1995 levels or less in accordance with the Landfill Directive (1999). From 870 million tonnes in 2004 to 1221 million tonnes in 2020, the quantity of waste that has been reclaimed has grown substantially since 2004 (EuroStat, 2022c).

Figure 5: The EU Waste Hierarchy

Source: European Commission, n.d.a

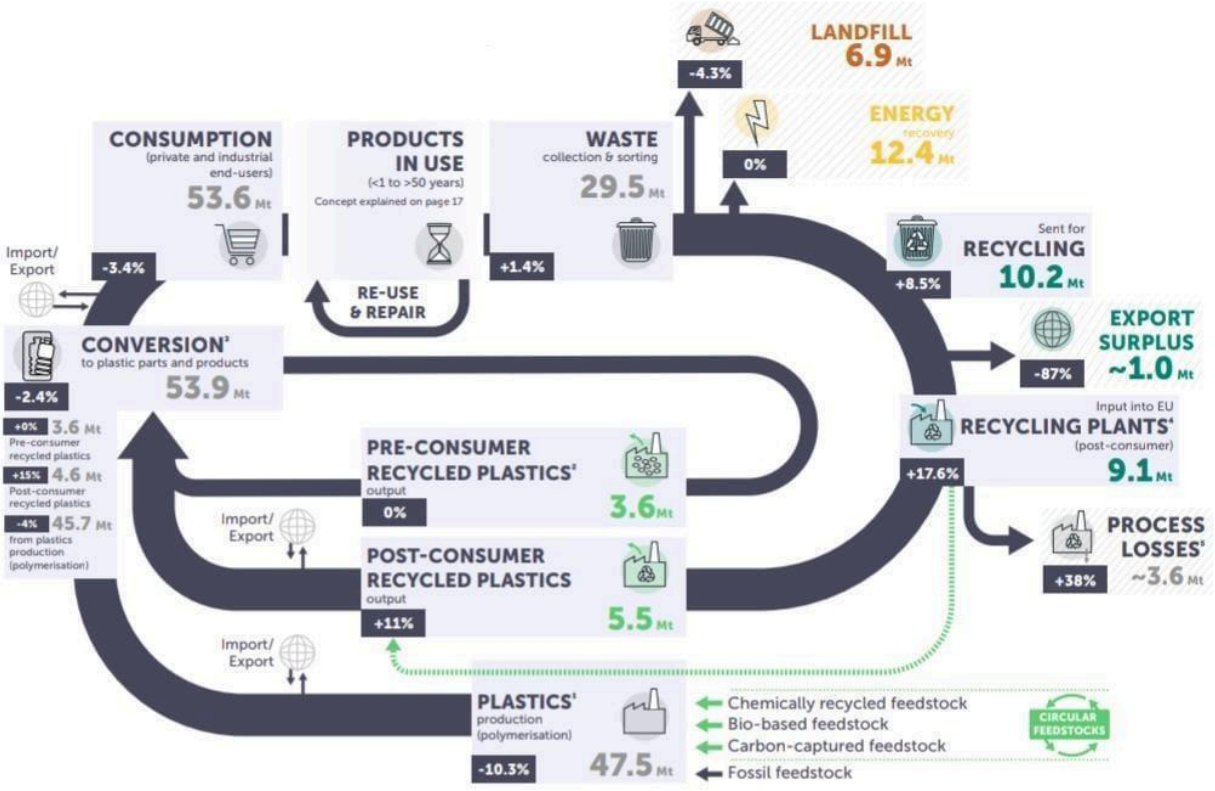
In other words, recovery's percentage of total waste treatment increased dramatically (from 46% in 2004 to 60% in 2020). While this was the case, the amount of waste that needed to be disposed of dropped (from 1027 million tonnes in 2004 to 808 million tonnes in 2020). So, from 54% in 2004 to 45% in 2020, disposal's percentage of total waste treatment fell below 50%. The EU processed almost 2029 million tonnes of waste in total in 2020. Belgium (74%), Slovakia (64%), Latvia (64%), and Italy (83%), all have very high recycling rates. However, some nations, like Bulgaria (92% landfill, 8% recycling), Finland (84% landfill - 10% recycling), and Romania (93% landfill, 5% recycling), preferred disposal via landfill and alternative treatment methods (EuroStat, 2022c).

Plastics Europe (2021) reports that since 2016, more than twice as much plastic waste has been transported to recycling in Europe, compared to a nearly 50% decrease in the quantity sent to landfills. According to the report's 2020 statistics, the recycling rate rose to around 35%. Nevertheless, landfills or energy recovery facilities still received 65% of the post-consumer plastic waste. The survey also notes that the absorption of recycled plastics rose by 15% from 2018 to 2019, reaching 4.6 million tonnes. The rate of improvement is still too slow to reach the

different industry objectives, notwithstanding these hopeful developments. In order to enhance the circularity of plastics, additional work needs to be done (European Commission, 2023).

As described below by **Figure 6**, positive trends towards increasing circularity appeared from 2018 to 2020. The amount of plastics produced (polymerized) has fallen by 10.3%. Post-consumer plastics waste volumes delivered to recycling have grown by 8.5% at the same period. For the first time since 2006, less waste was disposed of in landfills (-4.3%) while energy recovery remained constant. This resulted in a 15% increase in the supply of post-consumer recycled plastics, up 11% from 2018, and a 15% increase in the amount of plastics used in new products, up from about 4 million to 4.6 million tons. This indicates a beginning trend (from 7.2% in 2018 to 8.5% in 2020) toward the use of more recycled plastics in the manufacturing of new products (Plastics Europe, 2022).

Figure 6: The Outcomes of The EU Circular Economy



Source: Plastics Europe, 2022

Nevertheless, waste exports from the EU to countries outside the EU as well reached 33 million tons in 2021, a 77% increase since 2004. In 2021, Germany shipped more than 720,000 tons of

plastic waste, making it the largest exporter in the European Union. The Netherlands sent out the second biggest amount of plastic waste that year, at around 630,000 tons (European Parliament, 2021).

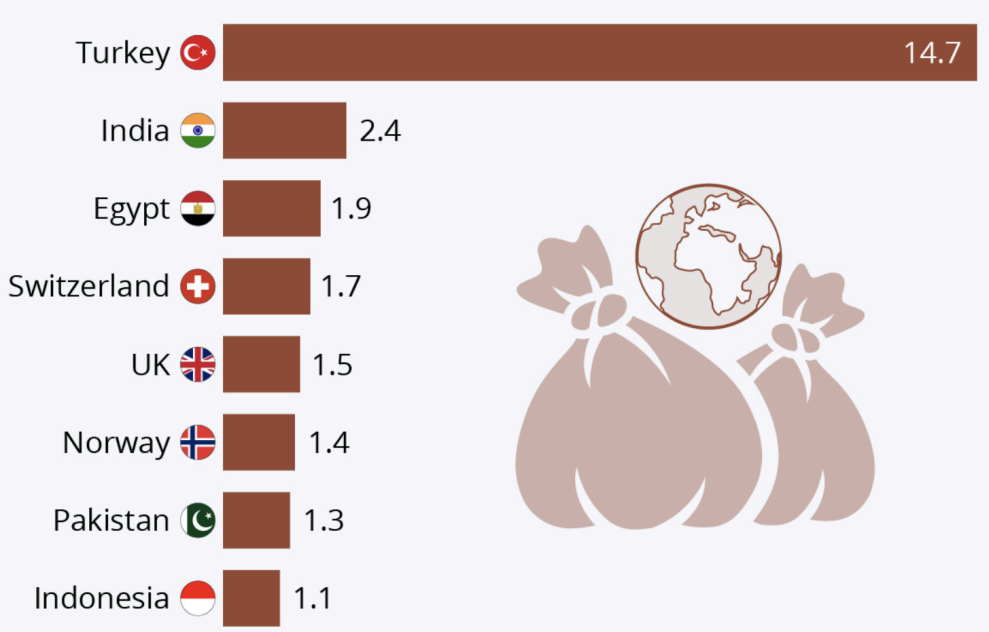
Recycling is the next most popular method for getting rid of plastic waste in Europe, after energy recovery. Approximately 25% of the plastic waste produced gets landfilled (European Parliament, 2023). For treatment in nations outside the EU, half of the plastic waste that is gathered for recycling is exported. This is linked to the inability of local waste treatment facilities to process waste effectively due to capacity, technological limitations, or budgetary constraints. Both the ecology and the economy suffer greatly as a result of the poor recycling rate for plastic in the EU. According to estimates, plastic packaging material has a short first-use life and loses 95% of its value to the economy. Over 850 million tonnes of greenhouse gasses were released into the environment in 2019 due to the manufacture and combustion of plastic. These emissions might reach 2.8 billion tonnes by 2050, with some of them curtailed by improved recycling. The quality and cost of the recycled plastic product in comparison to its non-recycled equivalent are the key obstacles to its recycling (CIEL, n.d).

The diversity of the raw material complicates the recycling process, making it expensive and reducing the quality of the finished product, despite the ease with which plastics may be customized to meet the functional or aesthetic demands of each producer. As a result, even though it made up just 6% of the market for plastics in Europe in 2018, the requirement for recycled plastics is expanding quickly (European Parliament, 2023).

