



**UNIVERSITÀ POLITECNICA DELLE MARCHE
FACOLTÀ DI ECONOMIA “GIORGIO FUÀ”**

Corso di Laurea Magistrale o Specialistica in International Economics and Commerce

**THE EUROPEAN UNION IN PROMOTING THE
CIRCULAR ECONOMY**

L'UNIONE EUROPEA NELLA PROMOZIONE DELL'ECONOMIA
CIRCOLARE

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Anno Accademico 2022 – 2023

ABSTRACT

L'Economia Circolare rappresenta una risposta innovativa e cruciale alle sfide ambientali contemporanee, poiché mira a ridefinire il modo in cui produciamo, consumiamo e gestiamo le risorse. Le politiche europee, incentivate dalla necessità di ridurre l'impatto ambientale e favorire la transizione verso una società a basse emissioni di carbonio, hanno dato vita a una serie di programmi e iniziative mirate a sostenere l'Economia Circolare.

Nel contesto aziendale, questo studio esplora le opportunità che le imprese possono cogliere nell'abbracciare l'Economia Circolare, ma anche le sfide pratiche e culturali che devono affrontare per adottare con successo questo modello.

Vengono presentati strumenti, programmi e pratiche per aiutare le imprese a implementare strategie circolari e adottare approcci sostenibili.

L'Economia Circolare emerge come un'opzione cruciale per affrontare le sfide ambientali e promuovere una crescita economica sostenibile.

Il suo futuro dipende dall'adozione diffusa e dall'impegno collettivo di governi, imprese e cittadini per creare un mondo più equo e rispettoso per l'ambiente.

ABSTRACT

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*“I believe that having the land and not spoiling it is
the most beautiful art form one could wish for”.*

Andy Warhol

INTRODUCTION

On 19 September 2020, at 3.20 p.m. in New York, an art event caught the attention of passers-by on the north wall of the residential skyscraper One Union Square South. On the well-known electronic clock of the public artwork Metronome, the phrase 'The Earth has a deadline' appeared, followed by some mysterious numbers: 7 : 103 : 15 : 40 : 07. This unusual installation, entitled 'Climate Clock', was conceived by two American writers, Andrew Boyd, and Gan Golan, and represents an anguished countdown indicating the time remaining before climate change becomes irreversible. The aim was to "remind the world every day how dangerously close we are to the abyss". If emissions continue to rise, the date when we will reach 1.5 degrees will get closer and closer.

According to data provided by the United Nations, 1 January 2028 is the day when, if the rate of carbon dioxide emissions remains unchanged, the total level of this substance in the atmosphere will reach the maximum allowable limit. This would result in a drastic average global temperature increase of 1.5-2 °C compared to pre-industrial levels, causing catastrophic impacts such as floods, droughts, mass extinctions and climatically uninhabitable regions.

The objective of this study is to analyse the impacts of today's consumer society on the planet and then to present a new economic model, the circular economy, as a solution to overcome the inefficiencies of traditional linear economies, which are mainly responsible for environmental damage. This new model aims at providing

companies with opportunities for economic growth, as well as preserving the environment and creating added value through new business models and an improved corporate image. The circular economy emerges as a key paradigm to address contemporary challenges related to environmental sustainability and responsible use of resources. In an era characterised by growing concerns over natural resource depletion, environmental pollution and climate change, the adoption of a circular economy model proves to be a vital option for building a sustainable future.

This paper will explore in depth the concept of circular economy, analysing its historical aspects, the policies adopted at EU level and the challenges and opportunities faced by companies that decide to adopt this approach. The work will be divided into four main chapters, each providing a comprehensive and detailed overview of the circular economy and its impact on different levels. The first chapter will address the history of the circular economy, examining its evolution over time and how it has become a key solution for reducing the environmental impact of human activities. Concrete examples of the circular economy in different industries will be examined and the environmental, economic, and social benefits of adopting this model will be explored. The operational modalities of the circular economy and how it differs from the traditional linear economy will also be explored. Central to this part will be the Ellen MacArthur Foundation, which has played a key role in promoting and supporting the adoption of the circular economy

globally. In the second chapter, we will focus on policies adopted at the European Union level to promote the circular economy.

The European Union has been and will be a pioneer in the development of strategies and regulations to foster the transition to the circular economy. The evolution of policies from 1957 with the first treaties until today will be analysed, with a special focus on the 'Fit for 55' programme. The latter aims to reduce greenhouse gas emissions by 55% by 2030. This section will also discuss the interconnection between environmental policies, regulations, and financial incentives, highlighting the importance of a holistic approach to achieve the goals set. In the third chapter, we will focus on the opportunities and challenges companies face when adopting the circular economy. The tools and programmes available to companies to facilitate the transition to a circular model by reducing waste, promoting product conversion, and encouraging innovation will be presented. The challenges that companies may encounter in the adaptation process, both at a practical and cultural level, will also be examined and how these challenges can be overcome. Finally, in the fourth chapter, we will look towards the future of the circular economy.

Prospects for development and potential technological innovations that could shape the path of the circular economy in the coming years will be explored. A key part of this chapter will be an in-person interview with MP Mercedes Bresso, a key figure in promoting sustainable policies within the European Union. In conclusion, this master's thesis aims to provide a comprehensive overview of the circular

economy, starting from its history and outlining its future prospects. Through the analysis of EU policies and opportunities for companies, it will attempt to demonstrate how the adoption of a circular economy model can be a concrete and constructive response to the environmental and socio-economic challenges of our time. Only through a collective and coordinated effort will it be possible to achieve a transition to a circular economy that is fairer and more sustainable for future generations.

CHAPTER ONE

FROM TRANSACTIONS TO THE CIRCULAR ECONOMY

1.1 HISTORY AND EVOLUTION OF THE CIRCULAR ECONOMY

Over the years, companies and consumers have produced and consumed without concern for the availability of raw materials and natural resources, leading to the creation of a global economy based on the linear model. In this model, the life of each product is represented by five stages: extraction, production, distribution, consumption, and disposal. The linear economy is also referred to as 'disposable'. Unfortunately, in this way, waste accumulates on the planet and in turn has negative consequences for the environment.

One of the worst consequences and risks of the linear economy is the emission of greenhouse gases. Due to the burning of fossil fuels, use of fertilisers and exaggerated waste production, the environment is damaged without the possibility of regeneration. Later, during the industrial revolution, goods were produced in masse for the first time thanks to the introduction of machines and industrial technologies. Industrialised countries became societies of abundance, leading to an increase in population and a decrease in poverty.

Global growth was possible by extracting finite resources and degrading natural capital to generate economic value. To increase profits, as many products as possible were put on the market, trying to lower production costs. It came to the

point that the product was considered end-of-life not because it was damaged or broken but by virtue of a sense of ownership. The linear production model, in this sense, could be described as unsustainable as it led to a great waste of value and resources and a huge environmental impact. At every stage of the product's life, there was interaction with the environment. The first element in the chain was raw materials, which of course being limited and even if some are renewable need a certain amount of time to regenerate. It is clear that it is not possible to extract raw materials indefinitely and at this speed. For example, Eurostat statistics show that in 2020, raw material consumption in Europe is 13 tonnes per capita per year, which is incredibly higher than the 9.5 tonnes per capita in 2000¹.

Next came production, during which, with the use of energy and chemicals, products were made for sale. For distribution, they were transported by sea, land, or air, using more energy, and increasing CO2 emissions. Consumers tend to use products continuously and frantically and as mentioned above, to 'planned obsolescence'² which becomes obsolete and unserviceable in the eyes of the

¹https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Material_flow_accounts_and_resource_productivity

² Sherif Y.S., Rice E.L.: *The search for quality: The case of planned obsolescence*, Microelectronics Reliability, 1986, Volume 26, Issue 1. Planned obsolescence involves a design plan that is intended to hasten existing products to become undesirable (not necessarily below that of competitive offerings) either functionally or psychologically and consequently to be replaced by new products.

consumer in comparison with new models that appear more modern, although they are little better from a functional point of view.

Planned obsolescence involves a design plan that is intended to hasten existing products to become undesirable (not necessarily below that of competitive offerings) either functionally or psychologically and consequently to be replaced by new products. In this age of scarce resources, energy shortages and new challenges, this paper re-examines planned obsolescence and searches for quality in today's products. Today we are faced with an increase in demand for raw materials and at the same time a scarcity of resources: the world population continues to grow and according to some United Nations forecasts will reach 10 billion in 2050, but many of the resources from our planet are being depleted.

As global wealth continues to increase, the Global Footprint Network stated that Italy in 2022³ has reached its resource depletion date seven months before the end

In this age of scarce resources, energy shortages and new challenges, this paper re-examines planned obsolescence and searches for quality in today's products.

³ The Global Footprint Network was founded in 2003 with offices in the United States, Belgium, and Switzerland. It was established as a non-profit organization. Its goal is to develop and promote sustainability tools, including the ecological footprint and biocapacity. These tools aim to bring ecological limits to the center of decision-making.

<https://www.overshootday.org/newsroom/country-overshoot-days/>

of the year. The data confirms that values were better in earlier years and are becoming increasingly fearful as we move forward.

There is therefore an urgent need to shift from a linear economy model, which has characterized the development of capitalism from the industrial revolution until today, to one of circular economy. Hence a model based on sustainable resource management, which aims to reduce waste, minimize the use of natural resources, and promote the regeneration of materials in the production cycle.

This model can be traced back to different currents of thought and it is difficult to establish a particular author or date as it is drawn from different inspirations and thought patterns. The first applications to economic systems date back to 1970 where Kenneth E. Boulding⁴ presented the idea of a circular material loop.

In his work, the author describes how materials are reused within an economic system. Here, materials are regarded as finite and valuable resources that can be recovered, recycled, and reused within the economic system. The aim is to create a more sustainable economy in which materials are used efficiently and the value of products and materials is maintained if possible.

⁴ Boulding, K. E.: *The economics of the coming spaceship earth*. Environmental quality in a growing economy. RFF Press, 2013. Pp. 3-14.

In 1976, Stahel and Reday-Mulvey⁵ delineated the vision of a circular economy and its impact on job creation, waste reduction and resource savings. For the authors, the circular economy promotes the reduction of the exploitation of natural resources, the reduction of waste and the creation of a more sustainable economy. Their focus is on designing durable products, on the efficient use of resources and on the valorisation of existing materials through recycling and remanufacturing.

In 1990, Pearce and Turner⁶, in their book explain the transition from the linear system to the circular system. They describe an economic system in which waste in the extraction, production and consumption phase is transformed into productive factors. Their main idea is the importance of minimising waste and maximising resource efficiency.

In 2009, the British Ellen MacArthur, a yachtswoman by profession, reflected during one of her long sea voyages: at sea, one had to rationalise consumption and not waste, so that resources would be sufficient for the duration of the voyage. In her view, land had to be considered a closed system, as in the sea, with limited resources to be used rationally. Hence the realisation that the linear model had to

⁵ Stahel W.R., Reday-Mulvey G.: *Jobs for tomorrow: the potential for substituting manpower for energy*. Vantage press. New York, 1981.

⁶ Pearce, D. W., and Turner R. K. *Economics of natural resources and the environment*. Johns Hopkins University Press, 1989.

be abandoned to a circular model in which materials could be recovered and reused at the end of their life. A model that does not produce waste but resources that can be reused. An economy that can regenerate itself, referred to as the circular economy. In 2010, Ellen announced the establishment of the Ellen MacArthur Foundation⁷, with the aim of extending the idea of the circular economy worldwide. The foundation currently has 14 partnerships with universities around the world to support research and teaching and to work with governments and associations to facilitate the transition to the circular economy⁸.

In 2012, the foundation published a report ‘Towards the circular economy: economic and business rationale for an accelerated transition’⁹ developed by

⁷ <https://ellenmacarthurfoundation.org>

⁸ The foundation works with global partners such as google, Philips, Renault, Ikea and Unilever to develop circular business initiatives with knowledge partners, McKinsey works to quantify the economic potential of the circular model. In addition, the foundation collaborates with several global partners including the un environment programme and the global fashion agenda and with members of the circular economy 100 programme, a network of companies committed to adopting circular business models. The foundation has also created the re-design project, an educational programme for students to promote the circular economy through competitions and internships. In 2015 the Intesa san Paolo group became a partner of the foundation with the aim of redefining business strategies and securing financial support for investments supporting circular innovation.

⁹ MacArthur, E.: *Towards the circular economy*. Journal of Industrial Ecology. 2013. Volume 2.1

McKinsey & Co. aimed at analysing and assessing business opportunities within the transition towards a circular economy model.

The report addresses the circular economy from an economic and business perspective. Various business opportunities and economic incentives derived from the circular economy are explored. Concepts such as recycling, repair and restoration are then presented. For example, the fashion and fashion industry is involved. Ellen explains 'moving to a circular economy in fashion involves transitioning to new business models that increase the life cycle of clothes or accessories through resale, repair or refurbishment'.

The foundation has been a great success and continues to be so. It represents a leading figure in the promotion of the circular economy and the promotion of a more sustainable future for all. Today, the circular economy is widely recognised as a sustainable and promising economic model for addressing environmental challenges and creating economic value. Currently, policies and regulations are being adopted both nationally and internationally and many companies are embracing the concept as an opportunity for innovation, resource efficiency and reduced environmental impact.

1.2 HOW THE CIRCULAR ECONOMY WORKS

The importance of the circular theme can be understood by referring to an article in which Boulding¹⁰ in 1966 likened the Earth before industrial society as a cowboy economy in the American West, where the frontier continually moved in search of new resources. In contrast, for Boulding today's economy is reminiscent of a spaceship where everything has to be saved and recycled. The cowboy economy represents the traditional approach that does not limit itself to resources and the disposal of polluting emissions. The spaceship economy is forced to deal with this as it is considered a 'closed system' that must remain in balance for the journey to continue. The European Parliament defines the circular economy as “The circular economy is a production and consumption model that involves sharing, lending, reusing, repairing, reconditioning, and recycling existing materials and products for as long as possible. This extends the life cycle of products, helping to minimise waste”. In practice, materials are reintroduced wherever possible through recycling, generating additional value. Traditionally, innovation in the circular economy implied the logic of the 3Rs: reduce or recover, recycle, and reuse the end of life of products and materials.

¹⁰ Boulding, K. E.: *The economics of the coming spaceship earth*. Environmental quality in a growing economy. RFF Press, 2013.

According to Reike, Hekkert and Kirchherr, the three Rs represent different approaches but have in common the goal: "to achieve sustainable development, which implies the generation of environmental quality, economic prosperity and social justice for present and future generations"¹¹.

Minimising the amount of resources and materials used in production processes and products themselves. Reduction is achieved through the optimisation of production processes, the adoption of efficient technologies and the design of environmentally sustainable products. The objective of reduction is to limit the use of natural resources and energy and to minimise the environmental impact of human activity. Reuse refers to the practice of extending the useful life of products and materials, giving the product a new life after it has fulfilled its original purpose. The aim is to limit the use of new resources, extend the useful life of products, prevent the creation of waste, and promote the adoption of sustainable consumption patterns. Finally, recycling consists of converting something that is no longer needed into something new. In the latter case, the goods produced can be made either for the use for which they were originally conceived or for a different use such as, for

¹¹ Kirchherr J., Reike D., Hekkert M., *Conceptualizing the circular economy: An analysis of 114 definitions*, Resources, Conservation and Recycling, 2017, Volume 127

example, from glass bottles create new glass bottles or create fleece from plastic bottles¹².

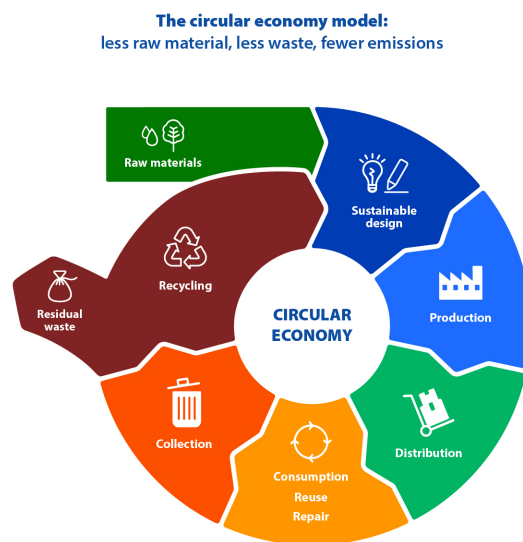


Figure 1: Committees European Parliament

¹² What binds bottles and fleece is precisely the material from which they are made: PET. Thanks to the recycling process of the polymer PET (Polyethylene terephthalate), a fleece can be produced with a small quantity of bottles (about 18). The process begins with the shredding of the plastic. The shredded material is then fed into the washing tank and is carried by the water current to the third stage, the grinding stage. In this step, the product is conveyed to a grinding mill that is designed to further reduce the size of the material. Finally, there is the fourth stage, which involves the drying of the ground plastic material, which is dried and then transformed into granules.

The model is evolving, and some scholars have expanded the 3Rs model to include others such as: repair which is the most profitable solution as it involves the use of the fewest resources. Repair is a form of reuse, as it extends the useful life of products and avoids the creation of waste. Then, redesign refers to the practice of redesigning products and systems considering the complete life cycle of materials and products in order to maximise resource efficiency, reduce waste and prevent waste creation. The aim is to take into account its environmental impact by changing old habits towards an increasingly sustainable model. Other scholars have also added the concept of rethinking, which refers to the need to reconsider the way we produce, consume, and manage natural resources and waste. It means questioning current consumption and production patterns and looking for innovative solutions to reduce the environmental impact of human activity. For example, companies are increasingly thinking about ecological solutions sustainable packaging or in the fashion industry with the reuse and rental of clothes.

