Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Trade and Finance

Master's Thesis

The Role of Global Trade in Circular Economic

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Aditya Ramanand Singh

Business Administration

Thesis title

The Role of Global Trade in Circular Economic

Objectives of thesis

The main aim is to evaluate the role of global trade in circular economic model to meet the demand of global resources, which is increasing year by year.
The another aim of this thesis is to find out the demand of total resources and the same is fulfilled by recycled materials quantitatively.
The partial goal is to find out the barriers emerged to implement principles of circular economic model in trade.

Methodology

The methodology of the thesis work will be based on theoretical as well as practical part of the work. The theoretical part of the work will be processed in the form of literary review of available resources from journals, publications, research papers and government statistics. The practical part of the work will work with the data founded from theoretical background, which will be processed in the form of tables and graphs and these data will be used to propose an economic model in GRETL program, which will be used to depicts the impacts of trade in circular economic model in the future.

The proposed extent of the thesis

60-80 stran

Keywords

circular economic, model, global trade, global resources, barriers

Recommended information sources

Anne P.M. Velenturf, Phil Purnell: Principles for a Sustainable Circular Economy. Sustainable Production and Consumption, 2021, ScienceDirect, Waste School of Civil Engineering, University of Leeds, Leeds, United Kingdom, https://doi.org/10.1016/j.spc.2021.02.018

Joachim Monkelbaan: The Circular Economy and Trade, 2020, Trade and Environmental Sustainability series, Quaker United Nations Office, Van Der Ven

Julian Kirchherr, Laura Piscicelli: Barriers to the Circular Economy: Evidence From the European Union (EU), 2018, Ecological Economics, www.elsevier.com/locate/ecolecon

Manuel Albaladejo, Nanno Mulder: The Circular Economy: From waste to resource through international trade, 2021 https://iap.unido.org/articles/circular-economy-waste-resource-through-international-trade

Morales, M.E., Batlles-delaFuente, A.: Theoretical Research on Circular Economy and Sustainability Trade-Offs and Synergies. Sustainability, 2021, https://doi.org/10.3390/su132111636

Smirti Kutaula, Alvina Gilani: Integrating fair trade with circular economy: Personality traits, consumer engagement, and ethically-minded behaviour, 2022, Journal of Business Research www.elsevier.com/locate/jbusres https://doi.org/10.1016/j.jbusres.2022.02.044

Yong Geng, Joseph Sarkis: How to globalize the circular economy, 2019, Institute for Sustainable Resources UCL, nature comment, ucl.ac.uk/bartlett/sustainable

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Declaration

I declare that I have worked on my master's thesis titled **"The Role of Global Trade in Circular Economic"** by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 01. 04. 2023 ____________________________

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The Role of Global Trade in Circular Economic

Abstract

This report includes the new economic model known as upcycling seeks to minimize environmental damage by maximizing the reuse of materials. In this report, there are legitimate concerns that the exploitation of raw resources, manufacture, and consumption that underpins the vertical economic system promoted by Global commerce has severe social and environmental consequences. This report assesses the current circular economic model participation level in Global exchange. The study thoroughly analyses how corporate sustainability ideas have influenced Global commerce's laws, practices, and consequences. This study also highlights Global exchange's possibilities and threats as it moves toward that supply chain. Notwithstanding significant challenges, the result suggests that Global commerce may help advance the cyclical economy by boosting productivity, decreasing pollution, and encouraging more environmentally responsible manufacturing and consumer. Conclusions and suggestions are offered on findings from the GRETL and how politicians, firms, and individuals might hasten the implementation of recycling and reuse in Global commerce.

keywords: circular economic model, global trade, global resources, barriers, trade policies, key challenges, Global cooperation

Úloha globálního obchodu v oběhovém hospodářství

Abstrakt

Tato zpráva obsahuje nový ekonomický model známý jako upcyklace, který se snaží minimalizovat škody na životním prostředí maximalizací opětovného využití materiálů. V této zprávě se objevují oprávněné obavy, že využívání surovin, výroba a spotřeba, které jsou základem vertikálního ekonomického systému podporovaného mezinárodním obchodem, mají závažné sociální a environmentální důsledky. Tato zpráva hodnotí současnou úroveň účasti cirkulárního ekonomického modelu v mezinárodní výměně. Studie důkladně analyzuje, jak myšlenky udržitelnosti podniků ovlivnily zákony, postupy a důsledky mezinárodního obchodu. Tato studie také poukazuje na možnosti a hrozby mezinárodní výměny při jejím směřování k tomuto dodavatelskému řetězci. Bez ohledu na značné problémy výsledek naznačuje, že mezinárodní obchod může pomoci pokročit v cyklické ekonomice tím, že zvýší produktivitu, sníží znečištění a podpoří ekologicky odpovědnější výrobu a spotřebitele. Závěry a návrhy se týkají zjištění GRETL a toho, jak by politici, firmy a jednotlivci mohli urychlit zavádění recyklace a opětovného použití v globálním obchodě.

Klíčová slova: oběhový ekonomický model, globální obchod, globální zdroje, překážky, obchodní politiky, klíčové výzvy, mezinárodní spolupráce

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1 Introduction

A linear model of production and consumption (take-make-use-dispose) in which items are produced from raw materials, sold, used, and then disposed through landfilling or trash incineration, has dominated the industrial evolution. The linear model's fundamental presumptions, however, are no longer valid in the current global context, and a number of significant trends are endangering its viability, necessitating the need for an alternative economic model. (Thibaut, W. 2018)

The world is facing an pressing need to transition towords a more sustainable economic model, one that not only supports economic growth but also reduces environmental and promots social equity. Circular economy is a framework that offers a potencial sollution to these challenges by promoting a regenerative approach to resource use an waste managemant. Decoupling actual raw consumption of resources from economic growth may be achieved via the circular economy's efforts to close, expand, and shrink material loops. Methods that might result in reduced rates of exploitation and use of resources are part of the shift towards a circular economy. For the greater good, this promotes sustainable materials management and greater resource efficiency. The circular economy began with the goal of reducing the amount of trash produced, but it has now expanded into a comprehensive strategy for increasing the sustainability of resource use. The potential it presents not just for resource savings and improved health and environment outcomes but also for trade and financial diversification is a significant element of the attractiveness of a circular economy. Global supply chains, final value chains, and trade-in services are just a few of how circular economy policies and initiatives are connected to Global commerce. The scale savings and new jobs created by trade are two ways in which it may boost the functioning of a circular economy.

Apart from this, the private sector needs help overcoming barriers to adopting circular business models globally. Therefore, it is essential that commerce that has unfavourable effects on the environment be avoided. A greater amount of work is required to ensure that the goals of commerce and the circular economy are compatible. The move to a circular economy may have unintended consequences for the supply chains of extractive sectors. Nonetheless, there will always be a need for certain key raw minerals. So, it is crucial to guarantee a fair and ecologically friendly transformation for the extractive global trade. Circular economy may have an impact on trade in goods and services. A shift to a circular economy typically involves a larger level of service sector participation, such as product maintenance, repair, and service systems, and may create new hope for services trade (Shunta, Y. 2021).

Shift forward to a global circular economy is progressively getting the attention of political leaders throughout the world. The purpose of this endeavour is to advance the circular economy not only within a particular jurisdiction but also by seeking out synergies with other nations in hopes of achieving material circularity and, ultimately, decoupling the consumption of resources from the expansion of the overall economy at the macro level.

2 Objectives and Methodology

2.1 Objectives

- The main aim is to evaluate the role of global trade in circular economic model to meet the demand of global resources, which is increasing year by year.
- The another aim of this thesis is to find out the demand of total resources and the same is fulfilled by recycled materials quantitatively.
- The partial goal is to find out the barriers emerged to implement principles of circular economic model in trade.
- To identify the challenges and opportunities of integrating circular economy principles into global trade practices.

2.2 Methodology

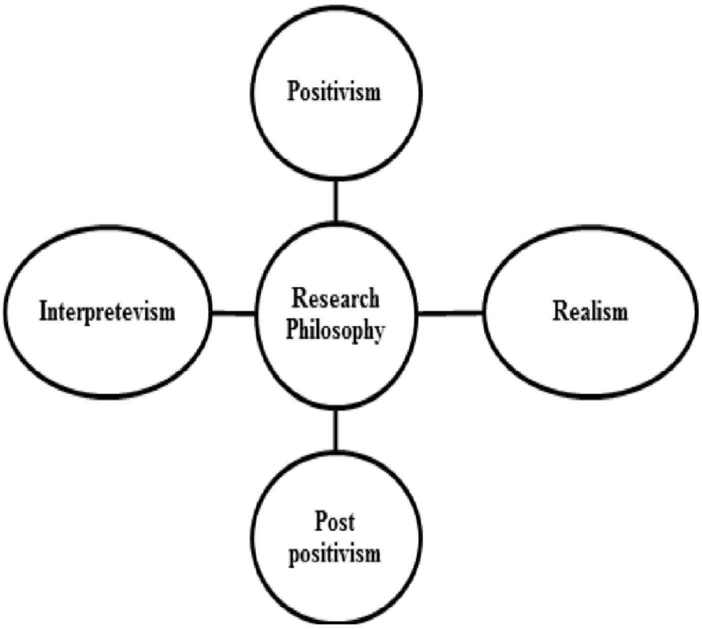
A circular economic model is the focus of this research, which investigates worldwide trading practices. For this investigation, a good technique has been chosen, which includes the following:

2.2.1 Research philosophy

Issues about the beginning, development, and expansion of knowledge are the focus of this study philosophy. A research philosophy may be considered a set of fundamental beliefs about the nature, purpose, and methodology of scientific inquiry. To rephrase, a research philosophy is an overarching principle that governs the study of the topic as a whole. Research philosophy is a set of principles for conducting studies based on a particular worldview and an understanding of the significance of information in that worldview.

The major focus of the academic discipline of philosophy is the investigation of basic questions, such as the nature of reality, the limits of human knowledge, and the significance of various aspects of the world. The major goal of philosophy is to seek out meaningful responses or intelligent answers to any issues using an analytical and systematic approach, with a primary focus on logic and reasoning as the basis for its inquiry.

Figure 1: Research philosophy



Source- (https://www.makemyassignments.com/sample/an-analysis-of-the-impact-of-customer-satisfaction-on-brand-loyalty-a-case-study-of-tesco-plc-uk/3/)

Research philosophy may be divided into two primary categories, which are as follows:

- **Positivism** - Positivism, which has its roots in the natural sciences, has extended across the social sciences and the humanities due to its focus on the empirical examination of hypotheses and the discovery of logical or analytical evidence produced via statistical analysis. That's why positivists tend to rely on large samples and provide conclusions that are objective and quantifiable. Positivism holds that the only reliable source of knowledge is empirical data collected via objective methods like sensory observation. The role of the researcher is to gather information and analyse it objectively. Because of this, the results of the research can be seen and quantified. Statistically-analysable empirical data is the foundation of positivism.
- **Interpretivism-** That reality results from cultural settings and power relations are the claim of interpretivism, which argues that several truths coexist. Simply stated, one's eyes are the only reliable source of information about the world outside one's head. Depending on one's upbringing and experiences, that may seem quite different. Interpretive approaches rely on inquiry and observation to unearth or generate an in-

depth understanding of the issue. This pairs well with qualitative methods of data collection. The critique of positivism offered by interpretivism is made from a more subjective position. By creating meaning, humans set themselves apart from inanimate objects, according to interpretivism. In interpretivism, the emphasis is on these many readings. According to interpretivism, studying people and their communities fundamentally differs from studying natural things.

Justification

To research about the impacts that the circular model has on the assessment of global trade that engages in a model of a circular economy, the positivism philosophy of research will serve as the study technique that is used. In this method of research, it has access to various resources thanks to the data-gathering strategy researchers have decided to use. In this way, these resources included academic databases, websites, and books, amongst other sorts of resources.

2.2.2 Research approach

A researcher's strategy for data gathering, analysis, and analysis is referred to as their "approach to the study topic" and the phrase "approach to the research question" Research may often be broken down into one of three categories: quantitative research, qualitative research, or research that combines several methods. The method that should be used to research a subject is ultimately the deciding factor. It contains hypotheses regarding the specifics of the study analysis.

A research approach represents an organized and systematic framework for conducting research; it encompasses everything from broad hypotheses to particular methods for gathering and analysing data, as well as drawing conclusions based on those results. A research approach may also be referred to as a research methodology. Consequently, in some case, it is dependent on the particulars of the research issue that is being investigated in the study. Whether making a quantitative or qualitative inquiry, researchers use a unique toolbox each time researchers investigate.

- **Quantitative method-** The goal of doing qualitative research is to get a deeper understanding of a topic by systematically examining, collecting, and evaluating a substantial quantity of textual and visual data. The analysis of events from several points of view at the same time to investigate of them in their natural state is an example of qualitative research, which may be defined in several different ways. The application of inductive reasoning is essential to this strategy.

- **Qualitative method-** The qualitative technique is the counterpart of the study's quantitative approach. It is common practice to see this as the polar opposite of a quantitative approach. The in-depth investigation of human feelings, ideas, and behaviours is the primary goal of qualitative research. When conditions are like this, researchers must rely on their instincts and intuitions to guide their work. When research is carried out this way, the results often provide conclusions that either cannot be expressed in quantitative terms or are not subjected to statistical testing. In-depth interviews, projective approaches, and focus groups are only some methods that are often employed. The constructionist approach, which maintains that information is constructed rather than discovered and that there may be several realities depending on the observer, is often favoured by qualitative researchers. This viewpoint claims that knowledge is created rather than found.

Justification

Both qualitative and quantitative analysis used to examine the role of global trade in the circular economy. These analysis provided valuable insights into the trends and patterns of global trade and its impact on the environment and the economy.

2.2.3 Research strategy

Research strategy can be defined as follows: An overarching plan for a research study is a research strategy. During a study, while designing, carrying out, and analysing a research project, a researcher might benefit from having a research strategy to assist them. Even though the research strategy offers helpful assistance on a more general level, it is necessary to supplement it with a research strategy to ensure that the research effort is carried out with the desired outcomes. The strategies of research instruct the researcher on how to acquire and evaluate data. When determining the most effective research approach, it is critical to consider the goals and objectives of the study, the amount of time and resources that are currently available, the philosophical stance of the researcher, as well as the scope and depth of existing knowledge in the field.

Based on the data, there are two primary tactics to be used in research strategy, and they are as follows:

- **Inductive**

  Inductive reasoning begins with specific findings that are limited in the field of view and then moves on to an overall point that is feasible yet uncertain given the evidence gathered. This general conclusion is reached after inductive reasoning moves on from specific findings that are limited in scope.

  The evolution of inductive reasoning may be thought of as progressing from the specific to the general. Here is one way of thinking about the process. The inductive method is employed in a sizeable quantity of scientific investigations worldwide. This approach entails compiling a list of facts, searching for recurring themes, and developing a hypothesis or theory to explain the findings.

- **Deductive**

  Deductive reasoning begins with the strategy that claims to be the best and is the one which is implemented in practice the most frequently makes a claim. Using this approach, the researcher will first highlight or outline a claim based on a past understanding of the subject that the researcher may have selected.

  Using the deductive technique, one may either start with the more general notions or work their way around to the more specific ones.

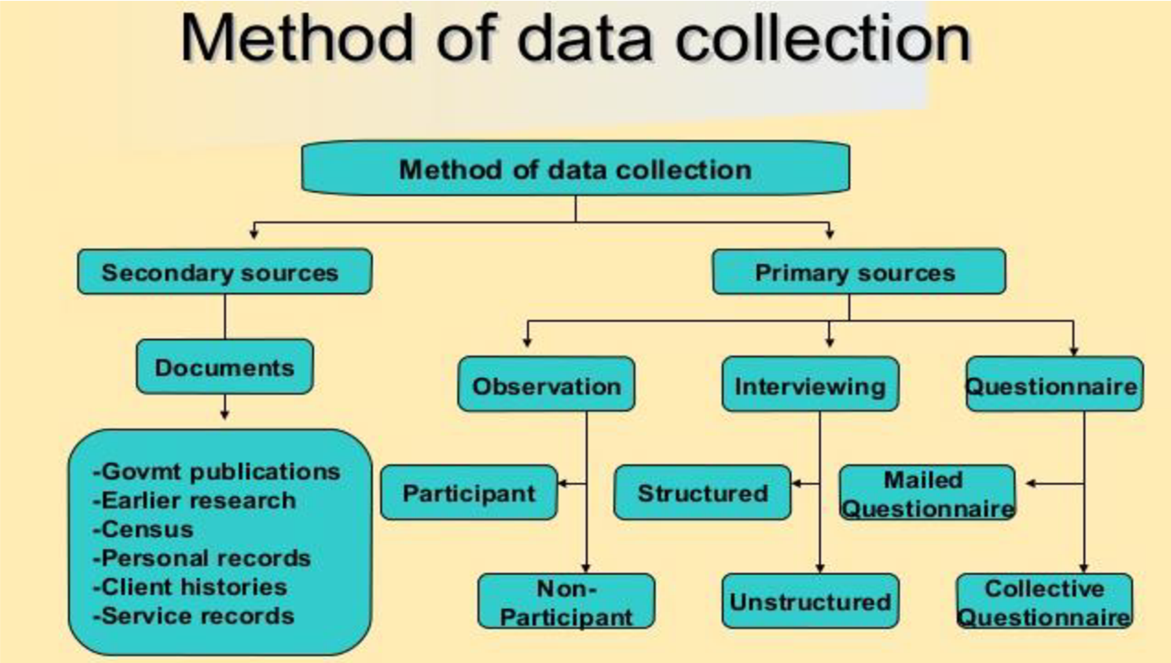
  Justification

  In order to examine whether or not global commerce participates in a model of circular economics, an inductive technique used since it was easier to sort resources that are required for the research.

2.2.4 Data collection method

In the field of statistics, the process of collecting information from any sources that are pertinent to the goals of the study is referred to as "data collection." With the use of research methods, one might come to an understanding of the utmost significance. In other words, data is a compilation of information from various sources, including facts, statistics, things, symbols, and events. To improve their decision-making processes, organizations gather data using different data-collecting approaches. Because it would be challenging for companies to make suitable judgments without data, data is compiled from various audiences at several other times in time.