The states importing the plastic waste from the EU are in their infancy when it comes to the waste management system. Imported waste could not even be treated in compliance with European regulations, or it might be burnt or disposed of in ways that are not controlled. Even if it is required by EU waste legislation that waste trading activities occur under "broadly equivalent conditions" to those that prevail within the EU, there is still cause to worry. Several actors in south-east Asia would profit from the absence of reliable businesses and the government's incapacity to manage the rising imports (CIEL, n.d).

The primary nations from which plastic is imported into the EU are shown in Figure 7. 33 million tons of waste were transported by the European Union to non-EU countries in 2021. The majority of EU waste was sent to Turkey in 2021—14.7 million tons, more than three times as much as in 2004. India received the second-highest volume of waste from the EU that year, at around 2.4 million tons. Egypt and Switzerland were second and third, with 1.9 and 1.7 million tons, respectively. Data from Eurostat (2022b) show that the EU's waste shipments to China have dropped dramatically in the last several years, from a peak of 10.1 million tonnes in 2009 to 0.4 million tonnes in 2021.

Figure 7: EU Waste Destination Countries in 2021



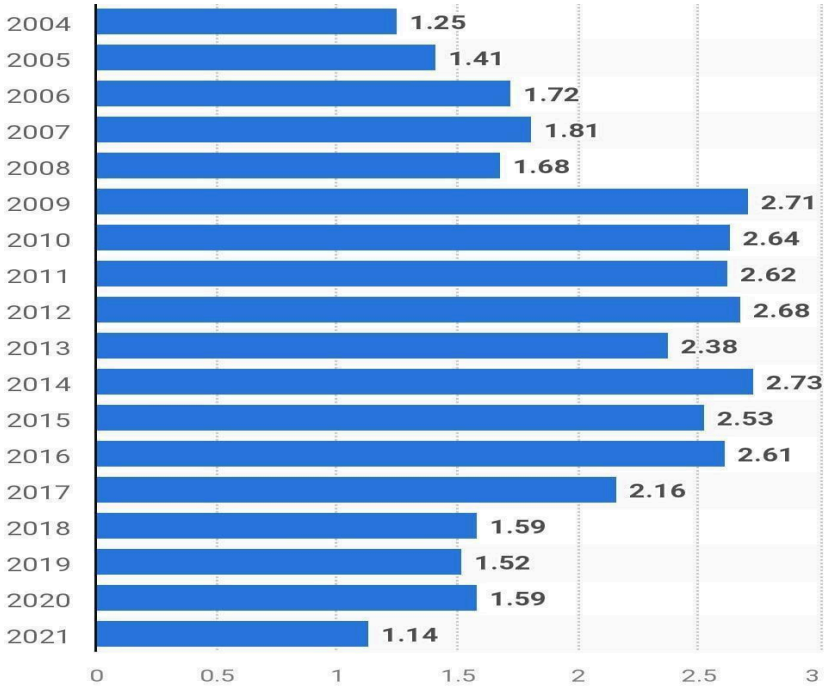
Source: Eurostat, 2022b

Due to governmental demands for the distinct collection of certain waste streams and requests for plastic waste for reuse and recycling, there was an increase in the visibility and accessibility of plastic waste throughout the 1990s. This sparked a sharp rise in the amount of plastic waste traded internationally. Between 1988 and 2016, the largest provider, the EU-28, was responsible for around one-third of all exports of plastic waste. The majority of this waste has already been sent to China and Hong Kong. Polyethylene (PE), sometimes referred to as polyethylene and usually used for packaging in the form of bottles or film as well as for insulating cables and pipelines, is the most widely used plastic in the world (EuroStat, 2022b).

PE production totals over 100 million metric tonnes annually. PE is traded in large volumes on a global scale. The exports of Saudi Arabia, the United States, and the EU members Belgium, Germany, and the Netherlands are all much higher than those of the majority of other countries. China is the greatest plastics importer due to its enormous manufacturing industry. The EU countries with the most imports are Germany, Belgium, Italy, and France. Along with that, a considerable volume of plastic waste is exchanged both inside and outside of the EU (ETC CE Report, 2023).

In the global plastics market, Europe's imports and exports are of a sizable quantity of both primary and non-primary plastics each year. Primary plastics, or the actual plastic materials, include compounded plastics and pure polymer granulates. Plastic completed goods like tubes and bags, plastic parts like vehicle interior panels that will be assembled later, and plastic-containing items like electronics, furniture, and automobiles are all examples of non-primary plastics. Primary and non-primary plastics trade is at a surplus in the EU, which shows that exports in both categories are more than imports. In 2018, Europe's trade balance was 15 billion euros (Plastics Europe, 2019).

Figure 8: The Plastic Waste Export in 2004 - 2021 by the EU



Source: Statista, 2023a

As indicated by **Figure 8** above, exports of plastic waste peaked in 2014 at 2.73 million MT from 1.25 million MT in 2004. But as time went on, shipments of plastic waste started to fall, hitting 1.6 million MT in 2018, the year China enacted a moratorium named "National Sword" on waste imports. As a result, 1.4 million MT of exports from the EU-27 to China in 2015 dropped to fewer than 1,000 tons by 2021. Due to these limitations, total exports of plastic waste from EU member states have dropped by approximately 60% since their increase in 2014 (Statista, 2023a).

There was a considerable shift of plastic waste from the EU-28 between January 2017 and April 2019, as well as a decline in its export to non-EU nations. Due to China's import limitations, exports of plastic waste to China and Hong Kong have significantly decreased and been diverted to other countries. In the medium term, the trend of decreasing plastic waste exports potentially will cause more incineration and landfilling because the EU currently lacks the ability to boost recycling and reuse (Wen, et al., 2021, 168).

Similar to the previous years, 2022 also saw an 8.4% increase in EU exports to non-EU nations of 6.4 metric tonnes of recyclable materials (paper, plastic, and glass). As a result of this, imports increased by 4.2% to 4.0 metric tons in 2022. In comparison to 2010, there was a decline of about 35.2 percent (or 9.8 metric tons) in the overall amount of recyclable items exported to non-EU nations. from 3.2 to 4.0 metric tons, a 23.9% rise in total imports. Regarding exports, paper accounted for almost 77.1 percent of all recyclable products exported outside the European Union in 2022 (4.7 metric tonnes), with plastic coming in second with 17.5% (1.1 metric tonnes) and glass coming in third with 5.4% (0.3 metric tonnes) (Eurostat, 2023). More than fifty percent (59.3%) of all recyclable materials imported from outside the EU were made up of 2.4 metric tonnes of paper that were imported in the same year. Glass (20.1% and 0.8 metric tonnes) was the second-largest category, followed by plastic (20.6% and 0.8 metric tonnes) (Eurostat, 2023).

Trade of plastic waste may damage the environment of the importer nations as mentioned in detail in the previous sections of the thesis. Some of these nations lack the infrastructure and laws required to control and recycle the increasing amount of plastic waste, which can result in mishandling and possible environmental contamination.

According to EU law, plastic waste cannot be exported to nations outside of the EU for disposal (European Commission, n.d a). The following are the factors that influence the quantity and destination of plastic waste exports to non-EU countries:

- Due to tariff and non-tariff obstacles, as well as variations in gate, plastic waste in particular has a considerable influence on the climate and the ecology.
- fees charged by treatment centers;
- transport expenses;
- taxes on the environment;
- enforcement of the law.

The EU continues to export poorly managed plastic waste from its member states, despite its many plans and policies. To accomplish a balanced approach to the trade of plastic waste, a complete strategy that considers the goals of a CE as well as the present environmental challenges is necessary. In addition to looking at cutting-edge solutions like creating recycling

technologies and reducing plastic consumption at the source, the EU must collaborate with receiving nations to support their shift to sustainable waste management.

3.5. The European Union Plastic Waste Trade Management

Over the past 10 years, the trade in plastic waste has grown uncontrolled, endangering the environment and human health. Plastic waste is often burnt outside, dumped in the ocean, or disposed of among waste piles. The policies of the European Union have altered the manner that plastic waste is managed. Examples of this include tighter plastic recycling targets set out in the 2018 waste directives and the European Union's policy for plastics in the circular economy (Bishop, Styles & Lens, 2020).

The EU's main legislation in this field is the 2006 Regulation on Shipments of Waste which regulates the transport of waste among EU member states and beyond the EU borders. EU waste shipment legislation also takes Basel Convention provisions and OECD rules into account. In 2021, the EU adopted an amendment to Regulation (EC) No 1418/2007 concerning the export for recovery of certain waste listed in Annex III or IIIA to Regulation (EC) No 1013/2006. With this, the EU attempted to bring its rules in the field in line with that of the OECD decision concerning the Basel plastic amendment of 2019. This prohibits the export of hazardous plastic waste for recovery to countries outside the Organization for Economic Co-operation and Development (OECD) and the export of plastic waste for disposal to countries outside the European Union (EU), with the exception of those in the European Free Trade Area that are parties to the UN Basel Convention. Different approaches are used based on the type of plastic waste and the eventual destination (inside the EU, to an OECD country, or outside) (European Commission, 2021b)

Legislation about the EU-exported waste:

- Plastic waste that poses a threat to human health (A3210) or is challenging to recycle (Y48) cannot be exported from the EU to non-OECD nations.
- Under specific conditions, only non-hazardous, clean, recyclable waste from the EU may be shipped to non-OECD nations (B3011).