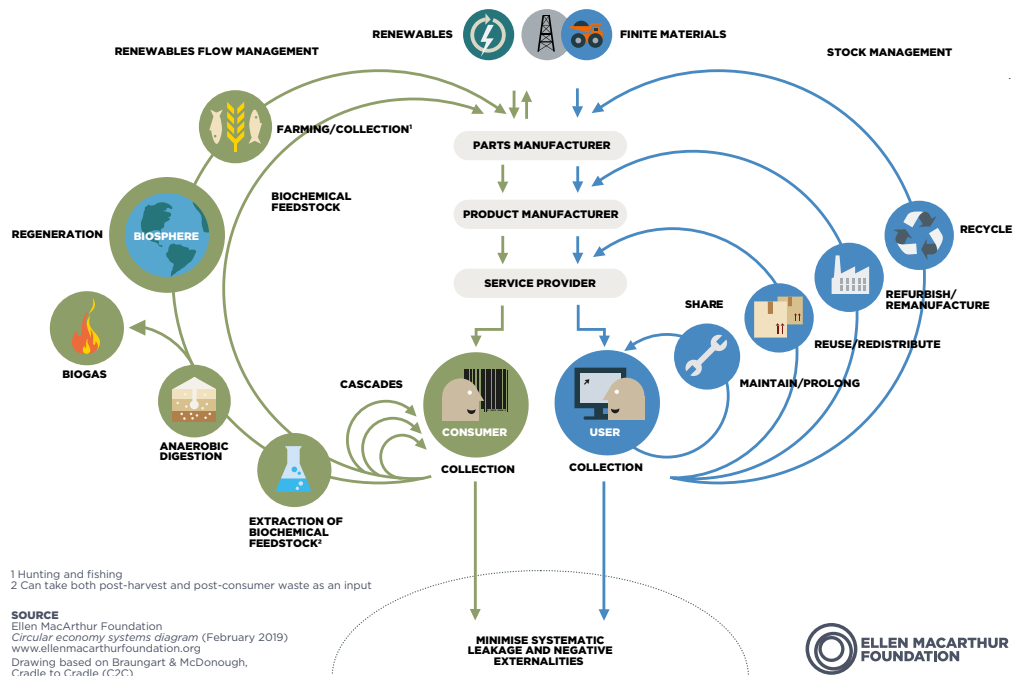


Figure 2: <https://ellenmacarthurfoundation.org/circular-economy-diagram>

The concept of the circular economy is clearly explained in the figure 2, prepared by Ellen MacArthur Foundation¹³, the system diagram of the circular economy is known as a butterfly diagram where the continuous flow of materials is illustrated. As the picture shows, there are two main types of cycles: the technical cycle and the biological cycle.

¹³ <https://ellenmacarthurfoundation.org/circular-economy-diagram>

On the left side of the diagram is the biological cycle. Here, materials can biodegrade and return to the Earth to regenerate nature like food. However, some materials such as cotton and wood can move from the technical to the biological cycle once they have degraded to the point where they can no longer be used to create new products. At the heart of the biological cycle is the concept of regeneration. Through this phase, waste can be recovered and fed into regeneration processes in order to give it a second life. In the circular economy, agricultural practices are used that allow nature to rebuild soils, enhance biodiversity and improve air and water quality. Composting and anaerobic digestion are ways to recover the materials contained in organic waste. In the first case, the process involves microorganisms in the presence of oxygen, returning valuable materials to farmland instead of artificial fertilizers. In the second case, the process takes place without oxygen. On the other hand, in the technical cycle, products are utilized rather than consumed. In this case, materials cannot re-enter the environment but must continuously flow through the system so that their value can be regained with each cycle. The diagram shows how internal cycles are surrounded by external, larger cycles. The internal ones preserve more of the intrinsic value of a product, thus keeping it intact. Here, products are favoured over external cycles as they see the product broken down and remade. The last cycle, that of recycling, represents the stage of last resort in a circular economy because it means losing the intrinsic value of products by having to reduce it to the basic materials.

The central part of the graph represents the meeting point between the two cycles, where biological and technological materials can be used synergistically, creating an even more efficient and effective system. In summary, the graph represents the idea that the circular economy must consider the specificities of biological and technological material cycles, using the resources at our disposal sustainably and efficiently to create a sustainable economic, social, and environmental system.

1.3 MECHANICS OF THE CIRCULAR ECONOMY

Ellen MacArthur contributes significantly to promoting the adoption of circular economy principles. The three main principles are identified. The first calls for the elimination of waste and pollution, circularity of materials and products and regenerate nature. For many products on the market, waste is incorporated and designed to be disposable. In nature, there is no waste but only the results of bad design choices. In the circular economy concept, a requirement is that all materials are reintroduced into the economy at the end of their use. Several companies nowadays have rethought the way they design, manufacture, and remake their products. For example, Apeel¹⁴ is an American company that has created a method to eliminate single-use plastic packaging from fresh fruit and vegetables. Specifically, they have developed a natural plant-based coating that extends the life

¹⁴ <https://www.apeel.com/blog/whats-in-a-peel>

of fruit and vegetables and reduces food waste. The coating consists of natural lipids found in the peels, leaves and seeds of plants that are extracted and transformed into liquid solutions. This solution is sprayed onto the produce, creating a resistant layer that protects it. In this way, the company contributes to reducing food waste and improving the sustainability of the food supply chain at the same time.

Or company DyeCoo¹⁵ has developed a technology that uses carbon dioxide instead of water to dye textiles, reducing the need for toxic wastewater and harmful chemicals associated with conventional dyeing methods. The closed-loop technology reduces operating costs and protects workers from exposure to toxic chemicals, while saving large quantities of water and chemicals. One of DyeCoo's machines can process 800 tonnes of polyester per year, effectively saving 32 million litres of water, avoiding the use of 160 tonnes of chemicals and completely eliminating the release of waste water into the environment.

The second principle requires the circulation of materials and products at maximum value. This means keeping materials in use even when not in use. For this reason, nothing becomes waste, and the value of products or materials is maintained.

In this system, materials are used efficiently and are not wasted, but rather reused, regenerated or recycled to generate new products. This reduces dependence on natural resources and limits the amount of waste and pollution generated.

¹⁵ <https://dyecoo.com>

To achieve this, an integrated approach involving all actors in the supply chain is required, from product design to waste management. The design of products should take into account their durability, ease of repair and the possibility of recycling or disassembly. Furthermore, companies should be incentivised to use recycled or reclaimed materials, reduce packaging and design products that can be easily repaired or remanufactured. In order to maximise the value of materials and products, it is also necessary to promote collaboration between companies in order to create circular economy networks and the exchange of materials and knowledge. Public policies should encourage the transition to a circular economy through the adoption of tax incentives, environmental regulations and funding for research and innovation in key sectors.

In conclusion, the goal of the circular economy is to create a closed circular system in which materials and products retain their value for as long as possible, promoting resource efficiency, waste and pollution reduction, and the creation of economic and social value. To cite one example: Ecovative¹⁶ is a company that produces sustainable materials using mushroom mycelium through their AirMycelium technology, which provides alternatives to plastic, leather, and meat. Their mycelial materials are grown using agricultural waste, produce no waste or pollution and use little water and land resources. In addition to its biodegradable packaging, called

¹⁶ <https://www.ecovative.com>

Mushroom Packaging, Ecovative has developed MycoFlex, a new material made entirely of mycelium, which can replace various unsustainable materials, such as foam in shoes, insulating paints for gloves and jackets, and cosmetic sponges. In addition, the company created MyForest Foods, which produces bacon-like proteins grown on vertical farms using their AirMycelium technology. Ecovative also offers research services through the Mycelium Foundry, to develop new mycelial materials, and offers partnership options for licensing their sustainable materials. Finally, the third principle is to regenerate nature. The idea is to use nature-based solutions to improve and restore ecosystems, promote conservation and sustainable management of natural resources. This principle is key to tackling the biodiversity crisis and climate change and requires the reduction of greenhouse gas emissions and the promotion of sustainable practices, such as creating circular food systems and supporting insects. The latter is an initiative to support insects and promote their conservation. They play a vital role in ecosystems and the worrying decline has moved several companies and associations to conserve their habitats, provide food resources and reduce pesticide use.

This can be achieved through collaboration between governments, companies and learning centres, with the aim of creating accredited training programmes for nature-based solutions that promote the conservation and restoration of ecosystems, sustainable management of natural resources and climate change mitigation.

Connect the Dots¹⁷, for example, is a private community management platform that connects community and public sector partners to develop innovative and actionable plans for cities and towns. The company uses data to take the guesswork out of event planning, providing users with information and event design for reliable audience engagement and return on investment. Connect the Dots has raised a total of \$57.3K in seed funding and has 15 employees. According to Similarweb¹⁸, their website has a weekly growth rate of 0.8% with a size multiple of 219x, and they have 5.5K Twitter followers and 15.0K unique visitors.

1.4 ADVANTAGES AND BENEFITS OF THE CIRCULAR ECONOMY

The circular economy is the new sustainable economic model that aims to preserve the value of products over time and seeks to eliminate the consumption of companies and territories by exhaustible natural resources. The transition to the circular economy leads to numerous advantages, including reducing pressure on the environment and optimising the availability of raw materials. When we talk about reducing pressure on the environment, we are talking about a fundamental aspect

¹⁷ <https://www.ctd.ai>

¹⁸ The platform provides information on a website's visits and engagement and its performance. The website provides data to help companies understand online user behaviour and identify new business opportunities.

for mankind. This includes improving air and water quality and preserving biodiversity. All these phenomena are directly related to human health, as a reduction in air and water pollution implies a reduction in pollution-related diseases. As stated by the UN body the Intergovernmental Panel on Climate Change¹⁹, the benefits of adopting a circular model are increasingly quantifiable as we are experiencing a real code red for humanity and the need to monitor climate change is obvious. Their studies show that even if the rise in the earth's average temperature can be maintained at 1.5° C degrees, the consequences will be critical. This will certainly lead to an increase in drought periods linked to areas burnt by fires during the summer and animals losing their habitats. By 2100 there would be a reduction of one third of the world's ice, alpine ice would almost completely disappear, and sea rise would reach one meter. It is therefore imperative to limit climate damage, as the changes are generated by CO2 emissions into the atmosphere due to human activities²⁰.

¹⁹ The Intergovernmental Panel on Climate Change (IPCC) is an international body established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). It was created in 1988 with the aim of providing policymakers with scientific assessments on climate change, its impact, and potential mitigation and adaptation strategies.

²⁰ McGrath M.: *Climate change: IPCC report is 'code red for humanity'*. BBC News, 2021.

Human influence has warmed the climate

Change in average global temperature relative to 1850-1900, showing observed temperatures and computer simulations

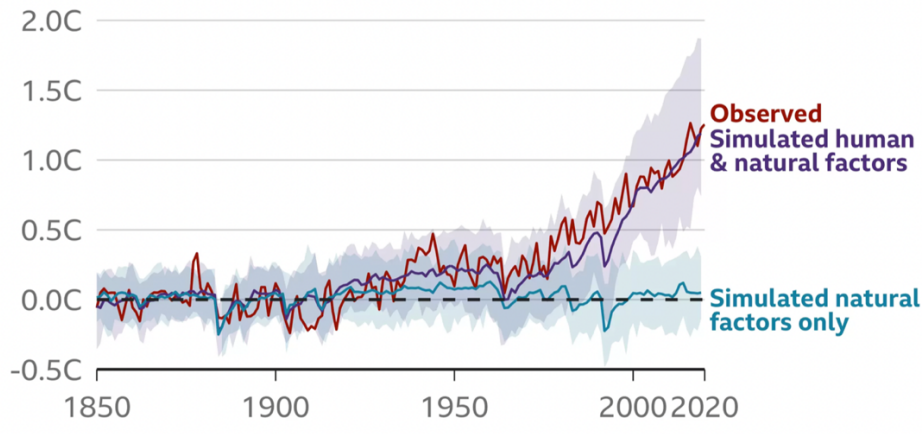


Figure 3: IPCC 2021, Summary for Policymakers

From the graph it is evident how man is the architect of the earth's climate change over the years, Matt McGrath from the report published in BBC news, states that global surface temperatures have risen faster since 1970 than in any 50-year period in the last 2000 years. How can humans avoid getting into tragic situations?

As confirmed by the European Parliament, reusing and recycling products would slow down the use of natural resources, limit the loss of biodiversity and reduce the destruction of landscapes and natural habitats. For the Strasbourg Parliament 'At the moment, the production of the materials that are used every day is responsible for 45% of CO₂ emissions²¹'.

²¹ Parlamento Europeo. Economia circolare: definizione, importanza e vantaggi. 2023

On 28 November 2019, the European Parliament adopted a resolution calling for the EU to set climate neutrality by 2050 as a long-term goal under the Paris Agreement and to -increase emission reduction targets to 55% by 2030. The Paris Agreement, signed by 194 countries and the EU, aims to limit global warming below 2°C and to continue efforts to limit it to 1.5°C in order to avoid the catastrophic consequences of climate change. All EU member states are signatories on their own, but their positions and common emission reduction targets are coordinated together at EU level.

Linked to this, the circular economy leads to a reduction in total annual greenhouse gas emissions. As reported by the Foundation for Sustainable Development²², doubling the current circularity rate from 8.6 per cent to 17 per cent can reduce material consumption from the current 100 to 79 giga tonnes and cut global greenhouse gas emissions by 39 percent per year.

Right now, we are faced with an increase in demand for raw materials and at the same time a scarcity of resources, many raw materials are limited but the world population continues to grow and the demand for these resources increases accordingly. Faced with this problem, the circular economy succeeds in ensuring that natural resources are no longer exploited at the current rate, but that their life

²² <https://circulareconomynetwork.it>

span is increased. The circular economy increases the competitiveness of companies by creating a more efficient and sustainable business model. Reducing waste and maximising the use of products saves material costs and creates new revenue opportunities. Furthermore, the adoption of environmentally friendly technologies and the use of recycled materials reduce dependence on natural resources and limit material waste. Another key benefit is due to increased innovation as the circular economy aims to keep products, components, and materials in use as long as possible by promoting the repair, recycling and reuse of existing products. Innovation is needed to increase the lifespan of raw materials used for production and to drive the transition to a circular economy.

As Roleen Sevillena, programme manager of circular cities Asia commented, "If we stick to business as usual, we will only perpetuate the unsustainable systems that exist in the world today. To go sustainable, we have to rethink the ways we do business, and this also requires new ways of doing things"²³. Innovation education is crucial to bring systems to sustainability and help the transition to the circular

²³ Circular cities Asia is an initiative to promote the transition of Asian cities towards a circular economy model. The aim is to support Asian cities in adopting circular economy models to address environmental, social, and economic challenges such as increasing urbanization, pollution and climate change.

economy. Roleen continues “We need to move beyond the take, do, use, waste economy and learn and teach different ways of doing business”.

The circular campus programme presents learning opportunities with circular economy experts leading the way in innovation education. In addition to teaching, a competition is also organised where all participants can submit circular ideas and solutions considering environmental, social, and economic impacts.

Thus, increasing innovation by creating an environment in which manufacturers must rethink the design of their products to maximise their durability, reparability, and recyclability. This requires the adoption of technologies to redesign products and reuse materials.

In addition, innovation can stimulate the creation of new business models and sustainable products, thus fostering economic growth. With the circular economy, consumers can also have more durable and innovative products that save money and improve their quality of life. An article in the European Parliament states that reconditioning light commercial vehicles instead of recycling them could lead to material savings of €6.4 billion per year (about 15 per cent of material expenditure) and €140 million in energy costs, with a reduction in greenhouse gas emissions of 6.3 million tonnes²⁴. In 2015, a study by McKinsey and the Ellen MacArthur foundation showed that a circular approach could increase resource productivity in

²⁴Parlamento Europeo. Economia circolare: definizione, importanza e vantaggi. 2023

Europe by 3% by 2030, generating cost savings of €600 billion per year and a further €1800 billion in economic benefits²⁵.

This clear study shows that in a circular economy, economic growth increases.

Moreover, as economic growth increases, companies tend to expand and invest more to exploit market opportunities. This would lead to an increase in employment. The creation of new jobs is linked to waste management and the production of sustainable goods and services. Reducing production costs and increasing efficiency can promote business expansion and the creation of new job opportunities. A study by the European Commission estimates an increase of more than 700,000 new jobs in Europe by 2030²⁶.

The French Minister of the Environment states that a package of 50 measures for the circular economy will add over 300,000 jobs in France. Again, the Finnish Environment Minister states that the implementation of a (roadmap) for the circular economy would create 75,000 new jobs in Finland. The picture that emerges, however, is differentiated by more or less resource-intensive sectors of activity, by regions where raw material extraction or material-intensive activities where labour costs are higher or lower. All those scenarios with higher employment also involve

²⁵Ellen MacArthur Foundation, *Growth within: A circular economy vision for a competitive Europe* (2015).

²⁶ Parlamento Europeo. Nuovo piano d'azione per l'economia circolare. 2021.

green taxation measures that increase the tax levy on the consumption of virgin materials and reduce it on labour. The best performing model is that of the Dynamix Reserach Group²⁷ with a 7.2% increase in employment. They envisage a gradual increase in the material tax levy, to 30% in 2030 and up to 200% in 2050, and the use of the collected financial resources to reduce the tax levy on labour. In addition, it would generate more than 5.2% GDP growth in Europe and decrease material consumption by 19% in 2050.

1.5 SUCCESSFUL CASE STUDIES IN THE CIRCULAR ECONOMY ADOPTION

The circular economy has become a key concept for achieving a balance between economic growth and environmental conservation. An increasing number around the world have embraced the idea of circularity as an integral part of their international strategies. Below are two companies that are different from each other but share the same philosophy. Both have demonstrated that environmental sustainability and economic profitability can co-exist, generating value for both the

²⁷ is a research and consulting company based in Canada, specializing in analysis and strategies for the environment and sustainable development. The company offers research, analysis and public policy development, strategic planning, environmental impact assessment and technical support for sustainable development projects.

company and the environment. An example of a multinational company committed to the circular economy is the company IKEA. IKEA was founded in 1943 in Sweden. After twenty years, it opened its first shop outside Sweden and in the 1970s-80s expanded into the world's most influential markets such as Japan, the United States, Australia, France, and Great Britain. Today, IKEA's products can be found in 342 shops in 42 countries around the world. Today, it is one of the largest furniture and home furnishing chains with a global presence and strong industry influence. It is committed to promoting many initiatives that make it uniquely environmentally sensitive. In 2009, IKEA invested EUR 1.7 billion in renewable energy, installing 416 wind turbines and around 75,000 solar panels on the roofs of its buildings. IKEA integrates sustainability into the design of its products. The aim is to efficiently use renewable and recycled resources to create value instead of waste along the production chain. In order to promote the circular economy, it is designing entire product lines that take into account not only the complete life cycle, but also possibilities for reuse. It is also increasing the use of renewable and recycled materials from sustainable sources. It uses materials such as wood from FSC-certified forests²⁸. When a forest is certified according to FSC standards, it means that it has been assessed and verified by independent third parties to ensure

²⁸ forest stewardship council, an independent non-governmental organisation that promotes responsible forest management globally.

that certain environmental, social, and economic criteria are met. Specifically, IKEA is committed to obtaining wood from sustainably managed sources to contribute to forest conservation and environmental protection. In addition to the origin of the wood, IKEA uses recycled materials in its products. For example, plastic furniture can be made from recycled plastic from bottles or other plastic objects. Or it tries to reduce the use of virgin materials in packaging by using recycled cardboard or cellulose-based materials from sustainable sources. The IKEA team stewed up a system to create kitchens in which the doors and worktops were totally recycled. The components produced are used in the *kungsbacka* kitchen line. Where plastic bottles from waste collection are melted into a foil that is applied to recycled wood panels, creating a durable and easy-to-clean laminate. Twenty-five half-litre PET bottles are needed to produce a 40x80 panel. This results in a recycled laminate with the same quality standards as a virgin material²⁹.

