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Título: The impact of the Chinese waste ban on the waste shipment and management of plastic, e-waste, paper and cardboard of Germany and Greece through the Green Theory perspective

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Mestrado em Estudos Internacionais

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Dedication

This dissertation is dedicated to my parents, Ioan and Mihaela, whose unwavering love, support, and belief in my abilities have been the guiding light throughout my academic journey. Your sacrifices and encouragement have shaped me into the person I am today, and this achievement is as much yours as it is mine. Thank you for being my constant source of inspiration and for instilling in me the values of hard work, resilience, and the pursuit of knowledge.

With all my love and gratitude,

Paula Mesaros

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Lastly, I reflect on the personal growth and development that this journey has brought about, and I eagerly look forward to future opportunities to contribute to my field.

This dissertation would not have been possible without the collective support and inspiration of all those mentioned above. I am deeply thankful for your contributions, and I carry your encouragement with me as I continue my academic and professional pursuits.

With heartfelt appreciation,

Paula Mesaros

Abstract (PT)

A dissertação explora o profundo impacto da interdição chinesa de importação de resíduos, especificamente papel, papelão, plástico e resíduos eletrônicos, nas práticas de gestão de resíduos da Alemanha e da Grécia. Adotando uma perspectiva abrangente que integra os princípios da Green Theory e da Economia Circular, este estudo mergulha nas respostas multifacetadas de ambas as nações a esse desafio ambiental global.

A Alemanha, reconhecida por suas políticas ambientais rigorosas, e a Grécia, um país lidando com infraestrutura limitada de reciclagem doméstica, oferecem estudos de caso intrigantes. Através de uma análise aprofundada, a dissertação investiga como esses dois países adaptaram seus sistemas de gestão de resíduos para se alinhar com os princípios de sustentabilidade, conservação de recursos e circularidade, à luz da proibição chinesa.

A pesquisa destaca a importância de fazer a transição para práticas de gestão de resíduos mais ecologicamente responsáveis, enfatizando a reciclagem, a recuperação de recursos e materiais ecologicamente amigáveis. Ao avaliar o impacto dessas mudanças de política, fornece conhecimento sobre a adaptabilidade e resiliência das práticas de gestão de resíduos no contexto de um cenário global em transformação.

Este estudo contribui para o amplo debate sobre práticas ambientais sustentáveis, ao lançar luz sobre as consequências do mundo real da proibição chinesa de importação de resíduos e ao oferecer um quadro para avaliar e avançar estratégias de gestão de resíduos sob a perspectiva da Teoria Verde e da Economia Circular.

Palavras-chave: Interdição chinesa de resíduos, Green Theory, Economia Circular, Transporte de resíduos, Alemanha, Grécia

Abstract (EN)

The dissertation explores the profound impact of the Chinese ban on waste imports, specifically paper, cardboard, plastic, and e-waste, on the waste management practices of Germany and Greece. Adopting a comprehensive perspective that integrates the principles of Green Theory and the Circular Economy, this study delves into the multifaceted responses of both nations to this global environmental challenge. Germany, recognized for its rigorous environmental policies, and Greece, a country grappling with limited domestic recycling infrastructure, offer intriguing case studies. Through an in-depth analysis, the dissertation investigates how these two countries have adapted their waste management systems to align with the principles of sustainability, resource conservation, and circularity, in the wake of the Chinese ban.

The research underscores the importance of transitioning towards more ecologically responsible practices in waste management, emphasizing recycling, resource recovery, and eco-friendly materials. By evaluating the impact of these policy changes, it provides insights into the adaptability and resilience of waste management practices in the context of a shifting global landscape.

This study contributes to the broader discourse on sustainable environmental practices by shedding light on the real-world consequences of the Chinese waste import ban and offering a framework for evaluating and advancing waste management strategies through the lens of Green Theory and the Circular Economy.

Keywords: Chinese waste ban, Green Theory, Circular Economy, waste shipment, Germany, Greece

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1. Introduction

The global waste management landscape has undergone a profound transformation over the last decade, largely catalyzed by China's historic decision to ban the import of certain categories of waste materials. This move, officially implemented in January 2018, has had far-reaching consequences for countries across the world, notably altering the waste management and shipment practices of different economies.

China in fact, had long been the global epicentre for the import of recyclable waste materials, including plastics, paper, cardboard, and various other commodities. However, the Chinese ban, which affected numerous waste categories, marked a turning point in the global waste management industry. It was a decision driven by China's determination to address domestic environmental concerns, particularly the excessive pollution resulting from the processing of low-quality imported waste. While it was a responsible move for China's environment, it sent ripples throughout the global waste management ecosystem, forcing other countries to adapt to the new waste disposal reality, revaluating waste management strategies and prompted a shift towards sustainable, environmentally responsible practices.

This study seeks to comprehensively assess the impact of the Chinese waste import ban on waste management and shipment practices in both Germany and Greece, with a theoretical framework rooted in Green Theory, complemented by the principles of the Circular Economy.

Germany, regardless of being renowned for its strong environmental policies and commitment to sustainability and with a well-developed waste management system and a strong tradition of recycling, was still one of the primary exporters of recyclable materials to China. The country recognized the need for domestic investment in recycling infrastructure, which, while costly, ultimately served to reduce its reliance on export markets.

In the case of Greece, the nation faced unique challenges in waste management due to its limited domestic recycling infrastructure and practices. Before the ban, Greece was heavily reliant on exporting plastic waste, electronic waste, and paper materials. This dependency was driven, in part, by economic considerations, as exporting waste to China was often more cost-effective than developing extensive domestic recycling facilities.

The implementation of the Circular Economy principles, emphasizing a holistic approach to resource management, has played a pivotal role in the waste management strategies of both Germany and Greece post-Chinese ban, presenting itself as a viable method in contrast with the linear economy, which is a wasteful paradigm due to its "take-make-waste" strategy in which raw resources are extracted to produce items that are then discarded by end users. The

Circular Economy paradigm on the contrary, promotes the idea that waste should be minimized, and materials should be continuously recycled, reused, and repurposed, ultimately reducing the strain on natural resources and minimizing environmental impact. Both countries have recognized the potential of the Circular Economy in reshaping their waste management practices and are actively working towards its integration.

The structure of this study is designed to provide a comprehensive analysis of the consequences of the Chinese import ban on waste materials and its subsequent impact on two European Union countries, namely Germany and Greece. The study employs a theoretical framework rooted in green theory to understand the environmental, economic, and policy implications of this ban.

The study begins by analyzing the consequences of the Chinese import ban on the global waste trade, highlighting shifts in waste management practices and international waste flows. It subsequently discusses the European Union legislation on waste shipment, shedding light on the legal framework governing waste transport within the EU.

The analysis then splits into two main sections, with a detailed examination of the impact of the import ban on both Germany and Greece. This includes an assessment of waste management practices and policy responses in each country. A comparative analysis will follow, elucidating the similarities and differences between these two case studies, offering insights into the broader European context.

The aim is to explore the multifaceted impact of the Chinese waste import ban on the waste management and shipment practices in Germany and Greece, with a specific focus on how Green Theory and Circular Economy principles have influenced these changes. By examining the strategies, challenges, and successes of these two countries in the post-ban era, we can gain valuable insights into the global shift towards more sustainable waste management practices. It is an opportunity to understand how even in the face of challenges, environmental sustainability can be at the forefront of waste management strategies, driving innovation and transformation in this critical field.

2. Theoretical Framework

The investigation will aim at understanding the case of Germany and Greece waste shipment and domestic waste management adjustments after the Chinese ban of 2018, by bearing in mind the Green theory perspective in order to assess which case has been more successful in handling the ban, which are the reasons behind it and which country was closer to implementing a sustainable system in the eyes of the Green Theory.

2.1 Methodology

Since there will be two European countries taken into consideration, the research will use a comparative study over the implementation process of the waste shipment of Germany and Greece, to assess which impact it had on the waste shipment of their own generated waste.

Comparative case studies examine two or more examples of case studies, which are an in-depth assessment of a particular situation, frequently conducted over time, such as a policy, program, intervention location, implementation method, or participant, in order to provide more generalizable information regarding causal problems, such as how and why specific programs or policies work or not. Comparative case studies are conducted across time with an emphasis on comparison within and across settings (Goodrick, 2014).

This comparison will enable to assess their different national policies and show why certain policies or programs succeed or fail. The question of the thesis therefore will be: "*Which are the impacts of the Chinese waste ban on the waste shipment and management of cardboard, plastic, paper and electronic waste in Germany and Greece and which actions were taken by each country to face the change*?"

The purpose of the evaluation is to illustrate how context affects an intervention's success and to demonstrate how to better customize the intervention to the unique environment to achieve desired objectives.

The decision to study Germany and Greece has several reasons. In the first place, Germany and Greece have different waste management systems: while Germany is known for its efficient recycling and waste separation practices, Greece has faced challenges in waste management. Comparing these two countries can provide insights into how different systems respond to the ban and which were the policies and strategies used to mitigate its effects.

The second reason is the belonging of both nations to the European Union: understanding how EU member states adapt to the ban can offer a broader perspective on how regional policy and collaboration influence the impact of such bans.

Finally, Germany's strong environmental regulations and sustainability efforts can be compared to Greece's potential environmental challenges in managing waste, shedding light on the effectiveness of the ban in reducing environmental harm.

The type of waste that will be taken into consideration is plastics, paper, cardboard, and electronic waste, since it's the type of waste that both countries were shipping to China and the ones that were mostly impacted by the ban.

Unfortunately, there is not a clearly identifiable 'Green' methodology, therefore I will be taking into consideration the implementation of the Circular Economy principles in waste management in each country, since it should aim to increase sustainability from a holistic system approach by minimizing waste and making the most efficient use of resources by reusing, recycling and repurposing materials and products. Its approach reduces the environmental impact of production and consumption, which is a core goal of Green Theory.

The Circular Economy promotes the following principles of the Green Theory: resource efficiency to reduce the need for extracting and processing new raw materials, waste reduction by designing products that can be easily disassembled, repaired and recycled in order to reduce landfills and incineration, environmental conservation by keeping products and materials in use for longer periods and reducing the need for constant production and the economic sustainability. A more Circular Economy may boost resource security, decrease reliance on imports, minimize material prices and price volatility, and provide new economic possibilities. By using the Green Theory framework, the dissertation will also look into the flows that it might have in respecting its principles.

The hypothesis is: *Greece faced more challenges on waste shipment after the Chinese ban because the Circular Economy is not implemented at the same level as Germany's.*

In order to test this hypothesis, the data taken into consideration will cover the years from 2012 to 2021, in order to study trends in waste shipment and management before and after the ban, and will include the following: waste generation data for cardboard, paper, plastic and e-waste generated in both Germany and Greece, waste recycling rates per material, export statistics before and after the ban, environmental impact such as landfill usage, legislation and policies implemented in response to the ban and their alignment with the Green Theory, waste management infrastructure and capacity to handle increase waste volumes and finally Circular Economy initiatives for cardboard, paper, plastic and e-waste.

The following section will give insights on the main principles of the Green Theory, which will be the theoretical framework for this study.

2.2 Green Theory

From the middle of the 1970s onward, green politics, that studies the global political processes and normative aspirations for the reorganization of world politics, became a prominent political force in many nations (Walewics, 2018).

First, it's vital to draw a difference between environmentalism and green politics. Environmentalists generally accept the framework of the current political, social, economic, and normative structures of international politics and work to mitigate environmental issues within those structures, whereas Greens argue that those structures are the primary cause of the environmental crisis and as such, need to be contested and transcended (Paterson, 2005).

The three main pillars of the Green Theory are decentralization of authority, growth restrictions and ecocentric ethics, with the last one being the distinguishing trait, according to Eckersley (1992).

The four primary ethical characteristics of ecocentrism, namely resource conservation, human welfare ecology, preservationism, and animal emancipation, jointly set it apart from other alternative environmental ethical viewpoints (Paterson, 2005). In contrast to merely narrow, instrumental economic interests in resource usage, it acknowledges the complete spectrum of human interests in the non-human environment, the rights of the non-human community, the concerns of both human and non-human future generations and finally, it adopts a holistic approach, placing equal significance on populations, species, ecosystems, and the ecosphere as a whole as it does on individual animals (Paterson, 2005).

Ecocentrism is the rejection of an anthropocentric worldview, which is human-centred and focuses moral worth exclusively on people, considering them to be the sole beings with inherent rights and making them superior to the rest of the natural world (Andrew & Norva, 2021). While anthropocentrism displays itself by emphasizing human well-being and prosperity and considering nature as an object, ecocentrism states that every entity has some degree of relative autonomy within the ecological interactions in which it is entrenched and humans are not allowed to rule the rest of nature (Eckerseley, 1992).