- The importing nation is required by Policy 1418/2007 to inform the European Commission of the import regulations that are relevant to such items.
- The "prior notification and consent procedure" will apply to the export of both hazardous plastic waste (AC300) and difficult-to-recycle plastic waste (Y48) from the EU to OECD nations. This strategy necessitates the approval of the shipment from both the exporting and importing nations (European Commission, 2021b).

Legislation about the EU imports include:

- The "prior notification and consent procedure" will apply when hazardous and difficult-to-recycle plastic waste from third countries are brought into the EU. The shipment must be authorized by both the importing and exporting nations under this procedure (European Commission, 2021b).

Shipments within the EU:

- The "prior notification and consent procedure" will also apply to shipments of non-hazardous, difficult-to-recycle plastic waste (EU48) and hazardous plastic waste (AC300) within the EU.

These new restrictions will not apply to any non-harmful waste for recovery shipments within the EU (EU3011) (European Commission, 2021b).

The new entries for non-hazardous plastic waste, EU3011 and EU48, and the Basel Convention entries also have some alterations. Plastic waste that is polluted, mixed, or challenging to recycle has been included in the UN Basel Convention. In order to manage plastic waste, this is expected to lead to a decline in the trading of plastic waste with nations outside the EU. In a very short period of time, this will undoubtedly lead to more waste being disposed of in landfills, but it will also make it clear to EU nations that they need to move toward a more circular economy. This requires managing waste in compliance with the greatest economic advantages and environmental requirements, as well as recycling and reusing plastics (European Commission, 2021b).

Major industrial nations including the US, Australia, Germany, Japan, and Canada are against Basel Convention changes because they have interests in the import and export of waste. The Basel Ban Amendment put into effect on December 5, 2019, 90 days after the required number of nations had ratified it, with Croatia becoming the 66th nation to do so on September 6 (UNEP, 2019b).

In addition to these projects, there are other measures that are part of the EU's plastic waste management policy. In comparison to more homogenous waste, such glass and metals, managing plastic waste in the EU is currently less frequent. A material-specific life cycle strategy to include use, reuse, and recycling processes into the plastic value chain was part of the EU's 2018 plastic plan. Two of these objectives were to increase safety via design and create safer chemical mixtures (European Commission, 2021a).

Large quantities of secondary material resources are present in the traded European plastic waste, and these resources might be of great use to the European manufacturing industry. Recycling would boost the economy of Europe and the environment by adding value and generating employment. By lowering and improving the volume of hazardous and low-value plastic waste, the Single-Use Plastics Directive and the EU's plastic policy as part of CEAPs will aid the EU in moving in this direction.

The European Union is currently updating its regulations on the export of plastic waste. In response to a call from "the European Parliament and the Council to move ahead with an innovative revision of the Waste Shipment Regulation," the Commission started work on this modification in 2021. According to the Commission, this update "also addresses the request under the Circular Economy Action Plan and the European Green Deal to amend the WSR with the objectives of facilitating waste shipments for recycling and reuse within the EU, guaranteeing that the EU does not export its waste obstacles to third countries, and addressing illicit waste shipments." (European Commission, 2021c). Revision would also bring EU plastic waste export rules further in line with the Basel Convention 2019 amendment and related OECD Decision.

In January 2023, the European Parliament adopted its negotiation position on the proposal that prohibits the transportation of any waste intended for disposal and sets stricter regulations and

control procedures for waste exports. The report on the transport of waste in the EU was passed by the Parliament with a margin of 594 votes in favor, 5 votes against, and 43 abstentions. “MEPs wanted to ban the export of plastic waste to non-OECD countries” (European Parliament, 2023). Pernille Weiss, the report's rapporteur for the Parliament, stated that in order to better protect our environment and competitiveness, “we must turn waste into resources in the common market.” The Danish MEP stated that “the new rules will also make it easier for us to combat waste crime inside and outside the EU”. Concerning their suggestion to put an “export ban on plastic waste” she said they “are pushing for a much more innovative and circular economy wherever plastic is involved. That is a true win for the next generations” (European Parliament, 2023).

The recycling sector in the EU is deprived of resources that may reduce its reliance on essential raw materials by waste exports, and these waste exports have a significant detrimental impact on the environment and public health in the destination nations. The European Parliament voted in favor of a ban on the transportation of any waste that would be disposed of within the EU to address this, with the exception of a few well-justified exceptions (EPP Group, 2023). Other political parties broadly supported the research, Pernille Weiss, an EPP member, wrote. The development of an EU risk-based targeting system to direct inspecting member states in avoiding and identifying unlawful waste exports was another demand made by the Parliament in its proposal.

The currently under discussion plan prohibits the export of waste plastic to non-OECD countries and gradually limits exports to OECD countries over a four-year period. The initial European Commission stated that it would need to be carefully studied to make sure "that it is in full compliance with our international commitments." The EU's environment commissioner, Virginijus Sinkeviius, announced during the plenary discussion that the Commission will support member state investigations with the help of OLAF, the EU's anti-fraud office (European Parliament, 2023).

According to the new rules, only waste that is transported for recycling is allowed to be exported from the EU to non-OECD countries. For imports from the EU and exports of plastic waste to OECD nations, strict rules will be in place. With these limitations, it is not advised to export

plastic waste to other countries, as they frequently lack the facilities and legal framework needed to dispose of it appropriately.

In order to evaluate the success rate of the new Waste Shipment Regulation, the EU is applying the evaluation of member states by the EEA. The 2025 municipal and package waste recycling objectives and the 2035 landfilling target were both identified in a report released by the Commission in 2023 as being at danger of not being met by some Member States. The European Environment Agency's (EEA) (2020) evaluation of the Member States provides the foundation for this.

According to the European Commission's early warning report for 2018, 14 of the 18 Member States at risk of not setting aside 55% of their municipal waste for reuse and recycling in 2025 were already in danger of doing so in 2020. The waste framework directive mandates that at least 50% of specific kinds of household and associated rubbish be recycled and prepared for reuse by Member States.

Three years prior to the target years, the European Commission and EEA jointly produced early warning reports. In addition to identifying each Member State's chances of achieving the goals, the early warning reports also aim to foresee implementation challenges. This will facilitate the application of policies and offer instructions on the proper course of action that must be followed in advance of the intended dates in order to achieve compliance (European Environment Agency, 2020).

On November 17, 2023, the European Parliament and the Council reached a political agreement about trash shipments in response to the Commission's request to amend the waste Shipment Regulation. The Commission is in favor of this agreement because it would ensure that the EU takes greater accountability for its waste and stops exporting its environmental problems to other nations. Furthermore, the standards will facilitate the repurposing of trash as an asset. According to Rethink Plastic (2023), the agreement aids in the European Green Deal's accomplishment of its goals of reducing pollution and advancing the circular economy.

It will be forbidden to export plastic waste from the EU to nations outside of the OECD. Individual nations may receive such waste up to five years after the new regulations go into effect, provided that stringent environmental requirements are fulfilled. Only when non-OECD nations can guarantee that they can handle the waste in a sustainable way will other recyclable rubbish be shipped from the EU to those nations. Simultaneously, contemporary digitized processes will facilitate the transportation of waste for recycling across the EU. In the battle against waste trafficking, there will additionally be more collaboration and enforcement. On the same day, a political agreement was obtained for the new Environmental Crime Directive, which would be supplemented by the new law (Rethink Plastic, 2023).

The waste export policies that have been implemented will be the benchmark for reducing the health and environmental issues in developing nations that arise from the improper handling of waste that was produced elsewhere. The revised regulation will introduce stricter rules regarding the export of plastic waste to third countries. Under this new legislation, waste can only be exported to non-OECD nations provided those nations notify the Commission that they are prepared to import the waste and can handle it sustainably. It includes a ban on exports of non-hazardous plastic waste (B3011) to non-OECD countries. Exports of plastic waste will not be permitted to non-OECD nations 2.5 years after the new law goes into effect, unless the nation can achieve certain requirements; in this scenario, imports will be permitted, but only five years after the new regulations go into effect (European Commission, 2023). New rules are also expected to help prevent and detect illegal waste shipments.

3.6. Circularity in the EU Plastic Waste Policy from an Environmental Justice Perspective

The urgent problem of managing plastic waste has been targeted by the ambitious Circular Economy Policy of the European Union (EU). The desire to reduce environmental damage and encourage sustainable activities is at the core of this undertaking. However, when examining the policy's effects through the lens of environmental justice, a complicated and frequently unequal reality emerges, especially in the context of waste exports to nations like Malaysia and Türkiye.

These two countries have become important receiving countries for exports of EU plastic waste, demonstrating both the interconnectedness of the global waste trade and the severe differences in environmental management capabilities. China was the world's top waste importer until 2018. Türkiye and Malaysia became the main destinations for waste exports after its restriction on the import of plastic. There are also commercial interests that are content to take care of Europe's plastic waste in these nations. The business is so open to accepting waste material from foreign sources because Malaysia and Türkiye are so inadequate at managing their own recycling. The fact that some of the poorest citizens in the nation are employed by the plastics sector also implies that there is a cheaper labor force available to manage the imported waste.