In this regard, IKEA in January 2020 eliminated all single-use plastic products and bags made from renewable materials from sugar cane. In addition, it aims to use only renewable or recycled materials by 2030 such as bamboo or wool. As of 1 September 2015, all cotton used in IKEA products comes from more sustainable sources. In fact, the original cultivation of cotton uses high amounts of chemicals

²⁹ <https://www.ikea.com/ch/en/life-at-home/kungsbacka-design-pube64886a1>

and water that damage the environment. IKEA together with WWF are committed to creating a positive change in the cotton industry and making it more sustainable. In addition, IKEA creates the 'return and recycling service' programme, which offers customers the opportunity to return used furniture to its shops, which is recycled or repaired to be sold as second-hand products again.

In recent years, IKEA has increased the percentage of recycling collection in its shops to 88% in 2017. IKEA stores have set up a Circularity Corner where an assortment of affordable products from different sources is offered. There are some pieces of furniture that have imperfections and instead of throwing them away are sold at reduced prices, items returned by customers, items that are used and returned to the shop to give them a second life or items that have suffered damage but are fully functional and usable.

IKEA is committed to educating and inspiring customers to adopt a more sustainable lifestyle. Through its website, catalogues and marketing activities, the company manages to provide advice on how to avoid waste, save energy and buy responsibly. On the official website, there is a page devoted entirely to sustainability and all the circularity activities it undertakes. IKEA through marketing strategies highlights how its products are designed to consume less energy than alternatives found on the market. For example, LED lamps use less energy and at the same time offer longer life and better light. Or they recommend

lowering the temperature in the house and buying their blankets, curtains or carpets that are made from sustainable materials and keep the house warm and cosy.

Their main goal is "to have a positive impact on the climate by 2030, reducing the amount of greenhouse gas emissions by more than the entire IKEA value chain, while growing the IKEA business". Alongside a large multinational company like IKEA that is committed to a sustainable strategy, there are several small and medium-sized companies that do the same. This is the case of Rothy's³⁰, a US company founded in 2012 and based in the United States, specifically in San Francisco. The company immediately decided to create an entirely sustainable, comfortable, and high-quality shoe.

A key element of Rothy's circular philosophy is the use of recycled materials. The products are mainly made of regenerated plastic yarn from post-consumer PET plastic bottles. This recycling process reduces the amount of plastic that ends up in landfills and oceans. Their online site shows that more than 158 million single-use bottles have been processed and more than 548,000 pounds of marine plastic used. During the process, plastic bottles are shredded and melted to make plastic filaments. These filaments will be processed into recycled filaments, resulting in a light and strong material. 3D printers are used to create the shoe components. This

³⁰ <https://rothys.com/pages/sustainability>

process reduces material waste as the components are printed precisely and customised for each shoe model. Each step in the production of Rothy's shoes is entirely designed to reduce waste and use recycled material. The company has invented a recycling programme that is created to encourage customers to return their shoes at the end of their life cycle instead of throwing them away. Once the shoes are returned, they are disassembled to separate the different materials that make them up. For example, the recycled plastic fabric is separated from the other components such as the sole or insole. The shoe materials are then recycled for use in the creation of new products. The materials undergo a transformation process that makes them ready for recycling. Finally, the processed materials are recycled and used for other creations. Such as recycled plastic filaments can be used to create new fabrics for the uppers of Rothy's shoes. The main objective of the company's recycling process is to keep the shoe materials in a continuous use cycle and thus reduce the need for new raw materials. In addition, the company is committed to social initiatives. Rothy's has donated funds to support environmental education projects and collaborated with organisations to promote awareness of the importance of sustainability. In summary, Rothy's is an excellent example of a company that embraces the circular economy in the production of its products and acts as a beacon for those small to medium-sized enterprises that should enter the circular world.

CHAPTER TWO

PROMOTING THE CIRCULAR ECONOMY IN THE EUROPEAN UNION

2.1 EUROPEAN UNION POLICIES FOR THE CIRCULAR ECONOMY

In this context, the European Union has played and continues to play a leading role in promoting and implementing the circular economy. The European Union has recognized the importance of this transition to a more sustainable economy and has adopted and will continue to adopt policies and measures to facilitate its implementation. The goal is to become a leader in the circular economy, generating opportunities, creating jobs, and reducing environmental impact.

The European Union has already been working for some time on various programmes and policies to achieve these goals. This starts with the founding treaties of the European Communities, dating back to 1957, did not provide any legislation for environmental protection, which today, however, is one of Europe's main interests. In 1987, the Single European Act was introduced, a one-title treaty dedicated to the environment, the protection of human health and the prudent and rational use of natural resources. With the Treaty of Amsterdam in 1997, environmental protection is one of the priority objectives of the European Union. This has evolved as awareness of the issue has grown: the United Nations Stockholm Conference on the Human Environment in 1972, the Rio de Janeiro

Conference where the United Nations issued the Rio Declaration on Environment and Development, the Framework Convention on Climate Change and other international instruments for the protection of biodiversity.

One of the most relevant circular economy policies is the 2015 Action Plan also called “Closing the loop” an European Action Plan for the Circular Economy.

The aim is to foster the transition to the circular economy through the more sustainable use of resources. It analyzed the interdependence of all processes in the value chain: from raw material extraction to product design, packaging and distribution, consumption and reuse, and recycling. These measures included the elaboration and/or revision of some legislative proposals and then a comprehensive Action Plan. The plan is complemented by several actions, such as the introduction of the concept of extended producer responsibility that makes producers also accountable for the disposal and recycling of the goods they produce, the setting of targets such as recycling and disincentives to landfill waste, and then improving legislation on organic fertilizers, water reuse and safety in the use of chemicals.

Actions in the Action Plan include a proposal for a regulation to create a single market for fertilizers with the aim of decreasing the sector's dependence on imports of critical raw materials such as phosphates or chemicals. The proposal to amend a 2011 directive to restrict the use of hazardous substances in electrical and electronic equipment, promote end-of-life recycling opportunities and increase waste prevention. A European strategy for plastics in the circular economy was included

in the plan, aimed at transforming the value chain of plastic products through actions to implement their useful life and quality product recycling. The crucial role of cross-cutting tools such as eco-innovation, green public procurement and European funding instruments was also emphasized. As of 4 July 2018, the four European Union directives, known as the Circular Economy Package, came into force, which Member States must transpose into their own laws by 5 July 2020.

With these directives, the EU has set targets to reduce the amount of non-recycled waste. The directives are:

- *Directive 2018/849 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators and 2012/19/EU on waste electrical and electronic equipment;*
- *Directive 2018/850 amending Directive 1999/31/EC on landfills;*
- *Directive 2018/851 amending Directive 2008/98 on waste;*
- *Directive 2018/852 on packaging and packaging waste.*

Targets and measure of updated EU Waste Directives

Target Year	2025	2030	2035	2018 levels (Eurostat 2020)
Directive (EU) 2018/851 amending Directive 2008/98/EC on waste	The preparing for re-use [*] and the recycling ^{**} of municipal waste is increased to 55 % by weight (Article 11.2).	The preparing for re-use [*] and the recycling ^{**} of municipal waste is increased to 60 % by weight (Article 11.2)	The preparing for re-use [*] and the recycling ^{**} of municipal waste is increased to 65 % by weight (Article 11.2)	EU municipal waste recycling rate: 47,4%
Directive (EU) 2018/850 amending Directive 1999/31/EC on the landfill of waste		All waste suitable for recovery, shall not be accepted in a landfill (Article 5.3a)	Max amount of municipal waste landfilled is 10 % (Article 5.5)	EU landfill of waste rate: 24%

* Preparing for re-use = checking, cleaning or repairing waste products so they can be re-used without any other pre-processing.

** Recycling = reprocessing organic and non-organic waste materials for the original or other purposes. It does not include energy recovery nor backfilling operations and it is only counted when recycled or composted materials actually re-used rather than simply reprocessed.

Table 6

Targets and measure of the updated packaging and packaging waste Directive

Target Year	2025	2030	2017 levels (Eurostat 2020)
Directive (EU) 2018/852 amending Directive 94/62/EC on packaging and packaging waste	65 % of all packaging waste recycled as well as: (i) 50 % of plastic packaging; (ii) 25 % of wood packaging; (iii) 70 % of ferrous metal packaging; (iv) 50 % of aluminium packaging; (v) 70 % of glass packaging; (vi) 75 % of paper and cardboard packaging (Article 6.1)	70 % of all packaging waste recycled as well as: (i) 55 % of plastic packaging; (ii) 30 % of wood packaging ; (iii) 80 % of ferrous metal packaging; (iv) 60 % of aluminium packaging; (v) 75 % of glass packaging; (vi) 85 % of paper and cardboard packaging (Article 6.1)	EU recycling rate for all packaging waste: 67,5%; Plastic packaging: 41,7%; Wood packaging: 41,2 %; Metal packaging: 80,7 %; Glass packaging: 75,9%; Paper and cardboard packaging: 85,5%

Figure 4: Paper: Analyzing European Union circular economy policies: words versus actions

It is evident from the table taken from the paper "Analyzing European Union circular economy policies: words versus actions" by Friant, Vermeulen and Salomone³¹, that the directives had precise objectives.

³¹ Friant M.C., Vermeulen W.J.V, Salomone R.: *Analyzing European Union circular economy policies: words versus actions*. Sustainable Production and Consumption, 2021, Volume 27, Pages 337-353.

These directives amended the previous directives on waste, packaging, landfill, electrical and electronic waste, end-of-life vehicles, and batteries. The aim is to protect the environment with an average annual emission reduction of 617 million tonnes of CO₂, with a positive impact on employment with the creation of 500,000 jobs and, according to estimates by the European Parliament, up to 7% more GDP growth by 2035³². Among the most important objectives of the new European regulations was to increase recycling rates to 55% of municipal waste by 2025. This will then rise to 60% in 2030 and 65% by 2035. The other target is 65% recycling of packaging waste by 2025 then 70% by 2030 with different targets depending on the type of material³³.

	By 2025	By 2030
All packaging	65%	70%
Plastic	50%	55%
Wood	25%	30%
Ferrous metals	70%	80%
Aluminium	50%	60%
Glass	70%	75%
Paper and cardboard	75%	85%

Figure 5: *European Parliament*

As for landfills, if not properly designed, they can contaminate soil and groundwater with chemicals in the waste. Although waste management in the

³² Confindustria, The four European directives on the circular economy come into force.

³³ European Parliament. The circular economy package: new EU targets for recycling. 2017.

European Union has improved a lot, more than a quarter of municipal waste is still landfilled. An objective of the directive is to limit the share of municipal waste for disposal to a maximum of 10 per cent by 2035.

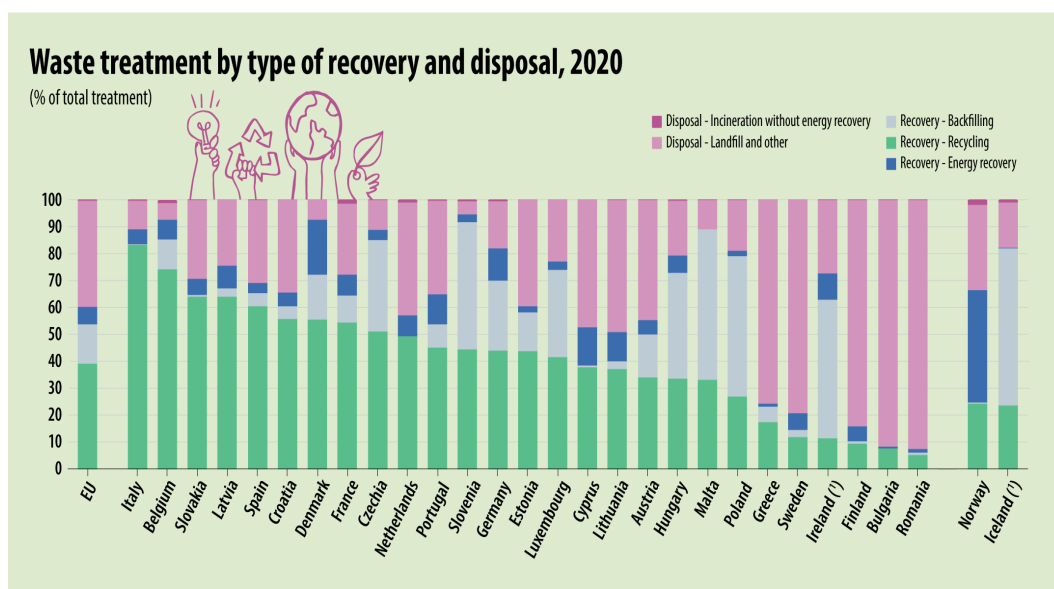


Figure 6: Eurostat 2020

According to data provided in 2020³⁴, 2153 million tonnes of waste were generated in the countries of the European Union. The 37.5% from construction and demolition, 23.4% from mining and quarrying, 10.8% from waste/water then manufacturing, households, other economic activities and energy. In 2020 in the

³⁴ Eurostat. Amount of waste recovered increases in 2020.

EU 39.2 % of waste was recycled and 31.3 % was landfilled. Italy is the country with the highest recycling rate at 83 %, followed by Belgium, Slovakia, and Latvia. On the other hand, there are European countries where landfilling prevails, such as Romania, Bulgaria, and Greece.

There are also plans to extend separate collection obligations for textile waste and hazardous household waste, such as paints, pesticides, oils, and solvents, which will have to be collected separately from 2025. Biodegradable waste will also have to be compulsorily collected separately or recycled at home through composting.

The long-term strategy is to involve companies in making products with new materials that do not generate waste, while the short-term strategy is to manage waste responsibly through reuse and recycling. On 11 December 2019, the Commission presented the European Green Deal. It is introduced as a package of policy initiatives that aims to set the European Union on the road to a green transition with the goal of achieving climate neutrality³⁵ by 2050. As communicated by the European Commission, the European Green Deal aims to ensure that in 2050 there are no more net greenhouse gas emissions, that economic growth is decoupled from resource use, and that no person and no place is neglected.

"Climate change is the greatest challenge of our time, but it also represents an opportunity to build a new economic model." The European Union's commitment

³⁵ Balance between harmful emissions originating with the appearance of man and their absorption.

is to become the first climate neutral continent by 2050. To achieve this goal, states commit to reducing emissions by 55% by 2030. At the same time, the goal is a transition to greener mobility offering clean, accessible, and affordable transport for all. New proposals are devised that will have an impact on European industry with an increase in the energy efficiency of buildings that will create jobs in the construction sector. In fact, it is proposed to renovate more than 35 million buildings by 2030, creating more than 160000 new jobs. The renovation of homes and buildings will save energy and fight energy poverty. The threat of climate change can only be tackled by working together with international partners. Working together will reduce emissions from shipping and aviation worldwide and improve modern environmental standards. As part of the Green Deal on 11 March 2020, the European Commission published its new Action Plan to promote the circular economy specifying measures to achieve the goal of climate neutrality by 2050. The Commission proposes new rules to make almost all physical goods on the market more sustainable and environmentally friendly, circular and energy efficient during their life cycle. The European Plan for the Circular Economy identifies sectors to be transformed and introduces legislative measures to:

- Making products sustainable according to EU regulations, making them more durable and made from recycled materials as much as possible.
- Provide useful information to consumers and public purchasers.

- Focus on sectors that use the most resources such as electronics, packaging, plastics, and construction.
- Ensuring that waste is reduced, and less waste is generated.
- Making circularity work for people, regions, and cities.
- Driving global efforts on circular economy.

To make products fit for a circular, resource-efficient economy and to reduce waste, the Commission has proposed a legislative initiative on a sustainable product strategy. The central objective of this initiative is to apply eco-design to a wide range of products respecting the principles of circularity.

On 31 May 2018, the European Commission endorses Ecodesign³⁶, i.e. ‘For certain product categories, minimum requirements relating to energy savings (Ecodesign requirements) are laid down, without which products cannot be placed on the European market. Manufacturers are obliged to reduce energy consumption and other negative impacts of products on the environment right from the design stage. This helps to avoid trade barriers, increase product quality, and improve environmental protection. Currently, products falling within the scope of the directive include, for example, boilers, computers, and household appliances. The Ecodesign policy will save households €490 in energy bills by 2020. Ecodesign requirements are complemented by obligations on energy labelling of products’.

³⁶ Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009.

The Commission has endorsed initiatives to improve the durability and reparability of products³⁷, increase the recycling content of products, increase their energy and resource efficiency, limit disposable products and allow remanufacturing.