Figure 2 : Methods of data collection



Source- (https://theintactone.com/2018/02/27/br-u2-topic-6-methods-of-data-collection-primary-and-secondary-sources/), 2020

- **Primary data**

  Primary data are those that have been collected directly by the individual or organization that is carrying out the study. With contrast to secondary data, the primary data is gathered by researchers themselves through first-hand experiences, questionnaires, experiments, and other first-hand sources. Primary data are the highest quality data available for scientific study since they are obtained directly from the start. The essential data sources used in a study are often selected and modified to fit the needs of that study. The research's goals and the people it aims to study must be defined before any data-gathering method can be selected.

- **Secondary data**

  The phrase "secondary data" is often used in the academic community to describe information utilized in a study but not collected by the study's primary researcher. The necessary data is easily accessible. Thus, there is no need to use unique data-gathering methods to get it. Data collection may be done in various ways, including soliciting information from the firm or group doing the study or external sources. Secondary data may be collected through the company's internal records, financial accounts, financial statements, details on staff, and reports gathered from customers and distributors.

Although, Observations collected from clients and retailers are different types of primary sources. Data obtained from periodicals like journals, books, and magazines; government research; and information readily accessible online are all examples of secondary sources of information.

Justification

In this research on global trade engaging in a circular economic model, secondary sources are used to meet this research objectives. The secondary method of data collection drawn from a wide variety of sources, comprising academic databases like Google Scholar, scientific publications, websites, and books.

2.2.5 Working Procedure

➢ For Quantitative analysis

- Data Collection- Data collected on global trade and circular economy practices from Eurostat in experimental statistics. The data included statistics on trade volumes, trade flows.
- Data cleaning- The collected data was cleaned and prepared for smooth analysis which included checking for missing values, outliers and inconsistencies in data.
- Data analysis: Analysed the data using statistical techniques such as regression analysis, ordinary least square, correlation matrix to identify trends, patterns and relationships between global trade and circular economy practice.
- Reporting and visualisation: Generated reports and visualisations of the analysed results which helped to communicate the findings and insights.
- Synthesis: Synthesize the analysis results and insights to draw the conclusion and made recommendation for enhancing the integration of circular economy principles in global trade practices.

- <u>For Qualitative analysis</u>

  In this section of critical analysis, I examined the strengths and shortcomings of the qualitative evaluation of global trade's involvement in the circular economic model.

- Flexible: Qualitative analysis is flexible, allowing me to adjust the approach as I gathered new information. Because of this, I honed down on the most pertinent aspects of the study.
- Holistic view: The circular economic model in global trade seen in its entirety through the lens of qualitative analysis. I comprehend the nuances of the model and its influence on a variety of stakeholders such as corporations, governments, and consumers.
- Validity: The validity of the study results improved by the use of qualitative analysis. By utilizing numerous sources of data, including interviews, observations, and case studies, I verified that the conclusions are valid and accurate.
- Limited generalizability: The findings of qualitative research are difficult to generalize. The conclusions of a qualitative study are distinctive to the setting in which the research was done and cannot be applied to other situations.
- Subjectivity: Qualitative analysis is subjective, and the conclusions are impacted by the biases and interpretations. I had a responsibility to take measures to reduce the influence of own biases.
- Limited sample size: Qualitative analysis required a restricted sample size, which limit the generalizability of the results. I ensured that the sample is representative of the population being investigated to maximize the validity of the results. In conclusion, the global trade engagement qualitative assessment gave a comprehensive knowledge of the execution and effect of the circular economic model. Although it had limits, including poor generalizability and subjectivity, these shortcomings were mitigated by utilizing several sources of data and ensured that the sample was representative of the community being researched. Overall, the qualitative analysis provided a valuable tool for evaluating the circular economic model in global trade.

3 Literature Review

3.1 Trade and circular economy

3.1.1 Global trade and circular economy

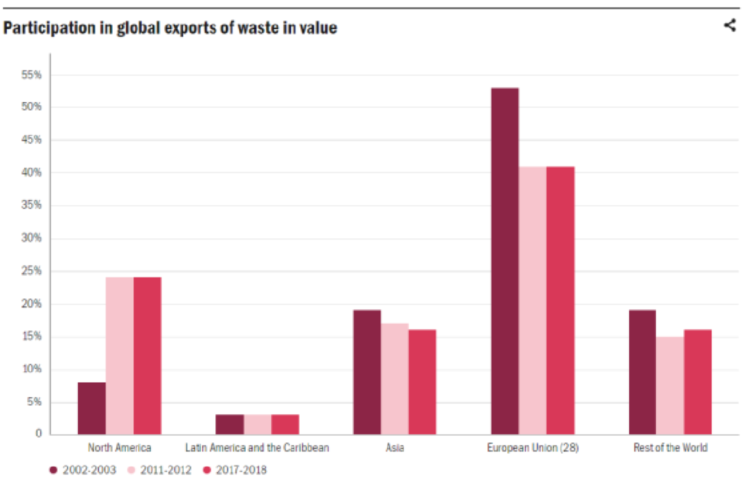
Circular economies preserve limited materials. By recycling or reusing trash, extending product life, and using sharing and services economies, this is done. The circular economy separates economic expansion from limited resource usage. Reusing and recycling waste helps. Global commerce may be crucial if done well (Adolph et al., 2020). To promote the global circular economy, one must comprehend how the many parts of the global industrial system are interrelated. Global commerce may accelerate this shift by stimulating FDI and technical innovation. Other circularity methods may relate trade flows. Secondhand raw materials, rubbish and junk for recycling, objects to be repaired and remanufactured, commodities, and services are rare.

- Trade in the context of a circular economy has the potential to diversify a country's exports while also producing economies of scale, two features that make this strategy more appealing.
- One example is urban mining, which improves e-waste management while generating cash from recovered metals. Likewise, agricultural economies can boost earnings by transforming organic waste into biofertilizers and biostimulants (Avau, Govaerts and Delarue, 2021). The link between the circular economy and global trade is also strengthened by the convergence of the digital and physical worlds. More Global commerce benefits services that have traditionally been considered part of the circular economy, such as eco-design, R&D, and repair and maintenance, as well as services that have evolved out of new circular business models enabled by the Fourth Industrial Revolution. The ultimate goal of Industry 4.0 technology is to improve the sustainability of consumption and production, which is the focus of Sustainable Development Goal 12. This is accomplished by promoting product "dematerialization" and new ways of thinking about ownership, such as "product-as-a-service" plans and "product-sharing" platforms.

3.1.2 Trade flows in waste can serve as valuable resources for production

Waste product trade has grown faster than overall commerce in recent years. Commercializing non-valuable rubbish and waste in a linear production system worsens environmental deterioration. It may represent unjust business practises like dumping textiles and clothes from industrialised nations into developing ones, which have less restraints. However, trading industrial waste and using it as a resource in other nations' production processes might help establish sustainable communities (Borrelle et al., 2020). As the scrap and waste industry shows, circularity methods, technology, scale economies, and legislation are needed to turn rubbish and trash into industrial resources. Scrap and rubbish markets prove this. The graph 1 show that the European Union (EU) and North America export the most waste, while the EU and Asia consume the most. Waste trade organisations rely on "commercial networks, freight forwarding, physical proximity, or Global treaties," therefore not all trash is carried "linearly" from affluent nations to developing ones. Onward transmission or networking systems for resource recovery and reuse may promote economic stability in Latin America and the Caribbean, where natural resource exports are the main industry.

Graph 1 : Global export of waste in value



Source: http://cdn.statcdn.com/Infographic/images/normal/18229.jpeg, 2020

3.1.3 Trade policies need to include circularity principles and objectives

The WTO detected 370 recycling-related trade barriers between 2009 and 2017. Trade agreements and regional corporate sustainability targets overlap in improving the environment, although WTO members' methods depend on the country' progress. Many underdeveloped nations have banned rubbish trade, whereas many wealthier ones promote green and circular paradigm shifts. The EU's "Farm to Fork" approach may hinder commerce in the Global South (Brändström and Saidani, 2022). Thus, emerging regions should be forward-looking and build coordination and implementation that allow access to demanding markets while improving local company profitability. Trade should be "mainstreamed" throughout all circular economy processes, so commerce policies help achieve circularity. This would strengthen ecologically responsible trade strategies that match exporting countries and trade agreement regulations. The circular economy requires integrated tactics from commerce, industry, and technology.

3.1.4 The Scope

Global trade is crucial to the circular economy, but numerous issues are stalling it. Terms, industry standards, and business classifications are undefined. Certain circular economy items are limited by technology and law (Caldeira et al., 2019). However, commerce mechanisms like variable pricing (based on carbon footprint) or circularity-based certifications and laws might promote the circular economy and trade confluence.At the intersection of trading and the circular economy, study themes include waste and debris trade, secondary raw material market participation by diverse locations, optimum governance systems, and corporate assistance for the transition to a circular economy.The balance between economies of scale, Global competitiveness, and innovation and carbon footprints and missed opportunities for local enterprises determines the possibility for circular commodity trade (Caldeira et al., 2019). Thus, a new governance framework, Global cooperation initiatives, and Fourth Industrial Revolution breakthroughs may enable a circular transition toward the SDGs.

3.1.5 Trade in waste material

Garbage is becoming seen as a resource and vital trade item. If garbage is sent to nations that sort and treat it well, recycling rates might grow globally. More individuals feel nonhazardous trash might be swapped for enhanced processing and recovery if safety standards were in place. Post-consumer goods and trash have inherent use in recovering resources and energy. India produced 13% of secondary steel in 2014 despite having little steel scrap. Secondary steel manufacture has historically traded waste and scrap to recover resources (Chen, Zhang and Xu, 2020). Limiting waste and scrap trade may reduce the availability of cheap feedstock materials, reducing industrial efficiency in increasing economies, especially advanced emerging countries. Due to rising worldwide garbage and scrap traffic, several export destinations may have environmental issues regarding rubbish management.

- According to several studies, worldwide garbage commerce increases when each country has different environmental protection rules (Cicconi, 2020). This means garbage can be transferred to countries with less strict waste disposal laws.
- There are various reasons to be concerned about the increasing volume of rubbish transported over Global borders to poor and developing nations with insufficient waste treatment equipment.
- Illegal rubbish trade may also be an issue (Cicconi, 2020). When illegal or informal recycling is carried out, particularly with e-waste in developing countries, toxic gases and waste acid are commonly released without adequate treatment or safety protocols.
- China has declared that beginning in January 2018; it will begin limiting the amount of garbage and scrap it can import, citing environmental concerns.
- The trade flows in garbage and scrap cannot be used to evaluate whether environmental pressure is increasing or decreasing.
- The real question is whether traded waste and garbage are processed and repurposed in an environmentally friendly and circular economy-friendly manner.
- The garbage and scrap trade's possible role in upcycling and down cycling should be studied (Cingiz and Wesseler, 2019). Even if it is challenging, distinguishing between trading trash for material recovery and trading waste as leftovers for energy recovery is critical.

- Different countries may have different ideas about waste, scrap, and secondary materials and how they should be classified. This could be a problem (Colombo et al., 2022). It might be difficult to tell the difference between old-fashioned items, harmless trash, and valuable scrap in many places.

3.1.6 Trade in secondary raw materials

The conventional and circular economies depend on secondary raw material trade. Replacing secondary raw materials with fundamental elements would help dissociate while maintaining economic development (Dushyantha et al., 2020). Due to environmental asset distribution, trade impacts primary raw material distribution globally. 43% of iron ore was exported in 2013. Secondary raw material providers exhibit similar tendencies. USA, Japan, and EU are leading scrap metal producers (Gadhok, I. 2020). However, without a standard definition of secondary raw materials, it is hard to track their commerce.

Trade restrictions on recycled items are being lifted to boost recycling. Secondary raw materials seldom have export restrictions. Garbage and trash export prohibitions accounted for one-third of all OECD trade barriers between 2009 and 2014. The EU has emphasised that the lack of sufficient tools and standards to evaluate the integrity of auxiliary raw materials may hinder their use and trade (Elgie, Singh and Telesford, 2021). Goods must be designed for recycling and avoid hazardous materials to be broadly accepted. End-of-life item recovery and recycling depend on protecting their chemical and physical data. With global economic activity growing, eco-design and eco-labeling schemes may help transition to a sustainable society.

3.1.7 Trade in second-hand goods

- In a global circular economy, exporting old cars and textiles would benefit the global economy and the environment (Frehner et al., 2021).
- Buying and selling used products has pros and cons.
- These exports may be seen as "leakage" from the official system from the perspective of the exporting nation's domestic policy, such as expanding producer responsibility programmes.

- Importing outdated products may slow the market's shift to energy-efficient, low-carbon economies or make it harder for some nations to get rid of outdated equipment (Fresco et al., 2021). Thus, nations that import used products may limit imports to better control and administrate them. To meet the Paris climate accord's objectives, several developing countries have considered tightening import bans on outdated, inefficient cars.
- Information about previously used items is scarce (Giovanni and Folgiero, 2023). Since the line between exports for recycling and recovery and used goods sales is unclear, this may cause a problem.

3.1.8 Trade in goods for refurbishment and remanufacturing

Exporting items that have reached the end of their useful lifecycle but have been remanufactured or rebuilt is becoming an increasingly common practise, which is cause for concern. Companies have had a hard time shipping unwanted goods across Global nations in order to recycle or remanufacture them since many of these items are considered garbage under the law. This has proven difficult for commercial enterprises (Hahladakis and Iacovidou, 2019). This because Remanufactured items that don't adhere to the most up-to-date export requirements may cause delays at international checkpoints. It's possible that the remanufactured goods can't be exported because of the new rules and regulations that have been established.

3.1.9 The Circularity Challenge

Top corporate leaders face supply interruptions, geopolitical crises, and devaluation. Climate change and resource depletion must be addressed promptly (Huang et al., 2020). Humanity uses 1.75 times Earth's natural resources yearly. Circular economies affect several areas.

The circular economy permits economic growth regardless of resource utilisation. Businesses must reduce waste, maximise product life via maintenance and repair, and recycle old parts (Jalal, Nassir and Jalal, 2019). Sharing economy and item-as-a-service business models boost efficiency.

According to a Bain & Company/World Economic Forum research, leaders are facing increased pressure to embrace a circular economy model. New rivals with innovative business tactics are upsetting several industries (Junginger et al., 2019). A recent C-suite survey found that the more senior managers prepare for circular disruption, the more they know how vulnerable organizations are to it. The analysis showed that supply chain executives aspire to double their profits from circular products and services by 2030.

In the face of disruption, CEOs are using circular products and business strategies to boost revenue, save costs, and build resilience in a low-carbon world. Over half of circular economy executives asked considered it as crucial to future success (Karman, 2022). As more firms implement circular business strategies, society will benefit more. If 21 successful circularity projects were implemented, the world's carbon dioxide emissions could be decreased by 39% and the European Union's GDP could climb 0.5% by 2030.

Circular logic makes sense. Most companies lack a roadmap to a circular business model. This kind of change may be hard to undertake and slow to succeed. Our results emphasise that. Some leaders are succeeding against the odds (Law et al., 2020). In this summary, examine how top managers feel about implementing a circular approach, how far along they are, and what they can do to get their top managers started.

3.1.10 New ways of thinking

Industrial rebels employ new ideas to create circular companies and processes. French carpooling firm BlaBlaCar identified underused vehicle capacity as a hidden commodity. Its messaging service platform doubles automobile occupancy and reduces CO2 emissions (Liang et al., 2021). The world's biggest community-based transportation group has 100 million members from 22 countries since 2006. The last investment round valued BlaBlaCar at $2 billion. Creative circular business models focus product resale, maintenance, and recovery. RealReal, founded in 2011 in the US, sells authentic Gucci and Burberry online and in shops (Müller, 2019). RealReal has approximately 24 million users, and industry estimates anticipate a €70 billion used luxury goods market by 2025, increasing from €33 billion in 2021.

French startup Back Market sells refurbished phones and PCs with quality assurance and technical assistance. Since 2014, the pioneering startup has changed consumer expectations of buying secondhand electronics, generating over $1 billion in the capital (Mutezo and

Mulopo, 2021). The company's last venture round valued it at $5.7 billion, nearly four times Currys, the UK's largest omnichannel consumer electronics shop.

Insurgents are two-fold. They reduce greenhouse gas emissions and material consumption while building a sustainable company. Of course, a start-up may disrupt an industry's cost structure quicker and easier than a dominant company (Nechifor et al., 2020). Newer companies lack long-term income streams and capital-intensive equipment to maximise earnings.

Few major firms have circularity aims. Circularity attempts fail to meet economic, operational, and environmental objectives, according to managers (Peña et al., 2021). This gap delays cyclic business model transitions and may prompt senior executives to depart them.

3.1.11 Key challenges

Circularity projects must overcome departmental misalignment. Circularity is a strategic problem, but executives disagree on its priority (Qu et al., 2019). Sales, marketing, and finance executives think they have a bigger part in circularity initiatives than operations and supply chain executives, although the latter group finds it more relevant. Sales, marketing, and finance executives are increasingly engaged in decision-making.

This discrepancy may be because supply chain and operations managers know how difficult and expensive it is to build genuinely circular processes and products (Ray, 2019). Supply chain executives worry that sustainability, resilience, and efficiency are overshadowing circularity initiatives. Circular solutions are important to sales and marketing, but customers may not.

Finding the right personnel from diverse sectors to establish a circular approach is another industry difficulty. Businesses adopt bottom-up or top-down techniques (Reynolds, 2021). Because of this, their failures usually include several variables.

Bottom-up solutions focus on one or two circular alternatives that may be integrated into a value chain. These solutions are gradual (Reznikova et al., 2019). This makes them short-term experiments with a limited audience that struggle to prove their worth. Their firm won't grow either.

However, top-down solutions that cover the whole value chain frequently fail because they are too abstract or comprehensive. Cross-functional coordination must be precise to deploy new business models and achieve circularity. Management teams generally overlook it, according to academics (Santillán-Saldivar et al., 2021). As a result, top-down plans seldom contain a framework for implementation, criteria for defining control, or incentives to work together. Thus, the department or function that pays for and implements circularity projects may not profit.

Leaders must use all of these channels simultaneously and facilitate team collaboration to accelerate organisational transformation. They intend to dramatically reorganise the corporation in five to ten years using cross-functional teams to prepare for a circular future (Sastre Sanz, 2021). They are also circularising several elements of their firm. "Today-forward and future-back" describes this perspective. It's crucial that it links the firm's current and future. This strategy yields short-term success and long-term worth.

Circularity policies are opposed by a broad range of stakeholder groups within and outside the organisation (Baron, D. O., 2021). For instance, most organisations acknowledge that suppliers are crucial external partners in their circularity initiatives, yet 60% say engaging suppliers is challenging.