Many indigenous civilizations, including the Maori of New Zealand, have origins in ecocentrism. As a result, nature and rivers are seen as an important element of the community's identity, with a certain duty to maintain and promote nature. In 2017, a Maori group was essential in awarding the Whanganui River legal personhood (Kramm, 2020).

The second pillar is the growth restrictions: according to the Green Theory, the current environmental disaster is mostly the result of the exponential economic expansion that has occurred over the previous 200 years (Paterson, 2005). The globe was fast running out of

resources to feed people or to supply raw materials for further industrial expansion as a result of exponential growth. Dobson (1990) contends that three points are crucial in this case. First, technology won't work; while they could delay the disaster, they can't stop it from happening eventually. Second, because development is exponential, "dangers accumulated over a relatively long period of time can very suddenly have a catastrophic effect." (Dobson, 1990). Finally, the issues brought on by expansion are all interconnected. Dealing with them separately will have significant knock-on consequences from problem to problem; addressing a single pollution issue may only result in a change in the medium through which pollution is transported, rather than a reduction in pollution as a whole (Dobson, 1990).

Decentralism is the third pillar and argues that the nation-state is both too big and too tiny to deal with sustainability effectively, therefore new regional and global institutions (along with decentralization within the state) are needed to coordinate efficient responses (O'Riordan, 1981). 'Think globally, act locally' is one of the most well-known Green political catchphrases (Paterson, 2005).

Eckersley (1992) contends that in order to practice ecocentrism, authority must be simultaneously decentralized at the local level and centralized at the regional and global levels (Eckerseley, 1992). According to O'Riordan (1981), the strategy most in line with ecocentrism is a "multitiered" political structure that distributes authority up to the regional and global levels and down to local communities (O'Riordan, 1981).

Green politics place special emphasis on human-nature relationships and the adoption of an ecocentric ethic with regard to those relationships, on growth constraints, on the negative effects of development, and on decentralization away from the nation-state (Paterson, 2005).

The goal of Green Theory in international relations is to explain the ecological crisis that humanity is currently experiencing, to focus on that crisis as potentially the most significant issue for human societies to face, and to provide a normative basis for dealing with it (Walewics, 2018).

3. Waste shipment practices and their impact

The triple danger of pollution, climate change, and biodiversity loss is mostly caused by the unsustainable production, consumption, and disposal of the world's resources, that are constantly harvested, used, and eventually wasted in a linear process of production and consumption that underpins the world economy.

Over 90% of the 100 billion tonnes of resources used annually are finally disposed of in landfills or burned. The extraction and processing of resources alone are responsible for 50% of all carbon emissions and 95% of all terrestrial biodiversity loss, making this exceedingly inefficient method of resource utilization the main cause of pollution, climate change, and biodiversity loss (Barrie, et al., 2022). Consequently, it is essential to modify the way mankind uses natural resources on a systemic level.

The numerous strategies for managing and disposing of waste are referred to as waste management and include discarding, destroying, processing, recycling, reusing and regulating wastes. The main goal is to limit the amount of worthless items while also avoiding potential health and environmental risks (Barrie et al., 2022).

Waste management is a key factor in today's society, which is characterized by an important growth in population and therefore in the generation of waste. Moreover, the increase in waste is affecting the lives of many people, when not correctly disposed of.

Since the 1990s, global waste and scrap trade has exploded, with the majority of it flowing into developing countries, since "purchasing" waste is less expensive than basic materials and simpler to obtain in a scenario where resources and technological capability are constrained. On the other hand, countries that "sell" waste, avoid strict waste disposal restrictions and onerous compliance expenses by exporting it to nations with low environmental regulations (Trang et al., 2021).

Consequently, high-income nations with strict waste disposal laws have a tendency to ship lower-value waste abroad, typically to low- or middle- income nations with cheaper labour costs and less strict environmental laws and, consequently, lower compliance costs (Barrie et al., 2022).

With the majority of resource consumption and wealth accumulation taking place in the Global North and the greatest environmental effects and hazards to human health occurring in the Global South, this linear model is also a substantial contributor to social inequality. These problems are made worse by rising geopolitical tension and the potential for more global supply-chain shocks and disruptions (Trang et al., 2021).

As a result, wealthier countries such as member states of the European Union, that possess better waste management infrastructures, are transferring waste to poorer countries that have lower rates of recycling and less structures to manage their own produced waste. The main issue is that there is no international criteria for classifying nations with enough waste infrastructures (Brooks et al., 2018).

Waste trade across international borders uses a global network of facilities in order to resource, recover and dispose of leftover wastes. Even though these trades mostly include non-hazardous waste fractions for material recycling and energy recovery, there is also the transport of certain particular waste categories across international boundaries, either for safe disposal such as waste incineration or landfilling or for special treatment, such as radioactive and other hazardous wastes (Parajuly & Fitzpatrick, 2020).

The two main non-hazardous waste streams that cross international borders are paper and plastic, which together accounted for 8–10 million metric tons (Mt) in 2005 and were mostly destined for the Far East (Parajuly & Fitzpatrick, 2020). Every year between 2010 and 2014, the EU sent non-hazardous waste worth up to €10 billion to nations outside the OECD (Parajuly & Fitzpatrick, 2020).

Within all the waste shipment that takes place, also significant volumes of illicit waste are shipped over European borders and beyond, despite the existence of several prohibitions (Olley, 2021). Although the bulk of waste is transported lawfully for resource recovery, estimates show that 25% of total shipments do not follow the rules (Brooks et al., 2018).

The issue of illicit waste trafficking still causes major worry for stakeholders across the world, despite the fact that some of these rules have been reviewed and updated in recent years. Along with exposing populations to dangerous compounds, illicit waste disposal and trafficking is also linked to financial problems including tax fraud and money laundering (Olley, 2021).

Recently China, which in the last decades has been the world's largest solid waste importer for recovery, enacted numerous limitations and began to enforce stricter waste import limits on the importation of waste, specifically plastic and packaging, metal scraps, e-waste and textiles, due to its inadequate waste management and growing waste smuggling. Until the enforcement of the ban in 2018, more than 85% of the plastic collected in the EU was going to China, which saw a chance for industrial progress, but at the price of the environment (D'amato et al., 2019).

The change shocked the world's waste economy, particularly the main exporters of waste from western nations, which were forced to find new homes for their massive volumes of

waste. This exercise revealed the weakness of the global reliance on a single importer for waste trading.

To assist with these issues, a shift to an inclusive Circular Economy is necessary, aiming to achieve complete decoupling between resource consumption, environmental effect and human and economic progress. This is accomplished by reducing, looping, and slowing down the flow of resources through the economic system, while also renewing the environment and eliminating toxicity. An inclusive Circular Economy may positively and significantly impact human development, poverty reduction, and global well-being by putting equal emphasis on environmental concerns, human needs, sustainable livelihoods, decent employment and social justice.

4. The consequences of the Chinese import ban

Over the previous two decades, China has seen unprecedented industrial and infrastructure growth, thanks to being the world's largest solid waste importer for recovery: since 1992 and prior to 2018, China imported more than 7 million tones of plastic, accounting for over 45% of all global cumulative imports, since its emerging markets could produce more goods for sale and export by importing plastic waste from other countries. Packaging waste, metal scraps, plastics, and e-waste are a few of the waste streams that have been sent to China from across the world. (Brooks et al., 2018).

Waste shipment from the European Union grew importantly in the last years and in fact half of the plastic waste collected in the EU is exported. Until 2018, more than 85 per cent of it was destined to China, which saw an opportunity for industrial growth (D'amato et al., 2019).

China has been the final destination for plastic, metal scraps and paper waste exported from other OECD nations, with the United States, Canada, and Japan serving as the main exporters. China took in half of the world's plastic waste, which rose from 6 Mt to 9 Mt between 2006 and 2012 (Trang et al., 2021). However, this uncontrolled increase of waste import has led in major environmental issues such as desertification, water scarcity, land degradation, biodiversity loss, and pollution (Ogunmakinde, 2019). Several writers have identified significant health, social, and environmental difficulties as a result of intensive industry, urbanization, shifting consumer habits, and population expansion.

The Circular Economy idea was recognized as one feasible solution for sustainable development: it was proposed and submitted to the federal government in 1998, and it was accepted in 2002, when an ambitious program for its successful implementation was established. It has since been refined and adopted as a national policy in order to achieve sustainable development (Ogunmakinde, 2019). China's Circular Economy legislation "is the world's first national law proclaiming an economy model different from the mainstream linear "raw materials in" at one end and "waste out" at the other end—a model that still implicitly dominates mainstream economics, as if our resources did not have limits" (Ogunmakinde, 2019).

Following this change, China implemented various restrictions and started to enforce more stringent waste import rules on the imports of waste, due to its poor management of waste and increased waste smuggling (Brooks et al., 2018). In 2013 the country introduced the operation called Green Fence, which imposed a temporary ban on waste imports that

needed much less contamination. The goal was to improve the quality of the plastic waste that China was receiving, while also reducing illegal foreign smuggling and trading of hazardous waste (Brooks et al., 2018).

In July 2017, the Chinese government informed the World Trade Organization of its intention to impose prohibitions on 24 different waste streams, enacting a new regulation called National Sword, which entered in force in January 2018 and prohibited the importation of most low quality plastic waste, paper and textiles. Their aim is to reach a level of zero import of solid waste, since a large part of it was usually mixed with dirty or hazardous wastes, which challenged the recycling process and endangered China's environment (Trang, et al., 2021).

In 2019, the government added 16 more waste categories (such as combined metal scrap, plastic waste from industrial sources, electronic waste, etc.) to the ban and also imposed to 46 cities to sort waste in order to increase the domestic recycling rate (D'amato et al., 2019).

The shift caused a shock to the global waste trade and finally demonstrated the vulnerability of the worldwide reliance concerning waste trade on a single importer (Trang, et al., 2021). Directly impacted by the Ban were China's waste management and recycling industries. In order to entirely halt the inbound flow of the prohibited waste streams, waste importers have been subject to crackdowns since the ban, which started across the nation. Waste firms often relocated to other nations or stopped operating completely when faced with stronger controls. Many communities had to shut down their material recycling operations and transfer the recyclable fractions to a landfill or an incinerator due to the rising expense of processing domestic waste, which raised concerns about pollution (Wen et el., 2021).

The Ban's effects outside of China, however, have been felt on a considerably bigger scale overall, mainly on the primary exporters of plastic waste as well as other Asian nations that were now the new destinations. In the first two months following the ban, compared to the prior year, waste shipment from the EU to China decreased by 96%, but, regardless of the fact that the European Union started decreasing its waste exports to non OECD countries already in 2014, making intra-EU exports of waste greater than the extra-EU ones, European nations are still dealing with comparable difficulties, such as the lack of recycling capacity since the created waste cannot be handled by the waste recycling industry's technological capability, which leads them to ship their waste to other countries. (D'amato, et al., 2019).

In fact, following the ban, a significant amount of waste was sent to other Asian nations such as Malaysia and Vietnam, which are currently importing high amounts of plastic waste hoping to enjoy the same economic growth and benefits that China did. Unfortunately,

because of their initial stage of waste management and because the infrastructure in these new destinations is insufficient to deal with the sharp increase in incoming waste streams, they are facing obstacles in managing waste sustainably (D'amato et al., 2019). Additionally, due to the lack of environmental restrictions, potentially hazardous waste streams that were smuggled into other nations in the form of recyclable plastic waste grew (Olley, 2021).

The European Union's standards state that recovery operations of traded waste must face the same conditions and regulations as those within the EU, but it is highly probable that part of the amount of waste sent for recycling will be in the end landfilled, dumped or burned in illegal ways (D'amato et al., 2019). As a matter of fact, landfilling of hazardous waste exported by EU Member States rocketed between 2001 and 2019, resulting in 698000 tonnes in 2017 before decreasing to 537000 tonnes in 2019 (Eurostat, 2020).

The ban has highlighted different key points. In the first place, the waste recycling sector's vulnerability in the absence of effective and lucrative recycling infrastructure in the EU and how the export of secondary resources is necessary to meet the EU's ambitious recycling goals (Wen, et al., 2021).

Secondly, The Chinese ban case showed how policy effects can transcend national boundaries, giving the fact that the recently introduced policy appears to be having a bigger influence on Europe than the long-standing Waste Shipment Regulation (Wen, et al., 2021).

The ban did, however, have some positive effects, including the advantages of dealing with residual waste (in terms of impacts on public health and the local environment), the promotion of legally compliant waste management industries, the establishment of waste separation and recycling systems and the anticipated growth of the domestic recycling industry (Wen, et al., 2021).

5. EU Waste Framework Directive and waste shipment regulations

The European Union establishes waste management roles and objectives for each member state.

The Waste Framework Directive (WFD) of the European Union sets specific target goals to guide waste management practices and promote a more sustainable approach to handling waste. These target goals include: waste prevention targets, recycling and recovery targets, landfill diversion targets, hazardous waste targets, extended producer responsibility (EPR) targets, separate collection targets, preparation for reuse targets, data reporting targets.