Another central element of the policy framework on sustainable products is to give consumers choice and offer less expensive solutions. The Commission will ensure that consumers are provided with relevant product information at the point of sale, including on durability and repair. It will seek to strengthen consumer rights with the 'right to repair' through incentives and guarantees for consumers to choose to repair rather than replace products. It also emphasizes the right of consumers to be informed about the environmental impact of the products and services they buy by combating the false sustainability policy of companies. An European Parliament citation say "Circularity and sustainability must be integrated at all stages of the value chain to achieve a fully circular economy from design to production to the consumer". In 2021, MEPs call for EU strategies for critical raw materials by promoting the recovery of critical raw materials. These aim to reduce the EU's dependence on imports of critical raw materials and to promote the recovery of

³⁷ According to a Eurobarometer survey, 77% of Europeans try to repair their items before buying new. A 2018 European Commission study found that consumers are three times more likely to buy a product if it guarantees sustainability and reparability. 79% of Europeans believe that digital devices should be easier to repair or replace than individual parts.

these materials from waste disposal and other alternative sources. The Plan includes a series of actions to improve the security of supply of critical raw materials, promote recovery and recycling, and develop new sources of sustainable supply.

The European Commission's Action Plan identified seven key areas, essential for the ecological transition and climate neutrality goals: plastics, textiles, electronic waste, food and water, packaging, batteries and vehicles, buildings, and construction. Among those most affected is electronics, one of the sectors with the highest growth rates in waste generation and a recycling rate of less than 40 per cent. As stated by Parliament rapporteur Jan Huitema "In 2017 the world produced 44.7 million tonnes of e-waste of which only 20% was properly recycled". As Eurostat statistics show³⁸, 10.3 kg of electrical and electronic waste per inhabitant in the European Union was collected in 2020. These devices contain harmful materials that pollute the environment and increase the risks for people. To remedy this problem, the European Plan for the Circular Economy aims to extend the lifespan of products through reusability and reparability. The proposal defines objectives such as the right to repair and improved reuse in general, the introduction of a universal battery charger and the encouragement for recycling electronics. Textiles is another sector with major environmental and social impacts. According

³⁸ Eurostat. Waste statistics- electrical and electronic equipment. 2020

to a report by the Ellen MacArthur Foundation³⁹, the textile industry uses a lot of raw materials and water, with less than 1% of materials recycled compared to 87% of products going to landfill. The EU strategy for sustainable and circular textiles aims to ensure that textiles are durable and recyclable, made as much as possible from recycled fibres and free of harmful substances by 2030.

Plastics have been an important topic in environmental policies for many years as they are the main source of pollution. According to the European Parliament communiqué, every year Europeans generate 26 million tonnes of plastic waste and less than 30% is collected for recycling. As an Eurostat image shows, in the EU states only 32.5 per cent of plastic is recycled while some is disposed of and the rest goes to landfill where it will be incinerated or, in the worst case, is not collected and ends up in the environment. MEPs have promoted a strategy that would phase out the use of microplastics, tiny pieces of plastic that are released into the environment as small particles. In addition, the European Parliament in 2015 supported the restriction on the use of lightweight plastic bags and from 3 July 2021 no new single-use plastic products can be marketed in Europe.

One of the main goals is to combat plastic waste and make all plastic packaging reusable or recyclable by 2030. The Commission has proposed improvements in

³⁹ Ellen MacArthur Foundation, *A new textiles economy: Redesigning fashion's future*. 2017.

packaging design, with clear labelling and with the intention of incentivizing reuse and recycling. They stipulate that 55% of plastic packaging waste must be recyclable by 2030. In 2022, the Commission proposes new initiatives with the aim of reducing packaging waste and encouraging the reuse or refilling of packaging. All clearly unnecessary forms of packaging, such as single-use food packaging or sugar sachets in bars and restaurants, are to be banned. Another key sector is the building and construction industry, on which 50% of the materials extracted today depend and which is responsible for more than 35% of the EU's total waste. Greenhouse gas emissions from material extraction, construction and building renovation are estimated at 5-12% of the world's total greenhouse gas emissions. Europe promotes the need to adapt the building sector to climate and environmental goals by promoting circularity principles during the entire life cycle of buildings. This means promoting recycled content in construction processes, extending the durability of materials, better waste management and setting carbon reduction targets in materials, such as minimum requirements on energy and resource efficiency. MEPs approved new rules on the production of all batteries on the EU market. They are required to have a low carbon footprint and meet social and ecological standards. Stricter targets will be included for the collection of portable

batteries, at 45 per cent by 2023, 63 per cent by 2027 and 73 per cent by 2030, and for transport batteries, 51 per cent by 2028, 61 per cent by 2031⁴⁰.

In addition, the new standards will prescribe easy removal or replacement of batteries, which will provide better information to consumers about the durability, chemical composition, and 'recycling' of batteries. Globally, according to the FAO⁴¹, the percentage of food produced is wasted is about 30% or 1/3 of food ends up in the rubbish each year. Almost 90 million tonnes of food are wasted every year. The food sector has a major impact on the environment: about 1/3 of greenhouse gas emissions come from food production and processing. With the Action Plan for the Circular Economy, Europe commits to halve food waste by 2030. Key targets are to reduce the use and risk of chemical pesticides by 50 per cent, to reduce fertiliser use by 20 per cent, to reduce sales of antimicrobials⁴² for farmed animals and aquaculture by 50 per cent, and to allocate 25 per cent of agricultural land to organic farming. Another focal point that the new 2020 Action Plan considers is waste management and shipment. Despite efforts at national and EU level, the amount of waste generated is more than 2.5 billion tonnes per year.

⁴⁰ European Parliament. 2022.

⁴¹ Food and Agriculture Organization of the United States.

⁴² An antimicrobial is a chemical substance, natural or synthetic, that kills microorganisms, or inhibits their growth.

EU waste exports to other countries reached approximately 32.7 million tonnes in 2020. Most of this waste consists of ferrous and non-ferrous metals, such as paper, plastics, and textiles, which mainly go to India, Egypt, and Turkey.

Policies include increasing high-quality recycling, minimizing incineration, eliminating landfill, and reducing harmful chemicals in waste. In October 2022, the European Parliament amended regulations on persistent organic pollutants with the aim of reducing the amount of chemicals in waste. The changes include the lowering of permitted levels for persistent organic pollutants in products and the obligation of destruction or incineration for materials containing high levels of pollutants. In January 2023, the Parliament adopted new legislation for EU procedures and control measures for waste shipments. In the text, a ban on the shipment of all EU waste for disposal to non-EU countries is highlighted and exports of hazardous waste to OECD (Organization for Economic Cooperation and Development) countries are banned within four years.

In July 2021, the European Commission presented the 'fit for 55' project, consisting of 12 directives and regulations to reduce carbon emissions by at least 55% by 2030. In June 2022, the Council of the European Union adopted important legislative proposals on the 'fit for 55%' package, and in December 2022, the Council and Parliament reach an agreement on the package's legislative proposals.

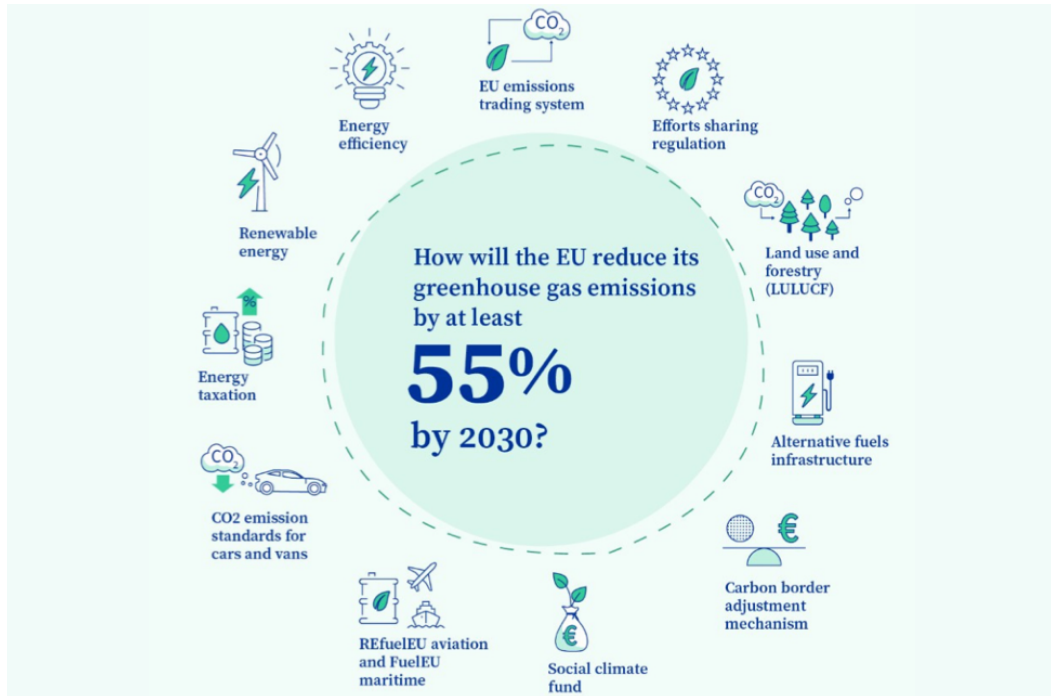


Figure: *European Council*

As the picture shows, the aim of the package is to reduce greenhouse gas emissions by at least 55% by 2030. The package is ambitious and includes several areas in which the EU will work.

The EU Emissions Trading Scheme (ETS)⁴³ is a carbon market based on a cap-and-trade system for energy-intensive industries and the power generation sector. It is a

⁴³ The emissions trading scheme, also known as the 'polluter pays' principle, obliges more than 11,000 power plants and factories to apply for a permit for every tonne of CO₂ they emit. This is a clear incentive to pollute less: the less you pollute, the less you pay. Industries have to buy these

tool to reduce emissions; since its introduction in 2005, emissions in the European Union have decreased by 41%. The Council approves the carbon border adjustment mechanism (CBAM) "As a tool to counter carbon leakage, a situation where industries with high greenhouse gas emissions relocate production to third countries where climate policy standards are lower than in the European Union precisely will help to reduce emissions globally while ensuring a level playing field for companies". This practice does nothing but shift the problem elsewhere, so MEPs want to stem this problem through a carbon repolarization instrument. The CBAM operates as a carbon tax that is levied on imports of certain goods from outside the EU. There is a risk that the most polluting sectors may shift production to countries with less stringent policies on greenhouse gas emissions than those in the EU. The CBAM is designed to operate in parallel with the EU Emissions Trading Scheme (ETS) and encourages high-emitting industries in the EU to reduce emissions. MEPs call for it to be implemented from 1 January 2023 with a two-year trial period and extended to all ETS sectors by 2032. By 2030, the CBAM should also expand to energy and industrial sectors that contribute 94% of the EU's industrial emissions. These sectors receiving large free allocations will have to be phased out by 2032.

allowances through auctions and the price follows the rules of supply and demand. Some quotas were given for free, to prevent - in some risky sectors - industries from moving to regions with fewer environmental restrictions.

The Commission proposed to Member States to allocate part of the revenues of the new ETS for carbon pricing in buildings and road transport to incentivize environmental performance in energy efficiency in buildings, tackling energy poverty and supporting economic growth by creating jobs in the green economy.

Thus, as part of its efforts towards zero emissions, the EU aims to introduce new requirements that will benefit the environment and people. The new rules will encourage citizens and micro-businesses to invest in alternative energy sources and cleaner transport. The social climate fund is an instrument to financially support those affected by the introduction of the new emissions trading scheme for fuels, buildings, and transport. The fund will be financed directly from the EU budget, using 25 per cent of the revenues from the new emissions trading scheme for buildings and road transport fuels: it is estimated to allocate EUR 59 billion to member states for the period from 2026 to 2032.

The European Council estimates that more than 34 million people will be in energy poverty by 2032 and resources will be allocated to them to provide temporary support to reduce energy poverty and to finance measures and investments for the most vulnerable. This fund will be under incentives to renovate and switch to renewable sources in buildings, incentives to switch from private to public transport, support for the development of the second-hand market for electric vehicles, and the reduction of energy taxes and fees to combat rising road transport and heating fuel prices. In 2020, the EU produced almost 22% of its energy from

renewable sources, two percentage points above the target, now with the new directive, the EU has set the quota at 40% of energy from renewable sources by 2030. Renewable energies have a low environmental impact because they emit less carbon than fossil fuels. Therefore, increasing the share of renewable energies is crucial for reducing carbon in the energy sector. According to data from the European Council, from 2005 to 2017 the increasing substitution of fossil fuels by renewable energy resulted in a 7% decrease in total Sulphur dioxide and 1% decrease in nitrogen oxide emissions. The directive aims to introduce sector-specific measures at EU level. For transport, states can choose between a 13% reduction in greenhouse gases or a 29% reduction in renewable energy in final energy consumption. In addition, the Council agreed on a 5.2% share of renewable fuels of non-biological origin and 4.4% of advanced biofuels by 2030. The rules call for a 1.1% annual increase in renewable energy for industry, a 49% renewable energy share for buildings, and for 35% of hydrogen used in industry to come from renewable fuels of non-biological origin⁴⁴.

⁴⁴ European commission “Renewable Fuels of Non-Biological Origin (RFNBO) are synthetic drop-in fuels mostly derived from electricity that can cover part of the EU’s demand renewable fuels in the coming years. Production is still limited by upstream hydrogen supply and carbon capture solutions, but the conversion technologies would be ready for a rapid market uptake”.

In light of the commitment to reduce greenhouse gas emissions, the EU must become more energy efficient. Using less energy is the most efficient solution for the environment and in terms of costs. The main goal is a reduction of final energy consumption by at least 11.7 per cent in 2030. In addition, a gradual increase of the annual energy savings target for final energy consumption to 1.9 per cent in 2030 is agreed. The revision of the Energy Performance Directive will also contribute to making buildings more energy efficient. All new buildings should be zero-emission by 2030 and existing buildings should become zero-emission by 2050. Solar panels should be installed on new residential buildings and an increase in infrastructure for bicycles and electric vehicles. The European Union is revolutionizing the energy taxation directive to encourage the move towards a greener future. The aim is to tax the most polluting fuels and incentivize producers to adopt more sustainable practices. This directive is crucial as 77% of greenhouse gas emissions in the EU come from energy. The directive's proposal concerns the structure of the minimum rates, which should be based on the actual energy content and the true environmental performance of fuels and electricity, and the broadening of the tax base to include more products. In this way, the most polluting fuels would be the most heavily taxed, maritime and aviation fuels would be subject to increased taxation while sustainable fuels would have a zero minimum rate, there would be no distinction between commercial and non-commercial use, and the price of minimum rates would be constantly updated according to Eurostat data.

The regulation sets annual greenhouse gas emission targets for Member States in sectors such as agriculture, transport, waste, and buildings. The rules aim to reduce emissions by 40 per cent by 2030. Each State sets national annual emission limits to reach the final target. Reducing emissions also means removing CO₂ from the atmosphere through soil and forest capture. Forests and soils absorb more carbon than they release, thanks to the ability of trees to absorb CO₂ from the atmosphere. Each year, forests absorb 10 per cent of total greenhouse gas emissions. Under the new rules, states must ensure that emissions from these sectors must offset a reduction in CO₂. The new target for 2030 is a reduction of 310 million tonnes of CO₂. As far as emissions are concerned, according to European Council statistics, passenger cars and vans account for 15 per cent of total carbon dioxide emissions. The new proposal introduces an emission reduction for passenger cars and vans by setting a target of 100 per cent by 2035. Thus, all cars and vans placed on the market by that year will have to be zero-emission.

In addition, the new regulation applies more meticulous regulations on methane emissions. Compared to carbon dioxide, methane can trap heat, making it a very potent greenhouse gas, responsible for 30% of global warming.

Sixty per cent of methane emissions are man-made through agriculture, waste, energy and biomass burning. It will be compulsory to measure and verify methane emissions through regular monitoring of equipment that detects leaks. Operators will have to immediately repair or replace any problems or breakdowns.

The European Union is proposing regulations for sustainable air transport (known as the ReFuelEU aviation initiative⁴⁵) and for the use of renewable and low-carbon fuels for maritime transport (Maritime FuelEU⁴⁶).

Aviation and maritime transport account for 14.4% and 13.5% of the EU's total transport emissions. Therefore, this regulation aims to increase the use of sustainable fuels and reduce greenhouse gas emissions from these transport sectors. In particular, the aviation regulation will oblige EU fuel suppliers to gradually increase the share of sustainable fuels. The minimum share of sustainable fuel supply will be 2% by 2025 and increase to 63% by 2050.

In addition, there will be an obligation for operators to refuel aircraft only with the fuel needed for the flight to avoid external weight emissions and to counter tankering practices⁴⁷. The maritime regulation will oblige ships over 5,000 tonnes calling at European ports to reduce the greenhouse gas intensity of the energy they use by an average of 2 per cent per year by 2025 to 80 per cent in 2050. In addition, at least 90 per cent of ships in seaports must have access to electricity supply.

⁴⁵ Policy proposal introduced by the European Union aimed at promoting the use of sustainable aviation fuels in the aviation sector.

⁴⁶ Policy proposal by the European Union aimed at promoting the adoption of sustainable maritime fuels and reducing greenhouse gas emissions in the maritime sector.

⁴⁷ Extra fuel to avoid refuelling at a destination airport where fuel is more expensive.

In addition, the proposal aims to provide alternative power supply to stationed ships and aircraft and ensure sufficient infrastructure to charge or refuel with alternative fuels. Charging stations will be installed every 60 km for cars and trucks by 2030, hydrogen stations every 200 km on main roads, and liquefied natural gas reference points along main roads.

"We need a regulatory environment that allows us to scale up the clean energy transition quickly. The Net-Zero Industry Act will do just that. It will create the best conditions for those sectors that are crucial for us to reach Net-Zero by 2050. Demand is growing in Europe and globally, and we are acting now to make sure we can meet more of this demand with European supply". The above quote is a clear message from the chairwoman of the European Commission, Ursula Von der Leyern, regarding the importance of key environmental issues. The Net-Zero Industry Act is presented by the Commission on 16 March 2023 with the goal of achieving climate neutrality by including zero net greenhouse gas emissions by 2050. The aim of the plan is to increase the production of technologies that are key to achieving climate neutrality, such as solar panels, photovoltaic cells or wind turbine blades. The aim is to approach 40 per cent of the annual need for strategic technologies produced in the EU by 2030.

The action supports Strategic Net-Zero Technologies that have been identified according to the overall objectives of the action and to increase the production

capacity of zero-emission technologies in Europe, in particular those that are commercially available and have a good potential for rapid scalability.