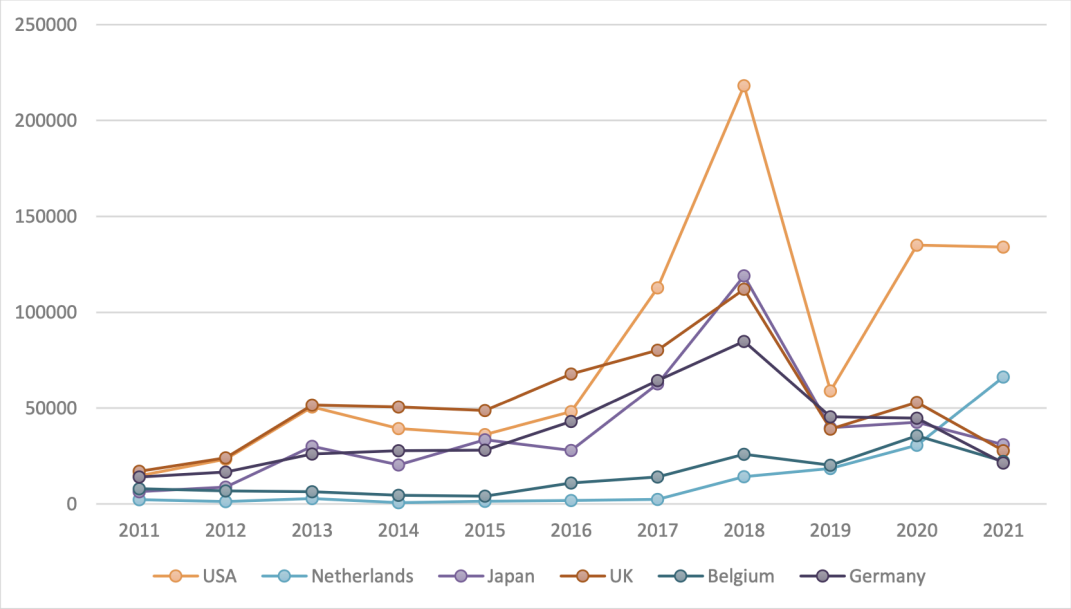
3.6.1. The Example of Waste Shipment from the EU Countries to Malaysia

Following China's 2017 restriction on the import of plastic waste, Malaysia, along with other Southeast Asian nations, saw a surge in its imports of plastic waste. As a result, Malaysia quickly surpassed all other countries as the world's top importer of plastic waste. Imports have declined since they peaked in 2018. A significant contributing factor to this was the National Solid Waste Management Department's (NSWMD) improved implementation, which at the end of 2018 implemented 18 new conditions for the issue of the licenses and enhanced the surveillance of the permit holders. The Covid-19 pandemic and the interruptions to international trade may have had an impact on imports in 2020 and 2021 (ETC CE Report, 2023).

With over 1300 factories, Malaysia's plastics sector is one of the largest in the world and collectively they shipped over 2 Mt of raw plastic in 2016. Consequently, one of the major plastic production sectors in the world is located in Malaysia. The plastic recycling sector in Malaysia imports plastic waste to supply its businesses and sustain its profitability due to the low local collection rate of plastic waste. Due to the Malaysian government's slow response to the Chinese prohibition, dealers were able to bring plastic waste into Malaysia, sometimes in an illegal way. It is quite likely that some of the EU27 plastic waste entering Malaysia does not match the recyclability criteria and is instead being burned or dumped as a result of some recyclers' illicit business practices (ETC CE Report, 2023).

One of the top international destinations for plastic waste is Malaysia, which has a $7.2 billion plastic recycling and manufacturing business. It is not, however, the rubbish dump of the globe, claim the nation's officials. Malaysia made a big concession; the amount of plastic waste it brought in from 10 countries in the first half of 2018 was almost equal to what it received in total in 2016 and 2017. Although these nations received waste, there were issues since it was not sufficiently recyclable (Jain, 2020).

Figure 9: The plastic waste export to Malaysia by specific countries, 2011-2021, tonnes



Source: ETC CE Report, 2023

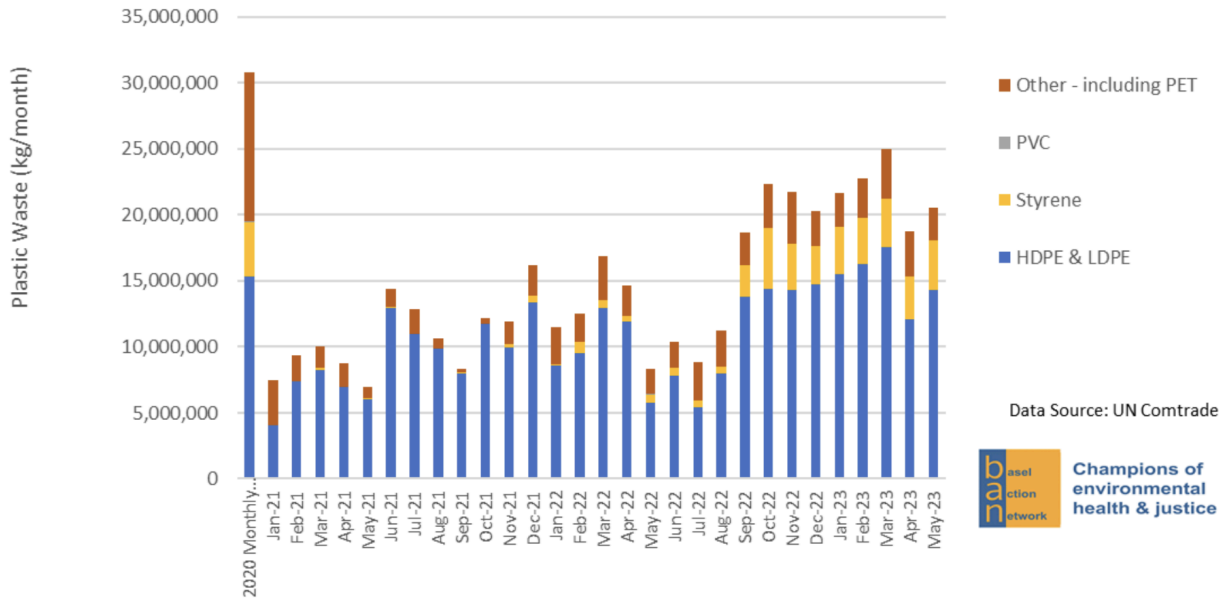
Malaysia imported 405 010 tonnes of plastic waste registered with the commodity number HS3915 in 2021 from all over the globe. More plastic waste likely entered the nation than shown by the official data as a result of illegal imports using incorrect commodity codes, such as using HS3920 (other plates, sheets, film, foil and strip, of plastics, non-cellular and not reinforced, laminated, supported or similarly combined with other materials) instead of HS3915 (Waste, parings and scrap of plastics (excluding that of polymers of ethylene, styrene and vinyl chloride) (Basel Action Network, 2023).

Since 2018, the provenance of the plastic waste transported into Malaysia has fluctuated significantly, albeit it is challenging to pinpoint its origin precisely owing to unlawful exports. Following China's declaration of the embargo, all of the major exporting nations, including the

EU27 and the UK, gradually boosted their shipments to Malaysia. The Netherlands and Belgium had the biggest proportional growths of 46,01% and 44,7% in their shipments of plastic waste to Malaysia between 2015 and 2021, respectively. **Figure 9** indicates the countries that exported plastic waste to Malaysia in 2011-2021 (Basel Action Network, 2023).

The majority of Malaysia's waste, which is estimated to be 89% of its total municipal solid waste and just 1% recycled, generally ends up in landfills. The waste management system is purely intended for waste collection and disposal in landfills or dumps, not for recycling. Only 62 of the 173 Malaysian plastic recyclers that have been found have an authorization to import plastic waste (ETC CE Report, 2023). The majority of rigid plastics, especially those made of a single substance, can be recycled in the nation thanks to the presence of plastic recyclers; multi-material plastics, however, still pose a significant difficulty. In Malaysia, HDPE, LDPE, PP, and PET are the four plastics that stand out in terms of their capacity to be recycled (Basel Action Network, 2023). We can infer the types of plastic waste imported by Malaysia from the EU in 2020 - 2023 by looking at the export data indicated in **Figure 10**.

Figure 10: The EU plastic waste exports to Malaysia in 2020-23



Source: Basel Action Network, 2023

These resins are also the most often manufactured and recycled in the nation. In Malaysia, LDPE is the most popular flexible plastic to be recycled, however recyclers have severe requirements

for its waste: it must be dry and clean to ensure better quality output material. Post-industrial waste is a common source for recycling firms to satisfy these requirements. Recyclers must import foreign plastic waste as inputs for their businesses since domestic collection rates for plastics are so low. Unfortunately, low-quality and contaminated plastics are also illegally imported during this process under false documentation, which results in a lot of recyclers having a lot of non-recyclable or less valuable plastics they have to get rid of and eventually dump or burn, seriously harming human health and environment (World Bank Group, 2021).