These target goals are designed to create a framework for sustainable waste management practices across the European Union, promoting waste prevention, resource efficiency, and the reduction of environmental impacts. They serve as benchmarks to track and assess the progress of member states in meeting their waste management obligations under the Waste Framework Directive and related EU waste legislation. Meeting these targets contributes to the Circular Economy and to a reduced environmental footprint associated with waste disposal.

Article 4 of the updated EU Waste Framework Directive (Directive 2008/98/EC) establishes a "waste hierarchy" comprising five processes for dealing with waste. It is ordered according to its impact on the environment and it prioritizes avoiding waste from being created in the first place. When waste is generated, it prioritizes re-use, recycling, alternative recovery (such as energy recovery), and disposal (landfill after pre-treatment), in declining order of environmental preference (Trenyik, 2015).

Important requirements in the Waste Framework Directive pertaining to municipal waste are that Member States take measures to promote high quality recycling and, to that end, establish separate waste collections where it is technically, environmentally, and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors.

By 2015, separate collections for at least the following materials had to be established: paper, metal, plastic, and glass. By 2020, the re-use and recycling of waste materials such as at least paper, metal, plastic, and glass from households, and possibly from other sources if these waste streams are similar to waste from households, had to be increased to a minimum of 50% by weight (2008/98/EC, 2008).

The Waste Framework Directive also mandated that, by 31 December 2014, the Commission assess the measures and objectives, strengthening them if required and possibly

setting targets for further waste streams (2008/98/EC, 2008). Consequently, in the summer of 2014, the European Council examined the laws and recycling targets under the EU Waste Framework Directive, the Landfill Directive, and the Packaging Waste Directive.

As a result, new aspects and goals were established. The concept is part of the Circular Economy philosophy and argues that in 2011, 500 million tons of waste were burnt or landfilled in the EU that might have been recycled or repurposed. Recycling that amount would boost resource efficiency and lead to a Circular Economy. It has also been stated multiple times that there are significant differences in waste management between member states (Trenyik, 2015).

For paper and cardboard waste, The Waste Framework Directive (2008/98/EC) and the Packaging and Packaging Waste Directive (94/62/EC) set general targets for recycling and recovery. These directives aim to ensure that a significant portion of paper and cardboard packaging waste is recycled and recovered rather than being sent to landfills or incinerated. The specific targets for paper and cardboard waste recycling and recovery can vary by EU member state, as they have some flexibility in setting their own targets. These targets typically depend on historical performance and infrastructure.

Speaking of plastic waste, The Single-Use Plastics Directive (2019/904/EU) sets specific targets for the reduction of single-use plastic products and plastic waste prevention, recycling, and recovery. These targets are designed to reduce plastic litter and promote a circular economy for plastics.

The Plastic Waste Directive (2018/851/EU) includes recycling and recovery targets for plastic packaging waste. By 2030, it aims for at least 55% of plastic packaging to be recycled. The Packaging and Packaging Waste Directive also includes specific recycling targets for plastic packaging materials. The EU's Plastics Strategy, adopted in 2018, outlines broader goals for plastic waste reduction and increased recycling and sets the stage for subsequent directives and regulations.

Finally, concerning the e-waste (Waste Electrical and Electronic Equipment - WEEE), the WEEE Directive (2012/19/EU) sets specific targets for the collection, treatment, and recycling of electronic waste, such as computers, mobile phones, and other electronic devices. Member states are required to collect a certain percentage of the average weight of electronic and electrical equipment placed on the market in the three previous years. The directive aims at increasing the collection rate over time to ensure that more electronic waste is properly treated and recycled.

The waste trade is regulated at the EU level by the Waste Shipment Regulation (Regulation EC No 1013) of 2006, which applies to shipments of waste between member states and to imported and exported waste between the EU and third countries, while internationally, it is regulated by the Decision on the Control of Transboundary Movements of Wastes Destined for Recovery Operations (OECD/LEGAL/0266), and by the Basel Convention of 1992, that controls the transboundary movements and disposal of hazardous waste (Jofra Sora, 2013).

5.1 The Basel Convention

In 1993, the Basel Convention became effective for regulating the transboundary movement of hazardous wastes and their disposal with the goal of safeguarding the environment and human health from the negative consequences of the production, transboundary transport, and management of hazardous wastes. It is currently the broadest worldwide environmental agreement on hazardous wastes and other pollutants.

The agreement obliges its parties to manage and dispose of such wastes in an ecologically responsible way and to reduce the amount of waste that is shipped by processing and disposing of the wastes as close as feasible to where they were produced and by avoiding or reducing waste formation at the source. In addition, signatories should ensure that the waste shipped is managed in an environmentally sound manner in order to protect the environment and human health from the harmful effects of hazardous wastes (Mutschler, 2022).

Signatories therefore have several general obligations of the convention. First of all, they cannot export or import hazardous wastes or other wastes to or from a non-signatory state and every export of waste needs prior consent from the receiving country following the notification form raised by the exporter, in order to allow time for a full acknowledgment and evaluation of the environmental and human health effects of the waste that it's being shipped. The notification used is called Previous Informed Consent (PIC), which calls for exporters of specific types of waste—mostly hazardous waste—to obtain prior approval from the national environmental agency in the receiving country (Mutschler, 2022).

Second, only international movements of wastes that do not hold any danger in regard to their movement and disposal are permitted and finally, each shipment needs to be accompanied by a movement document that tracks the travelling route and ensure compliance to the international rules (Mutschler, 2022).

Furthermore, under the Basel Convention, illicit waste shipments can be sent back at the exporting country's expense if they are discovered by the destination country's customs authorities (Mutschler, 2022).

The Basel Convention has undergone two significant recent amendments: first, the Ban Amendment, which took effect in December 2019 and forbade the export of hazardous waste from developed nations to developing ones; and second, the more recent Plastic Waste Amendments, which took effect in January 2021 and mandated that the majority of trade in plastic waste must be regulated using PIC (Mutschler, 2022).

While paper and cardboard is not taken into consideration by the Basel Convention due to its non hazardousness, the convention distinguishes between hazardous plastic waste and non-hazardous plastic waste based on specific characteristics and classifications such as toxicity of the plastic material, ignitability, corrosivity and reactivity when in contact with other substances. Plastic waste that does not exhibit any of these hazardous characteristics is generally considered non-hazardous and is not subject to the Basel Convention's hazardous waste regulations (Barrie et al., 2022).

The Basel Convention also recognizes that certain electronic waste materials can contain hazardous substances and pose environmental and health risks, and it provides regulatory measures to control the transboundary movement of such waste. The Basel Convention defines e-waste as "wastes generated from the discard of electrical and electronic equipment," and it may include items like computers, mobile phones, televisions, and various other electronic devices. Some electronic waste may be classified as hazardous waste, primarily due to the presence of hazardous materials such as heavy metals, PCBs (polychlorinated biphenyls), and other toxic substances (Mutschler, 2022).

Key aspects related to e-waste within the Basel Convention include: establishment of procedures and requirements for the transboundary movement of e-waste to ensure that such movements are conducted in an environmentally sound and legally compliant manner, Prior Informed Consent (PIC) Procedure and Environmentally Sound Management (ESM), which is the promotion of environmentally sound management of e-waste, including the collection, transportation, treatment, and disposal of electronic waste materials. It provides guidelines for the safe handling and disposal of hazardous components found in e-waste.

Unfortunately, the Basel Convention has its limits. For example, there is still ambiguity on the distinction between used and waste electrical and electronic equipment (UEEE and WEEE): according to the most recent standards for used electrical and electronic equipment, "used equipment is not considered as waste, if the equipment is destined for failure analysis,

for repair and refurbishment, with intention of extended reuse." The rules further provide that parties have the right to forbid the export or import of old machinery intended for failure analysis or repair (Wen et al., 2021).

Due to this ambiguity, used goods have frequently been shipped to developing nations with the purported intention of being sold for reuse, but the majority of the shipment's contents have since been determined to be unsuitable for reuse and marked for disposal. This adds to the burden on waste management services in recipient nations, many of which lack the specialized infrastructure needed to appropriately dispose of certain products. Additionally, this lack of clarity makes it challenging for border authorities to carry out required Conformity Assessment Procedures (CAPs), in order to check goods, services, or systems to confirm compliance with pertinent laws and standards (Barrie et al. 2022).

Furthermore, despite the agreement's annexes outlining what constitutes hazardous and other waste, parties to the convention are free to define new wastes as hazardous under their national laws. Parties may additionally include any requirements for the transboundary transfer of certain domestically specified hazardous wastes in national laws. As a result, there may be considerable differences in how different countries classify hazardous waste, non-hazardous waste, and non-waste commodities intended for reuse, repair, and refurbishment (Mutschler, 2022).

Due to the patchwork of regulatory requirements, externalization of costs, lax enforcement of current laws, and low financial risk (due to inadequate regulatory mechanisms), it may be difficult to attract investment in high-quality repair, renovation, and recycling infrastructure needed to implement a Circular Economy and fair waste trade. This may also make it easier for illegal trade to occur (Olley, 2021).

Because of its flaws, ambiguous definitions, and lack of commitment from the USA, the third-largest waste exporter who signed the treaty but never ratified it, some claim the Basel treaty has failed to fulfill its purpose (Mutschler, 2022).

5.2 OECD Waste shipment regulation

The Organization for Economic Co-operation and Development (OECD) has developed guidelines and recommendations for the transboundary movements of various types of waste, including paper and cardboard waste, plastic and e-waste. These guidelines are intended to facilitate the environmentally sound management of waste and prevent environmental harm during waste shipments. While they are not legally binding, they provide a framework for

member countries to establish regulations and procedures for the transboundary movement of waste.

The OECD's guidance on the transboundary movements of waste namely paper, cardboard, plastic and electronic waste includes similar key points to the Basel Convention, such as the prevention of environmental harm and minimization of risks to human health resulting from the transboundary movement and disposal of waste, responsible recycling and treatment, environmentally sound management, the transparency and information cxchange which stresses the importance of transparency, documenting and information exchange between the parties involved in waste shipments and the Prior Notification and Consent, which advises the country of export (also called "notifying country") to notify the country of import (or "competent authority") before shipping paper and cardboard waste. The competent authority can then give or withhold its consent based on whether the shipment complies with relevant regulations and does not pose environmental or health risks (Velenturf & Purnell, 2021).

The guidelines recommend that waste shipments be in compliance with the environmental legislation of both the exporting and importing countries, as well as any applicable international agreements and conventions, such as the Basel Convention.

5.3 EU Waste Shipment Regulation

As seen in the previous subchapter, the EU Waste Framework Directive of 2008 sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery and enforces the principle of self-sufficiency and proximity, which requires member states to take appropriate measures in order to dispose and recover waste in the closest installation. However, given the lack of proper domestic post-collection treatment and recycling in Europe as well as China and other Asian nations' readiness to import waste, the international waste trade has been a viable alternative for dealing with the rising volume of waste (D'amato et al.,2019).

The EU Waste Shipment Regulation (WSR), which was first adopted in 2006, was primarily intended to curb the unchecked cross-border flows of waste. It carries out the Basel Convention's requirements, which forbid the export of hazardous waste to non-OECD nations, the export of waste for disposal and further implements the guidelines set out in the OECD decision in 2001, creating a system of control for waste shipments intended for recovery inside the OECD region.

The WSR lays the fundamental guidelines for regulating the transboundary movement of waste during transit and shipment between EU and non-EU nations. Stakeholders and contributors were consulted publicly as part of the process, including 25 industry associations, 18 Member State authorities, eleven individuals, 5 private enterprises, 3 nongovernmental organizations (NGOs), 2 public organizations, and 1 EEA country authority. With the intention of "strengthening the inspections and enforcement of the WSR in order to effectively prevent illegal waste shipments," a number of policy proposals were assessed based on this consultation. Each alternative's costs, advantages, and "how the option solves the problem" were taken into consideration when evaluating it (Trenyik, 2015).

Regrettably, the economic expenses took precedence over the environmental and social consequences. It was noted that the export of hazardous waste to non-OECD nations was an issue, but the effects of transboundary shipments in the recipient nations outside of the EU were not included in this evaluation of the EU's main waste export policy. The effects of waste crime were also not discussed, despite the fact that it was mentioned as a crucial concern (Parajuly & Fitzpatrick, 2020).

The regulation contains general information requirements (Art. 18) for waste streams intended for recovery (so-called "green" listed waste—non-hazardous waste such as paper and cardboard) and prior written notification and consent for waste intended for disposal and for recovery (so-called "amber" listed waste—hazardous wastes such as electronic devices).

Plastic waste, like many other waste types, is subject to individual assessment and classification based on its composition, characteristics, and potential environmental and health risks. If plastic waste is found to contain hazardous substances or exhibit hazardous properties, it may be classified as hazardous waste and subject to the provisions of the amber list, which includes more stringent controls and procedures.