The law supports eight strategic technologies, including: solar photovoltaic and solar thermal technologies, onshore wind energy and offshore renewable energy, batteries and storage, heat pumps and geothermal energy, electrolysers and combustion cells, biogas/biomethane, carbon dioxide capture and storage, and grid technologies (such as smart and fast electric vehicle research).

The selection of these technologies is based on three criteria, the level of technological readiness, which considers these technologies to be commercially available and have good potential for rapid growth, the contribution to decarbonisation and competitiveness, expecting them to contribute significantly to the EU's legal commitment and to reduce greenhouse gas emissions by at least 55% by 2030.

Finally, security of supply risks relates to the EU's dependence on imports from individual third countries. To stimulate investment in zero-emission technologies, the draft regulation proposes several actions and instruments.

- Setting enabling conditions such as investments in technologies and reducing administrative burdens. It will also prioritise strategic projects to strengthen the resilience and competitiveness of European industry.
- Accelerating CO₂ capture: the goal is to reach an annual injection capacity of 50 million tonnes in strategic CO₂ storage sites by 2030. It also

introduces the concept of a strategic project for CO₂ storage to accelerate the development of a European Net-Zero CO₂ transport and storage value chain that industries can use to decarbonise their operations.

- Facilitating access to markets: the law requires public authorities to include sustainability and resilience criteria for zero-emission technologies in public procurement or auctions.
- Enhancing skills: new laws to ensure a skilled workforce to support zero-emission technology production in the EU.
- Fostering innovation: e.g., Member States are allowed to set up regulatory sandboxes to test innovative zero-emission technologies and stimulate innovation.
- Net-Zero Europe platform: useful for coordinating actions and exchanging information regarding industrial partnerships and monitoring progress towards the goals of the zero-emission industry law.

2.2 EUROPEAN PROGRAMS SUPPORTING CIRCULAR ECONOMY INITIATIVES

"If over a long work of billions of years, the Earth has created the conditions for the development of an intelligent species, capable of intervening in these processes, this same species must ensure that the prodigy of the living planet continues and is

not jeopardized by its action"⁴⁸ . In recent decades, the European Union has been committed to promoting sustainable development and the transition to more efficient and environmentally friendly production and consumption models. To support the transition of European businesses towards a circular economic model, the European Union has adopted a series of programmes and policies that aim to provide tools and incentives for the adoption of the circular economy in production activities. The LIFE programme, created in 1992, is a funding instrument for environmental protection, the fight against climate change and nature conservation. Its name derives from the acronym '*L'Instrument Financier pour l'Environnement*', which means '*Financial Instrument for the Environment*'. The programme was so successful that it was renewed six times. The latest version LIFE 2021-2027 was adopted in April 2021 with a budget of EUR 5.4 billion. This new phase aims to support projects that contribute to EU objectives, such as the European Green Deal and the EU Biodiversity 2030 strategy. Since 1992, the programme has initiated more than 5500 projects in Europe and third countries.

The programme is aimed at companies, legal entities in the Member States, national and local authorities, private companies and organisations, bodies and associations, universities, and research centres. It is structured in two main areas of intervention:

⁴⁸ Bresso M., *Economia ecologica. La transizione ambientale verso uno sviluppo sostenibile.*, Jaca Book, Milano, 2021.

environment with the sub-programmes 'Nature and Biodiversity' and 'Circular Economy and Quality of Life', and climate action with the sub-programmes 'Climate Change Mitigation' and 'Clean Energy Transition'.

The programme provides funding for a wide range of activities, training and awareness-raising programmes, and communication campaigns and public events to promote good environmental practices and support the transition to a circular economy. The Nature and Biodiversity sub-programme supports nature conservation, the promotion of biodiversity and the sustainable management of natural resources. Projects that contribute to the area of natural habitats and bird protection will be supported. The aim is to protect over 1,000 species, including mammals, reptiles, fish, and plants and 230 characteristic habitat types. The sub-programme Circular Economy and Quality of Life promotes circular and sustainable business models, efficient waste management and reuse of resources. On the other hand, the Climate Change Mitigation sub-programme aims to transform the European Union into a climate-neutral society. It offers climate change mitigation strategies and action plans at regional or national level. Climate change adaptation provides grants for planning and preventing extreme weather events, especially in coastal areas. Finally, the Clean Energy Transactions sub-programme contributes to the creation of markets and regulations for the energy transition, through activities to develop and disseminate best practices, improve skills, and offer funding for projects that reduce greenhouse gas emissions and

mitigate the effects of climate change. This sub-programme has almost EUR 1 billion in which it aims to facilitate the transition to an efficient renewable energy economy. In particular, it targets five areas of intervention⁴⁹ :

- Building a national, regional, and local policy framework to support the transition to clean energy.
- Accelerating the introduction of technology, digitization, new services, and business models and enhancing related professional skills on the market.
- Attract private funding for sustainable energy.
- Support the development of local and regional investment projects.
- Involve and empower citizens in the clean energy transition.

The LIFE programme finances a wide range of projects within it. In the area of biodiversity conservation, for example, the project for the conservation of sea turtles in the Canary Islands archipelago. It includes the creation of protected nesting areas and turtle monitoring programmes⁵⁰.

⁴⁹ https://cinea.ec.europa.eu/programmes/life/clean-energy-transition_en

⁵⁰ The LIFE MEDTURTLES ES project aims to protect endangered species of common and green turtles. Sightings are reported through an App and satellite transmitters track their movements around the Mediterranean Sea. The project is coordinated by Paolo Casale and Paolo Luschi and funded with around EUR 3 million by the European Union until 2023.

Also, sustainable resource management projects in the promotion of sustainable agriculture in rural regions by reducing the use of pesticides and chemical fertilisers. Or climate change mitigation and adaptation projects with a transition to sustainable mobility in urban areas. It focuses on the creation of bicycle and pedestrian infrastructure and the implementation of environmentally friendly public transport systems. Or information and communication projects, in particular awareness-raising campaigns to reduce the use of single-use plastics. The campaign includes information activities with events on the collection of plastic and its proper handling. On 9 March 2023, the European Commission announced a new investment of more than EUR 116 million for strategic projects within the LIFE programme. The funding will support eight Member State projects with the aim of achieving climate and environmental targets already set⁵¹.

In Belgium, under the LIFEB4B programme, protected areas will be extended, and critical animal habitats and species will be improved and developed. In particular, the aim is to protect and restore biodiversity in the country. In Slovakia, the LIVING RIVERS LIFE programme aims to preserve water quality and protect natural habitats by safeguarding fisheries and forestry. While in Finland, the PLASTLIFE team will focus on reducing plastic waste and plastic consumption by promoting recycling. In Estonia, the aim is to increase the country's capacity to

⁵¹ https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_1567

adapt to climate change through the LIFE-SIP ADAPTES programme. The LIFE ECOADAPT50 programme is proposed in Spain and aims to raise awareness of climate change adaptation and both business and government are involved. In Poland, the aim is to focus on the transport and public utility sectors through the LIFE AFTER COAL PL team, while the WETLANDS GREEN LIFE project envisages the expansion of protected areas especially in marshes and wetlands. Finally, in Italy, with the LIFE CLIMAX. PO the proposal is to improve the management of water resources from a climatic point of view for river basins, especially the Po River.

A natural evolution of the European Union's LIFE programme is the Horizon Europe programme. The programme was created in 1984 under the name "*Framework Programme for Research and Technological development*". Over the years, it has undergone several evolutions. In 2014, the Horizon 2020 programme was launched as a funding programme for research and innovation focusing on the promotion of scientific excellence, industrial competitiveness, and the use of innovative solutions to global challenges such as climate change. Subsequently, the Horizon Europe programme was launched covering the period 2021-2027 with a budget of EUR 95.5 billion.

It is divided into three major pillars: 'Science of excellence' which supports basic and applied research by funding the best researchers in Europe through programmes such as the European Research Council and Marie Skłodowska-Curie Actions

(MSCA)⁵². The second pillar is 'Global Challenges and European Industrial Competitiveness', which focuses on funding applied research to tackle global challenges such as climate change, health, environmental security, digitization, clean energy, and mobility. It also supports European Industrial competitiveness through innovation and the development of new technologies. Finally, the last pillar is 'Innovation for people and societies' which focuses on transforming ideas and innovations into concrete products and services, supporting research and development of key technologies to create a sustainable and better future for people and societies. Through the Horizon Europe programme, there is a call within cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment' for the period 2023-2024 with a budget of EUR 9 billion in which the aim is to support circular solutions driven by climate neutrality and the bioeconomy.

The aim is to protect the environment and use natural and biological resources in a sustainable manner. In addition to the areas of intervention that will be analyzed below, this cluster also contributes to the objectives of the European Green Deal in relation to the Biodiversity Strategy 2030 and all sustainable development goals.

⁵² Marie Skłodowska-Curie Actions (MSCA) are a European Union programme that supports the training and mobility of researchers. Launched in 1996, the programme promotes excellence in research through project funding, scholarships, and staff exchanges. MSCA fosters international collaboration and knowledge transfer between academia and industry.

Several areas of intervention are concerned.

- *Biodiversity*: the programme provides funding for the protection and restoration of ecosystems and biodiversity. The aim is to halt biodiversity decline and restore ecosystems through various actions, such as understanding the causes of biodiversity loss, enhancing, and restoring biodiversity and ecosystem services. The Commission strives to reach a target of 7.5 per cent of total biodiversity spending for the period 2021-2027⁵³.
- *Agriculture, forestry, and rural areas*: agriculture and forestry play a crucial role in providing food, feed, and non-food products, meeting the needs of various industries and consumers. In addition, they provide social and environmental benefits, support the development of rural areas, improve quality of life, and create employment. However, global population growth, hunger, obesity, and consumer demands pose challenges to agriculture, which needs to improve food and nutrition security while addressing resource scarcity, environmental degradation, climate change and biodiversity loss. Addressing these challenges requires locally adapted

⁵³ The European Commission strives to reach an overall spending target on biodiversity for its long-term budget 2021-2027 of 7.5% in 2024-25, and of 10% as of 2026 onwards. The total amount is EUR 9 billion, so the first spending target is EUR 675 million.

solutions that improve the economy and social conditions of agriculture, foster generational renewal, and contribute to the development and resilience of rural areas. Research and innovation play a key role in developing the knowledge, practices, technological and social innovations, policies, and governance needed for the transition to sustainable farming systems and rural communities. The EU has a long-term strategy for agricultural research and innovation focused on the sustainability of primary production and increased innovation in rural areas. For example, the European innovation partnership for agricultural productivity and sustainability (EIP-AGRI)⁵⁴ is an initiative that promotes innovation in the agriculture and forestry sectors to address global challenges. It coordinates funding for projects and facilitates knowledge exchange through the Common Agricultural Policy (CAP) and research and innovation programmes like Horizon 2020 and Horizon Europe. EIP-AGRI projects use a multi-actor approach, involving farmers, advisors, scientists, and stakeholders to develop practical and innovative solutions. The initiative supports local and transnational projects, including thematic networks that gather and disseminate knowledge. Networking activities at European, national, and regional levels foster collaboration and information sharing.

⁵⁴ <https://ec.europa.eu/eip/agriculture/en/find-connect/projects.html>

The European Commission plans to continue and strengthen EIP-AGRI by increasing funding for research and innovation in agriculture, food, bioeconomy, and rural development under the future common agricultural policy and Horizon Europe.

- *Oceans and seas*: the ocean and seas are vital for Europe and the world, but are threatened by problems such as pollution, climate change and overexploitation. Research and innovation are crucial to monitor, protect and sustainably exploit these resources. Next, the European Union's missions will be presented, including that of restoring our ocean and waters by 2030. In this context, efforts will be made to protect marine biodiversity, eliminate pollution, and make the blue economy sustainable and circular.
- *Food systems*: the current situation calls for a radical change in our food systems, as challenges such as population growth, urbanization, climate change and resource scarcity are putting the sustainability and health of our planet at risk. To address these challenges, research and innovation is needed to develop more sustainable, resilient, and inclusive food systems. The transformation of food systems also requires sound, evidence-based governance. Research and innovation play a key role in finding solutions, overcoming barriers, and identifying new market opportunities to create a

better food future. Food 2030⁵⁵ is the EU's research and innovation policy to transform food systems and ensure sufficient, accessible, and nutritious food for all. The aim is to create a resilient, sustainable, and environmentally friendly food system. The policy aims to address urgent challenges such as climate change, resource scarcity and biodiversity loss. Research and innovation are key to making food systems more sustainable, inclusive, and healthy. Food 2030 promotes policy coherence, financing and investment, the closing of the innovation gap and the adoption of effective solutions. The main objective is to achieve four key goals: sustainable nutrition, food systems for a healthy planet, circularity and resource efficiency, and innovation and community empowerment.

⁵⁵ European Commission's Food 2030 initiative and is meant to guide future research and innovation policy reflections relevant to Horizon Europe, the Farm to Fork strategy and European Green Deal, and beyond. The report sets out 10 Pathways where research and innovation can concretely deliver co-benefits to nutrition, climate, circularity, and communities, at multiple levels: from local to international. It will be concentrated in ten areas: Governance and systems change, Urban food system transformation, Food from the oceans and freshwater resources, Alternative proteins and dietary shift, Food waste and resource efficiency, The microbiome world, Healthy, sustainable and personalised nutrition, Food safety systems of the future, Food systems Africa and Food systems and data.

- *Environment*: European research and innovation are key to tackling climate change, implementing sustainable industrial policies, and achieving sustainable development.

The European Green Deal and Horizon Europe are key instruments to drive the transition to a climate neutral society by 2050. Science and citizen participation are key to developing green solutions and ensuring policy coherence. The EU has allocated significant funding to promote urgent and sustainable climate actions. Human health is closely linked to the quality of the environment in which we live. Negative changes in ecosystems pose a threat to human health and well-being.

The European Union, to protect citizens' health from negative environmental impacts, has developed a broad framework of programmes, policy objectives and regulatory actions. Research and innovation play a key role in understanding and addressing the impact of environmental factors on health.

The creation of project clusters by the European Union aims to promote collaboration between funded projects and maximise the impact of research initiatives. These efforts are part of a broad European strategy to tackle environmental challenges and protect people's health.

For example, research and innovation to support chemical strategies for sustainability. The European Partnership for Chemical Risk Assessment

(PARC) was launched in May 2022 with co-funding of EUR 200 million from Horizon Europe. PARC brings together ministers, risk assessment and public health agencies, research organisations and European agencies to address chemical safety challenges.

It focuses on protecting human health and the environment by supporting the assessment and management of chemical risks. HBM4EU⁵⁶, an earlier programme, contributed to the creation of PARC by providing European-level evidence for the regulation of chemicals.

In addition, the EU supports research into animal-free approaches for chemical safety assessment, with projects such as EU-TOXRISK⁵⁷ and the ASPIS⁵⁸ cluster.

⁵⁶ The European Human Biomonitoring Initiative <https://www.hbm4eu.eu>

⁵⁷ EU-ToxRisk is a European program aiming to replace animal toxicological tests with an approach based on human cell responses and a comprehensive understanding of toxic mechanisms. By integrating cellular biology, omics technologies, systems biology, and computational modelling, the program aims to define the links between chemical exposure and toxic effects. It focuses on repeated dose systemic toxicity and developmental and reproductive toxicity, with the goal of providing reliable animal-free testing strategies for chemical risk assessment.

⁵⁸ Animal-free Safety assessment of chemicals: Projects cluster for implementation of novel strategies. Is made up of three research projects funded by the EU Horizon 2020 and Research and Innovation Programme.

Finally, the EURION cluster (European Cluster to Improve Identification of Endocrine Disruptors) deals with the identification of endocrine disruptors and provides recommendations for managing the risks associated with these substances. Or research and innovation supporting the zero-pollution action plan. The strategy is committed to improving air, water, and soil quality, reducing transport noise, impact on biodiversity and waste generation by 2030. To achieve these goals, two important research clusters have been created: the European Human Exposome Network (EHEN) and the European Cluster on Health Impacts of Micro- and Nanoplastics (CUSP). EHEN focuses on studying the impact of environmental exposure on human health, while CUSP deals with the health effects of micro- and nanoplastics. Both clusters receive significant funding from the EU and work to improve understanding of environmental factors and develop preventive actions.

In September 2021, five Missions are launched by the European Commission with clear and well-defined objectives to achieve environmental and social outcomes. The first Mission concerns climate change adaptation, which supports EU regions, cities, and local authorities in building resilience against the impacts of climate change. The goal of the mission is to accompany at least 150 European regions and communities towards climate resilience by 2030. To achieve this goal, the mission helps regions understand future climate risks, develop preparedness strategies, and adopt innovative solutions on the ground to build resilience.

The second is the Cancer Mission and thus improve the lives of more than 3 million people by 2030 through prevention, treatment, and support for those affected by cancer and their families. Currently, cancer is a major problem for society, with millions of people affected every year in Europe. Without further action, according to the European Cancer Information System, the number of new diagnoses will increase significantly by 2040. The Mission on Cancer aims to reverse this trend by uniting the efforts of citizens, stakeholders, and Member States, with the goal of improving understanding of cancer, promoting early detection, optimizing treatment, and improving the quality of life of cancer patients.

The third Mission is 'Restore our Ocean and Waters'⁵⁹. It aims to protect and restore the health of the ocean and waters by 2030. Through research, innovation, citizen engagement and marine investments, the Mission aims to address ocean and waters in an integrated manner, contributing to climate neutrality and nature restoration. Crosscutting enabling actions such as public mobilization and a digital ocean knowledge system support this goal.