3.1.12 Avoiding common obstacles

Expect disaster: Start with the idea that innovative competitors or newcomers will disrupt the main business with a circular business model, then work backwards to uncover alternatives. Leadership teams should explore alternate sector futures (Shevchenko, Laitala and Danko, 2019). When reconsidering their company model, CEOs search for methods to boost organisational circularity. They monitor resource utilisation and value creation across the value chain. This lets them test alternate circular flows.

Existing items and processes may be circularised. This might provide the framework for a business strategy (Shopova, Petrova and Todorov, 2023). Buyback programmes, repairs, remanufacturing, reselling, and using renewable and recycled materials may prolong the lifespan of products. Circular approaches work best when they focus on scalable possibilities.

Finally, rules will drive change and disruption (Song et al., 2019). Businesses that embrace circular business models and strategies before it's too late may work with governments to accelerate the shift.

In a circular economy, a major automaker would predict how materials would travel through its value chain. The management group discussed where to get the supplies, how to make and assemble the parts, how to utilise the vehicle, and what to do with it afterward (Spooren et al., 2020). Analysis was difficult even before the switch to electric drivetrains. Leadership was also unaware of the upstream supplier chain.

Despite these challenges, modelling the value-production process in a future cyclical circumstance provided useful insights. The company developed innovative ways to reduce garbage and fuel usage. They reused parts in one example (Suzanne, Absi and Borodin, 2020). Recycling was increased to cut emissions. One-third cut costs and recycled batteries to boost earnings.

Discover value-creation nodes.

Discover new control points for value generation in the circular economy. Cyclical disruption may help companies create new value quicker (Thanassoulis, Blake and Parthasarathy, 2022). Consumer-adaptable companies may assist the environment.

Service providers may boost the circular economy. Business data shows that consumers are ready to transition from purchasing consumables to buying product access as part of a service package that guarantees dependability, ease, and returnability (Wang et al., 2020). The manufacturer controls remanufacturing and reuse to prolong the lifecycle of a service-marketed product. These strategies lessen new item reliance.

Sharing, reselling, and maintaining products may help manufacturers generate more money over time (Wen et al., 2021). The manufacturer retains all sales income when a product's materials and components are useless. New banks, insurers, shippers, and certifiers may support the circular economy.

The multinational carmaker they mentioned formed a committee of specialists from many fields to assess the financial effect of service-based business models. Data informed closed-loop revenue models, manufacturing processes, and vendor alliances (Wiebe et al., 2019). Corporate management believed remanufacturing and recycling components brought value to customers as part of a car-as-a-service model. Maintenance skills reduce material waste and carbon emissions.

3.1.13 Plan to scale

Build flexible channel choices for distributors and partners. Companies cannot overcome a circular economy alone (Xu, Liu and Dai, 2021). Thus, value chain data networks are essential.

Traceability may help circularity by showing real-time material flows throughout product development. Transparency requires an information and system architecture that seamlessly connects ecosystem actors and information sources. One of the world's leading retailers' management team noticed a need for QR code-based digital product IDs while working with a software provider (Adolph et al., 2020). From manufacture to sale to recycling, they gathered relevant data. Product identification improved resale, durability, and retail waste. The prototype initiative might become standard technology, enhancing its impact.

Several industry coalitions have adopted industry-wide frameworks and policies to encourage circularity (Avau, Govaerts and Delarue, 2021). The EU funded the Buildings as Material Banks project, which brought together 15 European companies and organisations to encourage circular building processes.

In certain markets, companies are cooperating on producer responsibility procedures to enhance polyethylene and other consumer product packaging collection, categorization, and reclamation. Ten Malaysian consumer goods companies formed the Malaysian Recycling Alliance in January 2021 to promote circular economy (Borrelle et al., 2020). More than 100 companies, including Unilever, Coca-Cola, and Walmart, and 50 NGOs and other organisations supported the Ellen MacArthur Foundation's labelling paper. Industry-led activities may also help firms build and grow their connection environment.

3.1.14 The role of trade in advance circular economy

Limiting domestic trade may help national governments promote circularity. Quality, National governments may establish minimum recycling criteria for health (Brändström and Saidani, 2022). Quality, regulatory standards for regenerated products, pose serious for recyclable, hazardous wastes, fuel efficiency criteria for exported used automobiles that must be represented in waste plastics, plus health and safety laws for recycled or recyclable items and materials. National governments may also regulate Global commerce in certain items. Because reconditioned mobile phones are occasionally destroyed beyond repair, numerous countries have banned their sale. They were dumped in landfills or even worse. To prevent dangerous chemicals from slipping into the wrong hands, recyclable plastics must be stored properly (Caldeira et al., 2019). Another CE-related government effort is environmental item and service liberalisation (EGS). Resource control and pollution control equipment, including recycling machinery, is subject to import duties. Scrap metal customs duties may be decreased or altogether (Chen, Zhang and Xu, 2020). It would also cut CE infrastructure and feedstock capital costs in import-dependent economies and boost CE operations throughout the supply chain.

In July 2014, eighteen Signatories launched discussions on an Environmental Goods Agreement (EGA) to reduce trade barriers on environmental products and services (EGS). APEC agreed on 54 tariff lines in 2012. Negotiators have added 340 subsections to the list, which now includes 10 major divisions (Cicconi, 2020). The circular economy includes "goods," "return - on - investment," and solid and hazardous waste management". Since the TESSD is interested in EGS trade, its workplan must include EGS-circular economy links. These global programmes also promote the circular economy by classifying and defining secondary raw resources, rubbish, and hazardous materials. Remember that "trash" and "waste for recycling" are different types of waste. The biggest issue with this problem is that governments lack standards or other quantitative criteria to identify recyclables from non-recyclables (Cingiz and Wesseler, 2019). Common standards would improve CE commerce compared to the current mix of national standards and agreements.

Thus, business interchange strengthens the CE. Old and recycled materials should be able to traverse borders to be reused or mended more efficiently and cheaply (Colombo et al., 2022). Used textiles are taxed 19%, whereas used plastics are taxed 6%. To succeed, CE must reduce or remove tariffs and other non-tariff trade barriers. For end-of-life recovery, product exchanges should follow good material stewardship standards like the Basel amendments' limitations on secondary plastics or an agreed-upon design (Dushyantha et al., 2020). It's ok for countries to prohibit imports that don't meet their standards.

3.1.15 Impact of circular economy on developing countries

Poor economies will suffer from CE routes. The developing world's growing middle class's acceptance of consumer electronics (CE) products and services supports this strategy. A fair transformation to a sustainable system involves multilateral treaty regarding rules and expectations and massive asset and transportation investment (Gadhok,I.,2020). Thus, poor nations may outline CE rules. Two options. The EU is reviewing all eco-design standards to see whether a new strategy is required to overcome difficulties. Standard lifetime evaluations that include creation, usage, and disposal do not consider "future use" of a material or refurbished object (Elgie, Singh and Telesford, 2021). Second, they may anticipate CE recognition and branding, such as a symbol or the A-to-G efficiency range. These classifications may help or hurt developing country exports. 10% of low-income countries' GDP comes from natural capital rents. Lower raw material demand creates possibilities (Frehner et al., 2021). Rising imports of recoverable waste to developing nations provide opportunities to construct higher-value tail businesses and transition away from staples-based industrial systems. Imports may help rising care and reuse firms manage trash. Servicing products takes more work than making them, which may benefit industry.

Emerging countries require support building regional competency to enable sustained economic production (Fresco et al., 2021). Enact adequate garbage disposal legislation. Eliminating CE-related Global trade barriers would circle key industries. CE's consequences on impoverished nations, unmanaged rubbish, and trash pickers must be considered. OECD CE data dominates, hence emerging countries need better EE data collection. Several developing nations handle waste informally (Giovanni and Folgiero, 2023). Even ILO's overlooked 1% of urban people who dig through trash may benefit from the CE strategy.

3.1.16 Fostering the circular economy in developing country

Despite policy and technical gains, underdeveloped country curricula have gotten little attention. Global CE debates have ignored the agricultural sector, but structural and political concerns, rapid economic expansion, and modernization mean it must be at the centre of future national CE strategies (Hahladakis and Iacovidou, 2019). Agriculture and other businesses are innovating in emerging countries, and their governments are promoting circular economic development.

Value chains, governance, and investment frameworks need greater circularity for global CE. Due to market saturation with inexpensive used garments, East African governments proposed to ban used clothes imports in 2015. (Hanusa, 2021). After US pressure, the import ban was changed to an import charge, but the case highlighted how poorly controlled secondary material commerce may worsen issues in conventional sectors and nations.

Opinion surveys show that several rising nations seek to restrict outmoded automobile imports.

When global circular value chains harm traditional labour or produce environmental or health issues like e-waste, the Global community must adopt universal rules and standards. The CE may facilitate economic diversification, product innovation, and skill development under certain situations (Jalal, Nassir and Jalal, 2019). Emerging countries benefit from the previous economic boom. Imagine if poor nations could "leapfrog" wealthier ones in technology and materials. If so, these nations may establish sustainable economies. Trade and foreign investment that seizes new possibilities may accelerate CE in developing nations. The CE and those seeking verification of procedures and therapies must exchange knowledge, lessons learned, money, and resources (Junginger et al., 2019). The Convention on the Integrity of the Ecosystem requires multilateral development banks to ensure climate resilience, biodiversity preservation, and sustainable development. For "triple-win" situations, governments of higher-income nations may investigate early possibilities to cooperate with lower-income nations on trade, the CE, and environmental objectives.

3.1.17 For global cooperation for sustainable development.

CE pathways must meet development standards and safeguard environmental and economic interests to be accepted and implemented Globally (Karman, 2022). Global and bilateral CE cooperation is possible due to tensions over waste trade, development aid, and climate change finance. Toxic waste debate has advanced in the Basel Convention, giving greater control over global e-waste flows (CIEL). The worldwide framework for controlling harmful chemical trade has several gaps. The WTO's Aid for Trade programme may help poor countries maximize the benefits of the circular economy transformation (Law et al., 2020). TESSD will cover Aid for Trade; hence its relationship to CE should be examined.

However, these initiatives must be considered with numerous other commerce sector developments. They may guarantee that CE becomes a collaborative Endeavour that correctly depicts global value chain interconnectedness (Liang et al., 2021). As nations recover from the COVID-19 pandemic, it will be crucial to mobilize adequate funds to support the CE transformation's feasibility and long-term stability.

3.1.18 Product Policy

A paradigm shift to a circular economy is needed to address climate change, ecosystem loss, and reckless exploitation of natural assets. The sequential take-make-discard monetary system will be complemented with a legal justification that should lead to safer, more reliable, reusable, and recycled contents items (Müller, 2019). Product-as-a-service, rentals, and communication will enhance identical product responsibilities. Nations must find a method to decouple the economy from virgin minerals to remain inside this environment.

In March 2020, the EU released its Circular Economy Action Plan (CEAP) to lead the global circular economy transition. The Comprehensive Environmental Action Plan (CEAP) of the European Commission defines a new sustainable product strategy (Mutezo and Mulopo, 2021). Reprocessing, reversal supply networks, and secondary raw material markets remain important in the circular economy, but planning has taken centre stage.

80% of a product's environmental impact is determined during development. For the industry to become more circular, each item and material must be designed for circular thinking from the start, from a cradle-to-cradle perspective, and its lifecycle must be monitored (Nechifor et al., 2020). Creating and using software product certifications is another CEAP innovation. The world is transitioning to a circular economy and a digital economy, which was accelerated by the COVID-19 pandemic. The EU is not the only institution with ambitious circular economy goals. China, India, Chile, and several African countries are pursuing circular economy policies (Peña et al., 2021). While mapping out the next stages, financial restrictions and a circular product policy are adopted.

3.1.19 Trade, Regulation and Global Circular Economy Transition

People will comprehend living in a circular economy when it extends to additional nations. Currency exchange rates are crucial (Qu et al., 2019). Global value networks and, increasingly, reverse value chains link commodity and material production, consumption, leasing, reintroduction, repair, recycling, and disposal. However, the new circular economy does not fit current business conditions. Due to the slow and inefficient customs code update process; they may not be able to identify secondary raw materials or items meant for reuse or repair (Ray, 2019). It is also unclear whether a manufacturing process or technology's resource and energy efficiency should be examined.

Global cooperation is necessary for circular economy growth. The World Trade Organization (WTO) is holding informal trade and circular economy talks while the Organization for Economic Cooperation and Development (OECD) conducts critical technical background research with stakeholder involvement (Reynolds, 2021). The World Economic Forum and the Global Chamber of Commerce, motivated by commercial interests, also provide real-world information.

Governments worldwide are supporting the circular economy, resulting in new regulations. Circular economy standards may clash (Reznikova et al., 2019). Because of this, it's important to start coordinating behaviours right away rather than waiting to figure out how to measure conformity and recognise each other.

3.2 Standards and Policies for the Circular Economy

3.2.1 Management Standards and Product Standards

The OECD and EU have produced two circular economy standards: I. management and organization standards, and II (Santillán-Saldivar et al., 2021). norms for circular economy objects. The Technical Committee 323 of the Global Structure for Standardization is working with the major trade blocs to produce a circular economy standard that emphasises organisation and administration (Sastre Sanz, 2021). The lengthy process benefits companies and governments.

The OECD divides circular product standards into upstream and downstream categories. The first group includes early manufacturing efforts. For instance, materials composition, recycled content, hazardous content, recyclability, reparability, and environmentally responsible manufacture are regulated (Shevchenko, Laitala and Danko, 2019). The second group covers value chain end-stage challenges. This category includes quality criteria for trash, scrap, secondary raw materials, and used, refurbished, and remanufactured products.

Companies are more likely than diplomatic or commercial dialogues to adopt second-category rules like a circular product policy. Again, this is because firms are more inventive. Many governments are enacting tougher product rules. Most store-bought goods must meet quality and safety standards. This is standard in business (Song et al., 2019). Instead of developing new standards, the process may include revising existing ones. However, circular services and innovative circular business models differ. Digital technology may provide circular solutions.

3.2.2 EU Circular Product Policy and the Ecodesign Directive

The EU's Circular Economy Action Plan (CEAP) shows how to create a circular product strategy. The EU Batteries Regulation will define circularity for one product category in December 2020. Legislative conflicts may inform the Sustainable Products Initiative. From raw material extraction through end-of-life disposal, this battery industry standard applies (Spooren et al., 2020). Between 2018 and 2030, battery demand and supply are expected to rise by 14 times as governments electrify to realise carbon neutrality. Due to tight EU regulations, lead, cobalt, nickel, and lithium may be recycled from batteries.

The Sustainable Items Legislative Initiative will help CEAP implement its new circular product strategy, which includes expanding the Eco-design Directive beyond energy-related items. The Sustainable Items Legislative Initiative gives the plan teeth (Suzanne, Absi and Borodin, 2020). The 2016 EU Circular Economy initiative focused on energy efficiency and was limited in scope (consumer electronics).

Electronics, ICT, textiles, furniture, and high-impact intermediates like steel, cement, and chemicals are the main emphasis areas (Thanassoulis, Blake and Parthasarathy, 2022). It will describe product policy concepts and sustainability and transparency criteria for most goods. Companies will also have constraints and incentives to be more responsible and make their products last longer (Wang et al., 2020). Take-back programmes, goods as a service, repair services, and spare component availability are examples.

The EU will also set public procurement sustainability standards. It will suggest giving customers sustainability labels and information on all commodities throughout value chains (Wen et al., 2021). These EU projects promote sustainability. Process inputs and outputs will be limited (e.g., to facilitate recycled content or to remanufacture and minimise the use of hazardous substances). Eco-design and energy labelling laws will be supplemented with uniform standards. A product's overall quality may be assessed (Wiebe et al., 2019). Companies may sell CE-marked products within the EU. EU and other stakeholders may engage in early public discussions.

When crafting circular economy legislation, it will be crucial to study how Global trade affects countries and how to interact with their laws (Xu, Liu and Dai, 2021). Europe cannot be autonomous inside the EU. However, as the world's first circular economy, the bloc might serve as a model. It must work with major countries and recruit developing nations to succeed (Adolph et al., 2020). Green protectionism worries about developing nations' capacity to meet new requirements. However, the circular economy is not just a green addition and will not rely on the same voluntary (or semi-voluntary) private sector regulations. Instead, it requires a digital-era product strategy that involves constant product and technological development (Avau, Govaerts and Delarue, 2021). Goods and services integration affects standardisation. Communication must start early and regularly. In Geneva, trade negotiators, standard-setting bodies, and industry representatives may discuss these issues.

3.2.3 Free trade agreement

Free trade accords may also be a forum for discussion and regulation due to commissions on technical barriers to trade and sustainable development.

Trade agreements should establish a sustainable society to answer worries about controlling standards and obtaining foreign clients (Borrelle et al., 2020). The EU-Singapore and EU-Vietnam treaties feature sustainable energy clauses that set the foundation for significant cooperation, which may serve as a model. These parts cover eliminating tariffs and non-tariff barriers and using globally accepted standards. Liked how a circular economy book might commit pages to product policy development.

Aid for Trade may give technical assistance on circular product norms and regulations to promote cooperation between impoverished and industrialised countries (Brändström and Saidani, 2022). The UN Industrial Development Organization (UNIDO) is vigorously working on a concept to foster value chain collaboration in sectors including textiles, ICT, and plastics by engaging private business and allowing co-creation and teaching by doing.

Creating a worldwide circular economy will need several techniques (Caldeira et al., 2019). Cooperation on standard formulation may integrate recycling into global supply chains and facilitate circular trade.

3.3 Implementing the Circular Economy in Specific Industries

3.3.1 Integrating the construction industry into the circular economy

The airborne dust and waste left behind when buildings are demolished is one of the most "visible" sorts of trash, because the company may not see it every day but it burdens the ecology. Building construction technological upgrades and long-term expansion may reduce the sector's environmental effect (Chen, Zhang and Xu, 2020). Making demolition waste "circular" and utilising it for building is one option. After extensive testing, trash may be utilised to produce concrete. Bricks, pottery, doors, and frames are routinely reused without processing. In Hungary, ÉMI Non-profit Llc. rates and regulations promote construction garbage recovery. Structural material manufacturers must also be addressed since, apart from legal issues, selling recovered waste output is commercially lucrative and reduces raw material use (Cicconi, 2020). The world's largest building resource firm, LafargeHolcim, consumes 54 million tonnes of trash and creates 6.5 tonnes of aggregates from municipal solid waste.