The authorities often do not need to be notified in advance for the transportation of "green-listed" non-hazardous wastes throughout the EU and OECD, although there are still requirements for information (Ling Chen et al., 2021). National competent agencies and inspection services are in charge of controlling custom offices and waste shipping and in 2014, the rule (EU) No 660/2014 tightened inspection mechanisms for the shipment of waste (Maricut & Gradinaru, 2022).

Both the EU regulations and the Basel Convention try to limit waste flows across borders to non-OECD members by prohibiting the export of certain types of waste, such as waste for disposal, and requiring previous notifications for shipments of non-hazardous waste such as plastic. As per hazardous waste, its shipment is only possible if the non-OECD country has

clearly requested it. On the other hand, within the European Union and OECD countries, the waste shipment regulations are generally milder and actually enabled countries into continuing with this practice (Mutschler, 2022).

In 2015, the European Commission adopted the Action Plan for a Circular Economy, aimed at enabling intra-EU material recovery, reducing the export of EU waste to third countries and tackling illegal waste shipments. The action plan included 54 new measures that regulate goods from production and consumption, to waste management and the secondary raw material market. Furthermore, the five priority sectors where the transition should be accelerated—along the entire value chain—have been highlighted: plastic materials, food waste, critical raw materials, construction and demolition, biomass and biomatter (Barrie et al., 2022).

From this new perspective, shipping waste becomes a loss of materials and value. The pressure to decreasing waste export may encourage investment and innovation in the EU, resulting in the emergence of new economic prospects. Consequently, keeping waste within the EU market might minimize its worldwide environmental pressure by ensuring better environmental management under EU regulations. The waste hierarchy of the European Union states that the most favoured option is prevention, followed by minimisation, reuse, recycling, energy recovery and finally disposal (Barrie et al., 2022).

In addition, the Circular Economy introduced several measures to minimize landfilling and maximize recycling, including an increased recycling target for plastic packaging waste (D'amato et al., 2019). Landfilling is, nevertheless, the least advisable procedure in waste management, due to the problematic consequences that include decrease of landfill space and contamination of the environment, while recycling consumes less energy and has a considerable lower impact on the environment compared also to incineration (Brooks et al., 2018).

The EU is having more conversations on waste reduction, innovation, the Circular Economy, and closed loops as a result of China's unwillingness to accept the low-grade recyclables and in fact, in November 2021, the EU Commission developed a revised version of the Waste Shipment Regulation with the goal of raising environmental standards, safe practices, and increasing circularity within the EU (Barrie et al., 2022). This was done in accordance with the Circular Economy Action Plan and the Green Deal, with the last being a combination of policy efforts that seeks to put the EU on a green transitional route with the ultimate objective of achieving carbon neutrality by 2050. It supports the transformation of

the EU into a fair and prosperous society with a modern and competitive economy (Mutschler, 2022).

Since the EU is dependent on secondary materials and is vulnerable to disruptions in global value chains, the EU impact assessment identified three weaknesses in the current regulation that call for revision: (1) burdensome shipping within the EU; (2) insufficient protection of the environment and safety of export waste management to the same standard as in the EU; and (3) ineffective enforcement that permits the shipment of waste without a permit (Mutschler, 2022).

Exports to OECD nations will be "monitored" as they increase, and the European Commission has the authority to halt them in the event of poor waste management (EC, 2021). Companies in the EU must make sure that independent audits are conducted in these foreign waste facilities if they intend to export waste to other nations.

5.4 WEEE Directive

Because e-waste contains various heavy metals and organic compounds, poor recycling techniques can pollute the area's air, water, and land and therefore have a negative impact on wildlife and human health.

The Waste Electrical and Electronic Equipment (WEEE) Directive is a European Union directive that outlines key requirements for the proper management and disposal of electronic waste, including large and small household appliances, IT and telecommunications equipment, lighting equipment, electrical and electronic tools, toys, leisure and sports equipment, medical devices, monitoring and control instruments, and automatic dispensers. The directive aims to reduce the environmental and health impacts of electronic waste by promoting recycling, reusing, and the responsible disposal of electrical and electronic equipment (Papoikonomou et al., 2020).

There are different key points of the WEEE Directive. First the Producer Responsibility, which invests producers and manufacturers of electrical and electronic equipment of the responsibility for the entire lifecycle of their products, including collection, recycling, and environmentally sound disposal. Second, the treatment and recovery targets that each country must reach. Third, WEEE Collection and Recycling through collection points events where consumers can return their old electronic devices. Fourth, the directive includes restrictions on the use of hazardous substances in electrical and electronic equipment. Producers are required to phase out the use of certain chemicals, including lead, mercury, and flame retardants, to reduce the environmental and health impacts of electronic waste. Finally, member states are

required to establish national registers to track producers, equipment categories, and the quantities of electronic waste placed on the market (Papoikonomou et al., 2020).

The WEEE Directive also includes restrictions on the export of electronic waste outside the EU, particularly to countries without adequate facilities for environmentally sound treatment and recycling. This is aimed at preventing the dumping of electronic waste in developing countries.

On average, only 20% of the 50 Mt of electronic waste produced worldwide is collected and processed by the official system, leaving the majority to be handled by unofficial and criminal entities (Eurostat, 2020). Inadequate management of hazardous chemicals and inappropriate processing of e-waste, which results in losses of valuable resources, are the main problems associated with the transboundary e-waste movement. The informal recycling industry frequently processes waste streams that have been exported illegally, which also implies that players in the formal waste management industry in both the country of origin and the country of destination lose out on commercial prospects. Additionally, the informal waste processing methods are connected to problems with the environment and public health at the destination, which is frequently in developing and undeveloped nations (Mutschler, 2022).

The aim of transferring obsolete electronics from developed nations (mainly the USA and European nations) to developing nations, such as China and African nations, is sometimes expressed as reuse. However, not all of the sent materials may be reusable, despite the fact that many products are shipped as used items with some possibility for reuse. "A large portion of the unreported but collected WEEE may either be treated in the EU without due environmental care or illegally shipped to developing countries where parts of the valuable material are recycled in ways dangerous to the health and environment, or dumped" (Olley, 2021).

According to the revised WEEE Directive (2012/19/EU), Member States of the European Union must also ensure that shipments of used electrical and electronic equipment (EEE) believed to be WEEE are handled in accordance with the minimum requirements and monitor such shipments accordingly. The WEEE Directive has been a turning point in the management of e-waste in Europe and has made the collection and reporting of e-waste against the established objective easier. The general objective of decreasing the environmental effects of e-waste, which may be accomplished through better product design, as well as by reuse and waste reduction, has not been properly achieved, though (Mutschler, 2022).

Economic considerations, which determine a policy initiative's efficiency, frequently dominate the policy review process. The primary expenses associated with waste management also include administrative costs, expenditures for other stakeholders linked to collection and transportation, prices for treatment and disposal, and additional costs for control and reporting (Jofra Sora, 2013).

Both the WEEE Directive and the WSR have been evaluated with an emphasis on these expenses. Other factors, particularly those relating to the environment and society, weren't covered as thoroughly. Researchers have also expressed worry about how some techniques to impact assessment tend to prioritize more politically relevant economic considerations above environmental and social problems (Maricut & Gradinaru, 2022).

5.5 Circular Economy

Although the precise definition of Circular Economy is still up for debate, it could be defined as "an economy system which is characterized by principle of sustainable growth and depends less on depletion of natural resources than traditional economies through the mechanism of recycling the waste output of its system" (Ogunmakinde, 2019).

The Circular Economy's goal therefore is to regenerate natural systems by avoiding the use of non-renewable energy sources, preserve or enhance renewable resources (such as using renewable energy instead of fossil fuels or returning valuable nutrients to the soil to support natural ecosystems), and slow the rate of material flow through the economy (including by extending the lifetime of products through durable design), all while making sure that all materials flowing through the economy are reused (Berrie at al.,2022).

The COVID-19 pandemic and the extreme weather events have increased supply-chain volatility and exposure to shocks. As a result, business and multilateral organizations are increasingly seeing the Circular Economy as a strategy that can achieve environmental goals while minimizing exposure to and the impact of supply-chain shocks. The Sustainable Development Goals (SDGs) of the UN include the circular economy on a global scale (Wen et al., 2021).

Governments are also gradually incorporating the Circular Economy into their national plans in an effort to achieve their obligations under the 2015 Paris Climate Agreement. Recently, also regional and multinational partnerships have been formed to quicken the world's transition to a circular economy. These organizations include the Platform for Accelerating the Circular Economy (PACE), the Global Alliance for Resource Efficiency

and Circular Economy (GARECE), the Circular Economy Coalition for Latin America and the Caribbean (CECLAC), and the African Circular Economy Alliance (ACEA).

With the introduction of the Circular Economy Action Plan (CEAP), a comprehensive body of legislative and non-legislative measures aimed at boosting supply-chain competitiveness and resilience, the European Commission made the Circular Economy a fundamental pillar in its European Green Deal.

Any circular trade that supports initiatives for a Circular Economy at the local, national, and global levels is considered to be engaging in circular commerce. A comprehensive list of economic activities that have been determined to significantly contribute to the implementation of a circular economy has been published by the EU taxonomy for sustainable activities (D'amato et al.,2019).

There are different types of waste or used items that can play an important part in the circular trade: used goods for reuse, repair, remanufacturing or recycling, refurbished or remanufactured items or components, secondary raw materials and finally trade in waste, scrap and residues for recovery or valorisation (Barrie et al., 2022). All of these categories can include paper, cardboard, plastic and e-waste.

Used goods for reuse, repair, remanufacturing or recycling can be traded in three basic ways. They may be exchanged with the aim of being sold into a secondary market directly for reuse; they can be repaired, refurbished, or remanufactured or they can be recycled to recover secondary raw materials. Waste should be defined as a used item that cannot be recycled, reused, mended, or remanufactured (Barrie et al., 2022).

The exchange of used items in compliance with the aforementioned criteria has several positive effects on the economy, the environment, and society. The market for second hand furniture is anticipated to grow to a total value of $47 billion by 2025, offering an export potential to the main consumer nation (Barrie et al., 2022). Secondly, trading can provide people in secondary markets access to high-quality products that would otherwise be out of reach. An example is the export of second hand railcars from Japan, which, as a result of stringent local environmental restrictions and significant expenses associated with recycling and scrapping trains, started exporting their used railcars to many different destinations. The Indonesian city of Jakarta, which has acquired more than 1,500 old Japanese railcars by 2018, became one of the greatest beneficiaries of this trade, since the cost is less than a tenth of the cost of purchasing new railcars (Barrie et al., 2022).

Despite the advantages, there are times when used-goods trade might backfire, especially for middle- and low-income nations. First off, if done in large enough numbers, such

commerce runs the risk of saturating the local market with wasteful and polluting goods and it could also undermine domestic production of comparable items, which could cause a response from the recipient nation to tighter trade restrictions (D'amato et al.,2019). Second, even if the product could be fixed and resold on the open market, many product categories might still lead to a reduced lifespan, resulting in higher expenses for end-of-life disposal. Domestic waste disposal services and infrastructure are put under further strain as a consequence (D'amato et al.,2019).

The sale of refurbished or remanufactured items or components is the second trade flow that supports the circular economy. The core undergoes a number of phases during the remanufacturing process to make sure it adheres to the required product standards, including inspection, disassembly, part-replacement or refurbishing, cleaning, reassembly and testing.

This type of trade may provide the advantage of greater quality control if the products are made in accordance with applicable standards. By eliminating the need for the production of new items (and the associated energy, land, raw materials, and water needed to make them) and increasing the need for high-skilled employment, remanufacturing also promises to have a positive impact on the economy and the environment. Remanufacturing techniques, according to the OECD, are capable of reducing waste production by more than 80% and saving more than 50% on energy (Mutschler, 2022). When it comes to handling dangerous chemicals, remanufacturing also offers a secure method of closing the loop.

Despite these advantages, there are several obstacles to trading in refurbished and remanufactured items. The first is that there is a lack of information about the cross-border trade of remanufactured items since the majority of nations do not explicitly distinguish between new, refurbished, remanufactured, and second-hand goods (or waste and scrap). This results from a combination of a lack of understanding of the remanufacturing process, mistrust or a perception that the local economy is in danger. Because of this, remanufactured items are frequently seen by governments as being similar to used ones. As a result these items may be subject to high import tariffs or non-tariff trade restrictions including import bans, core export bans, and time-consuming administrative procedures. These obstacles make it difficult for remanufacturing facilities to function because they raise transaction expenses and transaction costs and can increase the unpredictability of the supply of cores (Berrie at al.,2022).