The Mission also promotes regional involvement and cooperation through 'lighthouses' in various marine areas and river basins of the EU, which will serve as sites for experimentation, demonstration, and development of the Mission's

⁵⁹ The European Commission has identified over 800 EU-funded projects from 16 funding programmes that contribute to the objectives of the 'Restore our Ocean and Waters' mission.

activities. The fourth Mission is 'Climate-neutral and Smart Cities' which aims to engage European cities to achieve climate neutrality by 2030⁶⁰. One hundred pilot cities will be developed to serve as hubs for innovation and experimentation to drive all European cities towards climate neutrality by 2050. Funding and technical support will be provided to promote actions such as zero-emission mobility, clean energy, urban greening, and the association of Ukrainian cities to the mission. This transformation effort will be realised through citizen climate contracts co-created with the help of the Mission Platform. Finally, the last Mission is 'Soil Deal for Europe' which aims to create 100 living labs and beacons to promote the transition to healthy soils by 2030. Currently, most of Europe's soils are unhealthy, but soil is a valuable resource that supports life on Earth. The Mission is committed to funding social science research and innovation, creating a network of living laboratories to test solutions and co-create knowledge, developing a harmonised soil monitoring system and raising awareness of the importance of soil. The objectives of the

⁶⁰ The European Commission's online website shows that cities play a key role in achieving climate neutrality by 2050, the goal of the European Green Deal. They occupy only 4% of the EU's land area but are home to 75% of EU citizens. Furthermore, cities consume more than 65% of the world's energy and are responsible for more than 70% of global CO₂ emissions. European cities can make a significant contribution to the Green Deal's goal of reducing emissions by 55% by 2030 and, in more practical terms, provide cleaner air, safer transport and reduce congestion and noise for their citizens.

Mission include reducing desertification, conserving soil organic carbon, preventing soil sealing and pollution, and improving soil structure and soil literacy in society. The Mission will support the objectives of the European Green Deal and the Sustainable Development Goals (SDGs)⁶¹ through investments in research and innovation. The latter objectives refer to environmental and social issues that need to be managed as best as possible as a necessary condition for the positive evolution

⁶¹ The 17 goals are: end poverty in all its form everywhere, end hunger achieve food security and improve nutrition and promote sustainable agriculture, ensure healthy lives and promote well-being for all at all ages, ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, achieve gender equality and empower all women and girls, ensure availability and sustainable management of water and sanitation for all, ensure access to affordable, reliable, sustainable and modern energy for all, promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all, build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, reduce inequality within and among countries, make cities and human settlements inclusive, safe, resilient and sustainable, ensure sustainable consumption and production patterns, take urgent action to combat climate change and its impacts, conserve and sustainably use the oceans, seas and marine resources for sustainable development, protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss, promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels, strengthen the means of implementation and revitalize the global partnership for sustainable development.

of mankind. Each objective or target is referred to a strategic document 'transforming our world' in which it is intended to mobilise public and private actors to commit themselves, according to their resources and activities, to the pursuit of the objectives and targets described. “We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations”⁶².

2.3 THE CONCEPT OF “END OF WASTE” IN THE EUROPEAN UNION

La città di Leonia rifà se stessa tutti i giorni: ogni mattina la popolazione si risveglia tra lenzuola fresche, si lava con saponette appena sguosciate dall'involucro, indossa vestaglie nuove fiammanti, estrae dal più perfezionato frigorifero barattoli di latta ancora intonsi [...]. Sui marciapiedi, avviluppati in tersi sacchi di plastica, i resti di Leonia d'ieri aspettano il carro dello spazzaturaio. Non solo i tubi di dentifricio schiacciati, lampadine fulminate, giornali, contenitori, materiali d'imballaggio, ma anche scaldabagni, enciclopedie, pianoforti, servizi di porcellana: più che dalle cose di ogni giorno vengono fabbricate vendute comprate,

⁶² Assembly, General.: *Resolution adopted by the General Assembly on 11 September 2015*. New York: United Nations (2015).

l'opulenza di Leonia si misura dalle cose che ogni giorno vengono buttate via per far posto alle nuove. [...] Certo è che gli spazzaturai sono accolti come angeli, e il loro compito di rimuovere i resti dell'esistenza di ieri è circondato d'un rispetto silenzioso, come un rito che ispira devozione, o forse solo perché una volta buttata via la roba nessuno vuole più averci da pensare. Dove portino ogni giorno il loro carico gli spazzaturai nessuno se lo chiede: fuori dalla città, certo; ma ogni anno la città si espande, e gli immondezzai devono arrestare più lontano; l'imponenza del gettito aumenta e le cataste s'innalzano, si stratificano, si dispiegano su un perimetro più vasto. Aggiungi che più l'arte di Leonia eccelle nel fabbricare nuovi materiali, più la spazzatura migliora la sua sostanza, resiste al tempo, alle intemperie, a fermentazioni e combustioni. È una fortezza di rimasugli indistruttibili che circonda Leonia, la sovrasta da ogni lato come un acrocoro di montagne⁶³.

Italo Calvino had already described the city of consumption, driven by abandonment, and overwhelmed by waste. The principle of nature states that there is no waste and that everything is raw material for something else. The amount of urban and industrial waste is infinite, as are the problems associated with its

⁶³ Calvino, I., *Le città Invisibili, La città di Leonia*, 1972.

management. For several years, the inhabitants of Earth behaved like the inhabitants of Leonia, but when waste became more and more and began to be a pollution problem, it was realised that more responsible waste management was needed. In essence, the idea was that everything could be transformed, and waste decreased until it disappeared completely. The European Community, with Directive 2008/98/EC⁶⁴, defines waste as any substance or object which the holder discards or intends or is required to discard. In the context of the circular economy, the European Commission has adopted an ambitious new package of measures to encourage European businesses and consumers to make the transition to a more robust circular economy in which resources are used sustainably. This framework includes ambitious recycling targets, stricter standards and separate collection obligations, minimum requirements for extended producer responsibility and increased waste prevention and waste management measures.

Regarding the regulatory framework, it is important to emphasise that the process of transition to a circular economy model requires careful consideration of the concepts of by-product and end-of-waste. The concept of End of Waste is realised when an authorised waste treatment facility succeeds in transforming waste into actual products or raw materials.

⁶⁴ Directive of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

The End of Waste notion originates from a revision of the European waste legislation in directive 2006/12/EC⁶⁵ to which the Parliament and Council of the European Union adopted directive 2008/98/EC of 19 November 2008, also known as a waste framework directive. The latter defines the conditions set out in article 6 as amended in directive 2018/851/EU⁶⁶ under which the waste resulting from the recovery process is no longer waste because it has objectively become a product.

The precise conditions are as follows:

- It is commonly used for specific purposes: these must be widespread products, generally applied in known areas and capable of performing known and defined functions.
- There is a market or demand for the substance or object: the fact that a market exists shows that the recovered object is unlikely to be abandoned.
- The substance or object fulfils the technical requirements for the specific purpose and complies with existing standards applicable to products: the object must be able to guarantee the required performance under concrete conditions of use or consumption, in accordance with both legal regulations and technical standards relating to the specific good.

⁶⁵ Directive of the European Parliament and of the Council of 5 April 2006 on waste.

⁶⁶ Directive of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste.

- The use of the substance or object will not lead to overall negative impacts on the environment or human health.

The Communication⁶⁷ from the Commission to the Council and the European Parliament on the Interpretative Communication on waste and by-products specifies that: "If the material turns out to have a utility, it will cease to be waste as soon as it is ready to be reused as a recovered product [...] the existence of long-term contracts between the holder of the material and subsequent users may indicate that the contracted material will be used and that there is therefore certainty of reuse". Furthermore, "The fact that a manufacturer can sell a certain material at a profit indicates a greater likelihood that this material will be re-used, even if this element is not a sufficient indication". It is not the economic value of the material that is decisive, but the ability to prove its usefulness in the same way as any other product.

By fulfilling all the conditions set out in the Article 6, the product resulting from the recovery process is no longer considered a waste since it has effectively become a product. It is important to note that the directive explicitly opens the possibility of qualifying as a recovery operation also the control of waste in order to check whether it fulfils the criteria for ceasing to be waste.

⁶⁷ Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste.

The European Union has so far approved three regulations changing the status of certain materials. The first regulation 333/2011⁶⁸ concerns the management of scrap metal. Iron and steel scrap cease to be waste if certain conditions are met simultaneously including:

- Waste used as material of the recovery operation including waste containing recoverable iron or steel. Hazardous waste, filings, flakes, and dust containing fluids and drums and containers that contain or have contained oils and paints are not used. Waste containing recoverable aluminium or aluminium alloys while hazardous waste, waste such as filings, chips and dust containing fluids and drums and containers that contain or have contained oils and paint are excluded.
- The waste used as material in the recovery operation was treated in accordance with certain criteria, in particular:
 - 1) Iron or steel and aluminium scrap was separated at source or during collection and kept separate or the waste underwent treatment to separate scrap from non-metallic and non-ferrous elements.

⁶⁸ Council Regulation (EU) No 333/2011 of 31 March 2011 establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC of the European Parliament and of the Council.

- 2) Mechanical treatment necessary for scrap metal to its final use directly in steelworks and foundries has been completed.
- Iron or steel and aluminium scrap from the recovery operation is categorised according to customer, sector, or standard specifications for direct use in the production of metal substances or objects. In addition, the total amount of foreign materials is less than 2% by weight. Foreign materials are non-ferrous and non-metallic materials, combustible non-metallic materials, larger non-electrically conducting elements, and residues from smelting, heating, welding, or sawing operations.

It is specified that aluminium and aluminium alloy scrap may not contain polyvinyl chloride (PVC) in the form of coatings, paints, plastics.

Finally, two further conditions are laid down for both types of scrap: a declaration of conformity for each loss of scrap metal drawn up by the scrap metal producer or importer, who must forward this declaration to the next holder of the scrap metal consignment and keep a copy for at least one year from the date of issue. In addition, the application of a quality management system to demonstrate the compliance of scrap metal must document the effectiveness of radiation monitoring, waste acceptance control, monitoring of treatment processes and techniques, and customer observations on scrap metal quality.

Regulation 715/2013⁶⁹ provides for criteria determining when copper scrap ceases to be considered as scrap. In this case, the directive provides for the same laws as the Metal and Aluminium Scrap Directive.

Another regulation approved by the European Union concerns cullet. Regulation 1179/2012⁷⁰ states that cullet ceases to be waste when it is transferred by the producer to another holder.

- As with scrap metal, it must also meet customer, sectoral or standard specifications for direct use in the production of glass substances or objects.
- Only waste that is recoverable from the collection of packaging glass, flat glass or lead-free crockery may be used as material in the recovery operation, and waste containing glass from undifferentiated municipal solid waste or waste from sanitary facilities may not be used in the hazardous waste in the waste containing glass from undifferentiated municipal solid waste or waste from sanitary facilities.

⁶⁹ Commission Regulation (EU) No 715/2013 of 25 July 2013 establishing criteria determining when copper scrap ceases to be waste under Directive 2008/98/ EC of the European Parliament and of the Council.

⁷⁰ Commission Regulation (EU) No 1179/2012 of 10 December 2012 establishing criteria determining when glass cullet ceases to be waste under Directive 2008/98/EC of the European Parliament and of the Council.

- Processing techniques require that waste containing glass must be collected, separated, processed, and kept permanently separated from other waste.
- As for metal waste, the producer must draw up a declaration of conformity and implement a management system to demonstrate compliance.
- Cullet is intended to produce glass substances or objects by means of remelting processes.

As specified by the authors ⁷¹, several emerging themes are determined in the context of End of Waste, including increasing the efficiency of management systems, reducing waste generation and extended producer responsibility.

The first fundamental aspect concerns the imperative need to implement efficient solid waste management systems. Waste recycling and the practice of separate collection are activities that can only generate significant results if carefully coordinated. Separate collection is indispensable in many contexts, including municipal waste and construction and demolition waste.

The industry specialised in preparing materials for recycling comprises a diverse range of companies that sort and prepare waste to transform it into valuable secondary raw materials for recycling companies. This industry sector plays a crucial role in both municipal and special waste management.

⁷¹ Creazza, A., Pizzurno E., and Urbinati A.: *Economia circolare e management. Un nuovo approccio industriale per la gestione d'impresa*. goWare & Guerini Next, 2021.

Recycling has enormous potential, especially in Italy, due to the presence of substantial waste streams generated by production activities and the accentuated inclination towards the use of secondary raw materials in several industrial sectors, including metallurgy, paper, plastics processing, glass, and furniture.

Another relevant aspect concerns the concept of Extended Producer Responsibility (EPR), which is an environmental protection strategy adopted at Community level to promote the collection, recovery, and recycling of certain categories of products by making the business actors involved in their production responsible. This approach is based on the Community's 'polluter pays' principle and aims to incentivise the reduction of waste production and proper waste separation. This involves not only producers, but also distributors, public collection services, consumers, and all operators legally responsible for waste management. They have to contribute logistically, organisationally and accounting-wise to ensure that collection, recovery and recycling targets are met.

Another topic is the reduction of waste generation: the circular economy, initially to recycling, requires the avoidance of waste generation through prevention and reuse actions. To this end, the European Union imposes "A mandatory minimum content in national prevention programmes that promote and incentivise sustainable production models, supporting the design, production and use of efficient, durable, repairable, reusable and upgradable products, as well as the reuse of products and the development of systems that favour repair and reuse activities, and reduce waste

generation in processes linked to manufacturing and industry in general". In the field of packaging, the definition of reusable packaging is introduced, and measures are imposed to encourage an increase in the percentage of reusable packaging placed on the market, as well as the implementation of systems for the reuse of packaging. Waste is a major challenge for several reasons. First, waste generation is closely linked to the economic system in that it depends on production and consumption patterns, lifestyles, and settlement patterns: it would be necessary to overcome the philosophical conflict between sobriety and wastefulness and to identify economic models that allow the separation between GDP growth and waste generation. Secondly, different waste management options should be carefully evaluated from an economic point of view, carefully considering externalities: waste management, once generated, always represents a net cost to society, both in economic and environmental terms. For this reason, the circular model, in which waste becomes waste and is properly reused, is advantageous. Finally, waste is an example of market inefficiency in matching supply and demand efficiently. This is because waste shares many characteristics of a public good and a natural monopoly, and the recovery market is far from operating under ideal conditions.

CHAPTER THREE

THE ROLE OF BUSINESSES IN THE CIRCULAR ECONOMY

3.1 OPPORTUNITIES FOR BUSINESSES IN THE CIRCULAR ECONOMY

In recent decades, interest in sustainability and conservation has increasingly become a sensitive issue for companies. The adoption of this new approach offers not only a solution to environmental challenges but also a wide range of economic opportunities. First, there are different types of approaches to circularity on the part of companies. On the one hand, there are those companies that are born circular and integrate from the beginning the idea of a continuous cycle of resource utilisation, waste reduction and maximisation of product value. On the other hand, there are those companies that were born in the past and are reviewing and adapting their processes. In this case, companies may face challenges such as adapting production processes and training personnel. While in the former case companies can benefit from a design and organisation that incorporates the principles of the circular economy from the outset, companies that have to adapt may have opportunities to transform their business model and take advantage of the new economic opportunities that the circular economy can offer.

The introduction of the circular economy offers significant opportunities for companies in various sectors. Companies are being called upon to take new actions to design their traditional business models to transform them into circular ones,

including in their relationships with partners, in their value propositions to customers and in the value network.

This new approach, which paves the way for reducing waste and maximising the value of materials, facilitates a few competitive and sustainable advantages.

Ellen MacArthur's foundation has summarised these in several points. Companies that reduce material costs and develop entirely new markets will be able to make a profit. These new opportunities are mainly due to increased opportunities for growth and productivity. Companies can develop products that are designed to last as long as possible, using recycled materials and reducing environmental impact. In addition, companies can create repair services or collaborate with suppliers for recycling services to extend the useful life of their products. All this can generate additional revenues. A circular economy ensures that the company uses fewer raw materials and more recycled materials and that the value of raw materials is maximised over the lifetime of the products. The consequence is a reduction in procurement costs. In fact, material costs will be relatively lower than labour costs. This will enable the creation of value by preserving economic and environmental value through the efficient use of resources. Value creation is also associated with

the combination of resources and materials from different industries, the use of recycled materials and the disassembly of products to recover their components.⁷² As a result, there is a growing demand for new services for companies. For example, reverse logistics, which concerns the management of the flow of products, materials, and packaging from the customer to the company. Which collect, repair, and redistribute products to be reintroduced into the market. Companies can create digital platforms to facilitate the exchange and sharing of products between different organisations. Repair and maintenance service offerings can extend the life of products and reduce the need for replacement. A company can also offer specialised consulting services to help other companies implement circular practices in their supply chain. In addition, Ellen mentions entrepreneurs who can gain a competitive advantage over laggards in a timely manner. For the latter, the concept of creative destruction⁷³ is applied, which means that new business models will emerge more than existing ones.

⁷² Lewandoswi M., *Designing the business models for circular economy towards the conceptual framework*. Sustainability. 2016. Vol. 8(1), 43.

⁷³ a concept devised by Schumpeter that describes a process of economic transformation in which innovation of new technologies or new business models lead to the replacement or disappearance of old technologies or old business models.

For companies, optimising customer relations is crucial for the success and sustainability of the business model. Communicating transparently and accurately about all circular practices and informing customers about recycling or reuse processes will create trust and awareness of the company and its products. Offering a circular purchasing experience will create a long-term relationship between customer and supplier. the transfer of value to customers is fundamental as a managerial action that companies can take. This includes marketing actions related to customer segmentation and customer relations. It is indeed necessary to make the customer aware of the goodness of the circular transformation and the product or service being offered.⁷⁴ According to some authors, this could be done through a marketing-push activity that aims to continuously involve the customer in the redesign of the business model and provides for the use or promotions that validate the company's value proposition⁷⁵.

⁷⁴ Creazza A., et al. *Economia Circolare E Management. Un Nuovo Approccio Industriale per La Gestione D'impresa*. goWare & Guerini Next, 19 Apr. 2021.

⁷⁵ Geissdoerfer M., Morioka S.N., Monteiro de Carvalho M., Steve Evans. *Business models and supply chains for the circular economy*. Journal of Cleaner Production, Volume 190, 2018, Pages 712-721.

Lacy, Rutqvist and Lamonica⁷⁶, have identified five business models with which to follow the goals of sustainable development and increase the view of the circular economy. Respect for the environment should not be seen as a limitation for economic growth; on the contrary, these models are complementary goals to that of increasing profits and turnover.

The five models are:

1. *Circular supply chain from the outset*: the business model focuses on circular supply. It is crucial for companies that use scarce raw materials as the model requires that these resources be replaced with fully renewable, recyclable, or biodegradable resources. There are several models of companies that have applied this type of model such as the 'mushroom materials' project conducted by the design studio Ecovative Design. They have discovered how to create innovative materials based on mycelium, the vegetative part of mushrooms or maize stalks that are used in sectors such as construction, food, and packaging. The company has created a product called Mycocomposite, a mycelium-based material that can replace wood or polystyrene in the production of furniture and design objects.