Net Zero, a World Green Building Council programme, aims for near-zero carbon dioxide emissions from all facilities by 2050. By 2030, 75,000 professionals will acquire the knowledge and training needed to meet Net Zero criteria for big projects and properties undergoing major renovations. By 2050, 300,000 will do so (Cingiz and Wesseler, 2019). Construction's biggest milestone. Hungary's 2009-founded Green Building Council supports similar efforts. They aim to help establish energy-efficient buildings that use renewable electricity and generate excess energy. Power, waste, and water management may employ the idea (Colombo et al., 2022). BREEAM, DGNB, LEED, and the Net Zero project support buildings' energy performance and sustainability.

Entrepreneurial marketing to numerous industries has made IoT (Internet of Things) technology part of our everyday lives. The IoT sector is expected to treble its 2014 worth of USD 46 billion by 2020, driven by smart buildings. Developers choose sustainable buildings using IoT technology owing to their lower running costs and better property values, despite higher infrastructure expenditures (Dushyantha et al., 2020). Smart buildings should yield 6.6% more. Smart office administration and maintenance services help decrease workplace environmental impact. Vacant space costs investors and harms the ecosystem. Smart beacon systems provide real-time data on staff whereabouts, vacant spaces, meeting rooms, and cafeteria hours. In cities like London, where office buildings cost approximately $30,000 per year, space optimization is vital. Beacon data may boost worker productivity and space efficiency (Adolph et al., 2020). The optimal office setup may boost work discipline and inspire creative white-collar workers.

Repurposing a facility instead of destroying it reduces material and environmental damage and increases recycling and reuse. Reconstructing a building built using outdated standards and technology for a new purpose to meet contemporary standards is a difficult and expensive construction and engineering undertaking (Elgie, Singh and Telesford, 2021). However, there are many examples of how old constructions may be preserved and utilised. A noteworthy urban restoration programme in Essen, Germany, rehabilitated commercial premises abandoned by coal mines and steel factories that closed in the 1980s. Krupp Park, formerly Krupp steelworks, is a sustainable urban redevelopment scheme.

The Zollverein coal factory and industries have become a museum nature reserve. Due to public transit, sewer improvements, and tree-planting activities, Essen became Europe's first post-industrial "Green Capital" in 2017. (Frehner et al., 2021). Essen may be a model for many of Europe's major cities dealing with abandoned heritage constructions.

3.3.2 From smart to circular – The cities of the future

City dwellers climbed from 34% in 1964 to 54% in 2010 and are expected to reach 75% by 2050. A rapid increase like this may have a major impact on a municipality's finances and quality of life (Fresco et al., 2021). However, 60% of the cities expected to exist in 2050 will not, suggesting that a lot of new infrastructure may be built in the coming decades. Amsterdam, Paris, Copenhagen, London, and San Francisco mayors have vowed to include distribution chain in municipal projects. This may be done by setting specific goals or objectives in this area, establishing research programmes, asking economic stakeholders' opinion, or customizing legislation to a cause (Giovanni and Folgiero, 2023). Other urban leaders have made similar pledges. If municipal governments adopted this idea, it may improve cooperation between urban centers and industry, improving living conditions for urban dwellers worldwide.

3.3.3 Circular business models

First, academia, industry, and government prioritise re-X technology research and development (reuse, remanufacturing, recycling, etc.). However, it is clear that these technologies have far-reaching potential. Stakeholders must work together to maximise this technology's benefits as the circular economy evolves (Hahladakis and Iacovidou, 2019). This has led to the invention of new business models, which are effective at persuading consumers to adopt "circular" technology. Companies may adopt circular business models by leveraging Rheaply, a platform that promotes internal and external reuse.

"Circular business models" close loops, restrict their size, slow them down, intensify them, and dematerialize them to decrease a company's resource usage, waste, and emissions. These include changing products and services, increasing demand, and recycling rates (dematerializing). These concepts need a closed-loop supply chain with several material recovery methods (Hanusa, 2021). Circular products, business strategies, and the circular economy depend on material properties. Circular commodities, business strategies, and economies depend on how these materials can and cannot be used.

Circular business economic models can increase the "use cycle" of a product or material, recover materials through a "waste = food" mentality, ensure that biological materials returned to Earth are safe and non-toxic, and retain as much energy, water, and other process inputs as possible in the product and material. Increase the amount of times a product can. To encourage product stewardship, "polluter pays" laws, extra restrictions, taxes, and market mechanisms should be promoted.

3.3.4 Digital circular economy

Digitization and digital transformation—such as the Internet of Things, Big Data, Machine Intelligence, and Blockchain—can increase value generation and capture, growing the circular economy. Smart phones are highlighted in the European Green accord's Circular Economy Implementation Plan for their role in accelerating sustainability. The smart shared value paradigm connects digital media with water use (Huang et al., 2020). This helps assess the maturity of current supply chain systems, guiding business intelligence use to maximise circularity (i.e., optimising functionality and resource intensity). To support this, European Horizon 2020 programme CICERONE issued a Strategy Research and Innovation Strategy for the Sustainable Future that places digital technology at the centre of several critical creative sectors.

3.3.5 Strategic management in a circular economy

The CE doesn't change business's profit maximisation focus. Instead, it advocates rethinking SCA to address 21st-century environmental and social challenges (Jalal, Nassir and Jalal, 2019). Diverging from traditional agriculture usually leads to novel capabilities throughout the value chain, which improves overall performance in terms of reduced costs, increased productivity, compliance with strict environmental standards, and satisfaction of progressive governments and environmentally conscious buyers. CE judgment is a huge challenge with no alternative answer, even with many firms successfully integrating circular solutions across organisations and despite the multitude of possibilities when an organisation has clarity over whether circular activities match its profile and ambitions (Junginger et al., 2019). Due of the topic's intricacy and ambiguity, most organizations, particularly smaller ones, still consider circular approaches irrelevant or too costly and dangerous to implement. The Circular Readiness Assessment confirms this concern.

Organizational strategy side helps organisations carefully analyze CE-inspired concepts and dissect their operations to find roundness germs. Organizational Behavior and the Circular Economy initially described the study, conceptualization, and implementation phases of a CE strategically ruling process(Karman, 2022). However, this has yet to be proven. Kraljic has extensively defended his based product matrix, sector matrix, pricing equation, economic growth matrix, and portfolio matrix.

4 Practical Part

4.1 Quantitative Analysis

This table 1 shows data for a time series analysis of the relationship between private investment and gross value added in the circular economy sectors, and several factors that may impact this relationship. The data covers the period from 2011 to 2020 for trade of European Union.

These variables are important because they are all potentially relevant in determining the relationship between private investment and gross value added in the circular economy sectors. The generation of packaging waste per capita and the recycling rates of both packaging and municipal waste could reflect the level of environmental concern and sustainability practices in the economy. On the other hand, private investment and gross value added in circular economy sectors drives sustainable practices and contributed to lower waste generation and higher recycling rates. The data analysed in GRETL using various statistical methods to understand the relationships between these variables and the private investment and gross value added in circular economy sectors.

Table 1 : Data of European Union for analysis in GRETL

Time	Private investment and gross value added related to circular economy sectors in million Euros	Generation of packaging waste per capita in Kilograms per capita	Recycling rate of packaging waste by type of packaging rate in percent	Recycling rate of municipal waste in percent	Generation of municipal waste per capita Kilograms per capita
2011	110100	157	64	38	499
2012	108900	154	65	40	488
2013	108800	156	65	41	479
2014	113100	161	66	43	478
2015	114900	165	66	44	480
2016	117700	168	67	45	493
2017	125700	173	67	46	499
2018	130800	173	65	46	500
2019	139100	177	64	47	504
2020	139100	177	64	49	521

Source: https://ec.europa.eu, 2021

- <u>Intepritaion of Ordinary Least Square</u>

Figure 3 : Ordinary Least Square

```
gretl: model 1
File  Edit  Tests  Save  Graphs  Analysis  LaTeX
Model 1: OLS, using observations 1-10
Dependent variable: Privateinvestmentandgrossvaluea

                       coefficient   std. error   t-ratio   p-value
  --------------------------------------------------------------
  const                89596.5       67743.7       1.323    0.2432
  Generationofpack~      947.402       269.742     3.512    0.0171  **
  Recyclingrateofp~    -2836.59        702.233    -4.039    0.0099  ***
  Recyclingrateofm~      808.174       605.778     1.334    0.2397
  Generationofmuni~       47.7851       87.1915    0.5480   0.6072

Mean dependent var   120820.0   S.D. dependent var   12007.39
Sum squared resid    17556653   S.E. of regression   1873.854
R-squared            0.986470   Adjusted R-squared   0.975646
F(4, 5)              91.13635   P-value(F)           0.000074
Log-likelihood      -86.08118   Akaike criterion     182.1624
Schwarz criterion    183.6753   Hannan-Quinn         180.5027

Excluding the constant, p-value was highest for variable 6 (Generationofmunicipalwasteperca)
```

Source: Generated through GRETL, 2023

Analysis

$y1t = 89596.5 + 947.402\ x1t - 2836.59\ x2t + 808.174\ x3t + 47.7851\ x4t + ut$

y1t = Private investment and gross value added related to circular economy sectors (m€)
x1t = Generation of packaging waste per capita (kg) per capita
x2t = Recycling rate of packaging waste by type of packaging (%)
x3t = Recycling rate of municipal waste (%)
x4t = Generation of municipal waste per capita (kg) per capita

1. If all the variables are 0 then the value of Private investment and gross value added to circular economy sectors will be 89596.5 m€.
2. If only Generation of packaging waste per capita (kg) per capita increased by 1 unit then private investment and gross value added related to circular economy sectors increased by 947.402.
3. If recycling rate of packaging waste by type of packaging increased by 1% then private investment and gross value added related to circular economy sectors decreased by -2836.59.
4. If recycling rate of municipal waste increased by 1% then private investment and gross value added related to circular economy sectors increased by 808.174.

5. If generation of municipal waste per capita increased by 1 unit then private investment and gross value added related to circular economy sectors increased by 47.7851.
6. The P-value is 0.000074 which is much less than 0.05, so this is a good model.

- Intepritaion of Regular Least Square

Figure 4 : Regular Least Square

```
LASSO (ADMM) using observations 1 to 10 (n = 10)
Dependent variable: Privateinvestmentandgrossvaluea
single lambda-fraction 0.5
lambda-max = 9.52191

  lambda/n    df   criterion     R^2      BIC
  0.476095     1    0.386667   0.6800  19.2871


BIC = 19.2871 for s = 0.500000

LASSO coefficients

                       const      12758.9
Generationofpackagingwasteperca      650.578

Command line equivalent:
include regls.gfn
bundle rb = regls(Privateinvestmentandgrossvaluea, X, _(lfrac=0.5, verbosity=3))
```

Source: Generated in GRETL, 2023

Analysis

1. The output shows the results of running a LASSO regression using the alternating direction method of multipliers (ADMM) algorithm on a dataset with 10 observations and a dependent variable called Private investment and gross value added. The goal of LASSO regression is to select a subset of independent variables that are most important for predicting the dependent variable, while also reducing the impact of any irrelevant variables.

2. The lambda value used in this regression is 0.476095, which corresponds to a lambda/n ratio of 0.04761. The degree of freedom (df) is 1, and the criterion value is

0.386667. The R-squared value is 0.68, indicating that the model explains 68% of the variation in the dependent variable.

3. The Bayesian Information Criterion (BIC) is a measure of model fit that balances the trade-off between goodness of fit and model complexity. In this case, the BIC value is 19.2871 for a lambda-fraction of 0.5. The lower the BIC value, the better the model fit.

4. The LASSO coefficients show the estimated effect of the independent variables on the dependent variable. The intercept is 12758.9 and the only non-zero coefficient is for the independent variable called "Generation of packaging waste per capita", which has a coefficient of 650.578. This suggests that the generation of packaging waste per capita is an important predictor of private investment and gross value added.

- <u>Intepritaion of Heteroskedasticity Corrected</u>

Figure 5 : Heteroskedasticity-corrected

Model 4: Heteroskedasticity-corrected, using observations 1-10
Dependent variable: Privateinvestmentandgrossvaluea

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	116613	41210.4	2.830	0.0367	**
Generationofpackagingwasteperca	1145.63	182.668	6.272	0.0015	***
Recyclingrateofpackagingwasteby	−2987.67	445.674	−6.704	0.0011	***
Recyclingrateofmunicipalwastein	614.248	413.036	1.487	0.1971	
Generationofmunicipalwasteperca	−36.2648	59.8413	−0.6060	0.5710	

Statistics based on the weighted data:

Sum squared resid	6.652792		S.E. of regression	1.153498
R-squared	0.996389		Adjusted R-squared	0.993501
F(4, 5)	344.9596		P-value(F)	2.73e-06
Log-likelihood	−12.15164		Akaike criterion	34.30329
Schwarz criterion	35.81621		Hannan-Quinn	32.64361

Statistics based on the original data:

Mean dependent var	120820.0		S.D. dependent var	12007.39
Sum squared resid	22399714		S.E. of regression	2116.588

Source: Generated in GRETL,2023

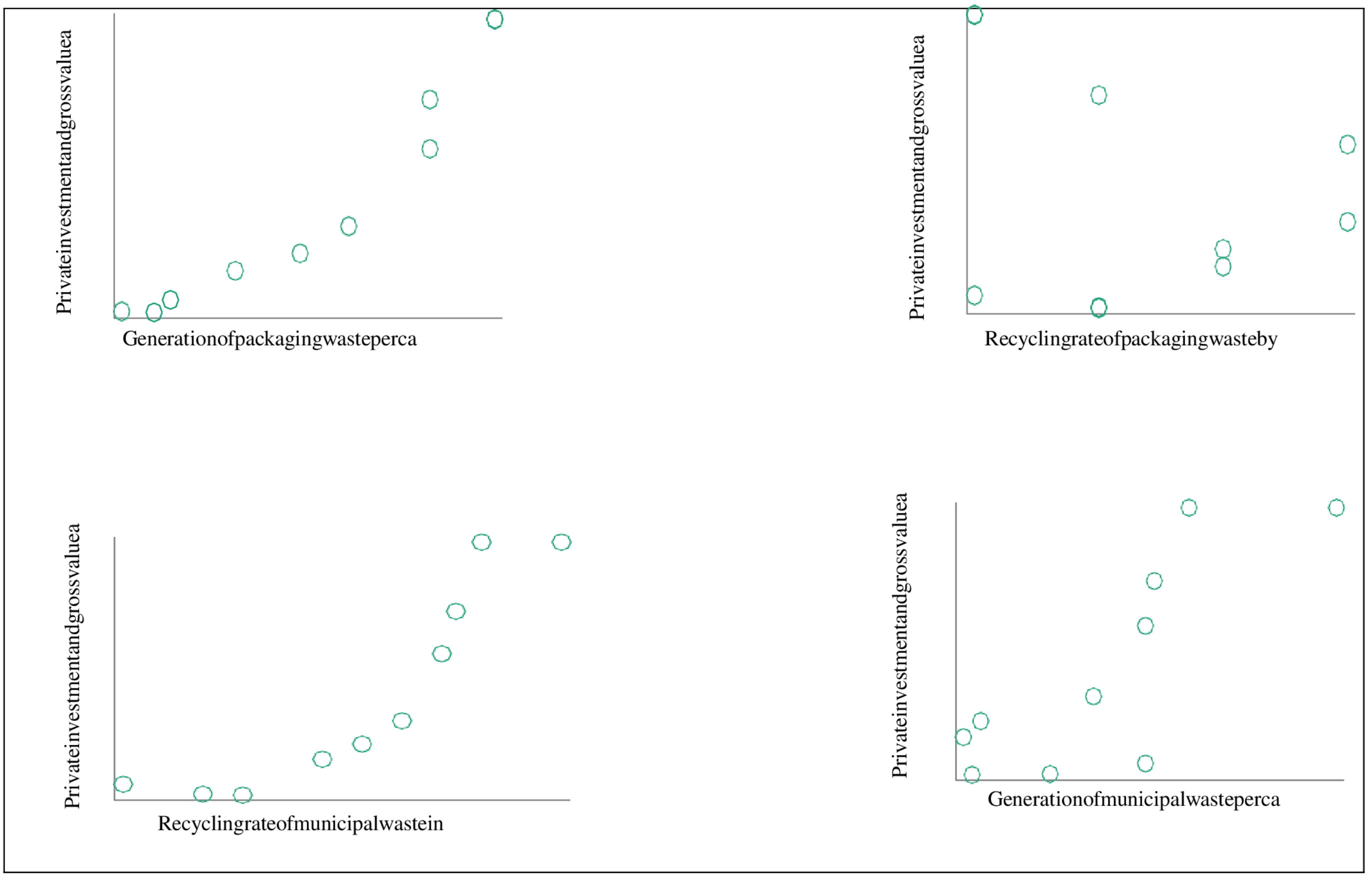
Analysis

1. This analysis is about how different things might affect private investment and gross value added, which is how much money is made from business activities. I looked at four different things: how much packaging waste is made per person, how much of that packaging waste gets recycled by households, how much municipal waste gets recycled, and how much municipal waste is made per person.

2. I found that if there is more packaging waste per person and more of that packaging waste gets recycled by households, then private investment and gross value added are likely to go up. However, if more municipal waste is recycled, then private investment and gross value added might go down. The amount of municipal waste made per person doesn't seem to have much of an effect.