The third circular trade flow is the secondary raw materials, frequently referred to as materials that can replace or supplement the usage of new materials in the production process. One of the most prevalent material of this kind of commerce, both in terms of economic

worth and weight, is the transport of metals and textiles. Between 2004 and 2019, the EU's exports of secondary raw materials increased by 61%, accounting for more than one-third of total waste trade shipped from the EU (Berrie at al.,2022).

Trading makes it possible to export secondary raw materials and to aggregate them in high demand regions to optimize economies of scale, making the conversion of waste streams into secondary resources more lucrative. Given the slim profit margins and erratic market pricing related to the sale of secondary raw materials, maximizing economies of scale is crucial. In the event that there are shortages or price fluctuation with new counterparts, having consistent access to high-quality secondary raw materials can boost supply security (Barrie et al., 2022).

The fourth and final circular trade flow is the trade in waste, scrap and residues for recovery or valorisation. Making the difference between hazardous and non-hazardous waste is crucial. When following the tight guidelines of the Basel Convention, hazardous waste should typically be handled locally. However, traded waste products continue to be incredibly varied, making regulation of them challenging.

Between 2000 and 2020, the worldwide trade in waste, scrap, and residues expanded from $90 billion to $294 billion (Mutschler, 2022). It is still unknown, nevertheless, how much waste that is traded internationally gets recycled versus down cycled (i.e., of lower quality and value), particularly waste that is meant for energy recovery. It is also challenging to quantify the amount of non-hazardous waste traded for recovery that is really collected as opposed to that that is burned or ends up in a landfill.

In addition to the previous mentioned pros and cons of the Circular Economy, the existing Harmonized System (HS) used by the World Customs Organization, which is a logical system for classifying commodities that is utilized by customs officials all around the world to correctly identify goods and determine which tariff lines and rules apply, is unfortunately insufficient because it makes it difficult for merchants to distinguish between the many types of used items, leading to a gray area and the "misdeclaration" of used goods (Barrie et al., 2022).

However, since 2013, there have been initiatives to improve the connections between the HS codes and the lists described in the Basel Convention. This would increase the effectiveness of trade in circular trade flows and the level of detail in the data gathering on shipments of global waste (Berrie et al.,2022).

If done well, global trade will be crucial for an inclusive Circular Economy to be realized. The trade should not only be based on reciprocal financial gains, but also on balancing of

environmental liabilities since there is often a disparity in the strength of environmental regulations between waste exporters and importers. The trade should also take into consideration that high quantities of used items can also overwhelm local waste management systems and harm local industry by flooding secondary markets. (Mutschler, 2022).

Although linear flows still predominate, circular trade is an intricate and expanding part of overall world trade. For instance, between 2000 and 2019, the value of trade in used products, secondary raw materials, and waste for recovery increased by more than 230%, whereas the value of export trade in all items increased by around 195% over the same time period (Ogunmakinde, 2019).

The value collected via circular trade flows is now distributed very unevenly, with the Global North continuing to hold the majority of the value. Growing geopolitical tendencies, such economic nationalism and deglobalization, will probably push nations to prioritize resource security in their circular strategies rather than global sustainability goals. The ensuing measures will unavoidably have an influence on other nations and exacerbate existing disparities, with ripple effects along global value chains.

6. Germany

6.1 Waste management

Germany is a Federal Republic consisting of sixteen Federal States (Bundesländer) and throughout the years, it implemented a multi-tiered regulatory framework where responsibility for waste management and environmental protection is shared between the national government, the federal states and local authorities. The government holds districts accountable for meeting waste management targets, therefore they must make preparations in their own region and population and demonstrate the results. They also determine the service fees (Trenyik, 2015).

Between 1974 and 1978, Germany had significant oil crises and recession, prompting economic diversification. As a result, more environmental difficulties arose, and the first waste regulation to safeguard the environment from further damage was discussed in 1971, when the Federal government devised a comprehensive action plan and environmental program based on the guiding concepts of precautionary environmental protection, causal responsibility, and cooperation, which resulted in the 1972 Waste Disposal Act. Between 1978 to the end of the 1980s, there was a high level of concern about proper waste management, including collection techniques, sorting, and reuse choices (Trenyik, 2015).

The German Packaging Ordinance (Verpackungsverordnung) implemented in 1991, which guided the 1994 Packaging and Packaging Waste Directive, has been changed several times in recent years. It includes requirements obliging producers and distributors to receive back used packaging in order to reduce municipal waste. To achieve this requirement, shops might engage in a system for collecting and recycling packaging materials (Nelles et al., 2016).

In 1994, a sustainable development model was introduced into the German constitution, and in 1998, it was included into the regional planning legislation and building code. This was a result of the government's dedication to conserving natural resources, protecting the environment, reducing soil sealing, conserving biological variety, and promoting resource sustainability. These laws laid the groundwork for the transition to circularity (Nelles et al., 2016)..

The German parliament approved the Circular Economy law in 1996, with the goal of reducing land for waste disposal through waste hierarchy avoidance and closed-loop recycling. It also distributes product responsibility to manufacturers, requiring them to design their goods to minimize waste, assure waste recovery, and reuse both in manufacturing and

usage. Based on this approach, Germany might be seen as a resource recovery role model (Nelles et al., 2016)..

Several laws, policies, and regulations have been put in place to safeguard the circularity of materials. For example, all outdated electrical and electronic appliances must be returned, and manufacturers must accept them free of charge beginning in March 2006 thanks to the Electrical and Electronic Equipment Act 2006 (Trenyik, 2015).

Similarly, waste cannot be landfilled without pre-treatment from June 1, 2005. Incineration facilities or mechanical-biological treatment plants are used for pre-treatment. Waste must be processed in order for it not to decay within a landfill: recoverable elements must be separated, and waste energy must be used. This way, landfills do not longer emit landfill gas, which contains methane and carbon dioxide and cause damage to the climate, including groundwater which absorbs harmful leachate. The goal was supporting the entire phase out of landfills by 2020 and improving waste recycling and reuse, with The Waste Storage Ordinance 2005. Around 50% of waste is recycled, and no municipal waste has been disposed of in a landfill since 2009 (Trenyik, 2015). Over the past five years, the overall landfilling rate of Germany remained slightly below 1 % (Eurostat, 2020).

In Germany, around 70 waste incineration plants with a capacity of 20 million tons are available for the treatment of residual waste. Furthermore, 30 refuse-derived fuel power plants have incineration capabilities of 4.6 million tons (Trenyik, 2015).

In order to comply with European Union criteria, including greater environmental, climate, and resource preservation, the German Circular Economy and waste regulations were amended and expanded in 2012 with the Circular Economy Act (“kreislaufwirtschaftgesetz KrWG”) and the Amended renewable energies act 2017 (Trenyik, 2015).

Waste management regulations have undergone significant changes in Germany concerning plastic, e-waste, paper and cardboard waste, particularly in the wake of the Chinese ban on imports of these materials in 2018.

6.1.1 Paper and cardboard

Germany was known for its advanced waste management systems, and the handling of paper and cardboard waste was no exception. The regulations in place before the Chinese ban focused on sustainability, recycling, and reducing the environmental impact of waste disposal. Paper and cardboard are collected mostly through separate door-to-door collection.

Before the ban, Germany had implemented already a good amount of regulations for the waste management of paper and cardboard. First, a cornerstone of Germany's waste

management strategy was the concept of Extended Producer Responsibility. Producers of paper and cardboard products were legally obligated to take responsibility for the recycling and proper disposal of their packaging materials. This 'cradle-to-cradle' approach aimed to minimize the environmental footprint of packaging. Second, Germany established ambitious recycling targets for paper and cardboard waste. The legislation mandated that a substantial percentage of these materials must be recycled, significantly reducing the need for landfills and incineration (Trenyik, 2015). Third, the country introduced a dual system for waste collection. Citizens use dedicated yellow bins to separate and dispose of packaging waste, including paper and cardboard. This system simplified the process of sorting and recycling these materials (Morlok et al., 2017). Fourth, to incentivize recycling and the return of packaging, Germany implemented a deposit system for beverage containers, which often consisted of paper and cardboard (European Environmental Agency, 2022). This encouraged consumers to return these containers for recycling. Fifth, the German legislation enforced strict quality standards for recycled paper and cardboard. This ensured that the recycled materials were of high quality and suitable for various applications, including the production of new packaging. Finally, invested in public awareness and education campaigns to inform citizens and businesses about the importance of proper paper and cardboard waste management. These efforts aimed to encourage responsible recycling practices.

In 1994, the Federal Environment Ministry of Germany has included an optional commitment to steadily raise the recycling rate of paper. Since 2001, Germany has attempted to keep the rate permanently at 80% (European Environmental Agency, 2022). This vow has been honoured to date, which is much appreciated from an environmental standpoint. As a result, the sector clearly meets its waste-related responsibilities for its goods. At the same time, this underscores the significance of waste paper recycling in the German paper manufacturing business, and it contributes significantly to reducing environmental consequences (Nelles et al., 2015).

After the Chinese ban on the import of various waste materials, Germany, like other countries, had to adapt and reshape its waste management strategies. Faced with reduced export opportunities, Germany made substantial investments in expanding its domestic recycling infrastructure. This included upgrading recycling facilities and developing more efficient methods for processing and recycling paper and cardboard waste. To mitigate the impact of the Chinese ban, Germany also worked on diversifying its export markets for recycled materials, reducing its dependence on a single country for waste disposal. This move was critical for ensuring a stable outlet for recycled paper and cardboard products. New

countries destinations for paper and cardboard include Thailand, Indonesia, India. The overall shipment of cardboard and paper waste has highly decreased in the last 5 years, passing from 630 tonnes shipped outside of the EU to 184 tonnes in 2021 (Eurostat, 2021). In addition, the country accelerated its transition toward a Circular Economy by putting more emphasis on reducing waste generation, promoting product durability, and increasing the use of recycled materials in manufacturing and also encouraged the development and use of eco-friendly packaging materials. This involved exploring alternatives to single-use packaging and investing in research to create more sustainable options. In conclusion, Germany also revised its waste management legislation. This included setting new recycling targets and exploring innovative approaches to reduce waste generation (Trenyik, 2015).

Germany's response to the Chinese ban showcased its commitment to sustainable waste management. By bolstering domestic recycling capabilities, diversifying export markets, and embracing a Circular Economy, the country continued to lead the way in environmental responsibility. The Chinese ban served as a catalyst for change, driving Germany to further refine its waste management practices and build a more resilient and eco-friendly system for the future.

Germany has already surpassed the 2025 target for paper and cardboard packaging with a result of 80.6% (European Environmental Agency, 2022). However, the overall packaging recycling rate (63.2%) is 1.8 percentage point lower than the target for 2025, therefore there are still some improvements that can be implemented (European Environmental Agency, 2022).

6.1.2 Plastic

Plastic, metals, and composite packaging waste (for example, beverage cartons) are often collected door-to-door in one container (yellow bin) or in plastic bags (yellow bag).

Recycling rates were very consistent between 2015 and 2018, and recycling objectives were already met. However, because of the new calculation standards, there is a considerable decline in recycling rates across all packaging waste streams in 2019. The country though, is not at risk of not meeting the goals by 2025 (European Environmental Agency, 2022).

Germany had an exemplary system in place for managing plastic waste even before the Chinese ban. Similarly to the paper and cardboard waste, the regulations in effect were designed to promote recycling, reduce plastic pollution, and minimize environmental impacts. The common regulations were the Extended Producer Responsibility (EPR), the recycling targets, the collection and sorting, the deposit systems and finally the awareness and

education. In addition, the country also implemented the Plastic Bag Regulation, which heavily regulates the use of single-use plastic bags. Many regions imposed bans or charges to discourage their use, thereby reducing plastic litter (Trenyik, 2015).

Germany responded with a series of legislative and practical changes to the Chinese ban on plastic waste imports in 2018: increased domestic recycling capacity, focused on Circular Economy and export market diversification, implemented the Single-Use Plastics Directive which restricts the use of certain single-use plastic products and encourages the use of sustainable alternatives, stricter packaging regulations to encourage producers to reduce excess packaging and opt for recyclable or biodegradable alternatives and finally the Extended Producer Responsibility Revisions that allowed Germany to adjust its regulations to hold manufacturers more accountable for their products' entire lifecycle, promoting eco-design and sustainable packaging (Trenyik, 2015). The shipment of plastic waste outside the European union halved, from 2018 with 571 tonnes shipped to 291 tonnes in 2021, with most of it being shipped to Turkey, Indonesia and Malaysia (Eurostat, 2021).

Also in this case, pre-ban regulations were characterized by a focus on recycling, extended producer responsibility, and stringent targets. Post-ban, the country adapted by enhancing domestic recycling capabilities, promoting the circular economy, and implementing stricter regulations on single-use plastics and packaging.