In 2021, Malaysia ranked second with 133,517 metric tons of plastic waste from the EU countries (Statista, n.d). The problem arises when the part of this waste was contaminated and not suitable for recycling. For instance, five containers of plastic debris from Malaysia were returned to Spain in June 2019 when it was determined that they were polluted. According to reports, Malaysia anticipates returning up to 3,000 tons of waste to the United Kingdom, United States, Japan, China, Canada, Australia, the Netherlands, Germany, Saudi Arabia, Singapore, Bangladesh, Norway, and France in the near future (Euronews, 2019).

Recent waste returns from the country have gone to China, Japan, Singapore, Sri Lanka, the United States, the United Kingdom, France, Canada, and Spain. With 43, France received the most, followed by 42 from the United States, 11 containers went to Canada, 10 to Spain, and 17 were sent back to the UK. China, Japan, Singapore, and the other four countries received unspecified amounts of money back (Euronews, 2020).

According to Mageswari Sangaralingam (2022), a research officer of Friends of the Earth Malaysia and the Consumers Association of Penang, "it is the right move by the Malaysian government to show to the world that we are serious about protecting our borders from becoming a dumping ground." She said that a significant amount of plastic waste entering Malaysia was "contaminated, mixed, and low grade," meaning that it could not be processed and had instead ended up in enormous hazardous waste dumps.

Malaysia received the majority of the waste that was diverted. Greenpeace reports that (2018) Malaysia imported 754,000 tons of plastic waste in the first half of 2018. The US, Australia, the UK, Germany, Spain, and France accounted for the majority of these imports. Significant social

and environmental consequences have resulted. According to the Global Alliance for Incinerator Alternatives (GAIA), an influx of hazardous waste has caused water pollution, crop death, and respiratory illnesses in Southeast Asia (Irfan, 2021).

The plastic waste that exported to Malaysia was not recycled and kept in the area where marginalized or poor people are residing because of the inadequate technologies and lack of knowledge needed for the recycling (Irfan, 2021). This case violates environmental justice due to the environmental, social and health harms caused by the hazardous wastes.

Numerous environmental movements and groups recognize plastic waste imports to Malaysia as a problem of environmental justice. These movements support more egalitarian and environmentally responsible waste management techniques. Although there are several groups and grassroots movements tackling this issue, some stand out, such as Greenpeace. The well-known international environmental group Greenpeace has vigorously fought against the shipment of plastic waste to Malaysia and other Southeast Asian nations. They have campaigned for stricter limits on the export of plastic waste and have emphasized the negative social and environmental effects of these shipments (Greenpeace, 2019).

Additionally, GAIA is a network of grassroots organizations and individuals promoting zero waste and sustainable waste management methods. They fight for minimizing waste creation at the source and have increased awareness about the environmental justice consequences of plastic waste exports. Another international response that acknowledges the environmental justice violation of the waste transport to Malaysia is called Break Free From Plastic. More than 2,000 groups throughout the world are involved in this movement, which aims to reduce plastic pollution's effects on society and the environment. They have demanded more responsibility and openness in the trafficking of plastic waste on a worldwide scale (UNDP, UNICEF & EcoKnights, 2020).

The Basel Convention, a global agreement on waste management, was amended to prohibit the importation of contaminated and unrecyclable plastic waste into developing nations without their consent. However, not all countries in Southeast Asia have signed on to it, and it did not take

effect until 2020. In consequence, plastic waste smuggling is witnessed in Malaysia and other similar communities.

There are a few noteworthy local environmental groups that should be included in addition to the international organizations since they are identifying the case as an issue of environmental justice. One of the nation's oldest and most renowned environmental groups is Sahabat Alam Malaysia (SAM), commonly known as Friends of the Earth Malaysia. By stressing its detrimental effects on the environment, they have aggressively campaigned against Malaysia's import of plastic waste (Sahabat Alam Malaysia, n.d)

Dedicated to environmental campaigning and education, EcoKnight is a nonprofit organization. They aim to promote sustainable waste management techniques and have increased awareness of the environmental justice consequences of imports of plastic waste. Such organizations and initiatives, among others, strive to raise awareness of the environmental justice problems brought on by the export of plastic waste to nations like Malaysia. To combat the detrimental effects of the international trade in plastic waste, they promote regulatory changes, more corporate accountability, and community involvement (UNDP, UNICEF & EcoKnights, 2020).

Illegal waste was being transported to Malaysia via unlawful means, such as mislabelling or false declarations, despite the severe rules that imported waste must be clean, homogeneous, and devoid of pollutants. According to the Basel Convention, Malaysian authorities continue to take harsh enforcement measures against importers who disobey laws, including returning waste containers imported from other countries to Malaysia (Sangaralingam, 2022).

The Environmental Quality (Amendment) Bill, which would have increased the fine for offenses such water pollution and improper disposal of scheduled waste, was approved by the Dewan Rakyat (House of Representatives) of Malaysia in October 2022. The new penalty would not exceed 10 million Malaysian ringgit (about USD 2.3 million). The Yang di-Pertuan Agong, who is Malaysia's constitutional monarch and head of state, would have to ratify the measure in the Dewan Negara, the Senate, and it must also have his consent before it can be gazetted and become law (Sangaralingam, 2022).

According to the new plastic regulation,

- Plastic waste imports are only permitted with a current license (approval permit) issued by the National Solid Waste Management Department (JPSPN) as the responsible agency;
- The Department of the Environment (DOE) issues a Compliance Letter to JPSPN if the importer complies with environmental regulations;
- The permit must be renewed annually.

The permit includes information about the facility's monthly import quota. Only recyclable clean plastic waste, free of household or hazardous waste, may be found in containers certified under HS Code 3915 (Sangaralingam, 2022).

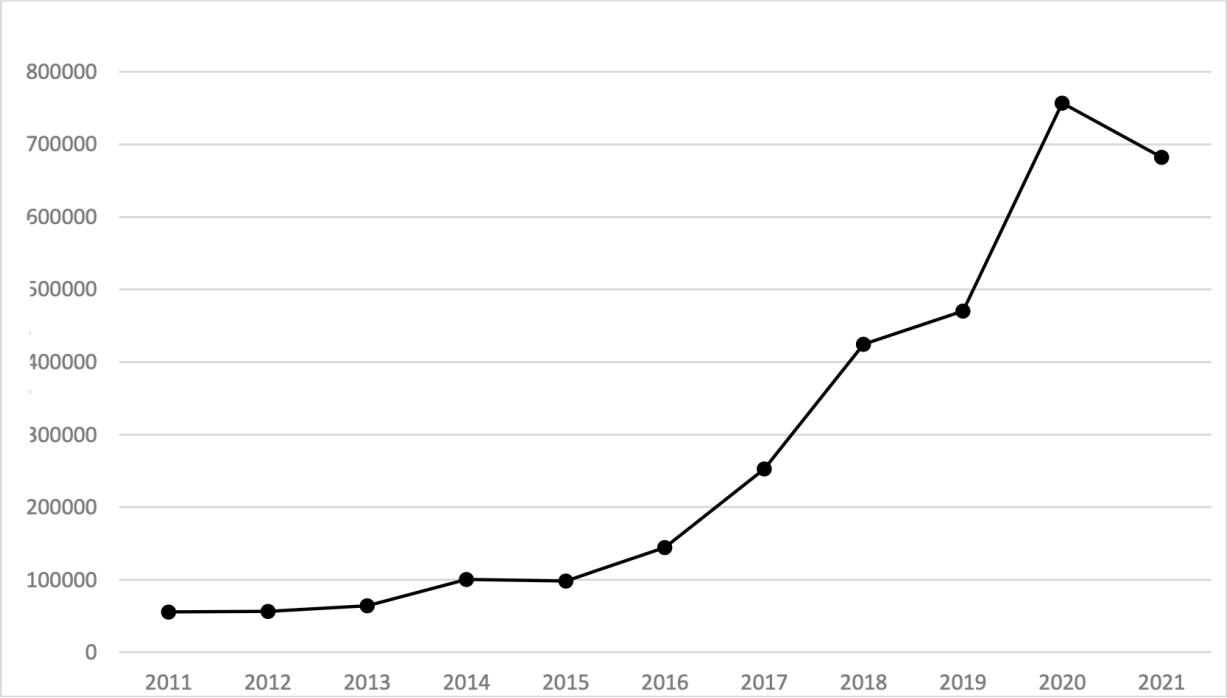
The current thesis asserts that, because Malaysia is not a member of the OECD, the EU's export of plastic waste violates not only the principles of environmental justice but also the Basel convention on transportation of hazardous wastes and the EU's waste shipment regulation. Furthermore, there is no follow-up with the waste treatment or the fate of the waste in the importing nation; the waste shipment laws and regulations primarily concentrate on the procedures preceding the waste shipment. False claims, disguising, mixing, or double stacking the waste in a cargo, as well as mislabeling specific packing, are all ways to breach the prior informed consent norm. The exporter and importer countries must undertake a thorough investigation to identify any instances of unlawful waste shipment since these strategies attempt to alter the actual contents of a container.