Or the Dutch company RoyaDSM, which has developed a cellulosic bioethanol from agricultural residues that is converted into renewable fuel.

⁷⁶ Lacy P., Rutqvist J., Lamonica B.: *Circular economy: from waste to value*. Egea, Milan, 2015.

The aim is to promote the production of sustainable, low-carbon biofuels.

The adoption of the circular supply chain implies a holistic approach that involves a systematic and integrated view of all phases of the product life cycle, from suppliers, consumers to producers.

2. *Resource recovery and recycling*: the model exploits technological innovations to recover and reuse resource outputs that eliminate material loss and maximise economic value. The model has several realisations: closed-loop recycling where waste materials are reprocessed into new resources and open-loop recycling where waste materials can be resold to other companies as raw materials. The advantages are manifold such as the reduction of costs related to raw materials and waste management, the revenue gained from the sale of unwanted by-products or the creation of interaction points between customers and companies where disposal and new purchases are combined. However, companies also have to overcome two challenges: preserving the quality of resources and maintaining property rights. An example of this model is the Walt Disney World resort⁷⁷ that sends food waste and food scraps from selected and collected restaurants to an anaerobic digestion plant operated by Harvest Power. The organic waste is converted into renewable biogas (methane and carbon

⁷⁷ <https://www.lifegate.it/disney-world-biogas-scarti-cibo>

dioxide) to generate electricity, and the remaining solid material is turned into organic fertiliser for agriculture. The energy generated helps power central Florida, hotels, and Walt Disney resort theme parks.

3. *Product life extension*: this model helps companies extend the life cycle of their products to ensure that they remain economically useful. Material that would be wasted is retained or improved through repair, remanufacturing, upgrading, or reconditioning. This model is increasingly successful because labour costs are cheap, and it creates high employment. For example, EcoATM is a self-service recycling station designed to recover electronic mobile phones and other mobile devices. EcoATM can evaluate and buy back used mobile phones, offering users the opportunity to get immediate cash in exchange for a device they no longer use. Since 2009, they have obtained approximately 38 million electronic devices, with an estimated 19 million 'pounds' equivalent to a reduction in greenhouse gas emissions through the removal of 3766 cars travelling per year or the recovery of electricity to power 9452 homes for one year.
4. *Sharing platform*: this model focuses on sharing products and assets with low utilisation rates. The platform increases the productivity of assets by enabling shared access and reducing the demand for resources and productive assets. The sharing model produces circular effects when it is able to reduce the use of resources and the environmental impact of

consumption, generating profits. Companies can exploit this model by maximising the use of the products they sell, improving productivity and value creation. The key factors are convenience, cheaper price, quality, and trust. For example, Uber allows users to share transport services using a network of drivers using their own vehicles. Uber connects people in need of a transport service with drivers willing to provide it, simplifying, and improving people's mobility by sharing resources. Another example is Airbnb as it allows users to share spaces in private homes using the online platform. Airbnb connects homeowners with guests interested in staying at their homes, facilitating the sharing of housing resources for temporary periods.

5. *Product as a service*: companies retain ownership of the product and offer it to one or more users through rental, lease, paid usage, and other types of performance-based arrangements. This model is attractive to companies with high operating costs because the product becomes a service, and the consumer also becomes a user. Costs related to ownership, maintenance and disposal are shifted from the consumer to the producer. Examples are Youtube Music, Netflix, Spotify that allow to rent films and music through subscription services, eliminating the need for CDs, players, and playback infrastructure. This allows users to access films and music whenever and wherever they want. Another example is Philips which sells lighting as a

service. This service is designed to help customers reduce energy costs and adopt sustainable lighting solutions, ensuring maximum system efficiency and reliability. In 2014 Philips and the city of Washington reached an agreement, the company offered lighting as a service by replacing 1,300 lighting systems at no cost⁷⁸.

3.2 CHALLENGES FACED BY BUSINESSES IN EMBRACING THE CIRCULAR ECONOMY

The circular economy represents a new and innovative form of resource management, through which efforts are made to reduce environmental impact and improve economic efficiency. However, adopting a circular model is not easy for

⁷⁸ Under a ten-year maintenance contract, Philips expects to earn a certain percentage of the two million dollars in annual savings generated by the new energy-efficient LED lamps. Philips also designed the lighting system for Rau Architects. It used LEDs on the ceilings and a sensor control system to dim or intensify the light based on movement or the presence of daylight. Already in the early stages of the project, a 35 per cent saving on Rau's energy costs was achieved. Subsequently, thanks to the installation of smart meters, costs were reduced by a further 20 per cent to a total of 55 per cent. Fundamental to this was the machine-to-machine technology, which can constantly inform the operator of the maintenance status of the supplied assets, so that action can be taken if necessary. In this way, the company is motivated to create an efficient, long-lasting product that can be repaired easily. Philips' 'green products' now account for 51% of sales. Today, Philips lighting services are offered under the Signify brand.

companies, as it requires a profound transformation from within and the adoption of new strategies. Circle economy's annual report estimates currently, only 7.2 per cent of the world economy can be defined as circular. A transition to a global circular system therefore requires unprecedented collaboration between companies and countries around the world. Surely the biggest challenge companies face is cost. Obviously, there are different types of costs that a company has to face, and these vary depending on the path the company wants to take to become sustainable, the specific industry and the starting level a company is at. Investment costs concern all those costs incurred for the production cycle to be designed with the aim of reducing the consumption of natural resources, for the implementation of eco-sustainable production processes, for the management and recovery of waste produced and for the improvement of product quality and safety. In addition, there are the investment costs for people, which include the costs used for professional training and organisational transformation with the aim of improving the working environment. In addition to this, there are the costs of adopting new technologies such as upgrading or replacing obsolete machinery and equipment with new environmentally friendly equipment. However, it is important to emphasise that while it is initially expensive to become circular, this can offer advantages and benefits to the company such as increased efficiency, reduced long-term costs and a positive reputation in terms of sustainability.

People play an important role in the transition to a circular economy, efforts are needed from all parties to change the current reality where products are designed to be waste. Companies must promote employees' circular behaviour and thus encourage and incentivise the adoption of consumption and production patterns to ensure waste reduction, reuse, and recycling of materials.

This can be done through communication campaigns, introducing economic incentives for companies that use recycled materials or environmentally sustainable production processes, creating platforms for sharing and collaboration between companies adopting circular business models, involving consumers in the circular economy by raising awareness and offering incentives such as a discount for the return of materials used or creating networks for sharing knowledge on the topic.

It is important to raise awareness among individuals and businesses about the need to adopt sustainable practices to reduce environmental impact and foster the growth of a fairer and more responsible economy. The lack of adequate waste management systems and services, such as disposal facilities, landfills, waste collection services, recycling and material recovery platforms is one of the main challenges for companies that want to adapt sustainable practices. In addition, the lack of infrastructure can lead to the occurrence of environmental problems, such as uncontrolled waste accumulation and the risk of soil and water pollution. Moreover, these problems can have a negative impact on people's health and the environment. In general, the lack of waste infrastructure is a major challenge, but it can be

overcome through collaboration, innovation and the adoption of sustainable business models based on the circular economy. Identifying the lack of waste collection and treatment infrastructure may require the need for expertise and collaboration with other companies and stakeholders to address problems and develop innovative solutions. It is possible that the lack of infrastructure can be overcome through the formation of partnerships and collaborations between businesses and governmental and non-governmental organisations in order to develop sustainable waste collection and disposal programmes and promote the adoption of circular economy strategies. In addition, it may be necessary to invest in training and new skills, such as waste management and the use of advanced technologies for processing recyclable materials. Working with stakeholders, such as customers, consumers, and civil society organisations, can also help raise awareness of the need to adopt sustainable behaviour and promote a culture of sustainability. Sofia Ritzen⁷⁹, believe that the lack of collaboration between organisations is identified as a barrier to achieving the circular economy. It is a situation where organisations fail to work together effectively to implement sustainable waste management practices. The lack of collaboration can result in missed opportunities and inefficiencies, hindering progress towards a circular

⁷⁹ In the paper: *Barriers to the Circular Economy - integration of perspectives and domains*. Procedia CIRP, Volume 64, 2017, Pages 7-12.

economy. Furthermore, the study discusses the need for new skills related to circularity. This suggests that organisations need to develop new skills, knowledge, and competencies in order to effectively move towards a circular economy. Lack of collaboration between organisations could make access to these new skills difficult and hinder progress towards a circular economy.

3.3 PROGRAMS AND INCENTIVES FOR BUSINESSES IN THE CIRCULAR ECONOMY

“Building a strong foundation for the circular economy requires coordinated action. Shifting to a circular economic model will affect all sectors and policy domains”. The quote is taken from the report “Growth within: A circular economy vision for a competitive Europe”, conducted by the Ellen MacArthur Foundation and the McKinsey Centre for Business and Environment. They defined six actions that companies should take to implement the circular economy. This work is called the ReSOLVE framework.







Circularity Actions	Examples
Restore/Regenerate 	<ul style="list-style-type: none"> • Shift to renewable energy and materials • Reclaim, retain, and restore health of ecosystem. • Return recovered biological resources to the biosphere.
Share 	<ul style="list-style-type: none"> • Share assets (e.g. cars, rooms, appliances). • Reuse/Second-hand • Prolong life through maintenance, design for durability, upgradability, etc.
Optimise 	<ul style="list-style-type: none"> • Increase performance/efficiency of product. • Remove waste in production and supply chain. • Leverage big data, automation, remote sensing and steering.
Loop 	<ul style="list-style-type: none"> • Remanufacture products or components. • Recycle materials • Digest anaerobic • Extract biochemical form organic waste.
Virtualise 	<ul style="list-style-type: none"> • Dematerialising directly (e.g. books, music, travel, etc.). • Dematerialising indirectly (e.g. online shopping).
Exchange 	<ul style="list-style-type: none"> • Replace old with advanced non-renewable materials. • Apply new technologies (e.g. 3D printing). • Choose new products/services (e.g. multimodal transport).

Figure 7: McKinsey's ReSOLVE framework

- *REgenerate*, which suggests using renewable sources for energy and materials. The concept is very close to that of renewable energy. In addition, conserve and regenerate on ecosystems and return biological resources that have been recovered to the biosphere. Subsequently, reintegration into the ecosystem is envisaged. Examples of large companies taking this action include Nespresso⁸⁰ or Savory Institute's whose mission is to regenerate fragile and critically important grasslands. Grasslands are landscapes that

⁸⁰ *The Positive Cup: Because coffee can have a positive impact. Creating Shared Values Report.* Nespresso (2016).

have the capacity to tackle poverty, climate change and the food and water problem. Obviously, they must be managed properly and this company is regenerating soils and increasing productivity and biological diversity. Currently 21 million hectares have been regenerated worldwide thanks to the work of the savory institute.

- *Share*, as fundamental as reuse or the second-hand market. The aim is to reuse products throughout their technical lifetime and to be able to extend their life through maintenance and repair. In addition to this, special attention must be paid to design and thus create products that last if possible. Examples are business models for sharing cars, houses, or clothing. BlaBlaCar is a 'car sharing' platform operating in 22 countries. The platform offers people to share car journeys between individuals. Patagonia, on the other hand, is a company that offers free repair or recycling services for their clothes, extending their useful life. In addition, they sell second-hand clothing and equipment offering customers to buy the products at a lower price.
- *Optimise* drives continuous improvement of technology performance and product and service performance. Everything must be done by ensuring the elimination of waste in production and all subsequent stages. Furthermore, the exploitation of automation, big data, and remote sensing without any changes in products or technologies. Toyota, for example, has increased

sustainability across the board. Their goal is to become totally sustainable by 2050. This includes six main challenges: eliminating carbon dioxide emissions from all vehicles and facilities, reducing CO2 emissions throughout the life cycle of its vehicles including production, use and disposal. In addition, it is committed to promoting water conservation and adopting sustainable water use practices. Toyota recognises the importance of protecting and promoting biodiversity and decides to work with local communities to conserve ecosystems, promote sustainable land use and minimise the negative impact of its activities on natural habitats. In addition, Toyota aims to promote a society based on recycling and envisions a future society where people can live in harmony with nature.

- *Loop* requires keeping resources as far as possible within the life cycle. For finished materials, this means remanufacturing products or components and recycling materials as Renault is doing. In fact, the company reuses parts from its vehicles to create new ones. Or the Dell company that has a line of products that have been repaired, reconditioned, or remanufactured to a functional state and sold as refurbished products. These products are laptops, computers, or electronic devices. As far as renewable materials are

concerned, these are anaerobic digestion⁸¹ and the extraction of biochemical substances from organic waste. In Europe, there were 729 plants in 2020 and 1023 the following year, a sign of rapid growth.

- *Virtualise* leverages emerging technologies in the IT sector to make digital what was previously physical including books, shopping, and music. Kindle is a reading device designed specifically for reading digital books. Zalando is an online platform specialising in the sale of clothing, shoes, and accessories. Or iTunes a multimedia content management platform. Mainly used for managing the music library.
- *Exchange* i.e., the replacement of old materials with new ones. New production technologies and new products and services are used to exchange old and more circular. 3D prints and electric motors are used. The case of Tesla with its all-electric, high-performance cars. Or even Adidas, which has developed 3D printer technology in its shoe soles.

⁸¹ Anaerobic digestion plants are systems that use biological processes to break down organic matter in the absence of oxygen. The plants contribute to the transformation of organic waste, the production of biogas that can be used as a renewable energy source. In addition to this, they are used to reduce waste and pollution by preventing them from ending up in landfills or being incinerated.

3.4 INSTRUMENTS AND PRACTICES FOR IMPLEMENTING CIRCULAR ECONOMY STRATEGIES IN BUSINESS

In this chapter I want to focus on the book *Ecological Economy* written by MEP Mercedes Bresso. One part of the book is dedicated to the microeconomics of the environment, in which the author sets out the different tools for internalising the costs of externalities. First of all, environmental economics makes it possible to propose methods and tools to make the private cost and the social cost as equal as possible in order to internalise all costs to the producer. These costs will be incorporated into prices and the consumer will not be induced to choose low-priced goods that do not incorporate all social costs⁸². In addition, it will be convenient for the producer to search for efficient technologies to reduce pollution to avoid incurring too high a cost. In general, a good environmental policy must use all the necessary tools and involve consumers who must be encouraged to behave and make the right choices to reduce environmental damage.

First, as Bresso specifies, the tools to be used to realise an efficient internalisation in the costs of externalities are those with regulatory solutions also known as command-and-control standards or those based on the market thus in incentive/disincentive mechanisms.

⁸² private cost is the cost incurred to produce, purchase, or consume a good while the social cost is the private cost-plus negative externalities.

Command and control norms establish requirements and obligations to control and regulate activities and behaviour. This approach is based on the establishment of rules and quantitative standards are set. Obviously, it is impossible to eliminate pollution. The damage can only be removed in part, and it is up to society to determine what level it should go to. Therefore, standards must guarantee a reference level for the emissions of a certain plant or product. There are different types of standards: emission standards for fumes, product standards, or they can be uniform or differentiated according to territorial areas, e.g., urban, or rural areas. Uniformity makes it much easier to control but more expensive to adhere to the specific standard. Since standards have to be set for so many cases, less costly solutions are sought that can be applied according to the amount of pollution generated. Among these are environmental taxes, which are an economic instrument to reduce pollution by imposing a tax on activities that cause damage to the environment. Environmental taxes can be applied to various sources of pollution, such as greenhouse gas emissions, water pollution or consumption of natural resources. Environmental taxes can take different forms. "The costs of purification are very different from each other, so it is better to push companies

with low purification costs to purify and make those with high costs pay a penalty”⁸³.

Set a tax per unit of pollution emitted so that each company can choose whether to pay the tax for the units or whether to purify. Obviously, companies with high purification costs will choose to pay while those with low costs will choose to purify. It will always be necessary to carry out controls, but they will be concentrated in the companies that choose to purify while for the others the quantity produced will be checked. One example is the carbon tax is a specific tax on carbon emissions, which seeks to internalise the costs of air pollution. This instrument can provide an incentive for companies to reduce greenhouse gas emissions and invest in low-carbon technologies. In addition, there are product taxes which incentivise companies to produce goods with low environmental impact by taxing those with high environmental impact. Fees for services rendered are the consideration for clean-up activities. Then, the security deposit is an amount that is paid when a product is sold, but part of it will be returned when the consumer returns the packaging empty or the product non-reusable. For example, the state of New York has imposed a small difference of cents between the deposit and the returned number of bottles and cans, to induce people to collect the empties and recycle

⁸³ Bresso M., *Economia ecologica. La transizione ambientale verso uno sviluppo sostenibile*. Jaca Book. 2021.

them. Another tool used are tradable emission rights (DEN) are a market-based instrument that aims to reduce pollutant emissions by setting a maximum limit on allowable emissions. Companies receive a certain number of emission rights, which represent permission to emit a certain number of pollutants. If a company emits fewer pollutants than the number of rights it holds, it can sell the unused rights to other companies that exceed their limits. This creates a system of economic incentives to reduce emissions and encourage the adoption of cleaner technologies. One of the best-known examples of DEN is the European Emissions Trading Scheme (EU ETS). This system covers several energy-intensive industries and represents one of the most significant efforts to tackle climate change internationally. Through the EU ETS, companies must buy or own enough emission allowances to cover their greenhouse gas emissions. The number of available allowances is progressively reduced over time, creating an incentive for companies to reduce emissions or purchase allowances from other companies.

Incentives are a positive approach to promoting sustainable behaviour and practices. These can take different forms, such as government subsidies, tax breaks or financial incentive programmes. Incentives can be targeted at both citizens and businesses to encourage the adoption of less polluting technologies and practices.

An example of an incentive is the solar energy subsidy programme, which offers financial incentives to owners of solar installations to promote the adoption of this

renewable energy source. These subsidies may cover part of the installation costs or offer incentive energy tariffs for electricity produced by solar installations.

Similarly, incentives for the purchase of electric vehicles can help reduce air pollution from road transport. Governments can offer subsidies or tax breaks to incentivise the purchase of electric vehicles, making them more affordable and competitive compared to traditional internal combustion vehicles.