- <u>Intepritaion of Scatter Plot</u>

Graph 2 : Scatter plot for variables



Source: Generated in GRETL, 2023

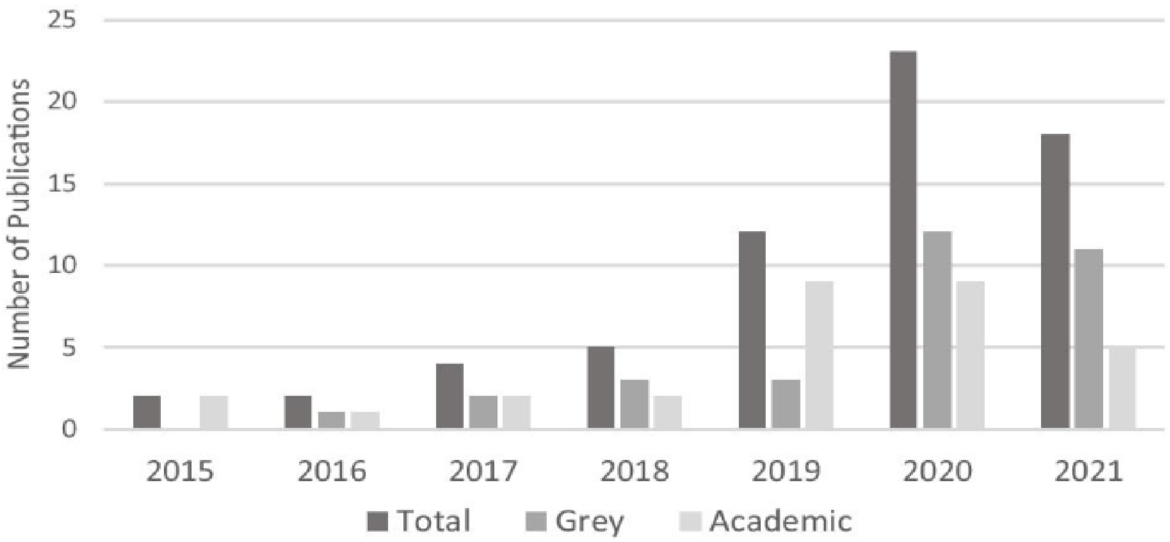
<u>Analysis</u>

- Private investment can lead to an increase in economic activity, which in turn can lead to an increase in the generation of municipal waste and generation of packaging waste. However, private investment can also lead to the development of more efficient and sustainable waste management practices, which can help to reduce the overall amount of municipal waste and packaging waste generated.

4.2 Qualitative Analysis

The concept of global trade engagement in the circular economic model emphasizes the recycling and reusing of materials and resources within the economy. The assessment of this model done also by qualitative analysis, which entails obtaining data through focus groups, observations, and case studies. The qualitative research sheds light on the obstacles, rewards, and possibilities presented by the circular economic model in global trade.

Graph 3: Chronological evolution of publications on global trade and circular economy

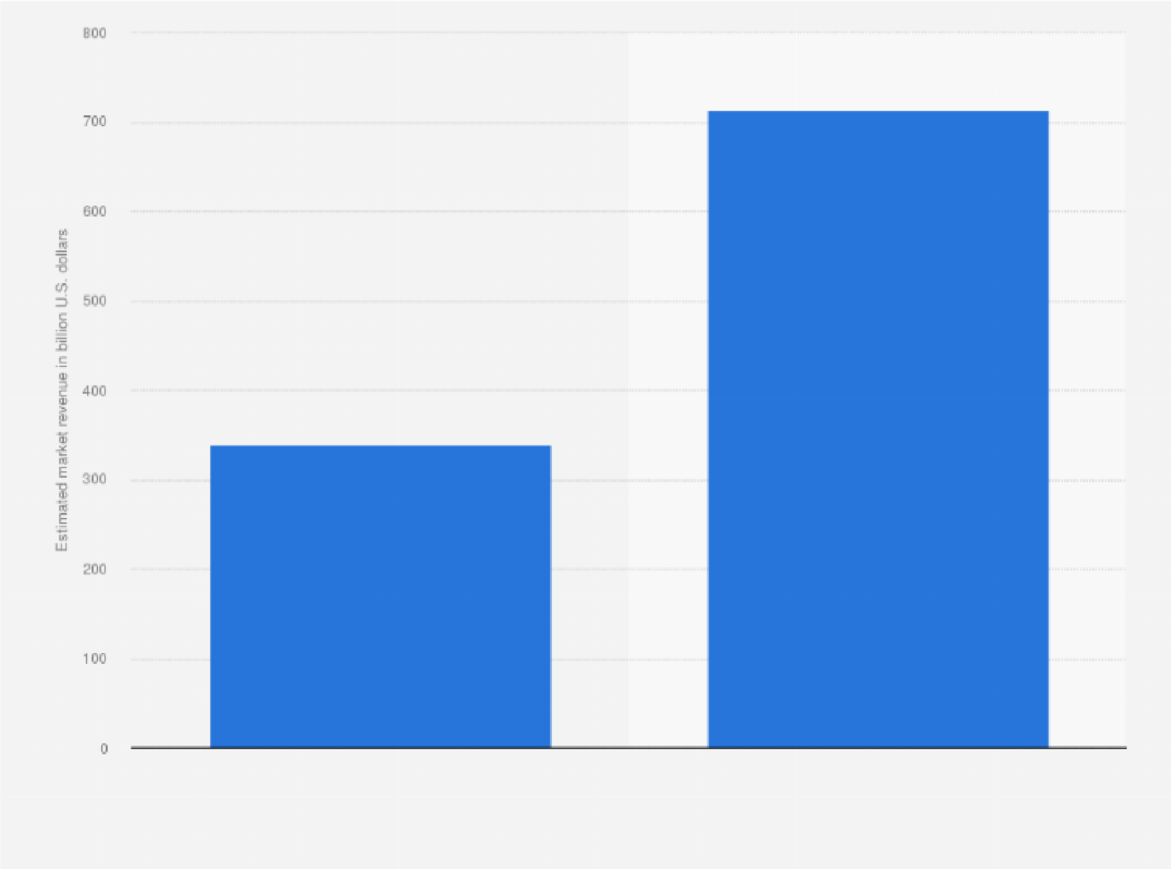


Source: (Barrie & Schröder, 2021)

Data mining reveals that studies on the intersection of the circular economy and global commerce are frequently increasing, despite their low baseline level. Eighty percent or more of papers and publications have been generated during the previous three decades (2019-2021) (Barrie & Schröder, 2021). Both academic and grey liter constituting the vast majority of published works (covering mostly publications for international organizations).

4.2.1 Global Trade And Circular Economy

Graph 4: Circular economy revenue worldwide 2022-2026

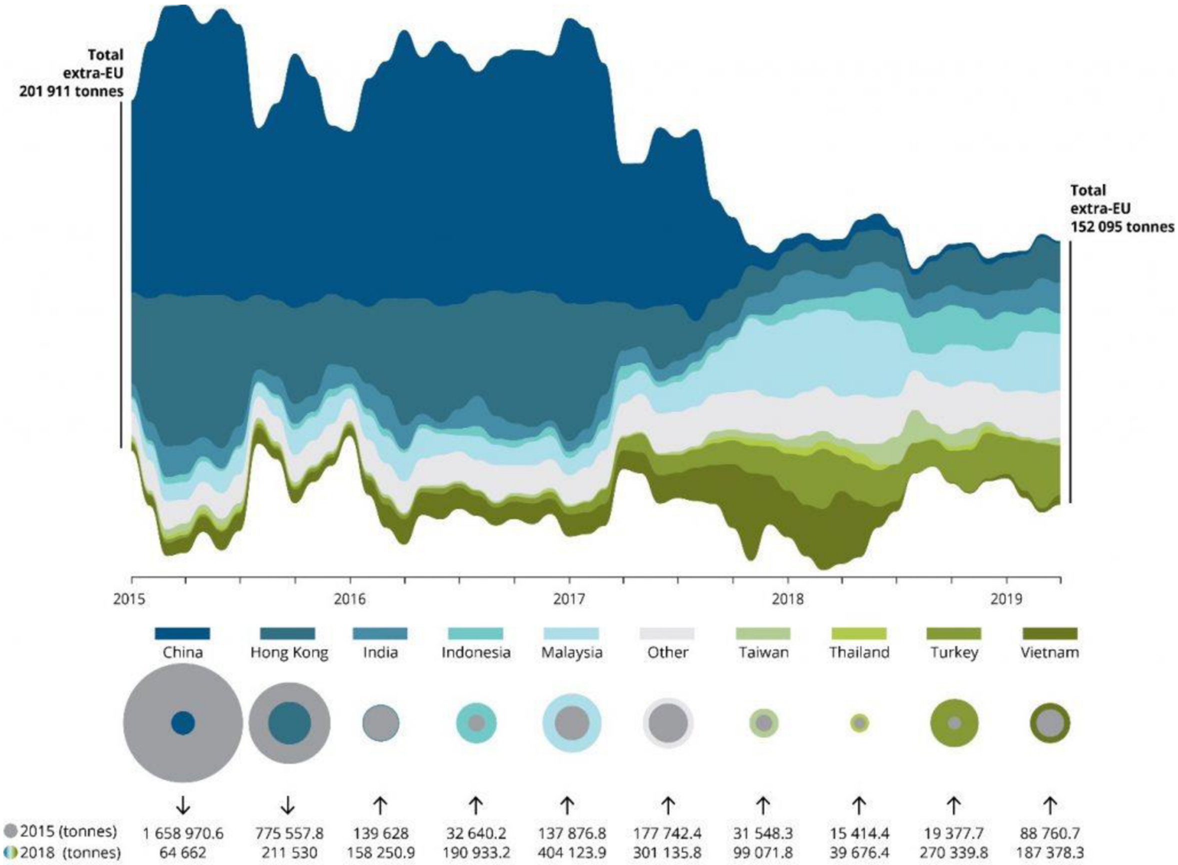


Source: (P. Smith, 2022)

In the global circular economy, revenue from used, rental, and reconditioned items alone was predicted to reach around $339 billion in 2022 (P. Smith, 2022). By 2026, this was expected to have increased by double.

4.2.2 Trade Flows In Waste By Country

Graph 5: Global Waste Trade and its Effects on Landfills in Developing Countries



Source: (Mariam, G. 2021)

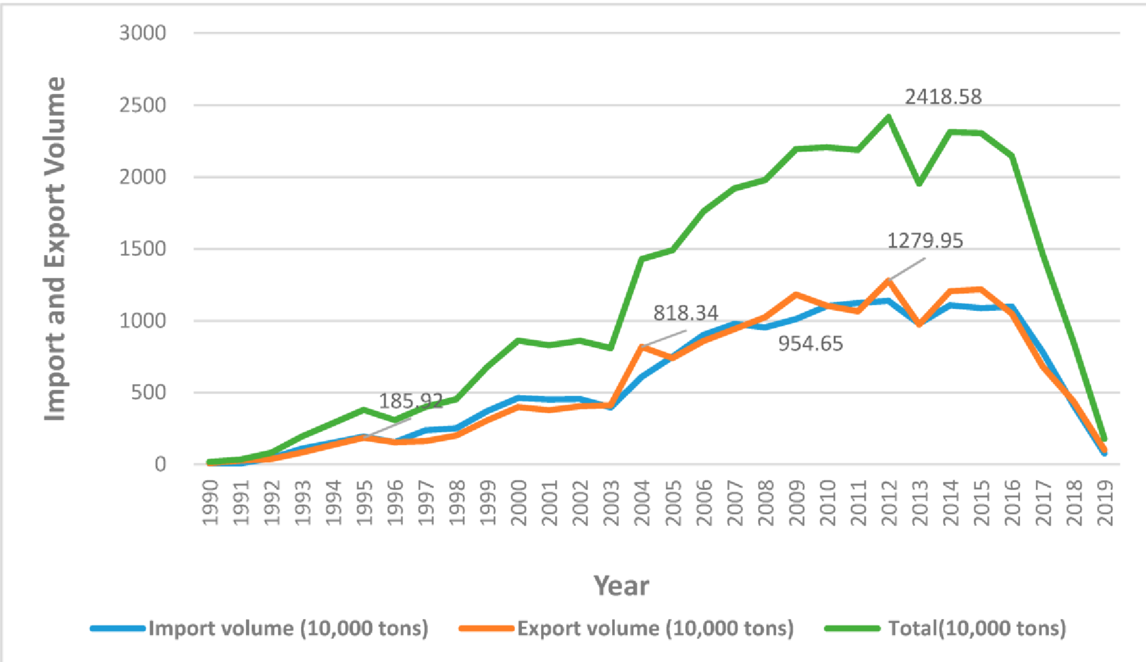
The graph 5 shows that most acquiring nations do not have the resources to properly handle their garbage, much alone waste brought in from elsewhere. The prevalence of trash heaps in poor and medium-income nations indicates this. That's why much of it winds up in the seas, overcrowded landfills, or open dumps. By prohibiting most plastic imports in early 2017-18, China made the first tangible step toward turning the tide of the global garbage trade by implementing the "Green Fence" rule. The quantity of plastic trash traveling from Europe to Asia was drastically cut as a result of this change in the trade balance. In early 2015, Europe sent over 250,000 tons of plastic garbage to Asia; by early to mid-2018, that number had reduced to below 150,000 tons (Mariam, G. 2021). This is so even if several Southeast Asian nations have tried to fill the void created by China's embargo.

20 For instance, in 2018, Germany sent over 114,000 tons of plastic trash to Malaysia, a rise of 125% from January to October. By 2019, other nations had followed China's lead, albeit they were looking to a United Nations treaty for help this time.

An unprecedented chance for international cooperation and innovation in waste management has arisen. Countries will need to reorganize their domestic solid waste management systems to address domestic garbage that is not exported, for example, by exp infrastructure. Sustainable waste management should be mandated by lav other emerging countries. To make up for the loss of imports, which some ling nd have relied on for financial support, they will have to invest in infrastructure upgrades, among other things. For a more level playing field in the trash trade, governments worldwide will need to coordinate stricter regulations on the export of hazardous materials, for instance.

4.2.3 Trade In Waste Material

Graph 6: Global plastic waste import and export trade volume from 1990 to 2019



Source: (Zhao et al., 2021)

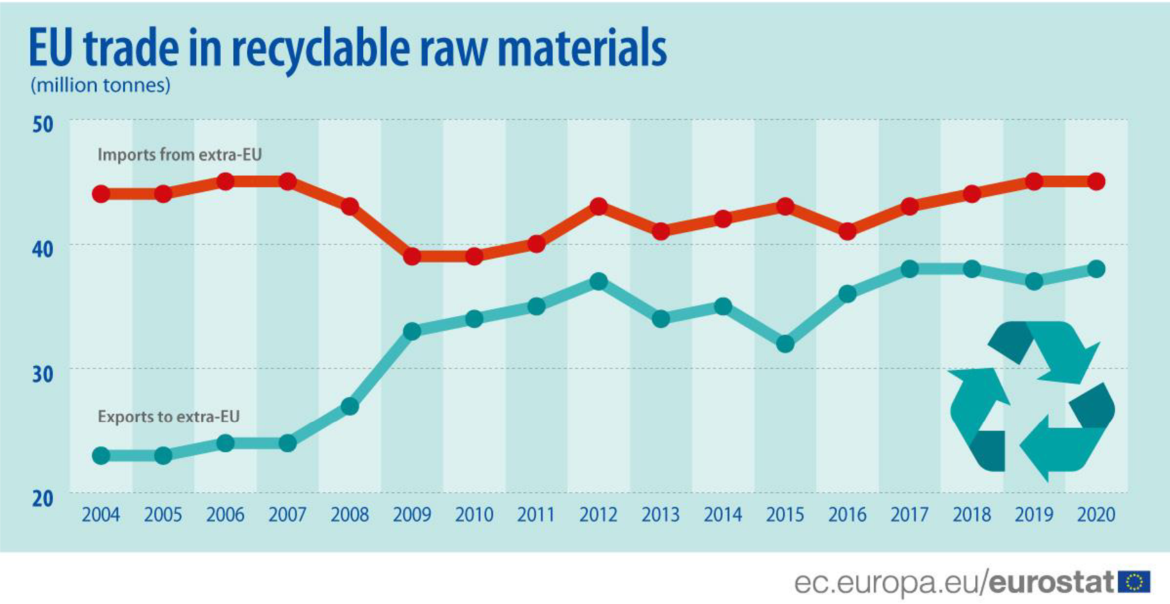
The accompanying graph 6 shows the future outlook for imports into the global trading market. Global trade in plastic garbage skyrocketed after 1990, peaked from 2006 to 2016, and plunged after that year. There was a time of stability in global trade as imports fell from 7.823.200 tons in 2016 to 765,000 tons in 2019, after increasing from 84.500 tons in 1990 to 11,386,200 tons in 2012. The entire amount of worldwide exports and imports follows the same pattern of initially increasing and decreasing. The Green Fence Campaign, which led to a decrease in the amount of plastic trash that could be thrown out in China and the subsequent shipping of that trash back to the countries of origin, was a major factor in the worldwide decrease in exports was seen in 2013. The worldwide import and export volume of plastics was impacted by the lack of waste disposal facilities in other places, and both dropped simultaneously. Yet this shift is just transitory; exports and imports increased between 2014 and 2016. In 2017, China imposed a ban on plastic garbage, which had a dramatic effect on worldwide imports and exports. In most cases, plastic garbage is sent abroad rather than brought in. Countries' inability to "digest" their plastic garbage indicates a lack of systematic plastic waste management.

The Graph 6 illustrates the three activity levels in the global trade of plastic garbage. At the beginning (ie., before the year 2000): In 2000, the world imported 84,500 tons of plastic garbage and exported 92,800 tons. These figures climbed to 4,628,700 and 3,992,300 tons, respectively. The European Union and North America were major trading partners during this time. The second phase (from 2001 to 2016) saw dramatic growth in global trade. There was a rise from 4521 thousand tons exported in 2001 to 10,492 thousand tons exported in 2016 and an expansion from 3774.400 tons imported in 2001 to 10,985,000 tons imported in 2016. The largest value was 11.39 million tons imported and 12.8 million tons exported in 2012. These numbers represent increases of 142% and correspondingly. In the third phase, from 2017 to 2019, the world's total import volume decreased from 782 million tons and 6.82 million tons in 2017 10 765,00 1.025 million tons, a loss of roughly 90% and 85%, respectively. In the 199 recycled plastic trash effectively by employing it in the production sector, demonstra... how plastic commerce may lower production prices (Zhao et al 2021). China is accepting more than half of the world's plastic garbage, trying to make it the world's global plastic waste factory at the turn of the 21st century, as its insatiable appetite for plastic drives the worldwide plastic trade. As China's industrial sectors grown, so have the priorities shifted. Implementing the "green fence p 56 of 98 grams undertaken by the Chinese government in 2017. China has enacted plastic import limits to safeguard the natural environment at home. The worldwide plastics industry was thrown into disarray due to this "national sword action" to combat the smuggling of solid trash.