3.6.2. The Example of Waste Shipment from the EU to Türkiye

Plastic waste is one of the problematic topics that attracts the public's attention in Türkiye as it is in the whole world. As indicated in the thesis before, the China ban caused the plastic waste import to Türkiye to increase as well. As demonstrated in most of the research and reports, there is a huge increase in the amount of waste entering Türkiye since the 2000s. 2004 to 2019 Plastic waste trade to Türkiye increased by 96%. Türkiye was the top destination for recyclable plastic exports in 2022 as well (29% of all exports of plastic outside of the EU), which was followed by

Malaysia (15%) and Indonesia (17%). The source of waste entering the country was not only by the EU countries, but also certain non-EU countries like the United Kingdom exported a large amount of waste to Türkiye (Eurostat, 2023). After England left the EU, the plastic import numbers are indicated as decreasing. These big numbers are the reason for the topic to be the center of attention. In European Topic Center Circular Economy (ETC CE), Basel Action Network, and Greenpeace reports these figures are clearly indicated. **Figure 11** displays the increasing amount of plastic waste imported by Türkiye from 2011 to 2021.

Figure 11:Total imports of plastic waste, Türkiye, 2011–2021, tonnes



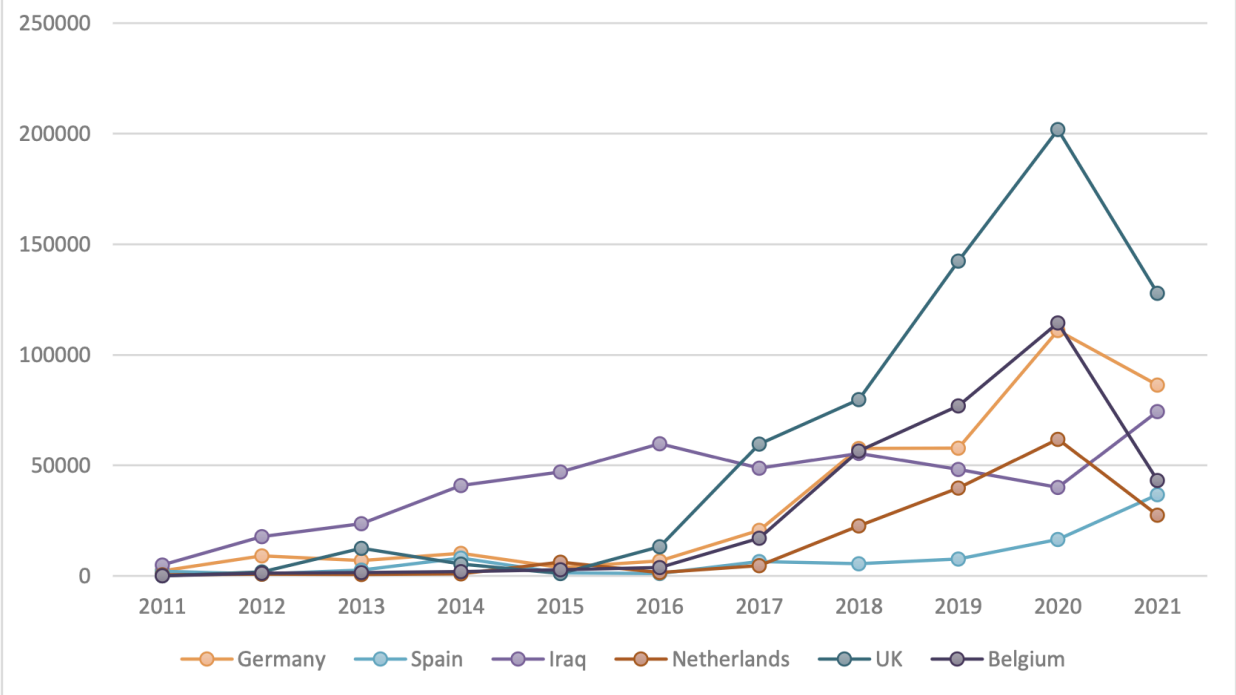
Source: ETC CE Report, 2023

Since the Chinese government forbade the import of plastic waste in 2018, several Global North countries have been frantically searching for alternative destinations for their plastic waste. With over half of the EU's plastic waste shipments to Türkiye in 2020 and 2021, Türkiye has established itself as the main market for the continent's plastic waste. The top destination for EU exports of plastic waste in 2020 was Türkiye. The EU-27 was the primary exporter of plastic waste in 2021, sending 395,000 metric tons there (Statista, 2023b). Due to the nation's near proximity to Europe, tight trading relations with the EU, and participation in the Organization for Economic Cooperation and Development, a great amount of waste trade has occurred. In order to

analyze the waste trade in Türkiye in detail, the ETC CE report has been referred to mostly in this part of the thesis, as it provides official and more uptodate information about the topic.

Following China's restriction on the import of plastic trash, a significant share of EU exports have gone to Turkey. To ensure input for the country's industry, the government has partially supported this flow by providing incentives like tax exemptions. Plastic recycling and the manufacture of new goods from this recycled material are important sources of income for the country and its recycling industry. Furthermore, Turkey has grown to be a significant export route for EU-produced plastic trash since the EU banned the export of mixed and difficult-to-recycle plastics to non-OECD countries starting in 2021. Thus, Türkiye became a competitive option to formerly well-liked Southeast Asian destinations (ETC CE Report, 2023).

Figure 12: Imports of plastic waste by Türkiye, selected countries, 2011–2021, tonnes



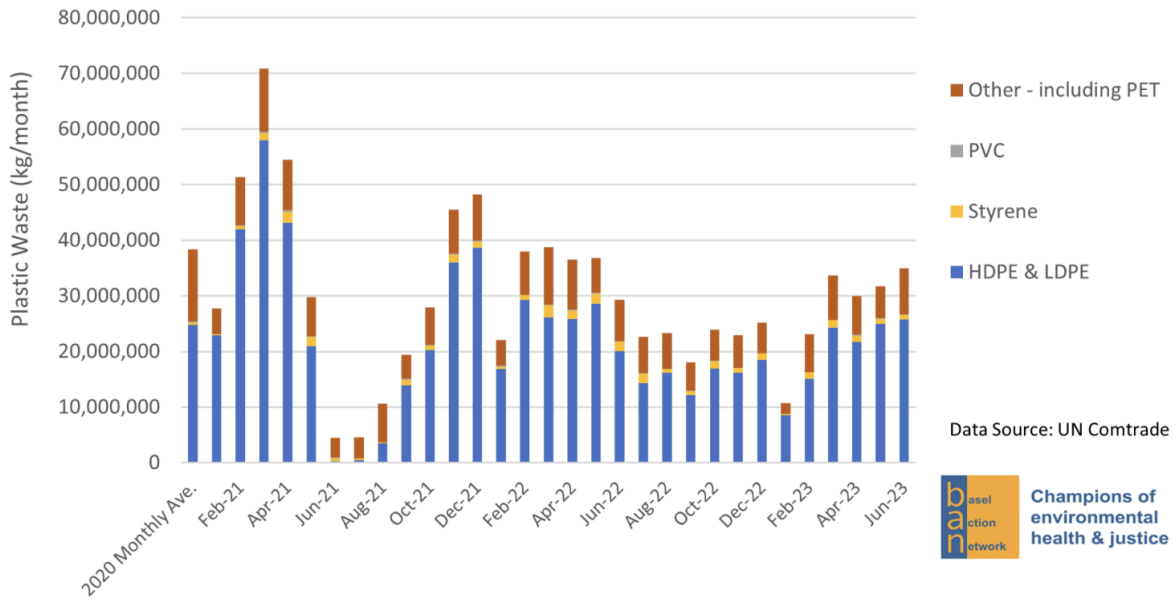
Source: ETC CE Report, 2023

The source of the plastic debris entering Türkiye is seen in **Figure 12**. The UK stands alone for the biggest rise in exports to Türkiye, despite the fact that all the major nations follow the same pattern. While the Netherlands has seen a steady growth in exports, Germany and Belgium are significant exporters to Türkiye as well (ETC CE Report, 2023). Nevertheless there are 2

different graphics (11;12), both of them show us the plastic waste imported to Türkiye in the long term and short term, so we can judge the difference between when the UK was part of the EU and when it was not.

The European Union sends a great amount of plastic waste to Türkiye each year for recycling. However, due to insufficient plastic recycling facilities in Türkiye, the security of workers, local residents, and communities, notably children, refugees, and illegal immigrants, is in jeopardy. The present Commission plan already moves in the correct direction by placing a de facto restriction on plastics exports to countries outside of the OECD. In order to ensure that a facility can safely and efficiently handle waste and protect the health of employees, exporting companies of the EU will need to perform their own independent audits of the facility in the importing country (EuroStat, 2022b).