6.1.3 E-waste

Before the Chinese ban, Germany had comprehensive regulations governing the disposal and recycling of electronic waste. These regulations were designed to minimize the environmental impact, ensure responsible handling and promote recycling: the extended producer responsibility, collection and recycling networks, ambitious recycling targets, consumer awareness and finally hazardous substance restrictions, which strictly limited the use of hazardous substances in electronic products. This reduced the environmental and health risks associated with the disposal and recycling of e-waste (Trenyik, 2015).

The strategy in order to deal with the Chinese ban regarding the electronic waste is similar to the one adopted for cardboard, paper and plastic: expanding domestic recycling infrastructure, focus on Circular Economy, export market diversification and Extended Producer Responsibility enhancements. Regulations and incentives were also introduced to promote eco-design in electronic products, encouraging manufacturers to create more easily recyclable and sustainable devices to ensure the safe handling and disposal of hazardous

substances present in electronic products, further reducing environmental and health risks (Trenyik, 2015).

In conclusion, Germany's e-waste management regulations have evolved significantly before and after the Chinese ban. Pre-ban regulations were characterized by a focus on recycling, extended producer responsibility, and stringent targets. Post-ban, the country adapted by enhancing domestic recycling capabilities, promoting the circular economy, and implementing stricter regulations on hazardous substances and eco-design.

In terms of WEEE, the 2021 amendment to the Electrical and Electronic Equipment (EEE) Act (ElektroG) states that beginning on 30 June 2022, in addition to EEE distributors (sales area for electrical and electronic equipment of at least 400 m2), food distributors (total sales area of at least 800 m2) who offer electrical and electronic equipment several times per calendar year or permanently, must take back WEEE free of charge throughout the year (European Environmental Agency, 2022).

6.2 Circular Economy

The waste management strategy adopted in Germany during the last 20 years is based on closed cycles and allocates disposal duties to product makers and distributors. This has boosted public awareness of the importance of waste separation, resulting in the introduction of novel disposal methods and improved recycling capacity (Lagman-Bautista, 2020).

There are different signals of the Circular Economy in waste management in Germany after the Chinese ban: the investment in recycling infrastructure, which includes upgrading recycling facilities and increasing the capacity for sorting and processing recyclable materials, the resource efficiency promoting minimization of waste generation, the Extended Producer Responsibility, the promotion of sustainable packaging with a focus on reducing single-use and non-recyclable packaging materials and the continuous implementation of Circular Economy legislation (Velenturf & Purnell, 2021).

Closed cycle management is not only good for the environment, but it is also good for business. The waste management industry in Germany has evolved to be a significant and important economic sector, employing almost 200,000 people in approximately 3,000 businesses with an annual turnover of approximately 40 billion euros. Recycling and recovery methods help to increase resource efficiency in 15,000 systems. Recycling rates for municipal and commercial waste are roughly 60%, while construction and demolition waste is 90% (Trenyik, 2015).

The German waste management system is entirely funded by fees, no subsidies. The "polluter-pays" idea states that the producer must pay for waste treatment or disposal. Municipal and private waste management firms (waste collection, recovery, and disposal) are among the major players involved in waste management. Municipal waste management firms handle bio waste and residual waste (domestic waste), whereas private waste management companies handle waste recycling (domestic waste, trade waste, and commercial waste) (Trenyik, 2015).

The quantity of waste produced now is still far too excessive. To prevent waste from growing, further efforts toward resource efficient consumption are required, particularly in the sector of municipal waste (European Environmental Agency, 2022).

Germany has one of the greatest waste recovery rates in the world, demonstrating how the waste sector helps to sustainable economic production and management in the country by conserving raw resources and primary energy. The portion of waste that cannot be collected must be disposed of without endangering the environment or human health. Organic waste must always be mechanically-biologically or thermally treated to render it harmless, hence reducing drainage water leakages and landfill gas emissions.

6.2 PAYT scheme in Aschaffenburg

The pay as you throw scheme is an economic instruments that follows the "polluter pays" approach by charging local residents based on the quantity of residual, organic, and bulky waste they transfer to third-party waste management. When combined with well-developed infrastructure for collecting the various waste fractions (residual waste, paper and cardboard, plastics, bio waste, green cuttings, and many recyclables), as well as a high level of citizen awareness, its performance has frequently been linked to an increase in recyclables collection rates (Morlok et al., 2017).

Policies for waste management comprise a variety of complimentary measures such as regulatory, economic, educational, and informational tools. The goal of an economic instrument is to induce waste producers to redirect waste from landfill or incineration to material recovery, therefore optimizing resource usage while contributing to waste management service expenses. Waste disposal taxes, waste pricing, deposit refund schemes, extended producer responsibility, tradable permits and other economic instruments are implemented through national or regional waste policies. The majority of these actions are beyond the responsibility of municipal governments (Nelles et al., 2015).

The PAYT approach's technical execution is based on three pillars: identification of the waste source, measurement of the amount of waste transported for treatment, and unit pricing. The waste price should not only be determined by the amount of waste created, but should also include a basic and variable (service-based) fee. On the one hand, this represents the waste disposal cost structure, which comprises of constant and variable expenses, and on the other hand, the inclusion of a set charge helps to minimize unlawful disposal activities, which might increase if fees are only based on collected waste volumes.

The following case study from the German country of Aschaffenburg has been implemented for the past 20 years across 32 municipalities, for a total of 173,000 inhabitants. Untreated waste was landfilled until the early 1990s. As the landfill's capacity was approaching its maximum, a new location was identified. However, popular support for a new landfill was extremely low, leading in demonstrations. As a result, the county was forced to develop new waste-diversion options, including separate collection of plastic waste in 1990, incineration of residual waste in a neighbouring county in 1994, increased fees to reduce commercial waste, a reduced collection frequency for bulky waste (only twice per year), and separate bio waste collection in 1994/1995 with a trial in the municipality of Stockstadt. The county shifted from landfill waste disposal to waste management, with the goal of avoiding and reusing waste (Morlok et al., 2017).

Following early experiments in the town of Stockstadt from 1994 to 1996, the county implemented a PAYT system in 1997. Since then, the system has been operating, and Aschaffenburg now boasts one of the highest recorded rates of recyclables collection (Morlok et al., 2017). This county is a good PAYT example due to its early adoption and the availability of a lengthy data time series on waste management performance. In fact, a well-developed infrastructure is required for the effective implementation of an efficient PAYT system, which collects different fractions of recyclable waste in a convenient manner for people, either in individual bins outside their homes or at conveniently positioned centralized or mobile collection points (Morlok et al., 2017).

The Aschaffenburg PAYT system needed significant effort to obtain and process data for billing, accounting, and system optimization. All bins and containers must be labelled, and collection trucks are outfitted with a reading and weighing equipment. Data is delivered in real time to a central facility via telemetry, where it is processed, accounted for, and billed to end users. Aschaffenburg additionally utilizes the obtained data to assess the system's economic effectiveness and to optimize the system's logistics (Morlok et al., 2017).

The county achieved a total recycling collection rate of up to 86%, a substantial improvement above the average performance of PAYT systems, which typically reach recycling rates of approximately 70% (Nelles et al., 2015). Aschaffenburg's recycling rate of 86% is regarded as a model for the waste management industry. The adoption of a weighing system, the provision of considerable infrastructure for the collection of recyclable waste streams, and a high degree of environmental consciousness and active support from individuals are the primary differentiating aspects in this specific example (Nelles et al., 2015).

Improving the efficiency of recyclables separation and collection is a priority for European Union member states in order to meet overall targets of recycling 65% of municipal waste and 75% of packaging waste by 2030, according to the objectives in the proposed waste regulation. Implementing PAYT systems, as well as developing necessary infrastructure, promoting awareness, and other Circular Economy measures, would aid in meeting such lofty goals (Emmanouil et al., 2022).

6.3 Ecocentric concept in German legislation

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems (IPBES) issued a study in 2019 warning that "around 1 million species are already facing extinction,... unless action is taken" (Müller-Perron & Habsburg, 2023). While there have been various initiatives in the international community to reverse this trend, such as the United Nations Sustainable Development Goals, a real impact has yet to be shown. The domination of national economic interests, the lack of responsibility of major international firms, and a lack of political will are all causes. Given this, it is reasonable to reconsider what further actions we could take to successfully address the climate catastrophe.

The German Federal Constitutional Court pronounced existing climate policy unlawful in a statement issued in April 2021. As a result, it was contended that enforceable decisions regarding additional emission reductions beginning in 2031 were lacking, and that "governing national climate targets [are]... incompatible with fundamental rights" (Müller-Perron & Habsburg, 2023).

Germany's climate change regulations are insufficient and infringe basic freedoms by shifting the burden of reducing CO2 emissions to the young, according to the country's top court. It claims that the rule does not provide enough specifics on how to reduce CO2 emissions once present objectives expire in 2030. "The provisions irreversibly offload major emission

reduction burdens on to periods after 2030," the report stated. They delay too much of the action needed to reach the Paris targets until after 2030 (Müller-Perron & Habsburg, 2023).

The government's role in climate protection emphasizes the government's duty to protect the environment and thus implicitly states that nature is not granted the status of a legal subject, because the government must take on the responsibility of protection, making nature's rights inherently dependent on political motives (Müller-Perron & Habsburg, 2023).

The court's decision to declare present environmental measures unconstitutional might be interpreted as a critique of the state's commitments being non-binding and abstract or as a call to action to broaden the judiciary's involvement in successful climate protection. The preservation of nature is simply stated as a government goal, with no specific indicators of environmental norms or boundaries (Müller-Perron & Habsburg, 2023).

Second, this law, like any other, must constantly be balanced with other rights and liberties. Despite the fact that the preservation of the "natural foundations of life" is enshrined in the Constitution, it does not have absolute precedence over other laws and must be balanced with other fundamental constitutional (human-) rights and principles, such as the general freedom of action or the freedom of profession as stipulated in Germany's Basic Law (Müller-Perron & Habsburg, 2023). As a result, they limit its enforcement by adding significant legal balances that must be considered for every judicial judgment (Bundesverfassungsgericht [Constitutional Court], 2021a). In practical terms, this implies that behaviours that release a lot of CO2, such as flying, cannot simply be outlawed; they must be understood in light of other constitutional provisions, such as freedom of action. To summarize, nature's legal character might be viewed as an instrument worthy of safeguarding for future generations.

As stated in Article 1, human dignity and its preservation are at the heart of the German constitution, and hence environmental protection is just viewed as a tool to enforce compliance (Müller-Perron & Habsburg, 2023). Furthermore, balancing other fundamental rights reinforces the non-binding and abstract nature of this statute. Returning to the philosophical views noted earlier, the German constitution displays an anthropocentric worldview in which human concerns take precedence.

Implementing environmental personhood might result in a movement toward a more ecocentric view to nature, therefore activating a first step toward greater environmental preservation. As a result, it was proposed that granting nature legal personhood may not only drive environmental study by establishing specific threshold values of acceptable natural resource utilisation, but also counterbalance our existing economic system based on

ecological deterioration. Furthermore, it was stated that adopting environmental personhood may successfully answer society's current desire for improved climate protection. This was placed against the backdrop of several philosophical approaches to assigning value to nature, as well as an analysis of present climate protection.

By incorporating this article into its constitution, Germany might set a pattern for an ecocentric approach to environmental preservation, inspiring other countries to do the same. Furthermore, climate preservation would no longer be just a political issue. Unlike ephemeral administrations and shifting priorities for climate measures, an amendment to the German constitution would have a long-term impact on our understanding of the environment and its preservation, resulting in a move toward an ecocentric worldview.

7. Greece

7.1 Waste management

The legislative framework that governs waste management in Greece closely follows the evolution of European waste management and the associated Directives (EIB, 2010), which have been transferred into Greek legislation throughout the previous decade.

According to the National Solid Waste Management Plan (NSWMP), the Ministry of Environment is in charge of policy formulation, national planning, technical concerns, and the licensing and regulation of large waste treatment and disposal facilities, while waste management authorities are responsible for the operation of transfer stations, waste processing, and waste disposal (Perkoulidis et al., 2022).

Other than municipal solid waste, manufacturers bear management responsibility for waste streams, pursuant to the 'polluter pays concept' established in 2003. The inter-ministerial committee for integrated waste management was founded in 2008 in accordance with M.D. 325/14.03.08 on the 'Establishment of a Waste Management Inter-ministerial Committee' and has been charged with strategic planning (Perkoulidis et al., 2022).

As a result of Law 2939/2001, the management of packaging waste was transferred to the Hellenic Recovery Recycling Corporation (HERRCO), which requires economic actors (producers, importers) to organize or participate in collective (or individual) systems of alternative waste management (i.e. return, collection, transportation, and recovery systems) in order to meet specific quantitative targets. It was created in December 2001 by industrial and commercial firms that either offer packaged goods to the Greek market or produce various packaging items, as well as the Greek municipal confederation (HERRCO, 2012).