4.2.4 EU Trade

3. **In recyclable raw materials**

Graph 7: EU Trade In recyclable raw materials

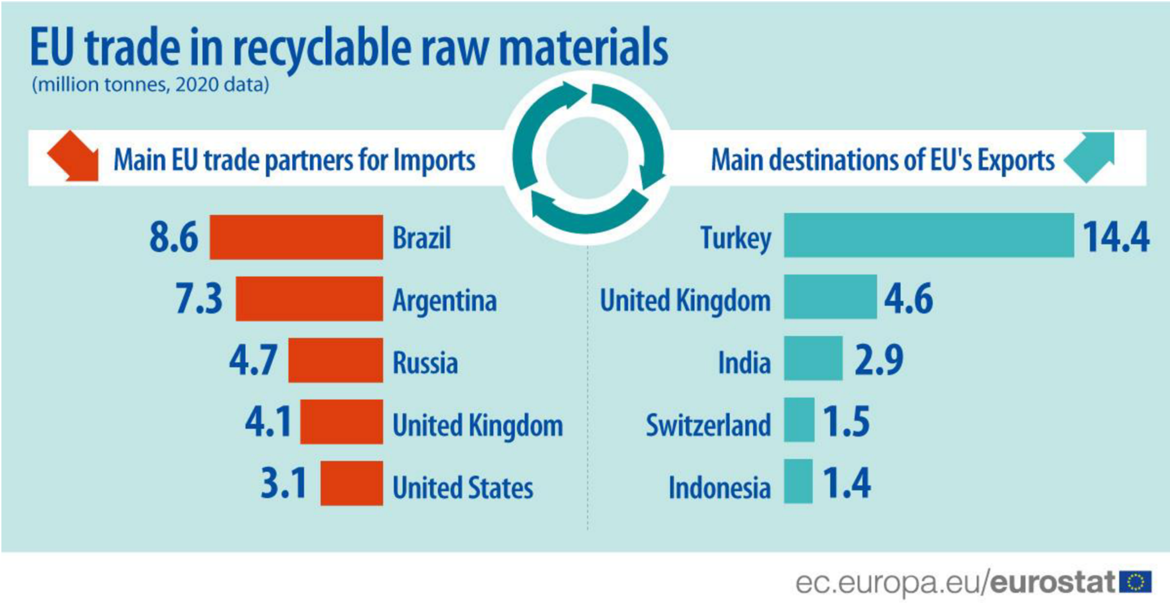


Source: (eurostat, 2021)

The preceding graph 7 shows that in 2020, EU Member States exported 38.4 million tonnes of recyclable raw materials (including recyclable trash and scrap and secondary raw materials) to countries outside the EU (eurostat, 2021). Since 2004, these exports have been on the rise and it is expected to peak in 2020 (an increase of 70% from 2004 levels).

In contrast, the European Union (EU) imported 44.7 million tons of recyclable raw materials from countries outside the EU in 2020, a decline of 0.2 percent from 2019's 45.0 million tons and a rise of around 2 percent from 2004's 33.8 million tons (43.7 million tonnes).

Graph 8: EU Trade In recyclable raw materials

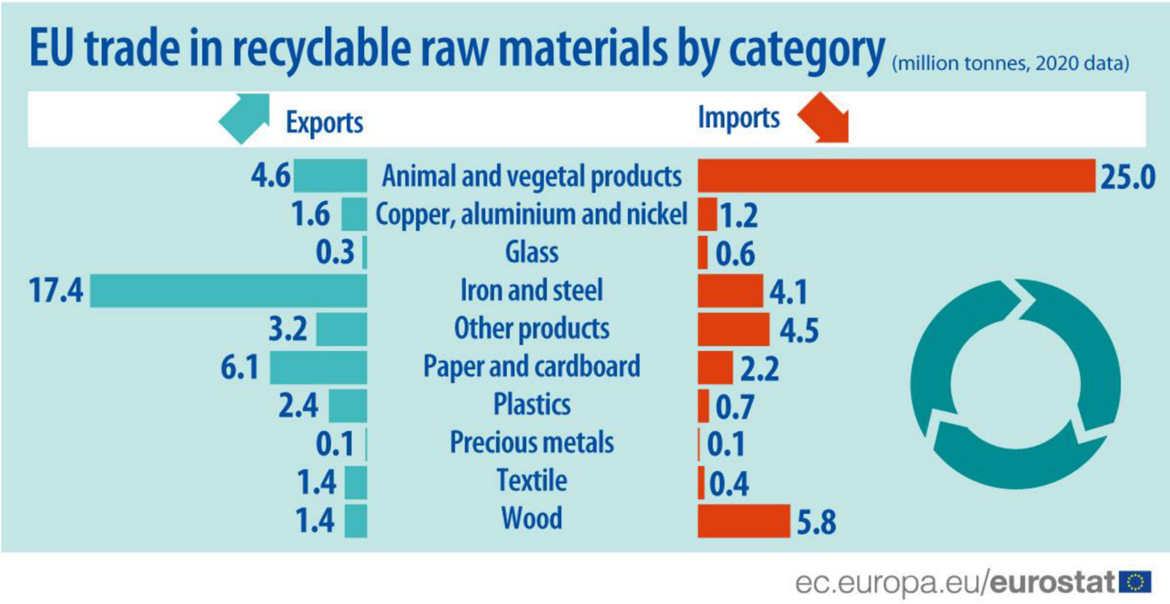


Source: (Eurostat, 2021)

Turkey and China are the European Union's primary export markets for recyclable raw materials. The graph 8 shows that in 2020, Turkey will receive around 14.4 million metric tons (12million metric tons in 2019) of recyclable raw materials exported from the European Union (Eurostat, 2021). United Britain was the second biggest recipient in 2020, taking in over 4.6 million tonnes, followed by India (2.9 million tonnes), Switzerland (1.5 million tonnes), and Indonesia (1.4 million tonnes).

The EU relies mostly on imports from Brazil and Argentina for recyclable raw materials. Brazil (8.6 million tonnes) and Argentina (7.3 million tonnes) dominated EU imports of recyclable raw materials in 2020, followed by Russia (4.7 million tonnes), the United Kingdom (4.1 million tonnes), and the United States (4.1 million tonnes) (3.1 million tonnes).

Graph 9: EU Trade In recyclable raw materials by category



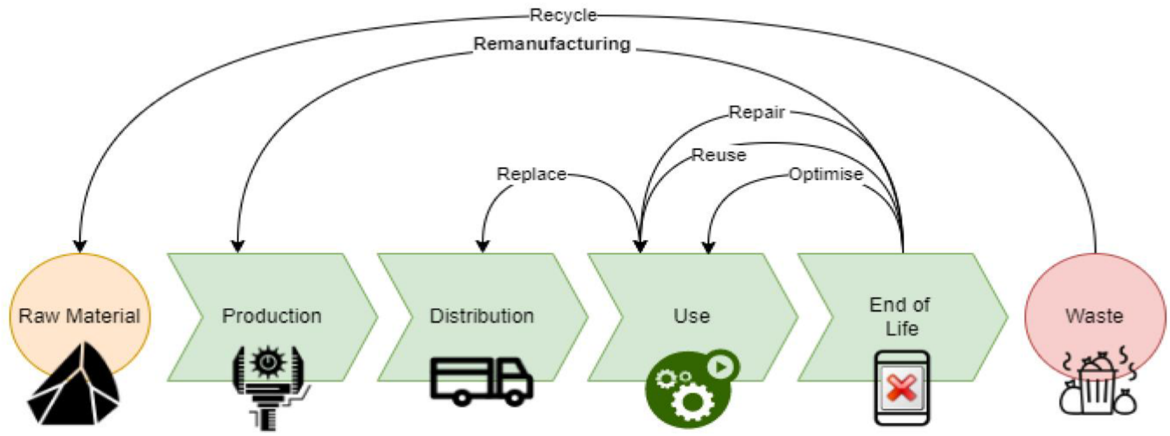
Source: (Eurostat, 2021)

Ferrous metals accounted for 45.3% of the EU's exports of recyclable raw materials. The above graph 9 shows that in 2020, ferrous metals (iron and steel) accounted for over half (45.3% of all recyclable raw materials exports) of the EU's total exports. Animal and vegetable goods accounted for 12.1% of the total, while paper and cardboard accounted for 15.8% (6.1 million tonnes).

More than half (56%) of all recyclable raw materials imported to the EU came from animal and vegetable goods (25.0 million tonnes), making up the biggest group (Eurostat, 2021). Ferrous metals (iron and steel) totalled 4.1 million tonnes, 9.1%, while wood accounted for 13.1% (5.8 million tonnes).

4.2.5 Global Co-Operation On Circular Economy Value Chains

Figure 6: Role of remanufacturing in CE context

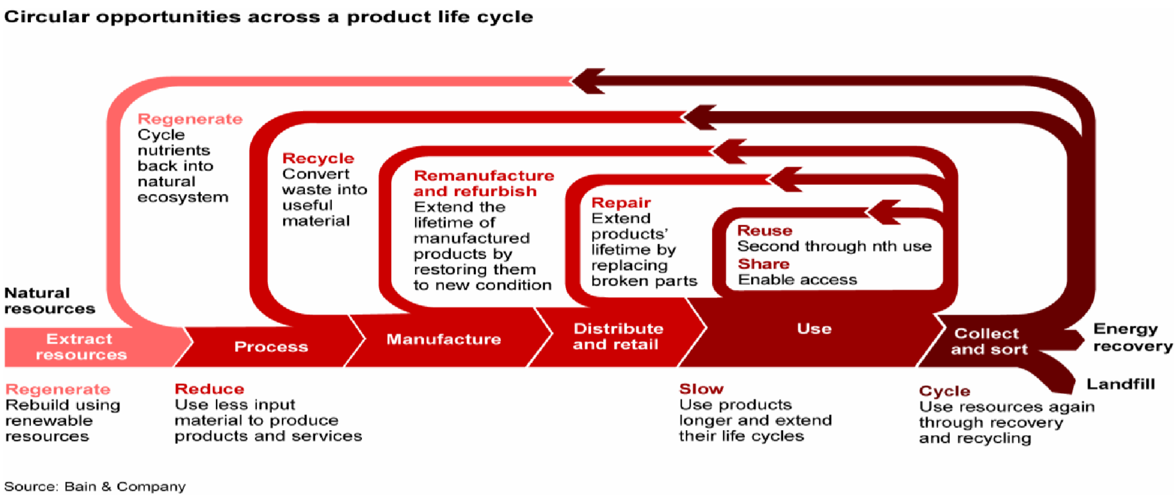


Source: (Khan et al., 2022)

The figure 3 above demonstrates that specific products are either no longer manufactured or are difficult to replace. Nevertheless, they are brought again into manufacture due to a remanufacturing issue (thus performing reverse logistics). The concept of reprocessing as a component of a closed-loop supply chain is increasing traction in the business world (Khan et al., 2022). As shown in the figure 3, such measures considerably aid in achieving CE objectives.

4.2.6 The Circularity Challenge

Figure 7:The Circularity Challenge

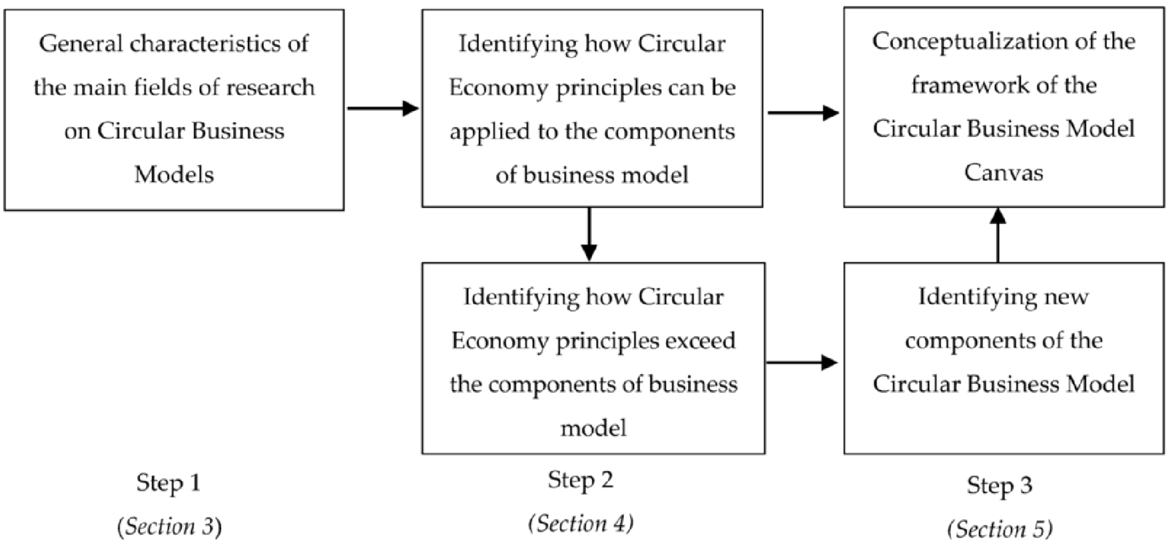


Source: (Bain & Company, 2022)

Initiatives that incorporate circularity into current goods and operations are shown to form the basis of a sustainable economic paradigm in the figure 4. Buyback schemes may prolong products' useful lives, repairs, remanufacturing, and resale or use renewable and recycled materials in their production (Bain & Company, 2022). Scalable prospects and the development of repeatable paradigms are crucial to achieving circular strategies.

4.2.7 Key challenges for circularty

Figure 8: The Concept of Developing a Framework of Business Model



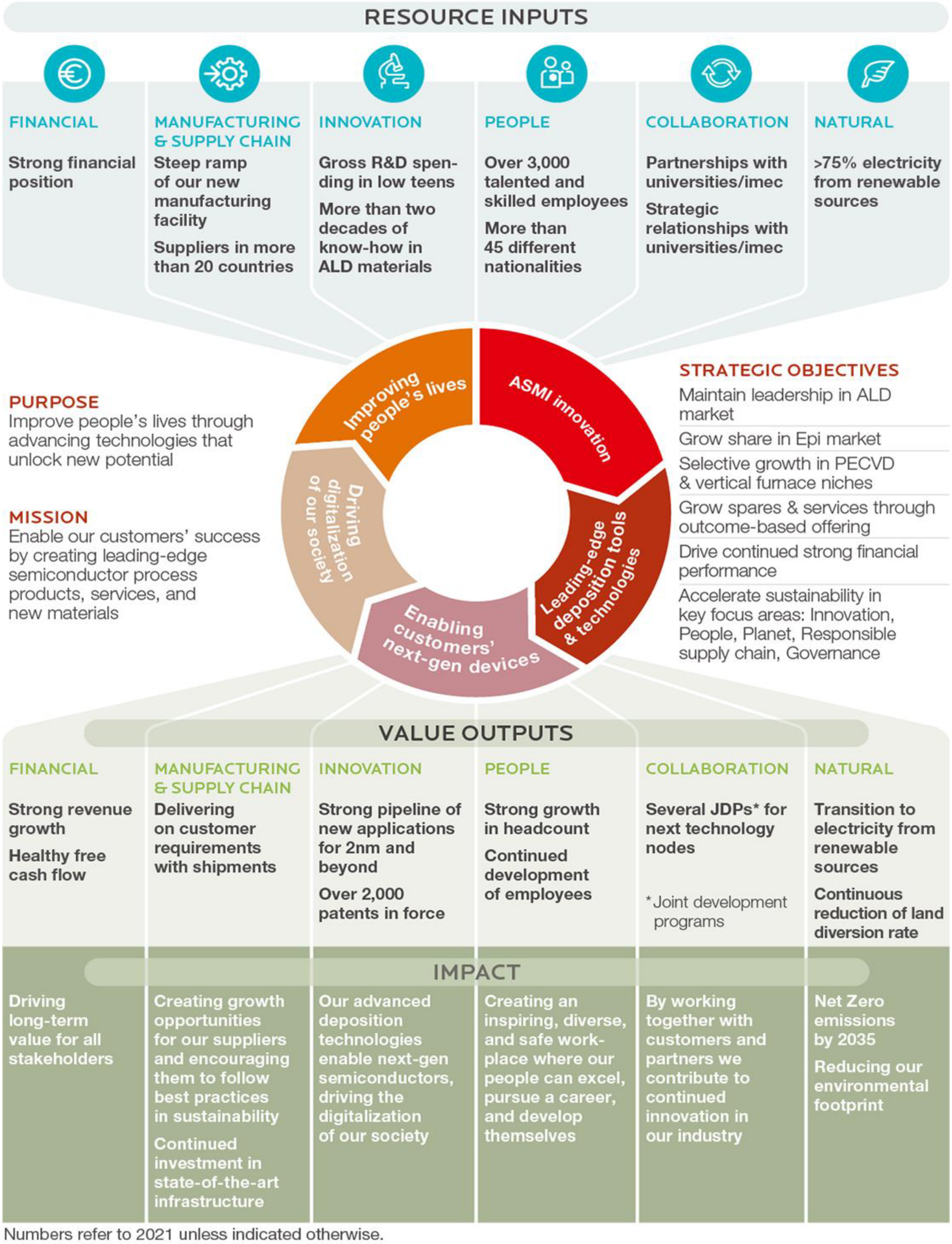
Source: (Lewandowski, 2016)

According to the above image there are three criterias:

- Business model state-of-the-art recognition in the context of the CE (circular business models)
- Classification of the primary literature by business strategy design elements (Lewandowski, 2016)
- The Circular Business Model: A Synthesis and Outline for Growth

4.2.8 Avoiding common obstacles

Figure 9: Value creation model

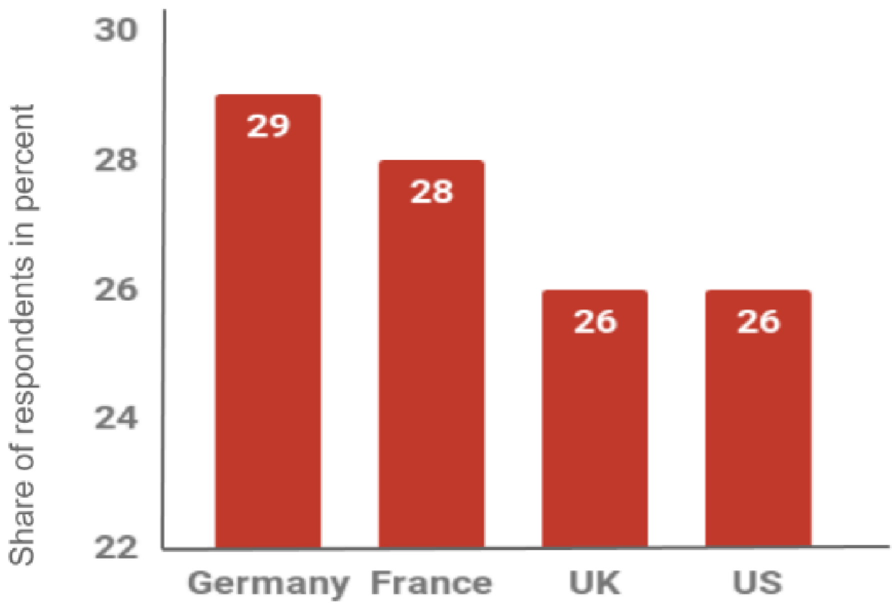


Source: (ASM, 2023)

4.2.9 Plan to scale

In 2014, Adobe Systems reportedly studied QR codes used for three months, as seen in the graph 10 following. Germany, France, the United Kingdom, and the United States were all included in the research.