Figure 13: 2020-23 EU Plastic Waste Exports to Türkiye (HS 3915)

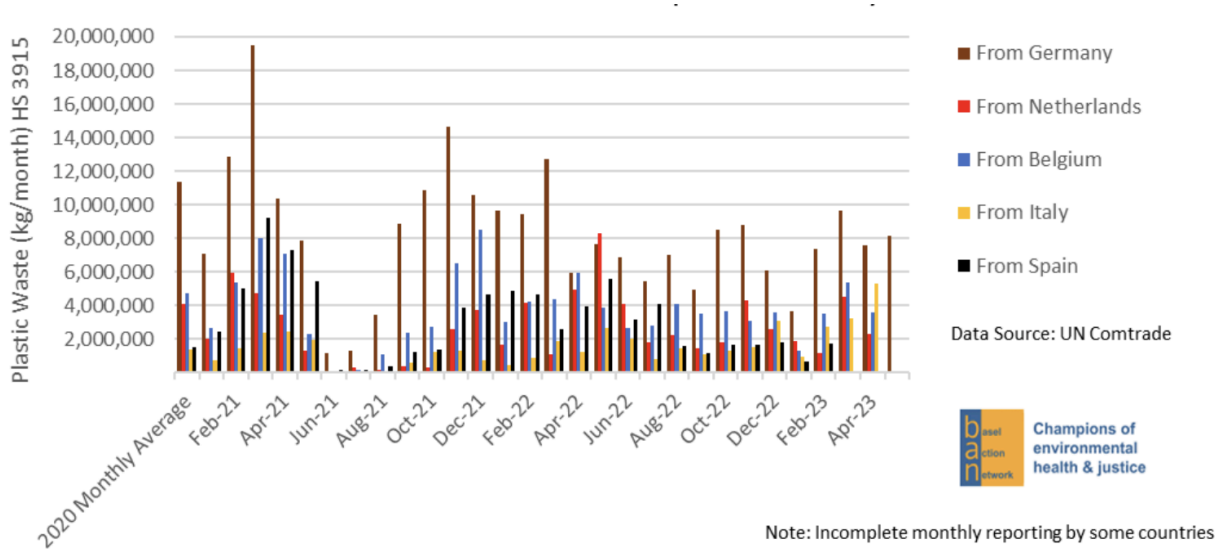


Source: Basel Action Network, 2023

The types of plastic shipped from EU nations to Türkiye between 2020 and 2023 are shown in **Figure 13**. EU shipments to Türkiye increased from 4.5 metric tons per month in June 2021 to 31.7 metric tons per month in May 2023. That amounts to 192 truckloads of waste plastic per day. As indicated by the figure, HDPE and LDPE constitute most of the plastic waste imported into the country. The volume of plastics imported into the nation plummeted virtually to nothing

between May and July of 2021 as a result of the Turkish Ministry of Trade import restriction on plastics, but once the embargo was lifted in July of that year, exports once more rose to their pre-ban levels. **Figure 14** depicts the import of plastic waste to Türkiye from particular European nations. According to the figure, the great percentage of the plastic waste to Türkiye is coming from Germany and the Netherlands (Basel Action Network, 2023).

Figure 14: 2020-23 Plastic Waste Exports to Türkiye from the EU Countries:



Source: Basel Action Network, 2023

Before the year 2021, Türkiye permitted the import of all kinds of plastic waste. But beginning in July 2021, the government forbade the importation of polyethylene plastic waste, including PE, PET, HDPE, and LDPE. "This restriction was only in place for a few weeks until it was lifted as a result of increased demand from the recycling sector, which needed polyethylene imports to feed its recycling plants since it was dependent on foreign waste". A plastic recycling business can only import as much as its heat treatment capability will allow, thus there are also further restrictions on the rate at which it may do so. The Turkish government claims that the cost of this equipment would restrict the number of recycling businesses that may import plastic waste (PAGEV, 2021).

Due to the initiatives of the PAGEV to lift the restriction, the plastic waste restriction changed into an extended control and regulations over the imported plastic. All of the 1350 recycling firms operating in Türkiye will have their licenses extensively examined in accordance with the

new rule, which emphasizes active control. A letter of credit was necessary in order to stop fraud in the import of waste. A further goal of the letter of assurance is to weed out businesses that could misuse the law. Up to 50% of a company's production capacity—which is provided by crushers—could formerly be imported, with the remaining 50% coming from domestic sources. In February 2022, Türkiye also approved the Basel Convention's revisions regarding plastics (PAGEV, 2021). These seek to tighten regulation of plastic waste's transboundary movements and so restrict the flow of the material into Türkiye. Recyclable plastic waste should enter the nation.

Despite the fact that Türkiye's existing waste management system and recycling capacity are extremely constrained and unable to handle the domestic waste output, 90% of Türkiye's municipal solid waste is landfilled, and a substantial percentage of the nation's recycling capacity is devoted to imported waste. Because of poor sorting, locally generated plastic waste is sometimes of lesser quality than imported waste. This may account for the Turkish recycling industry's preference for imported plastic (ETC CE Report, 2023). So, domestic plastic waste is a factor that is readily available for recycling. In fact, Türkiye is among the OECD nations with the lowest total waste-recovery rates. The ETC CE report quotes (Uğurtaş, 2020) recycling companies must import waste because of poor collection rates in order to have enough to be profitable. Industry executives contend that trash imports need to go on as long as plastics producers need them, until local recyclers are better equipped to handle Türkiye's domestic waste. This, however, runs the danger of lowering domestic plastic waste demand, which might impede Türkiye's waste management industry's growth and recycling goals.

Currently, businesses that recycle plastic waste need to be licensed and approved. There are 751 authorized recycling facilities and 566 collection and separation facilities in the nation, reported to the non-governmental organization PAGEV. However, only 6% of household plastic waste is processed in this way. Along with an increase in imports, criminal activity using plastic waste has increased in Türkiye. There have been several reports of the illegal importation of dangerous or non-recyclable plastics, as well as the illegal burning and disposal of such debris. Some businesses presently spend more money treating hazardous plastic waste inside the EU than they do sending it to Türkiye (PAGEV, 2021).

Even while recycling plastic waste is generally referred to as the greenest choice, it can nonetheless be dangerous. Before being melted and formed into pellets for reuse, plastic must be cleaned, sorted, and shredded for recycling. Additionally, scientists have connected exposure to these poisons with a higher chance of developing cancer, cognitive issues, and reproductive system impairment. Human Rights Watch (2022) has documented the potential dangers of plastic recycling in Türkiye. The significant health issues that they believe are linked to plastic recycling are reported by workers and nearby residents. These include skin conditions, difficulty breathing, and a high rate of asthma. There is a link between the release of toxins during recycling and an increased risk of cancer, miscarriage, and disabled children. The same report argues that most of the time the laws to keep people safe from serious harm are not enforced by Turkish authorities.

These difficulties are not unusual. According to the same report, numerous workers at Türkiye's plastic recycling plants were interviewed, as were locals who said they had trouble getting medical care, suffered from acute respiratory problems, and were afraid of the facility owners' reprisal, if they reported the problems to the authorities. The issue is made worse by the Turkish government's ineffective implementation of environmental and occupational health rules, which forbid minors from working in plastic recycling plants and demand that facilities be examined for labor and environmental compliance (Human Rights Watch, 2022). As mentioned in this thesis, environmental justice demands that all people share equal rights in environmental quality and justice, without bias or discrimination. As indicated in the thesisBoth Malaysia and Türkiye examples indicate that the plastic waste import and export cause environmental justice concerns.

The international environmental movements such as Greenpeace, Human Rights Watch and so on are acknowledging the environmental, social and health issues derived by the legal or illegal waste shipments to Türkiye. Even if they are not specifically mentioning it as an environmental justice issue, in their reports and publications it can be clearly understood as a case of environmental injustice according to the description of problems and consequences of the waste dumps. As stated by Gündoğdu (2022), the instance of Adana shows how the plastic waste trade, which may be referred to as "waste colonialism", exposes the ecosystems of the Global South and the inhabitants to significant amounts of harmful chemicals from wealthy nations' waste.

When they have a final decision on the EU Waste Shipment Regulation, the European Parliament and the European Council ought to make sure that the EU ceases the destructive practice of exporting its plastic waste to other countries, regardless of their membership in the OECD. The EU is made up of some of the world's richest countries. The EU should take care of its own waste rather than requiring nations with less financial means to bear this unjust burden. Instead of shipping their waste to countries where environmental and labor regulations are not enforced well or at all, countries that export plastic waste, including those in the EU, should take steps to better manage their waste domestically.

4. CONCLUSION

The circular economy in the EU has been a key topic for numerous research papers and thesis produced until now. The circular economy arose as the right solution at a time when problems with plastic waste were beginning to appear. As a result, there are numerous papers and studies that evaluate the circular economy in general and the EU circular economy in particular by highlighting solely its advantages and benefits. Despite the fact that critical works have been published on the CE that critique it from a theoretical, ideological, and practical viewpoint, the evaluation of CE from the perspective of the environmental justice theory has not yet been the subject of any specialized study or thesis. Therefore, the topic of this thesis is considered as unique in its research area. The goal of the current thesis is to study EU circular economy policy, particularly its plastic waste legislation, using environmental justice principles that basically emphasize equitable access to all environmental goods and bads. In order to analyze the topic and answer the questions raised the thesis has four general topics and subtopics connected to them.

In the first part of the thesis, the author starts by explaining the subject of the study, providing a conceptual framework and methodology used to collect data and analyze the topic. The thesis attempted to find answers to the raised questions during the study and generate the results by using descriptive and analytical techniques. The literature of the thesis is relying upon the primary and secondary source of information, articles, academic papers, research studies, official web pages, publications, documentations, Action plans and so on, in order to collect the data to evaluate the subject.