The Joint Ministerial Decision 50910/2727/2003 on measures and terms for solid waste management with the National Waste Management Plan affixed to it, has been the key engine behind waste management in Greece. There are basic concepts and aims for solid waste management, as well as standards for national and regional planning. The plan should be updated every five years, or sooner if needed (HSWMA, 2012).

The National Waste Management Plan has been updated in 2015 through the Ministerial Council Act 49/15.12.2015 (Government Gazette 174A), aiming at the following 2020 milestones: reduce generation of waste per capita, prepare 50% of municipal solid waste for re-use and recycling and dispose of less than 30% of municipal solid waste being disposed through landfilling (Perkoulidis et al., 2022).

However, the plan has been unable to contribute to the acceleration of the transition to an integrated municipal waste management model due to a lack of realistic targets and the passive participation of regional waste management authorities. Despite the fact that the separate collection has been legally binding since 1/1/2015 (in accordance with Law 4042/2012, Directive 2008/98, and relevant European Commission Guidelines), the dominant practice is still to collect all recyclables into a single bin (European Environment Agency, 2022).

The European Union imposed strict targets for waste management through different legislations. The Waste Framework Directive 2008/98/EC (as revised by EU Directive 2018/851) specifies a goal of recycling and reusing 55% of municipal waste generated by 2025. The Packaging and Packaging Waste Directive (94/62/EC as revised by EU Directive 2018/852) establishes aims for total and material recycling of packaging waste by 2025. The Landfill Directive (1999/31/EC as revised by EU Directive 2018/850) mandates municipalities to reduce municipal waste landfilling to 10% of total municipal waste generated by 2035. The Directives also call on the European Commission, in collaboration with the European Environment Agency, to produce early warning reports on the Member States' progress toward meeting the goals (Perkoulidis et al., 2022).

Greece generates around 5.6 million tons of municipal waste per year, with waste output increasing by 6% since 2015. This equates to 524 kg/cap in 2019, which is higher than the (assumed) EU average of 501 kg/cap. The country is strongly reliant on landfilling; while its proportion has reduced by 6 percentage points since 2015, it is still 77.7% in 2019. Despite the progress, the aim is still 67.7 percentage points away. To accomplish the aim, Greece must accelerate the pace of landfill reduction (European Environmental Agency, 2022).

According to the EC (2019b), a landfill tax, which had been repeatedly postponed, was finally enacted in Greece by legislation in 2012. Unfortunately, the Greek landfill charge is established to cover the costs of landfill operation and aftercare and not as an incentive to divert waste away from landfilling, A low landfill entrance charge combined with inexpensive illicit dumps has created little incentive to increase recycling (Banias, et al., 2020).

In addition, to this day, there is presently no landfill ban in effect. However, according to the law 4819/2021 transposing the WFD and PPWD into national law (Government of Greece, 2021b), it will be illegal to landfill textiles, electrical electronic equipment, daily hygiene products, footwear, and books that are unsuitable for sale or use, particularly due to defects or faults in their packaging, labeling, or weight, or because of withdrawal from the market or proximity to the expiry date, without the prior stipulation (Banias, et al., 2020).

PAYT schemes have only been used on a small basis in Greece, but in July 2021, the Greek Parliament approved an integrated municipal waste management strategy to reduce end-of-life waste. PAYT schemes will become the standard pricing model for municipal waste; from January 2023, municipalities with a population of 20,000 to 100,000 should implement PAYT for municipal waste (Emmanouil et al., 2022). In order to implement a successful PAYT scheme, citizen's education on sustainable development and waste prevention activities should be clearly communicated to the community in order to prepare them for the upcoming changes in their daily habits, and should focus on individual waste streams to increase their awareness of individual responsibility for the community's sustainability (Emmanouil et al., 2022). However, in order to make meaningful progress toward the EU's goals, the PAYT plan must be completely implemented by the 2025 deadline. The EGD's 2030 and 2050 targets (reduced GHG emissions, carbon neutrality, etc.) will be extremely impossible to meet if such measures are not implemented by 2025 (Emmanouil et al., 2022).

The EU assertively promotes PAYT programs. The basic shortcomings and weaknesses of such projects include a lack of public participation and social acceptability, as well as a balance between application, execution, and cost in respect to the present waste management paradigm. As a result, education is in charge of integrating environmental knowledge and community responsibility, and it is one of the most crucial foundations for the success of comparable incentives.

Greece, on the other hand, has made strides in improving recycling and expanding extended producer responsibility (EPR) initiatives. Furthermore, it has succeeded to limit waste disposal to unlawful landfills, which in 2019 was estimated at 100 000 tons (European Environmental Agency, 2022).

Much of the necessary infrastructure needed to manage waste is still under construction or in the planning stages, despite the fact that under EU legislation, it should have been completed many years ago due to the lengthy maturity of the infrastructure projects. As a result of these delays, the country is implementing waste management infrastructure projects that respond to historical design data rather than the needs arising from rapidly evolving legislative and technological developments. Greece is paying huge fines as a result of the recurrent problem of unauthorized landfills and a lack of suitable infrastructure for the handling of hazardous industrial waste. In terms of municipal waste, the majority of illegal landfills have been closed (14 illegal landfills were operational by the end of 2018), and an action plan is being executed to eliminate the remaining ones, albeit with delays (Emmanouil

et al., 2022). However, the country not only lacks adequate municipal waste management facilities, but some of those that do exist are currently inoperative.

Although there have been some notable individual successes, such as the significant reduction in the consumption of single-use plastic bags through taxation and the very satisfactory results of certain extended producer responsibility schemes, the general feeling in the country is that recycling is well below the European average.

7.1.1 Paper and cardboard

After the Chinese ban on importing certain types of paper and cardboard waste, Greece experienced significant changes in its waste management and recycling policies, due to its reliance on exporting significant quantities of paper and cardboard waste to China for recycling. The country's recycling industry was not as developed as some Western European nations, stemming from relaxed quality standards of the collected waste.

Greece faced challenges with waste export and tried to make investments in domestic recycling infrastructure, including more advanced recycling facilities, improved collection and sorting processes, and developing a circular economy approach to waste management. In addition, they implemented stricter regulations on the collection, sorting, and recycling of paper and cardboard waste to meet the new quality standards required by alternative export markets (Banias, et al., 2020).

Similar to other countries, also Greece began looking for alternative markets after the ban. They started exporting to other countries, mostly in Southeast Asia and Eastern Europe, although these markets had stricter quality standards. Compared to Germany however, the amount of paper and cardboard shipped before and after the ban has not lowered noticeably. While in 2018 the country shipped 337 tonnes to non-EU countries, in 2021 it still shipped 332 (Eurostat, 2021). The new destinations are India, Indonesia and Thailand.

Greece's response to the Chinese ban was also influenced by the European Union's Circular Economy Action Plan, which emphasizes resource efficiency and sustainable waste management. This encouraged Greece to develop its recycling and waste reduction strategies further.

In summary, the Chinese ban on paper and cardboard waste imports had a transformative impact on Greece's waste management practices. It led to a shift from heavy reliance on exporting recyclable materials to developing a more robust domestic recycling infrastructure and adhering to stricter quality standards. The ban prompted Greece to revaluate and improve

its waste management strategies, with a greater emphasis on sustainability, resource conservation, and reducing waste contamination.

7.1.2 Plastic

Before the Chinese Ban, Greece relied on exporting to China also a significant portion of its plastic waste for recycling. Due to a lack of domestic recycling infrastructure for processing and recycling plastic waste, the country depended on exporting plastic waste as an easy solution to manage its plastic waste stream. In addition, the limited extended producer responsibility (EPR) was not as comprehensive as it is now, which caused a low involvement of producers in managing the entire lifecycle of plastic products.

After the Chinese Ban, Greek authorities and businesses had to seek alternative markets for their plastic recyclables as they did for paper and cardboard, since China was no longer an option. Compared to paper and cardboard, plastic it's shipped in smaller amounts by Greece to non EU member states. In 2021, they in fact shipped outside the EU only 14 tonnes of plastic, while in 2017 and 2016 the average was of 32 tonnes (European Environmental Agency, 2022).

Greece also improved its quality standards of plastic waste materials and increased the EPR, obliging producers to become more responsible for the collection, treatment, and recycling of plastic waste from their products. Finally, it promoted the Circular Economy Principle, emphasizing resource efficiency, recycling, and sustainable waste management.

From 2014 to 2018, there was a 30% increase in both recycling and recovery of packaging materials (Moustakas et al., 2022). In terms of the legislation's minimum recycling and recovery objectives, performance rates are adequate after 2015, however the corresponding recycling performance is much below than the National Waste Management Plan's 2020 target. The EU's recycling and recovery rates are 67% and 80.1%, respectively (Eurostat, 2021).

7.1.3 WEEE

Similar to the case of plastic, paper and cardboard, Greece had similar issues in managing e-waste: first, the limited domestic infrastructure for recycling and processing e-waste pushed Greece to export e-waste items rather than processing domestically, second, the EPR's scope and enforcement of these regulations were not comprehensive enough, leading to challenges in tracking and managing the entire e-waste lifecycle.

After the Chinese Ban, Greece had to find alternative markets for its e-waste. This led to increased stockpiles of e-waste and the need for better domestic management, stricter EPR Regulations and Circular Economy principles. The focus shifted toward supporting local recycling initiatives, including electronics take-back programs, to encourage the responsible recycling of electronic products (Papoikonomou et al., 2020).

According to statistics for the management of waste electrical and electronic equipment for the period 2014-2018, separate collection of WEEE in the residential sector exceeds 4 kg/inhabitant. From 2016 onwards, when the WEEE collection objective is updated (45% of the average yearly weight of EEE placed on the market in the three prior years), the collection target appears to be reached just minimally (European Environmental Agency, 2022).

In terms of WEEE collection needs, there was an increase in the quantities collected, reflecting a boost in the electronic equipment quantities put on the market (expressed as an average of the three preceding years), while WEEE collection performance has remained stable at 46-47% over the last three years. It is worth mentioning that the WEEE collection target has been raised to 65% of the average annual weight of EEE placed on the market in the three preceding years, or 85% of WEEE created in that Member State, beginning in 2019 (European Environmental Agency, 2022).

There are 12 WEEE treatment (de-pollution / disassembly) facilities that work with collective alternative management organizations (Appliances Recycling SA & Fotokiklosi SA). Even after increasing the WEEE collection objective from 45% to 65% of the average annual weight of EEE put on the market in the three prior years, these factories can satisfy the country's demands, as defined in Directive 2012/19/EU (European Environmental Agency, 2022).

7.3 Circular Economy and ecocentrism

In Greece, the following actions reflect the adoption of circular economy principles in waste management after the Chinese ban: waste reduction and prevention, upgrade and expansion of its recycling infrastructure, strengthening of the Extended Producer Responsibility, the implementation of more Circular Economy inspired legislation, resource efficiency and sustainable packaging initiatives: to reduce single-use and non-recyclable packaging materials (Lagman-Bautista, 2020).

The following are Greece's primary long-term goals (2030) within the context of Circular Economy. In the first place, integrating ecological design/planning criteria and product life cycle analysis, preventing the introduction of hazardous chemicals into their manufacture, and

allowing reparability and product life span extension. Secondly, effective execution of waste management priority, promoting waste prevention and encouraging re-use and recycling. Third, encouragement of different kinds of consumption and promotion of a model based on transparency of information about the characteristics of goods and services, their life duration, and energy efficiency. Fourth, facilitation and establishment of suitable channels for information exchange and coordination across governments, the scientific community, and economic and social institutions, resulting in synergies consistent with the transition to the circular model. Finally, create visible and viable indexes to track the transition's execution (Perkoulidis et al.,2022).

Recycling is not a new notion in Greek society, and it is made easier by the "blue bin" plan managed jointly by the Central Union of Greek Municipalities and the Hellenic Recovery Recycling Corporation. Citizens may deposit recyclable waste such as paper, tin, aluminum, plastic, and glass in a blue container without previous sorting. Other recyclable waste bins (bins for glass or paper alone) have appeared in various towns, with variable outcomes (Perkoulidis et al.,2022).

Speaking about ecocentrism, the first Greek national forest policy with a temporal horizon of 20 years (2018-2038) was just enacted. Its stated strategic aim is: “Ensuring sustainability and increasing ecosystems' contribution to the country's economy through versatility, adaptability, and strengthening their socioeconomic role." (Gray, 2021).

Sustainable forest management is the use of forest ecosystems in such a way and at such rates that allow their biodiversity, their ability to regenerate, in the present and in the future ecological, economic, and social services, locally, nationally, and globally, without harming other species." A review of ecocentric ethical orientation within the national forestry policy of Mediterranean countries (Gray, 2021).