Graph 10: QR Code Statistics.

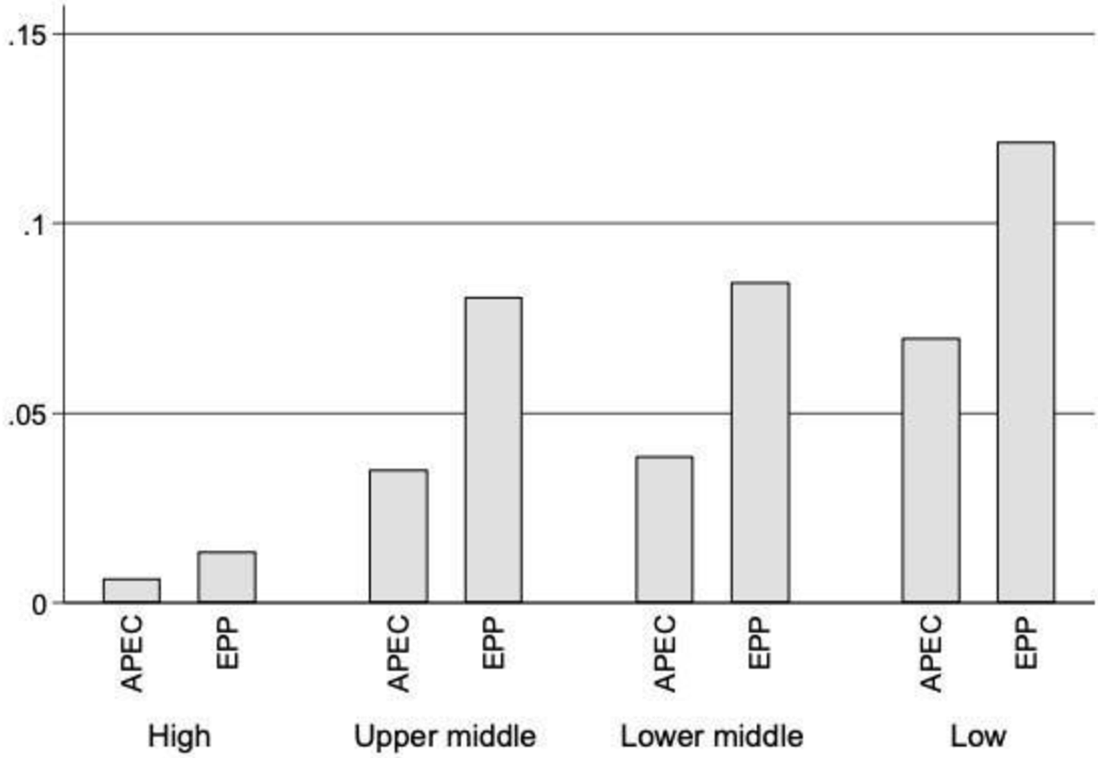


Source: (ASM, 2023)

In Germany, over a third of all respondents said they had used a QR Code before. France ranked highest at 28%, followed by the UK and the US at 26% (Scanova Blog, 2019). As a result, one can confidently state that 25-30% of people in industrialized countries regularly utilize QR Codes. And this occurred in 2014. Its use has evolved considerably ever since.

4.2.10 The role of trade in advance circular economy

Graph 11: Environmental Goods Agreement



Source: (CEPR. 2023)

The above graph 11 demonstrates how several contributing factors have kept emerging nations from joining. First, affluent nations' typical tariffs on environmentally friendly products hover near 0.5 percent, with minimal exceptions. As a result, the present parties involved in the EGA discussions have nothing to lose on the tariff front (CEPR. 2023). Second, for both data sets, average imposed tariffs rise when income falls, as one would predict.

4.2.11 Impact of circular economy on developing countries

Graph 12: Adopting Circular Economy

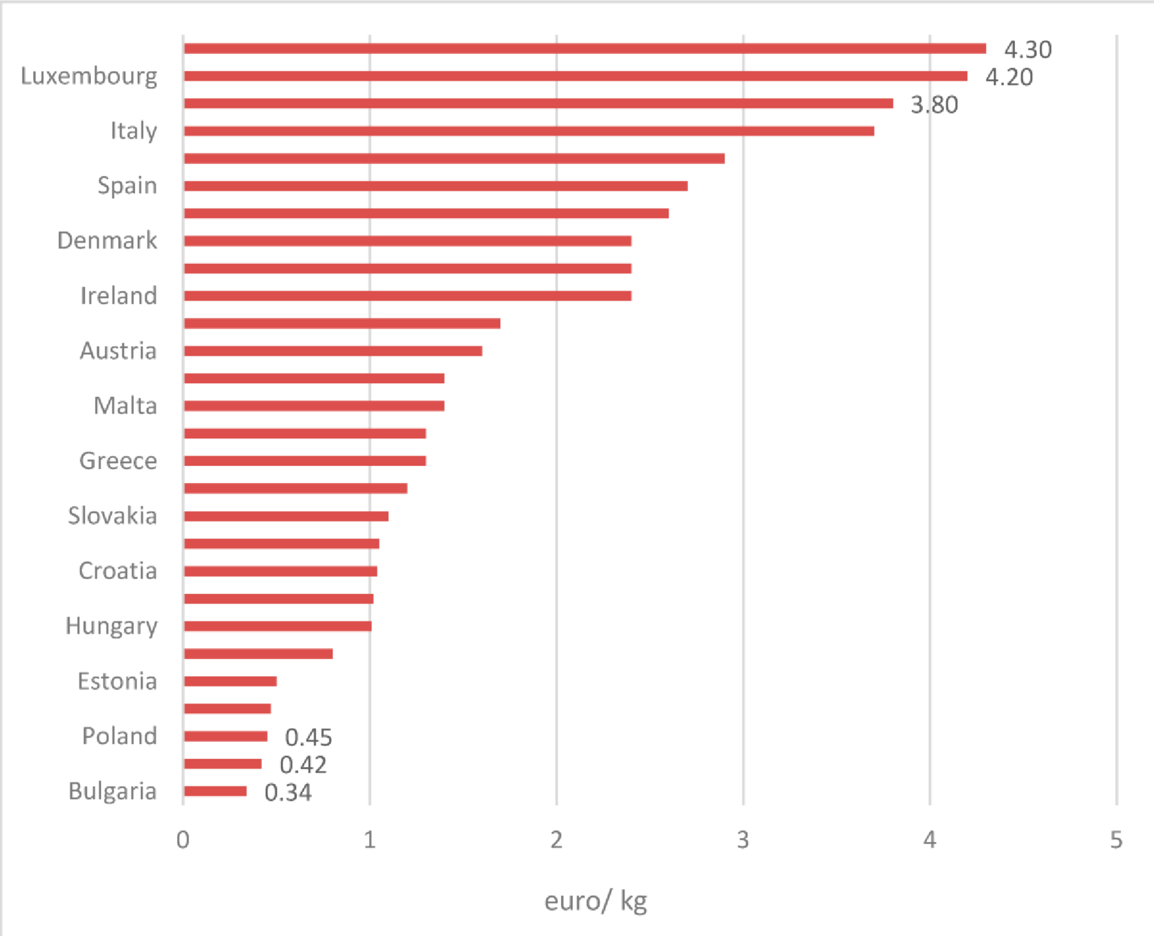


Image Souce: (Busu, M. 2019)

The graph 12 shows that "resource productivity" is a key performance metric for the CE. This metric, which measures how efficiently the economies of the 27 EU member states utilize resources to generate prosperity, is characterized as a country's gross domestic product divided by its domestic consumption of resources (Busu, M. 2019). This indicator's value is expressed in euro/kg at the level of EU member states.

5 Results and Discussion

Discussion 1

According to the statement, the circular economy is gaining ground and significance throughout the globe. By 2022, the market for pre-owned, rented, and refurbished goods is expected to produce $339 billion in sales. The rise in the popularity of sustainability and the circular economy is likely responsible for this development. The increasing demand for products and services that contribute to the circular economy directly results from people's growing awareness of the advantages of reusing and recycling materials. This growth is anticipated to continue since circular economy revenues are projected to quadruple by 2026. Companies may exploit a rising market by increasing their supply of environmentally friendly and resource-efficient goods and services.

The circular economy has many benefits, but it also has certain drawbacks. Ensuring that recycled and repurposed goods are good quality and safe for customers is a significant obstacle. To make sure the circular economy is not compromising safety and quality standards, this has to be closely monitored and regulated.

Discussion 2

The declaration emphasizes the need for global collaboration and new approaches to waste management in light of the difficulties inherent in the global rubbish trade. The statement's accompanying demonstrates that many recipient countries lack the infrastructure to properly process their trash, much alone that of other countries. This has exacerbated the issue of plastic pollution in the seas and led to waste piles in low- and middle-income countries. The statement describes how China's "Green Fence" legislation, which banned the import of most plastics in 2017-18. has contributed to a decrease in the quantity of traveling from Europe to Asia argues that sustainable waste management should be imposed by law in all Asian and other rising countries, while some Southeast Asian governments have moved to hole created by China's ban.

The statement goes on to note that countries throughout the globe would need to coordinate stronger rules on the export of hazardous chemicals and that investment in infrastructure improvements will be required to make up for the loss of imports. If everyone followed the same rules, the garbage trade would be more stable, and marine plastic pollution could be reduced.

Discussion 3

The declaration analyses current tendencies and contributing elements in the global trade of plastic trash. The remark is accompanied by a graph showing the accumulation of plastic trash imported and exported worldwide.

During the 1990s, the statement claims, there has been a rising worldwide trade in plastic trash, reaching a high between 2006 and 2016. In 2012, key trade partners were the European Union and North America, who together imported 10.98 million tons of plastic waste and exported 12.8 million tons. The number of global imports and exports fell drastically when China banned plastic waste in 2017 and the Green Fence Campaign in 2013.

However, the declaration acknowledges that countries with insufficient plastic waste management have sometimes exported their trash to other countries that are willing to take it. Countries should restructure their domestic solid waste management systems to handle domestic rubbish that is not exported, such as by developing recycling infrastructure, as the statement says there is a unique potential for global collaboration and innovation in waste management.

Discussion 4

By 2020, the volume of recyclable raw materials exported from EU Member States to countries outside the EU would have peaked at 38.4 million tonnes, according to the statement. This suggests a large demand for these resources outside of the EU, and that demand is being satisfied by EU Member States. The rising awareness of environmental problems and the significance of responsible resource management are likely driven need. While it has risen since 2004, reaching a record of 45.0 million tonnes in 2019, the EU's import of recyclable raw materials from countries outside the EU decreased marg. in 2020. Possible causes for this drop include changes in global trade policy and environmental legislation. It's worth noting that the European Union (EU) is sending more recyclable raw materials out of the region than it's bringing in. This may allow the EU to lessen its reliance on foreign sources of raw materials by fostering the growth of its recycling and circular economy sectors.

This study details the top importers of recyclable raw materials to the European Union (EU) and top exporters from the EU. In 2020, Turkey received an estimated 14.4 million metric tons of recyclable raw materials shinned from the EII un from the 12 million metric tons sent in 2019. After Turkey, the United Kingdom, India, Switzerland, and Indonesia were among the top countries to receive aid. In contrast, the European Union imported recyclable raw materials mostly from Brazil and Argentina, followed by Russia, the United Kingdom and the United States. The recycling business in the European Union is highly dependent on the export of recyclable raw materials, particularly to Turkey. The recycling sector was not immune to the effects of the disruption in global supply networks brought on by the COVID-19 epidemic. Yet, in 2020, Turkey remained the EU's primary export market for recyclable raw materials. It's important to note that some have been worried about how exporting recyclable raw materials would affect environmental quality and the EU's own circular economy goals. Some analysts claim that exporting recyclable materials might impede the EU's attempts to improve recycling and decrease waste by fostering a linear, rather than a circular, economy. Nonetheless, other nations are supplying the EU with recyclable raw materials: in 2020. Brazil and Argentina will be the leading suppliers. The European Union's (EU's) requirement to import recyclable raw materials from other nations illustrates the need for global collaboration in reaching sustainability targets. The European Union has been working closely with other nations to provide information on sustainable waste management and stop the export of unlawful rubbish. The European Union's ambition to implement a circular economy also seeks to improve domestic recycling infrastructure, lessen trash, and encourage eco-friendly manufacturing practices.

All recyclable raw materials exported and imported by the European Union in 2020 are detailed in the following statement. Based on the numbers provided, it is clear that 45.3% of total exports consisted of ferrous metals. The global manufacturing sector places a high value on recycled metals and drives up demand for them. Products derived from animals and plants accounted for 12.1% of all exports, making them the second most popular category.

Materials in this group are mostly used to manufacture textiles and organic fertilizers, including animal skins, wool, and vegetable waste.

The large percentage of EU paper and cardboard exports reflects their widespread use in international packaging. Animal and vegetable products made up the bulk of imports (56 percent) and showed the EU's dependence on outside sources for these products. This is probably because of the scarcity of these components in the EU. While making up a

significant portion of exports, ferrous metals comprised just 9.1% of total imports. This indicates that the European Union (EU) is exporting a surplus of ferrous metals to other parts of the world.

Discussion 5

As per the above statement, remanufacturing and reverse logistics are crucial to realizing circular economy (CE) goals. By designing closed-loop systems in which materials are continually reused and recycled, the CE model seeks to cut down on waste and encourage the sustainable use of resources. This is accomplished by minimizing waste over the product's entire life cycle and designing things for reuse and recycling. Remanufacturing is fundamental to the CE model since it allows for the refurbishing and reusing of otherwise abandoned items and components. This not only helps the environment by decreasing production waste, but it also helps save resources.

The statement emphasizes the need to remanufacture goods that are hard to replace yet have a long useful life, such as engine components and office furniture. Businesses may accomplish their CE goals related to lowering their environmental impact. The importance of reverse logistics in CE is also shown in the graph. To reuse, recycle, or dispose of an item, "reverse logistics" entails transporting it from its ultimate destination back to its original starting location. This is crucial to achieving a closed-loop system and reducing waste.

Discussion 6

The declaration emphasizes circular techniques as crucial to a long-term economic paradigm shift. The statement illustrates the potential gains from adopting circular strategies, including buyback programs, repairs, remanufacturing, and using renewable and recycled resources in product manufacturing. These circular practices may help make items last longer and reduce waste, which helps create a more sustainable and circular economy.

The statement highlights the importance of circular strategies, the necessity for scalable possibilities, and the creation of repeating paradigms. Businesses must adopt circular practices compatible with their existing products and processes. Circular techniques may have a bigger effect since they can be used more widely and again. The notion of circularity is gaining prominence in business as organizations see the value in developing waste-free goods and practices. By adopting a circular economy approach. businesses may help create a more sustainable future and reap financial advantages, including reduced expenses, higher productivity, and new income sources.

Discussion 7

The statement details the amount of carbon dioxide (CO2) saved by carpooling on the BlaBlaCar platform, demonstrating the potential of carpooling to significantly cut carbon emissions in comparison to other modes of transportation, BlaBlaCar car-poolers saved 1.6 million tonnes of CO2 in 2018, according to research done by Le BIPE and BlaBlaCar. This data indicates carpooling may be viable for lowering transportation-related carbon emissions.

The results also show Europe's low average occupancy rate, which comes in at just 1.9 people. Nonetheless, carpooling can increase the number of people in each vehicle, leading to more efficient resource use and decreased carbon emissions. The study demonstrates that carpooling may enhance productivity by a large margin because it allows twice as many people to ride along in each vehicle. The research also shows that informal carpooling off-platform may help reduce emissions. There is a chance that informal carpooling will expand as people learn more about the environmental advantages of carpooling.

Discussion 8

According to the above statement, the framework of a circular economy and the three criteria provided are all directly applicable. A more thorough knowledge and acknowledgment of circular business models within the larger circular economy framework is suggested by the first criteria, "business model state-of-the-art recognition in the context of the CE".

Discussion 9

This means that circular business models must be recognized as integral to the circular economy and given the resources they deserve. The significance of classifying original material according to business strategy design aspects is highlighted in the second criterion, which emphasizes the need to comprehend the 60 fundamentals of circular business models. This is essential for making sense of the many forms that circular business models might take and the various ways they can be implemented.

According to the third criterion. "The Circular Business Model: A Synthesis and Framework for Growth," there should be a unified model or framework to direct the creation and execution of circular business models. Circular business models may be scaled and expanded using a framework based on a synthesis of current knowledge and best practices.

Discussion 10

The data provided above comes from a 2014 Adobe Systems research looking into QR code adoption in four developed nations: Germany, France, the United Kingdom, and the United States. Over a third of German respondents had used a QR code previously, while between 26 and 28 percent of respondents from France, the United Kingdom, and the United States reported doing so. These findings suggest that in 2014, a sizable percentage of people in these nations were already acquainted with and frequently used QR codes. It's worth noting, however, that the research was performed in 2014 and that a lot has changed in terms of both technology and customer preferences since then. New research is needed to determine whether or not QR code use has risen or decreased since the last survey was taken.

The success of QR codes as a promotional tool is partly contingent on how effectively they are used in actual promotions. Using a QR code on an ad or product packaging may not enhance engagement or sales without a compelling call to action or value proposition.

Discussion 11

The data in the statement breaks down environmental product tariffs by income bracket and select product categories. As shown by the chart, many issues have prevented developing countries from participating in EGA (Environmental Goods Agreement) talks. One of these reasons is that countries engaging in EGA deliberations have little to lose on the tariff front since wealthy nations often have low tariffs on environmentally friendly items. As a result, some developing countries may be put off from signing on since they may see little to no gain from participating.

The statement also shows that tariffs on environmental products, on average, rise when income lowers. Having to pay higher tariffs than more developed countries is one possible reason developing countries are unwilling to participate in EGA talks. This may hinder developing countries' ability to compete globally for eco-friendly products and services.