The second section of the thesis focuses on circular economy, plastic waste and environmental justice by giving separate explanations for each of them. The plastic has been analyzed by looking at its historical evolution, types of it and their effect on the recycling capability, amount of plastic produced and consumed in different time periods by various countries by indicating statistical figures, the plastic waste problem and how it leads to another global issue of waste trade. Plastic waste has become a serious concern to the environment, endangering global ecosystems, animals, the climate, and the economy. Oceans, rivers, and the ecosystem as a whole have become contaminated as a result of the inappropriate handling and dumping of plastic

waste. The issue of plastic pollution is getting worse as plastic manufacturing and usage rise. The thesis looks at different kinds of plastics and how they affect environmental pollution, highlighting the necessity of moving toward a circular economy.

In order to answer the main question of the thesis which is whether the EU circular economy is a just policy or not, the environmental justice perspective has been utilized by considering its four dimensions - distributional, procedural, recognitional and capabilities approach. In this section of the thesis the historical emergence and evolution of the environmental justice notion has been explained in its relation to the Circular economy in more detail. Relatedly, the alarming amount of plastic production and pollution and its impact on the environment have been discussed. It is mentioned that in order to avoid high expenses of recycling and lack of ability to handle the plastic waste in their own area anymore, most of the developed countries prefer to export their waste to the underdeveloped countries. In consequence, the thesis argues that the plastic waste trade leads to environmental injustice as the imported waste which most of the time contains hazardous substances inside, is disposed of in the indigenous areas where vulnerable people are residing. Those people are exposed to the most damage caused as a result of plastic waste piled up near their houses, which is observed as different kinds of health issues, environmental, air and water pollution.

The research primarily concentrates on plastic waste within the EU's CE package due to the escalating volume of plastic waste and the international trade associated with it. The study compares plastic waste issues in EU and non-EU nations and examines the export and import of plastic waste. It posits that the circular economy policy must undergo critical analysis to address concerns related to environmental justice and avoid perpetuating inequalities.

The circular economy in general has been explained theoretically and practically and the EU CE has been analyzed from the perspective of environmental justice theory particularly in the third section of the thesis. The thesis primarily focuses on the European Union's Circular Economy (CE) plan, which was introduced in 2015 and strengthened by the Circular Economy Action Plan of 2020. The goal of the policy is to create a resource-efficient, competitive economy with no emissions of greenhouse gasses. It sets goals to improve sustainability, create jobs, and use less natural resources. The thesis, however, analyzes the strategy critically from the standpoint of

environmental justice, stressing challenges with possible power inequalities and the transfer of plastic waste from the developed to underdeveloped nations.

The study argues that the circular economy policy inadvertently perpetuates environmental injustices by enabling developed countries to dispose of their waste in developing countries. Nevertheless, there was a waste trade happening even before the EU CE concept, after the CE the plastic waste trade happened even in illegal ways by showing the CE as an excuse for it. According to the EU CE Action plan, the plastic waste trade can be done according to the EU waste shipment regulation, Basel convention on the control of transboundary movements of hazardous wastes and their disposal. Regarding these regulations, the EU can not export its waste to non EU and non OECD countries, the export and import of hazardous waste are prohibited, there should be a prior informed consent process if the exported waste requires special control. However, in the thesis it is mentioned that in most of the plastic trading examples, the EU has violated these regulations. This argument has been supported with the proper reliable data and statistics in the thesis. The thesis underscores the necessity of considering fairness and equality in environmental decision-making processes and the equitable distribution of environmental resources.

Within the third section, the thesis analyzes different examples to evaluate the circularity in the EU plastic waste policy from an environmental justice perspective. For the samples Malaysia and Türkiye have been selected as a focus area in order to obtain a more clear picture about the study. According to the findings of the thesis, due to their geographical positioning, dependence on the plastic industry, and cheap solutions for the plastic waste problem, these countries are ranked as first (Türkiye) and second (Malaysia) in terms of receiving the most amount of plastic waste from the EU countries. According to the thesis findings, the waste exported by the EU countries to Türkiye and Malaysia contains hazardous substances as well, the waste was not being treated in an environmentally sound manner, and caused a lot of environmental and health issues. Moreover, there are not any follow up rules and regulations after exporting the plastic waste. Therefore, these countries are considered as a place where violation of environmental justice is observed based on the thesis findings.

These results indicate that the EU circular economy policy has yet to be developed and expand its focus area to include not only economical factors, but also environmental and social

consequences as well. To fully unlock the potential of the circular economy, a comprehensive approach is indispensable. Incorporating circular concepts throughout many industries and phases of the product life cycle are all part of this strategy, which also includes removing systemic hurdles, fostering sufficiency and efficiency, and integrating them.

Enterprises, consumers, civil society organizations, and legislators must all work together for the circular economy to be implemented successfully. Globally, the idea of the circular economy is gaining popularity as a viable response to the environmental problems caused by linear systems of production and consumption. While wealthy countries, notably those in the European Union, have made substantial progress in putting forward circular economy practices, emerging countries, particularly those in Asia, are also starting to grasp the significance of switching to a circular economy model. Asia's expanding middle class and consumer spending provide possibilities and difficulties for putting circular economy concepts into practice.

Several Asian countries have already taken steps to promote a circular economy. China, for instance, was among the first nations to adopt a circular economy model by enacting regulations in 2009. Other countries, including India and Indonesia, have implemented laws and policies to encourage resource recovery and responsible waste management. These endeavors highlight the potential for circular economy practices to address pressing issues related to plastic waste and pollution in the region.

The circular economy, in general, offers a thorough and efficient strategy for handling resources and waste reduction. It gives governments and companies the chance to reexamine conventional linear systems and adopt cutting-edge business models that put a premium on resource efficiency, waste reduction, and environmental preservation. Nations may not only reduce the negative environmental effects of current consumption patterns by embracing and putting into practice circular economy ideas, but they can also unleash economic gains and improve their competitiveness in a world with limited resources. To secure a more sustainable and prosperous future, the transition to a circular economy is a worldwide undertaking that requires cooperation and group effort.

Addressing the issue of plastic waste necessitates international cooperation that transcends borders. Southeast Asia, in particular, has become a hotspot for plastic pollution, with the

COVID-19 pandemic further exacerbating the problem through increased consumption of disposable plastic items. Prioritizing policies and investments that promote circular economy approaches, waste management infrastructure, and the reduction of single-use plastics is critical.

To effectively tackle the plastic waste problem, it is essential to raise awareness, educate the public, and engage stakeholders from various sectors, including governments, businesses, and communities. By promoting responsible consumption, supporting research and development of alternative materials, and implementing comprehensive plastic waste management strategies, we can work towards a more sustainable and plastic-free future.

The European Union grapples with challenges in managing its plastic waste and resorts to exporting it due to limited recycling and recovery capacity. However, the improper handling of plastic waste poses significant environmental risks, such as marine ecosystem pollution, various health issues and negative impacts on wildlife. The EU has introduced rules and directives, such as limitations on single-use plastics and adherence to the Basel Convention's rules on transportation of plastic waste, to enhance the management of plastic waste.

The EU has to improve its CE policy by focusing more on decreasing the general amount of plastic production and increasing the recycling capacity as seen by the decrease in exports of plastic waste to China, which was formerly the main destination. Globally responsible waste management is encouraged by international accords and conventions like the Basel Convention, which try to combat the smuggling of plastic waste. For the management of plastic waste in a sustainable manner and for environmental preservation, it is essential to put the circular economy's ideas into practice with a focus on reduction of plastic production, recycling and reuse.

In the framework of the circular economy, the problem of waste export and its effects on environmental justice are crucial. As a result of Europe's reliance on exporting waste to developing countries with lower labor costs and lesser environmental standards, inequities have arisen in both the social and environmental spheres which is an environmental justice problem. Environmental justice is a concept that emphasizes the equal allocation of resources and environmental quality across various racial and ethnic groups, and it offers a framework for comprehending and resolving these problems. The environmental justice movement has

developed to overcome practical and financial obstacles to provide equal access to a healthy and clean environment.

In conclusion, this thesis directs its focus towards the investigation of waste, environmental justice, and the circular economy policy within the purview of the European Union (EU). Emphasizing the significance of plastic waste as a considerable environmental peril, the thesis extensively examines its ramifications, underscores the imperative for efficacious waste management, and delineates policy measures aimed at curtailing plastic waste. Rigorous analysis is devoted to scrutinizing the EU's circular economy policy, thereby highlighting apprehensions pertaining to potential environmental injustices and the practice of exporting waste to developing nations. In addition, the advantages and challenges inherent in the circular economy are meticulously expounded upon, in conjunction with an appraisal of the endeavors undertaken by the EU and Asian countries to embrace circular practices. The thesis further underscores the paramount importance of collaboration, innovation, and public engagement in the pursuit of a sustainable future devoid of plastic waste. Ultimately, the thesis concludes that while the circular economy holds considerable promise, its fruition necessitates far-reaching systemic transformations and a profound cognizance of environmental justice to ensure the actualization of authentic sustainability.

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