Most durable goods and buildings will be in use until 2030 and for some even in 2050. A good use of incentives could be crucial to accelerate the pace towards a green transition. The instruments listed above are based on the relationship between business and State. Author Bresso argues the importance of introducing instruments that also directly involve consumers by making them responsible in choosing environmentally friendly products. One tool is the eco-label is a mark or label that is placed on a product or packaging to indicate that the product has been assessed and certified as environmentally friendly or low environmental impact. Eco-labels provide information to consumers on the environmental characteristics of a product and enable them to make more informed purchasing decisions.

Eco-labels may be specific to a certain sector or product category, e.g., there are eco-labels for household appliances, food products, chemicals, building materials, textiles, and so on. In some cases, eco-labels may be voluntary, allowing companies to submit their products for assessment and apply for the label, while in other cases they may be mandatory, imposed by environmental legislation or regulations.

As the author Bresso argues, self-responsible behaviour on the part of companies towards the environment is becoming increasingly common. Associations of eco-companies are springing up, which exchange codes of conduct. For example, agreements between paper and cardboard producers for the recovery and recycling of paper in Italy or agreements between chemical companies to define procedures for environmental audits. In addition, many companies present eco-budgets along with their financial statements. These tools provide a detailed analysis of environmental impacts such as greenhouse gas emissions or water or air pollution. Empowering producers and consumers appear to be the only way to ensure that environmental impacts are reduced, and environmental costs are contained.

CHAPTER FOUR

THE FUTURE OUTLOOK OF THE CIRCULAR ECONOMY

This chapter concerns an important milestone within my thesis, as it focuses on a valuable source of direct information: an interview with a prominent MEP. The opportunity to interact directly with a key figure in the circular economy landscape made me aware and able to write this part. Member of Parliament Mercedes Bresso enriched the thesis with unique perspectives and privileged viewpoints on the topic. She is involved in discussions and votes on sustainability issues. She is also the author of several scientific texts on sustainability and the environment.

The interview with Ms Bresso was carefully planned and realised, aiming to address in depth different facets of the future of the circular economy in the European context. During the interview, targeted and open-ended questions were asked to stimulate debate and allow Mrs Bresso to freely express her personal opinions and considerations. The aim of this chapter is to take stock of the current situation and understand what the future of the circular economy might look like.

Bresso explained to me that the circular economy is currently a circle to be closed and that the main goal for the future is to make the circle close. Obviously, this will be almost unattainable and unlikely to happen, but the work of the European Union is doing everything possible to bring the goal closer to being achieved. Unfortunately, it must be remembered that the circle will always remain open for

energy consumption because energy is not recyclable, and therefore in working to increase circularity one must always pay attention to the energy consumption of recycling: if these are too high, it may not be worthwhile. This limitation also explains why the focus is on repair, product life extension and reuse. So why is it important to take part in the circular economy?

Industrial waste, in the traditional model, damages underground drinking water supplies, plastic waste ends up in seawater, burning waste contaminates the air and causes air pollution, and landfills contaminate agricultural soil. With the circular economy, waste is minimised through recycling and returned to the economy through sustainable reuse and biodegradable waste. The circular economy seeks to reduce dependence on the import of natural resources from third countries and use products that do not harm the environment. In addition, it creates opportunities for businesses, promotes innovations and stimulates the competitiveness of the European Union.

On 22 March 2023, the European Commission presented a new proposal⁸⁴ for common rules to promote the repair of goods, with the aim of ensuring savings for consumers and supporting the European Green Deal by helping to reduce waste.

⁸⁴ Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND THE COUNCIL on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394, Directives (EU) 2019/771 and (EU) 2020/1828.

This proposal, for which Ms. Bresso is shadow rapporteur for Envi⁸⁵, will make repair more convenient and cheaper for consumers, rather than opting for replacement goods. Moreover, by increasing the demand for repairs, it will also stimulate the repair sector, while at the same time incentivising manufacturers and sellers to develop more sustainable business models.

Today's proposal will ensure that more products can be repaired, both during and outside the legal warranty period, giving consumers more convenient options for repairing technically repairable products, such as vacuum cleaners, tablets, and smartphones, when the legal warranty has expired or when the good has stopped working due to wear and tear.

These new measures to promote and facilitate repair and reuse include the introduction of a 'right to repair' for consumers, both during and outside the legal warranty period. During the legal warranty period, sellers will be obliged to offer repair unless this is more expensive than replacement. Outside the legal warranty, consumers will have access to several new rights and tools that will make the repair option easier and more affordable, including:

⁸⁵ The ENVI committee is currently the largest committee in the European Parliament, which emphasises the need for the EU to move faster and more ambitiously in the fight against climate change.

- The right for consumers to request manufacturers to repair products that are technically repairable under EU law, such as washing machines or televisions. This will give consumers a point of reference for repairs and push manufacturers to develop more sustainable business models.
- An obligation on manufacturers to inform consumers about the products for which they have to provide repair services.
- The creation of an online repair platform, which will connect consumers with repairers and sellers of refurbished goods in their area, facilitating the search according to location and quality standards.
- The introduction of a European repair information form, available to consumers from any repairer, which will ensure transparency about repair conditions and costs and make it easier to compare offers.
- The establishment of a European quality standard for repair services, which will help consumers to identify repairers committed to superior quality. This standard, called 'easy repair,' will be open to all repairers in the EU who wish to commit to minimum quality standards based, for example, on the durability or availability of products.

The next steps are for the Commission's proposal to be approved by the European Parliament and the Council.

A recent Eurobarometer survey found that 77% of Europeans feel responsible for taking action to limit climate change. Currently, many functional products are

discarded rather than repaired, generating huge amounts of waste, wasted resources and greenhouse gas emissions in the EU. In addition, consumers lose almost EUR 12 billion a year by choosing replacement instead of repair. It is estimated that this initiative will bring EUR 4.8 billion in growth and investment to the EU.

However, repair is often considered complex by consumers. This initiative, known as the 'right to repair,' is part of a broader framework of initiatives to promote sustainable consumption throughout the life cycle of products. The overall goal of the European Commission is to make the EU the first climate neutral continent by 2050, which can only be achieved if consumers and businesses adopt more sustainable consumption and production practices.

The 'right to repair' proposal was announced as part of the new consumer agenda and action plan for the circular economy. It aims to overcome barriers that discourage consumers from repairing, such as lack of transparency, difficult access to repair services and inconvenience. The aim is to incentivise repair as a more sustainable consumption choice, contributing to the climate and environmental goals of the European Green Deal.

This initiative complements other instruments to promote sustainable consumption through repair, including the regulation on the eco-design of sustainable products and the proposed directive on empowering consumers for the green transition. The three initiatives work in synergy to cover all stages of the product life cycle, contributing to achieving the objectives of the European Green Deal. Furthermore,

the initiative for verification of environmental self-declarations will prevent companies from making misleading claims about the environmental merits of their products and services, contributing to a more genuine green transition.

On 3 May 2023, the Council defined its position regarding the proposal⁸⁶ for a directive concerning the encouragement of consumer responsibility in the context of the ecological transition. The aim of this initiative is to strengthen consumer rights. The Council's position is characterised by a strengthening of consumer rights, a strict ban on generic environmental declarations and the introduction of a uniform EU graphic format to facilitate the recognition of durability guarantees in the context of trade.

Erik Slottnér, the Swedish Minister for Public Administration, emphasised the importance of collective action towards the ecological transition, recognising the crucial role of consumers in the process. The aim is to provide consumers with the right tools, such as accurate information, protection from misleading advertising and facilitating recycling and repair.

About protection from unfair practices, many consumers wish to contribute to the circular economy by purchasing more sustainable products. However, they are

⁸⁶ Proposal for a directive of the European Parliament and of the Council amending Directives 2005/29/EC and 2011/83/EC as regards empowering consumers for the green transition through better protection against unfair practices and better information.

often faced with unfair business practices, such as false environmental claims or products that deteriorate prematurely or are difficult and expensive to repair. To address these challenges, the Council position strengthens consumers' right to information, allowing them an active role in the ecological transition process.

Among the proposals contained in the negotiating mandate approved by the Council is a ban on generic environmental claims such as 'environmentally friendly', 'green' or 'climate neutral'. Manufacturers will no longer be allowed to promote their products, processes, or activities in such generic terms, unless such claims can be supported by a publicly accessible certification system.

In order to facilitate product comparisons and reduce consumer confusion, only sustainability labels based on official or registered certification, or established by public authorities, will be allowed in future.

These measures are closely linked to information on the durability and reparability of products, or the criteria used by professionals to assess the

It is considered an unfair commercial practice on the part of professionals to fail to inform consumers about the limited lifespan of a good or a feature introduced to limit its durability. Consumers will also have to be warned if, the European Council states, "The good is designed so as not to be compatible with consumables, spare parts or accessories supplied by third parties. It will also be prohibited to advertise goods as repairable when this is not actually possible".

The Council proposes the introduction of a uniform graphic format that provides consumers with a clear representation of durability guarantees for specific goods. This will entail the use of a single visual logo within the common market, making it easier to identify goods covered by such guarantees.

The compromise proposal also imposes an obligation on professionals to respect the right to information regarding products containing digital elements. For instance, in the case of products that include software updates, consumers will have to be informed about the validity period of these updates.

In order to allow the Member States to transpose the legislative changes properly, the Council extended the implementation period from 18 to 24 months.

On 30 June 2023, the European Council adopts a new position on the Construction Products Regulation and the Regulation on Classification, Labelling and Packaging of Chemicals.

Regarding the first regulation, the Council has today defined its position on the construction products regulation, with the aim of renewing the existing legislation dating from 2011. This step was taken on the last day of the Swedish Council Presidency and represents an important contribution to the creation of a greener and more sustainable European construction sector.

The proposal for a regulation establishes harmonised European standards for the marketing of construction products, orienting them towards the principles of the circular economy, promoting their longevity, reparability, and recyclability at the

end of their life cycle. The aim is to promote European harmonisation and remove obstacles to the free movement of construction products in the internal market. This update also proposes digital solutions to simplify administrative procedures, including a database or system for building products.

The Council's negotiating position suggests harmonisation on a case-by-case basis of construction products on the market, extending the regulation also to used and remanufactured products through technical specifications. The procedure for product harmonisation is clearly defined, involving the European Committee for Standardisation (CEN). If CEN does not provide a standard, the Commission can take alternative measures.

The Council's position is aligned with the new internal market laws, the Market Surveillance Regulation, and the Eco-design Regulation, ensuring consistency between regulations. Furthermore, it authorises the Commission to set mandatory environmental requirements for public procurement or incentives for the purchase of green building products.

The negotiating mandate details the future European database for construction products, making it more accessible to economic operators, making it easier to update and ensuring security and protection against fraud.

The next phase will involve negotiations between the Council and the European Parliament once the latter has defined its position.

This revision of the Building Products Regulation is part of a package of measures linked to the European Green Deal and the circular economy, which is essential for a construction sector responsible for 50 per cent of resource extraction and consumption and 30 per cent of waste in the EU, as well as 40 per cent of energy consumption and 36 per cent of energy-related greenhouse gas emissions.

The second regulation the Council set out its position on the proposed update of the EU's CLP (Classification, Labelling and Packaging of Chemicals) regulation. This regulation aims to modernise the existing legislation and to improve the rules on classification and labelling of chemicals, especially in view of online sales.

It adapts to modern forms of trade, such as online and re-use of containers. It is committed to making labels clearer and more understandable, also in their digital version, to ensure a high level of safety against hazardous chemicals.

The Swedish Minister for Climate and Environment, Romina Pourmokhtari, emphasised the importance of adapting the regulations to digital and ecological transitions and improving information for consumers, businesses, and workers.

The proposed revised regulation aims to further protect human health and the environment in a context where new trade trends and new risks related to chemicals require an update of the 2008 regulation. This includes a simplification of information procedures on chemical hazards, clearer rules on labelling and advertising, and specific rules for refillable chemicals.

The Council's negotiating mandate, which supports the objectives of the regulation, introduces some changes to improve the clarity and legal certainty of the proposal. These changes concern, for example, labelling, digital labelling, and the online sale of chemicals. In addition, the Council calls for a report on the classification of chemicals with multiple components four years after the entry into force of the regulation.

This update of the CLP Regulation, together with the planned revision of the REACH Regulation, is an important part of the EU strategy for sustainable chemicals, which is central to the European Green Deal. Negotiations between the Council and the European Parliament will start after the latter has finalised its position, with an expected start around October 2023.

On 10 July 2023, the Council adopted a new regulation on batteries and battery waste⁸⁷. The Council approved a new regulation that strengthens regulations on the sustainability of batteries and their waste. This regulation will apply to all stages of the life cycle of batteries, from production to reuse and recycling, with the aim of ensuring that they are safe, environmentally friendly, and competitive.

⁸⁷ Regulation of the European Parliament and of the Council concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC.

Teresa Ribera, the Spanish Minister of Ecological Transition, emphasised the importance of batteries in decarbonisation and the transition to zero-emission transport in the EU. Furthermore, she emphasised the need to recover valuable raw materials from spent batteries instead of depending on external suppliers, thus contributing to the competitiveness of European industry.

The regulation will cover all types of batteries, including waste portable batteries (target to collect 63% by the end of 2027 and 73% by the end of 2030), batteries for electric vehicles, industrial batteries, and others. These new regulations aim to promote a circular economy for batteries by introducing collection and recovery obligations, as well as extended producer responsibilities.

The regulation sets ambitious targets for the collection of waste portable batteries and for materials to be recovered, such as lithium. The target is to recover 50 per cent by the end of 2017 and 80 per cent by the end of 2031. It also imposes minimum recycled content levels for different types of batteries, accompanied by documentation of the recycled content.

To improve the functioning of the internal market for batteries, the regulation introduces performance criteria, restrictions for hazardous substances, and mandatory information on the carbon footprint of batteries. Specific labelling and an electronic 'battery passport' will also be introduced.

Furthermore, the regulation promotes a duty of care for operators to verify the origin of battery raw materials. There is an exemption for small and medium-sized enterprises.

Now, the regulation will be signed by both the Council and the European Parliament and will become operational 20 days after its publication in the Official Journal. This initiative is crucial considering the increasing demand for batteries due to the development of electric mobility.

The conversation with the MEP is a key piece in my research work on the future direction of the circular economy. Through this interview, I had the opportunity to access a first-hand perspective from a key figure in the political landscape. Her contributions significantly helped the issues related to the circular economy, offering a detailed insight into future regulations concerning the circular economy. Her remarks emphasised the inevitable evolution towards an economy based on sustainability and resource efficiency. This shift represents not only a response to growing environmental concerns, but also an opportunity to create economic value in an increasingly interconnected world.

Moreover, his deep understanding of the regulatory environment and policy dynamics revealed the real challenges in implementing policies and laws that promote the circular economy.

In conclusion, the interview with the parliamentarian significantly enriched my chapter on the future circular economy, providing an authoritative and pragmatic

perspective on how to address the challenges and exploit the opportunities of this emerging economic paradigm. Her words reinforced the urgency to act decisively and responsibly to shape a more sustainable and circular future for generations to come.

CONCLUSION

In conclusion, as we stand on the brink of an environmental crisis, symbolised by the ominous countdown of the Climate Clock, it is clear that the urgency to address the challenges posed by our consumerist society has never been more pressing. The clock is ticking, and the Earth does indeed have a deadline.

The words of Andrew Boyd and Gan Golan, who devised the Climate Clock, resonate in our minds: "reminding the world every day how dangerously close we are to the abyss". These words serve as a stark warning of the consequences of inaction. If we continue on our current trajectory of uncontrolled carbon emissions, the date of 1 January 2028 looms ominously as the point of no return. The Earth's climate will change irrevocably, triggering a series of catastrophic events.

It is in this context that this master's thesis set out to analyse the unstoppable relationship between our consumerist society and the environment, offering a path towards a more sustainable future through the adoption of the circular economy model. This new model aims to provide companies with opportunities for economic growth, as well as preserving the environment and creating added value through new business models and an improved corporate image.

The circular economy emerges as a key paradigm to address contemporary challenges related to environmental sustainability and responsible use of resources. In an era of growing concerns over natural resource depletion, environmental

pollution, and climate change, adopting the circular economy model proves to be a vital choice for building a sustainable future.

Throughout the chapters, the historical evolution of the circular economy is traced, from a niche concept to a global imperative. Its potential is admired, seeing how it not only mitigates environmental degradation, but also offers economic opportunities. The Ellen MacArthur Foundation, as the driving force behind this transformation, has shown what can be achieved when visionary leadership meets environmental protection.

Crucially, the EU is becoming a leader in the quest for a circular economy. From its pioneering treaties to the ambitious 'Fit for 55' programme, the EU exemplifies the importance of policy and regulation in driving systemic change. The interplay between policy, regulation and financial incentives underlines the holistic approach required to achieve our environmental goals.

Moving into the corporate world, the emphasis goes on the opportunities and challenges that companies face when adopting the circular economy. Tools and programmes available to companies to facilitate the transition to a circular model by reducing waste, promoting product conversion, and stimulating innovation will be presented. The challenges that companies may face in the adaptation process, both practical and cultural, will be examined and how these challenges can be overcome.

As we look to the future, the potential of the circular economy is unlimited. Technological innovations and visionary leaders like MEP Mercedes Bresso offer hope and inspiration for what lies ahead. The opportunity to speak directly with such an influential figure committed to promoting the circular economy within the European Union was a significant moment in the research journey. The in-depth knowledge and expert perspective shared by MEP Bresso greatly enriched my understanding of the future challenges and opportunities for the adoption of the circular economy.

In this journey through the chronicles of environmental awareness and economic transformation, we have come to a crucial point. The circular economy is not simply a theoretical construct; it is a concrete and constructive response to the monumental challenges of our time. It is a path to a more equitable and sustainable future, in which we all collectively protect our planet for generations to come.

In the words of Mahatma Gandhi, 'The future depends on what you do today'. The time to act is now, and the circular economy stands as a beacon of hope, lighting the way to a brighter and more sustainable tomorrow. As we move forward, let us remember that only through collective and coordinated efforts can we hope to achieve the transition to a circular economy that our world so desperately needs.

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