Discussion 12

The statement emphasizes "resource productivity" as a critical success factor in creating a closed-loop economic system (CE). The indicator calculates a country's resource efficiency in producing economic output by dividing GDP by domestic use of resources (in euro/kg). The study also reveals substantial differences in resource productivity across EU member states, with Germany ranking highest and the Netherlands and Austria coming in second and third, respectively. Bulgaria, Romania, and Poland are examples of nations with poorer resource productivity, Certain nations seem to be better able to create economic value with less input than others.

Resource productivity is an important indicator of success in creating a sustainable and circular economy. Increasing a country's resource efficiency may help them save money and lessen its environmental impact. Adopting circular business models, product design, and manufacturing techniques are just a few examples of how increasing resource productivity may assist in boosting resource efficiency.

Discussion 13

The declaration also emphasizes the significance of supply chain management and business strategies in advancing sustainability. Incorporating sustainability concepts like "reduce." "reuse." "recover." and "recycle" into company strategies and embracing digital innovations like "The Internet of Things," "blockchain," and "progressive organizational paradigms" are emphasized to hasten the growth of circular economy practices. The declaration also highlights the barriers to the widespread use of digital technologies and circular economies, including the need to virtualize better automation, process design, and knowledge management structures. It recommends that government officials and bureaucrats establish regulatory frameworks that make it easier to implement circular economy principles.

6 Conclusion

It is concluded that this study investigates about how global trade interacts with the shift towards a more resource-efficient and circular economy. The ultimate question that needs to be answered is how the policies of a circular economy and trade policies could be associated with inspiring the divergence of resource usage from growth in the economy on a global level without causing extra barriers to global trade as well as undesirable environmental consequences. The little amount of previous research that has been published on this topic provides a powerful impetus for more investigation into this field.

Private investment can contribute to the growth of businesses and industries that produce goods, including packaged products. As businesses expand and produce more goods, they may also generate more packaging waste as a by-product of their production processes. Similarly, gross value added can be an indicator of the level of economic activity in a particular sector, including the manufacturing and packaging industries. As the value of goods produced in these industries increases, it may also lead to an increase in the amount of packaging waste generated.

LASSO regression using ADMM algorithm has identified one significant predictor for the dependent variable, while effectively reducing the impact of any irrelevant variables. The model has an acceptable degree of fit and complexity as indicated by the BIC value. Furthermore, the statistics I used, shows that the results are reliable and suggest that this analysis explains most of the differences in private investment and gross value added. These findings helped to make decisions about how to promote economic growth using circular economic model with taking care of the environment.

7 References

Adolph, B., Allen, M. and Beyuo, E., (2020). Supporting smallholders' decision making: managing trade-offs and synergies for sustainable agricultural intensification. *International Journal of Agricultural Sustainability*, 19(5-6), pp.456–473. doi:10.1080/14735903.2020.1786947.

ASM (2023). Corporate responsibility. [online] www.asm.com. Available at: https://www.asm.com/about/corporate-responsibility

Avau, M., Govaerts, N. and Delarue, E. (2021). Impact of distribution tariffs on prosumer demand response. *Energy Policy*, 151, p.112116. doi:10.1016/j.enpol.2020.112116.

Barrie, J. and Schröder. P. (2021). Circular Economy and International Trade: a Systematic Literature Review. Circular Economy and Sustainability doi:https://doi.org/10.1007/s43615-021-00126-w.

Borrelle, S.B., Ringma, J., Law, K.L., Monnahan, C.C., Lebreton, L., McGivern, A., Murphy, E., Jambeck, J., Leonard, G.H., Hilleary, M.A., Eriksen, M., Possingham, H.P., Frond, H.D., Gerber, L.R., Polidoro, B., Tahir, A., Bernard, M., Mallos, N., Barnes, M. and Rochman, C.M. (2020). Predicted Growth in Plastic Waste Exceeds Efforts to Mitigate Plastic Pollution. *Science*, 369(6510), pp.1515–1518. doi:10.1126/science.aba3656.

Brändström, J. and Saidani, M. (2022). Comparison between circularity metrics and LCA: A case study on circular economy strategies. *Journal of Cleaner Production*, [online] 371, p.133537. doi:10.1016/j.jclepro.2022.133537.

Busu, M. (2019). Adopting Circular Economy at the European Union Level and Its Impact on Economic Growth. Social Sciences, 8(5), p.159. doi: https://doi.org/10.3390/socsci8050159.

Caldeira, C., De Laurentiis, V., Corrado, S., van Holsteijn, F. and Sala, S. (2019). Quantification of food waste per product group along the food supply chain in the European Union: a mass flow analysis. *Resources, Conservation and Recycling*, [online] 149, pp.479–488. doi:10.1016/j.resconrec.2019.06.011.

Carus, M. and Dammer, L., 2018. The circular bioeconomy concepts, opportunities, and limitations. Industrial biotechnology. *Nova paper #9 on bio-based economy 2018-01* 14(2), pp.2.
Available at: https://bioplasticfeedstockalliance.org/?mdocs-file=1285
External_Resource_Nova_Paper_9_The_Circular_Bioeconomy%20(1)

Chen, Z., Zhang, L. and Xu, Z. (2020). Analysis of cobalt flows in mainland China: Exploring the potential opportunities for improving resource efficiency and supply security. *Journal of Cleaner Production*, 275, p.122841. doi:10.1016/j.jclepro.2020.122841.
Cicconi, P. (2020). Eco-design and Eco-materials: An interactive and collaborative approach. *Sustainable Materials and Technologies*, 23, p.e00135. doi:10.1016/j.susmat.2019.e00135.

Cingiz, K. and Wesseler, J. (2019). Opportunities and the Policy Challenges to the Circular Agri-Food System. *Palgrave Advances in Bioeconomy: Economics and Policies*, pp.293–318. doi:10.1007/978-3-030-28642-2_16.

Colombo, S.M., Roy, K., Mraz, J., Wan, A.H.L., Davies, S.J., Tibbetts, S.M., Øverland, M., Francis, D.S., Rocker, M.M., Gasco, L., Spencer, E., Metian, M., Trushenski, J.T. and Turchini, G.M. (2022). Towards achieving circularity and sustainability in feeds for farmed blue foods. *Reviews in Aquaculture*. doi:10.1111/raq.12766.

Dushyantha, N., Batapola, N., Ilankoon, I.M.S.K., Rohitha, S., Premasiri, R., Abeysinghe, B., Ratnayake, N. and Dissanayake, K. (2020). The story of rare earth elements (REEs): Occurrences, global distribution, genesis, geology, mineralogy and global production. *Ore Geology Reviews*, 122(122), p.103521. doi:10.1016/j.oregeorev.2020.103521.

Gadhok,I.,Mermigkas,G.,Hepburn,J.,Bellman,C.,Krivonos,E.2020.Trade and Sustainable Development Goal 2-Policy options and their trade offs. Rome, FAO.
Available at:
https://www.fao.org/common-pages/search/en/?q=Trade%20and%20Sustainable%20Development%20Goal%202-Policy%20options%20and%20their%20trade%20offs.%20Rome

Elgie, A.R., Singh, S.J. and Telesford, J.N. (2021). You can't manage what you can't measure: The potential for circularity in Grenada's waste management system. *Resources, Conservation and Recycling*, 164, p.105170. doi:10.1016/j.resconrec.2020.105170.

eurostat (2021). EU trade in recyclable raw materials. [online] ec.europa.eu. Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210429-1.

Frehner, A., De Boer, I.J.M., Muller, A., Van Zanten, H.H.E. and Schader, C. (2021). Consumer strategies towards a more sustainable food system: insights from Switzerland. *The American Journal of Clinical Nutrition*. doi:10.1093/ajcn/nqab401.

Fresco, L.O., Geerling-Eiff, F., Hoes, A.-C., van Wassenaer, L., Poppe, K.J. and van der Vorst, J.G.A.J. (2021). Sustainable food systems: do agricultural economists have a role? *European Review of Agricultural Economics*, 48(4), pp.694–718. doi:10.1093/erae/jbab026.

Giovanni, P.D. and Folgiero, P. (2023). *Strategies for the Circular Economy: Circular Districts and Networks*. [online] *Google Books*. Taylor & Francis. Available at: https://books.google.com/books?hl=en&lr=&id=siWnEAAAQBAJ&oi=fnd&pg=PT9&dq=Trade+policies+need+to+include+circularity+principles+and+objectives+&ots=_to-_gOx_f&sig=oeN5SZ99J2q9eQSUJnULLDvpJTc.

Hahladakis, J.N. and Iacovidou, E. (2019). An overview of the challenges and trade-offs in closing the loop of post-consumer plastic waste (PCPW): Focus on recycling. *Journal of Hazardous Materials*, 380, p.120887. doi:10.1016/j.jhazmat.2019.120887.

Hanusa, I. (2021). *Opportunities and Challenges for a B2B Trading Platform of Secondary Raw Material : An Exploratory Analysis based on the Sourcing Process of Sustainable SMEs in the Fashion and Textile Industry*. [online] *www.diva-portal.org*. Available at: https://www.diva-portal.org/smash/record.jsf?pid=diva2:1593470.

Huang, Q., Chen, G., Wang, Y., Chen, S., Xu, L. and Wang, R. (2020). Modelling the global impact of China's ban on plastic waste imports. *Resources, Conservation and Recycling*, 154, p.104607. doi:10.1016/j.resconrec.2019.104607.

Jalal, M., Nassir, N. and Jalal, H. (2019). Waste tire rubber and pozzolans in concrete: A trade-off between cleaner production and mechanical properties in a greener concrete. *Journal of Cleaner Production*, 238, p.117882. doi:10.1016/j.jclepro.2019.117882.

Jean, M. S., Jaime, d. M., (2023). What's wrong with the WTO's Environmental Goods Agreement: A country perspective. CEPR. Available at: https://cepr.org/voxeu/columns/whats-wrong-wtos-environmental-goods-agreement-developing-country-perspective

Junginger, H.M., Mai-Moulin, T., Daioglou, V., Fritsche, U., Guisson, R., Hennig, C., Thrän, D., Heinimö, J., Hess, J.R., Lamers, P., Li, C., Kwant, K., Olsson, O., Proskurina, S., Ranta, T., Schipfer, F. and Wild, M. (2019). The future of biomass and bioenergy deployment and trade: a synthesis of 15 years IEA Bioenergy Task 40 on sustainable bioenergy trade. *Biofuels, Bioproducts and Biorefining*, 13(2), pp.247–266. doi:10.1002/bbb.1993.

Karman, A. (2022). The Review of Policy Instruments Stimulating Circular Economy: A Case Study of Poland. *Przegląd Prawno-Ekonomiczny*, [online] (2), pp.31–58. doi:10.31743/ppe.13133.

Khan, S., Ali, S.S. and Singh, R. (2022). Determinants of Remanufacturing Adoption for Circular Economy: A Causal Relationship Evaluation Framework. Applied System Innovation, 5(4), p.62. doi: https://doi.org/10.3390/asi5040062.

Law, K.L., Starr, N., Siegler, T.R., Jambeck, J.R., Mallos, N.J. and Leonard, G.H. (2020). The United States' contribution of plastic waste to land and ocean. *Science Advances*, [online] 6(44). doi:10.1126/sciadv.abd0288.

Lewandowski, M. (2016). Designing the Business Models for Circular Economy Towards the Conceptual Framework. Sustainability, 8(1). p.43. doi: https://doi.org/10.3390/su8010043

Liang, Y., Tan, Q., Song, Q. and Li, J. (2021). An analysis of the plastic waste trade and management in Asia. *Waste Management*, [online] 119, pp.242–253. doi:10.1016/j.wasman.2020.09.049.

Mariam, G (2021). Global Waste Trade and its Effects on Landfills in Developing Countries Global Waste Cleaning Network, [online] Available at: https://gwcnweb.org/2021/11/14/global-waste-trade-and-its-effects-on-landfills-in-developing-countries/

Müller, S.M. (2019). Hidden Externalities: The Globalization of Hazardous Waste. *Business History Review*, 93(1), pp.51–74. doi:10.1017/s0007680519000357.

Mutezo, G. and Mulopo, J. (2021). A review of Africa's transition from fossil fuels to renewable energy using circular economy principles. *Renewable and Sustainable Energy Reviews*, 137, p.110609. doi:10.1016/j.rser.2020.110609.

Nechifor, V., Calzadilla, A., Bleischwitz, R., Winning, M., Tian, X. and Usubiaga, A. (2020). Steel in a circular economy: Global implications of a green shift in China. *World Development*, 127, p.104775. doi:10.1016/j.worlddev.2019.104775.

P. Smith (2022). Circular economy revenue worldwide 2022-2026. [online] Statista. Available at: https://www.statista.com/statistics/1337519/circular-economy-market-revenue/.

Peña, C., Civit, B., Gallego-Schmid, A., Druckman, A., Pires, A.C. -, Weidema, B., Mieras, E., Wang, F., Fava, J., Canals, L.M. i, Cordella, M., Arbuckle, P., Valdivia, S., Fallaha, S. and Motta, W. (2021). Using life cycle assessment to achieve a circular economy. *The International Journal of Life Cycle Assessment*. doi:10.1007/s11367-020-01856-z.

Qu, S., Guo, Y., Ma, Z., Chen, W.-Q., Liu, J., Liu, G., Wang, Y. and Xu, M. (2019). Implications of China's foreign waste ban on the global circular economy. *Resources, Conservation and Recycling*, 144, pp.252–255. doi:10.1016/j.resconrec.2019.01.004.

Ray, A. (2019). *Scalability and Business Outcomes: Essays on Managing Trade-Offs when Fringe Technologies go Mainstream*. [online] hammer.purdue.edu. Available at: https://hammer.purdue.edu/articles/thesis/Scalability_and_Business_Outcomes_Essays_on_Managing_Trade-Offs_when_Fringe_Technologies_go_Mainstream/11048195.

Reynolds, A. (2021). *'Worthy to Be Reserved': Bookbindings and the Waste Paper Trade in Early Modern England and Scotland*. [online] *brill.com*. Brill. Available at: https://brill.com/view/book/edcoll/9789004424005/BP000024.xml.

Reznikova, N., Zvarych, R., Zvarych, I. and Shnyrkov, O. (2019). *GLOBAL CIRCULAR E-CHAIN IN OVERCOMING THE GLOBAL WASTE*. [online] Available at: http://procedia-esem.eu/pdf/issues/2019/no4/72_Reznikova_19.pdf.

Santillán-Saldivar, J., Cimprich, A., Shaikh, N., Laratte, B., Young, S.B. and Sonnemann, G. (2021). How recycling mitigates supply risks of critical raw materials: Extension of the geopolitical supply risk methodology applied to information and communication technologies in the European Union. *Resources, Conservation and Recycling*, 164, p.105108. doi:10.1016/j.resconrec.2020.105108.

Sastre Sanz, S. (2021). *Resource extraction, trade and waste management: a regional approach to the Spanish socioeconomic metabolism*. [online] www.tdx.cat. Available at: https://www.tdx.cat/handle/10803/673648.

Baron, D. O., Alina, N., Dorina, N., Catalin, M. 2021. Good Practices in Using Secondary Raw Materials at the Level of Companies within the Fashion and Textile Industry. Annals of the University of Petrosani Economics, *[s. l.]*, v. 21, n. 1, p. 55–70, 2021. Available at: http://infozdroje.czu.cz/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=bsx&AN=156561281&site=eds-live

Shevchenko, T., Laitala, K. and Danko, Y. (2019). Understanding Consumer E-Waste Recycling Behavior: Introducing a New Economic Incentive to Increase the Collection Rates. *Sustainability*, 11(9), p.2656. doi:10.3390/su11092656.

Shunta, Y., 2021. Global Trade and Circular Economy- Policy Alignment. OECD Trade and Environment Working Papers 2021/02. pp. 14-15 Available at: https://www.oecd.org/env/Global-trade-and-circular-economy-policy-alignment-ae4a2176-en.htm

Shopova, M., Petrova, M. and Todorov, L. (2023). Trade in Recyclable Raw Materials in EU: Structural Dynamics Study. *Lecture Notes in Management and Industrial Engineering*, pp.43–64. doi:10.1007/978-3-031-23463-7_3.

Song, J., Yan, W., Cao, H., Song, Q., Ding, H., Lv, Z., Zhang, Y. and Sun, Z. (2019). Material flow analysis on critical raw materials of lithium-ion batteries in China. *Journal of Cleaner Production*, 215, pp.570–581. doi:10.1016/j.jclepro.2019.01.081.

Spooren, J., Binnemans, K., Björkmalm, J.,(2020). Near-zero-waste processing of low-grade, complex primary ores and secondary raw materials in Europe: technology development trends. *Resources, Conservation and Recycling*, [online] 160, p.104919. doi:10.1016/j.resconrec.2020.104919.

Suzanne, E., Absi, N. and Borodin, V. (2020). Towards Circular Economy in Production Planning: Challenges and Opportunities. *European Journal of Operational Research*. doi:10.1016/j.ejor.2020.04.043.

Thanassoulis, E., Blake, C. and Parthasarathy, S. (2022). Implicit and explicit incentives within economic regulation. *Decision Analytics Journal*, 4, p.100099. doi:10.1016/j.dajour.2022.100099.

Thibaut, W. (2018). Exploring the role of independent retailers in the circular economy. *ResearchGate,* pp. 18, DOI: 10.13140/RG.2.2.17085.15847 Available at: https://www.researchgate.net/publication/323809440

Wang, C., Zhao, L., Lim, M.K., Chen, W.-Q. and Sutherland, J.W. (2020). Structure of the global plastic waste trade network and the impact of China's import Ban. *Resources, Conservation and Recycling*, 153, p.104591. doi:10.1016/j.resconrec.2019.104591.

Wen, Z., Xie, Y., Chen, M. and Dinga, C.D. (2021). China's plastic import ban increases prospects of environmental impact mitigation of plastic waste trade flow worldwide. *Nature Communications*, [online] 12(1), p.425. doi:10.1038/s41467-020-20741-9.

Wiebe, K.S., Harsdorff, M., Montt, G., Simas, M.S. and Wood, R. (2019). Global Circular Economy Scenario in a Multiregional Input–Output Framework. *Environmental Science & Technology*, 53(11), pp.6362–6373. doi:10.1021/acs.est.9b01208.

Xu, J., Liu, Z. and Dai, J. (2021). Environmental and economic trade-off-based approaches towards urban household waste and crop straw disposal for biogas power generation project

-a case study from China. *Journal of Cleaner Production*, 319, p.128620. doi:10.1016/j.jclepro.2021.128620.

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