In conclusion, the enactment of the first Greek national forest policy represents a significant step toward embracing ecocentrism and sustainable forest management principles. The policy's strategic aim, as articulated by the Deputy Minister of Environment and Energy, underscores the importance of ensuring sustainability and recognizing the multifaceted contributions of forest ecosystems to the country's economy. The adoption of sustainable forest management principles aligns with the broader concept of ecocentrism, emphasizing a holistic and ecologically conscious approach to forest policies (Gray, 2021).

The incorporation of ecocentric ethical orientations within national forestry policies, not only in Greece but also across Mediterranean countries, highlights a growing recognition of the significance of harmonizing human activities with the natural world. The commitment to

maintaining biodiversity, ensuring regeneration, and promoting ecological, economic, and social services while minimizing harm to other species represents a shift toward a more sustainable and ecologically responsible forest management paradigm.

8. Comparison

The two approaches adopted by both Germany and Greece emphasize sustainability, resource efficiency, and environmental responsibility. By examining the measures taken in both countries, we can gain insights into their commitment to reducing waste and promoting a more sustainable future.

Starting with cardboard and paper waste management and shipment, Germany, often recognized as a global leader in waste management, has demonstrated a strong commitment to reducing cardboard and paper waste and fostering a Circular Economy. The nation has invested significantly in recycling infrastructure, including modern recycling facilities and efficient waste collection systems. One of Germany's key initiatives is its Extended Producer Responsibility (EPR) program, which holds manufacturers accountable for the entire lifecycle of their products. In the case of cardboard and paper products, this means designing packaging that is easily recyclable. Additionally, Germany has promoted public awareness and participation in waste separation and recycling programs. Citizens are educated about the benefits of recycling and provided with convenient access to recycling facilities. This not only reduces the environmental impact of cardboard and paper waste but also fosters a culture of sustainability.

Greece, while making strides in improving its waste management practices, faces some unique challenges compared to Germany. The country has had to adapt to the Chinese waste ban by enhancing its cardboard and paper recycling efforts. Similar to Germany, Greece has also been investing in recycling infrastructure and encouraging EPR. The promotion of green procurement has also been emphasized to influence the market toward more sustainable packaging options. However, Greece faces some specific challenges in managing cardboard and paper waste. The country's waste management infrastructure is less developed compared to Germany, and there is a need for additional investments in recycling facilities and collection systems. This presents an opportunity for Greece to prioritize Circular Economy practices by developing efficient recycling processes and reducing waste generation.

Regarding plastic waste management and shipment, Germany's approach is guided by Green Theory and Circular Economy principles. The nation has recognized the need to reduce plastic waste and minimize its environmental impact. One of the notable initiatives is Germany's focus on sustainable packaging. This involves reducing single-use plastics and non-recyclable packaging materials. The emphasis is on promoting alternatives such as biodegradable and easily recyclable materials.

Greece has also been taking measures to address plastic waste in line with Green Theory and the Circular Economy. The country has been investing in recycling infrastructure and emphasizing the importance of EPR for plastics. Efforts to reduce single-use and non-recyclable plastic packaging have gained momentum in Greece, with initiatives promoting the use of sustainable alternatives. Greece however keeps having infrastructure challenges in waste management of plastic and is still behind when compared to other European countries.

Finally, speaking of e-waste management and shipment, Germany has a comprehensive system for collecting and recycling electronic waste. This system is driven by the Electrical and Electronic Equipment Act (ElektroG), which places responsibility on manufacturers for the disposal and recycling of electronic devices. One of the central aspects of Germany's e-waste management is the promotion of resource efficiency. Rather than discarding e-waste, Germany encourages the refurbishment and reuse of electronic devices whenever possible. This approach extends the lifespan of products, reduces waste, and conserves resources.

Greece, on the other hand, faces challenges in managing e-waste. While it may not have the same level of infrastructure and legislation as Germany, it has been working to align its e-waste practices with the principles of Green Theory and the Circular Economy. The country is increasingly recognizing the importance of e-waste recycling and the need to reduce electronic waste's environmental impact. E-waste collection and recycling facilities are being developed, and public awareness about responsible e-waste disposal is growing.

When comparing Germany and Greece from the perspective of Green Theory and the Circular Economy in waste management and shipment, several common key observations can be made: first, both Germany and Greece have been investing in recycling infrastructure to improve waste collection, sorting, and processing facilities. Second, the Extended Producer Responsibility has been implemented and strengthened in both countries in order to hold manufacturers accountable for the waste generated by their products. EPR promotes sustainable design and responsible disposal, aligning with Circular Economy principles. Third, both Germany and Greece are emphasizing resource efficiency in their waste management practices, aiming to maximize resource recovery and minimize waste generation. Forth, Germany has developed comprehensive legislation to promote the Circular Economy, while Greece is in the process of aligning its regulations with these principles. Legislation is a critical driver for sustainable waste management. Finally, both countries are encouraging the reduction of single-use and non-recyclable packaging materials, promoting more sustainable packaging options.

The main differences in the waste management and shipment from the Green Theory perspective are mainly on ecocentrism and decentralisation of the authority.

The waste management system works well in Germany since accountability is established at lower levels as well, such as towns and districts. In the multi-tiered regulatory framework implemented in Germany, the responsibility for waste management and environmental protection is shared by the national government, federal states, and local governments. Districts are held accountable by the government for reaching waste management objectives, thus they must prepare in their own region and population and demonstrate the outcomes. This division of responsibilities allows a better management on the low and high scale since the needs of the local population and authorities can be met easier. In this regard, there is a major divergence between the legal systems of Greece and Germany.

In Greece, there is a lack of adequate municipal waste management infrastructure, as well as incidents of malfunctioning or even non-operational landfills as a result of local responses. Much of the necessary infrastructure is still being built or planned, despite the fact that under EU legislation, these infrastructure investments should have been finished many years ago due to the lengthy maturity for their completion. These delays prohibit the country from keeping up with European waste regulations because it develops facilities and programs that fit the design requirements of the time rather than the demands deriving from the continually evolving legislative landscape.

Ecocentrism is not fully implemented in any of the two countries analyzed, however there are some little signs of a sensibility that throughout the years might increase awareness over the importance of providing nature a status similar to the one assigned by us to human beings.

Germany demonstrated a commitment to ecocentrism when the Federal Constitutional Court declared the country's climate regulations inadequate and in violation of fundamental freedoms in April 2021. It criticized the lack of specifics for reducing CO2 emissions post-2030, effectively deferring necessary actions to achieve the Paris Agreement targets. The court's decision reflects a need for more concrete and enforceable climate policies. The German government's role in environmental protection is criticized for making nature's rights contingent on political motives.

The recent enactment of the Greek national forest policy for the years 2018-2038 marks a step toward embracing ecocentrism and sustainable forest management principles because it underscores a holistic and ecologically conscious approach to forest policies. The incorporation of ecocentric ethical orientations within national forestry policies extends beyond Greece and resonates with other Mediterranean countries, signifying a growing

recognition of the need to harmonize human activities with the natural world. This commitment to preserving biodiversity, promoting regeneration, and fostering ecological, economic, and social services while minimizing harm to other species reflects a shift toward a more sustainable and ecologically responsible forest management paradigm. It exemplifies a profound acknowledgment of our interconnectedness with nature and the imperative to protect and sustain our vital ecosystems.

9. Conclusions

Both Greece and Germany have made significant changes in their waste management, particularly in response to the Chinese ban on imports of paper and cardboard waste, plastic waste, and e-waste.

Greece faced various challenges due to its heavy reliance on exporting recyclable materials and limited domestic recycling infrastructure. However, this challenge prompted Greece to revaluate and improve its waste management practices, shifting towards sustainability, resource conservation, and reducing waste contamination.

In the area of paper and cardboard waste, Greece invested in developing a more robust domestic recycling infrastructure, improving collection and sorting processes, and adhering to stricter quality standards. This shift aligns with the European Union's Circular Economy Action Plan, emphasizing resource efficiency and sustainable waste management.

Similarly, in dealing with plastic waste, Greece had to seek alternative markets for recycling its plastic waste after the Chinese ban. They improved quality standards for plastic waste materials and increased Extended Producer Responsibility (EPR) initiatives. This transition towards sustainability and resource efficiency was further encouraged by the Circular Economy principles promoted by the EU.

When it comes to Waste Electrical and Electronic Equipment (WEEE), Greece also witnessed a change in its approach. The need to find alternative markets for e-waste led to a focus on better domestic management, stricter EPR regulations, and adherence to Circular Economy principles. The emphasis on local recycling initiatives and take-back programs contributed to the responsible recycling of electronic products.

Greece's commitment to Circular Economy principles in waste management is reflected in its long-term goals for 2030, which include waste reduction, prevention, the promotion of re-use, and recycling. This demonstrates the country's determination to align with the EU's environmental objectives. Furthermore, Greece's recent enactment of its first National Forest Policy marks a significant step towards embracing ecocentrism and sustainable forest management principles. The policy's strategic aim emphasizes sustainability, recognizing the multifaceted contributions of forest ecosystems to the country's economy.

From the Green Theory perspective, Greece can make several improvements in its waste management practices. Greece should focus on reducing the generation of waste at its source. This can be achieved through initiatives like reducing packaging materials, encouraging the use of reusable products, and adopting sustainable production practices.

In addition, Greece should continue to invest in and expand its recycling infrastructure. This includes the development of advanced recycling facilities, improving collection and sorting processes, and implementing more efficient recycling technologies.

Greece should also accelerate its efforts to reduce the amount of waste sent to landfills. This can be achieved by implementing waste-to-energy facilities, composting programs, and increasing recycling rates. Reducing landfilling aligns with the Green Theory principle of minimizing environmental harm.

On the other hand, Germany's multi-tiered regulatory framework, involving the national government, federal states, and local authorities, has laid the foundation for an efficient and eco-conscious system. The German Packaging Ordinance and other related policies demonstrate a strong focus on reducing waste, recycling, and minimizing the environmental impact of waste disposal. This progressive stance led to Germany being considered a role model in resource recovery.

Notably, the response to the Chinese ban on waste imports in 2018 showcased Germany's resilience and commitment to sustainability. The country invested in expanding domestic recycling infrastructure, diversified its export markets, and enforced stricter regulations to reduce waste generation and enhance product sustainability. These actions helped Germany continue to lead the way in environmental responsibility and circular economy principles.

Germany's focus on waste management efficiency extends to the pay-as-you-throw (PAYT) scheme, which has successfully increased recyclables collection rates. This approach, combining economic instruments with a well-developed infrastructure for waste collection, is a testament to Germany's proactive stance in improving waste management and resource usage. Furthermore, the German legislative system reflects a commitment to environmental protection. It seeks to balance fundamental human rights with ecological considerations, even in the face of climate change concerns. However, it's essential to recognize that the current legal framework remains anthropocentric, with nature's rights dependent on political motives.

The proposal to grant legal personhood to nature within the German constitution could potentially signal a paradigm shift towards an ecocentric worldview. This would not only enhance environmental protection but also have far-reaching implications by driving a more ecologically conscious economic system. Such a transformation could inspire other nations to adopt similar measures and solidify Germany's role as a trendsetter in environmental preservation.

The study on waste management and shipment practices in Greece and Germany following the Chinese waste import ban is of paramount importance within the framework of

Green Theory and environmental sustainability. It sheds light on critical aspects of waste management strategies and their adaptability to global challenges, thereby contributing significantly to the broader discourse on sustainable environmental practices.

The significance of this study lies in its ability to highlight the real-world consequences of the Chinese waste import ban, not just in one country but across two distinct nations with different waste management systems and approaches.

From a Green Theory perspective, the study underscores the importance of transitioning towards more sustainable and ecologically responsible practices in waste management. It emphasizes the need for a Circular Economy, where recycling, resource recovery, and eco-friendly materials take centre stage.

Since the ban is recent and its impact cannot be fully assessed yet, future studies in this area can further enrich our understanding of sustainable waste management and environmental protection. These may include:

- Long-Term Impact Assessment: an extended study over several years can analyze the long-term impact of these policy changes. It would provide insights into the sustainability and resilience of waste management practices, offering lessons for other nations.
- Comparative Analysis: expanding the scope to include more countries and their responses to the Chinese waste import ban would offer a comprehensive overview of global waste management strategies and their environmental consequences.
- Policy Frameworks and Legal Personhood: Further research on granting legal personhood to nature, as discussed in the German context, can be undertaken to explore its feasibility, challenges, and potential impact on environmental preservation.
- Growth limitations: the Green Theory states that countries should limit their economic growth in favour of a more sustainable and environmental management of the resources. Due to the limited length of the dissertation, it was not possible to assess whether Germany or Greece imposed growth limitations in order to meet their environmental targets.

The study on waste management and shipment practices in Greece and Germany offers a critical foundation for future research in the realm of environmental sustainability. By examining these two European nations' responses to the Chinese waste import ban, we gain valuable insights into the practicality and adaptability of Green Theory principles, helping guide future efforts to build a more sustainable and ecocentric world.

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