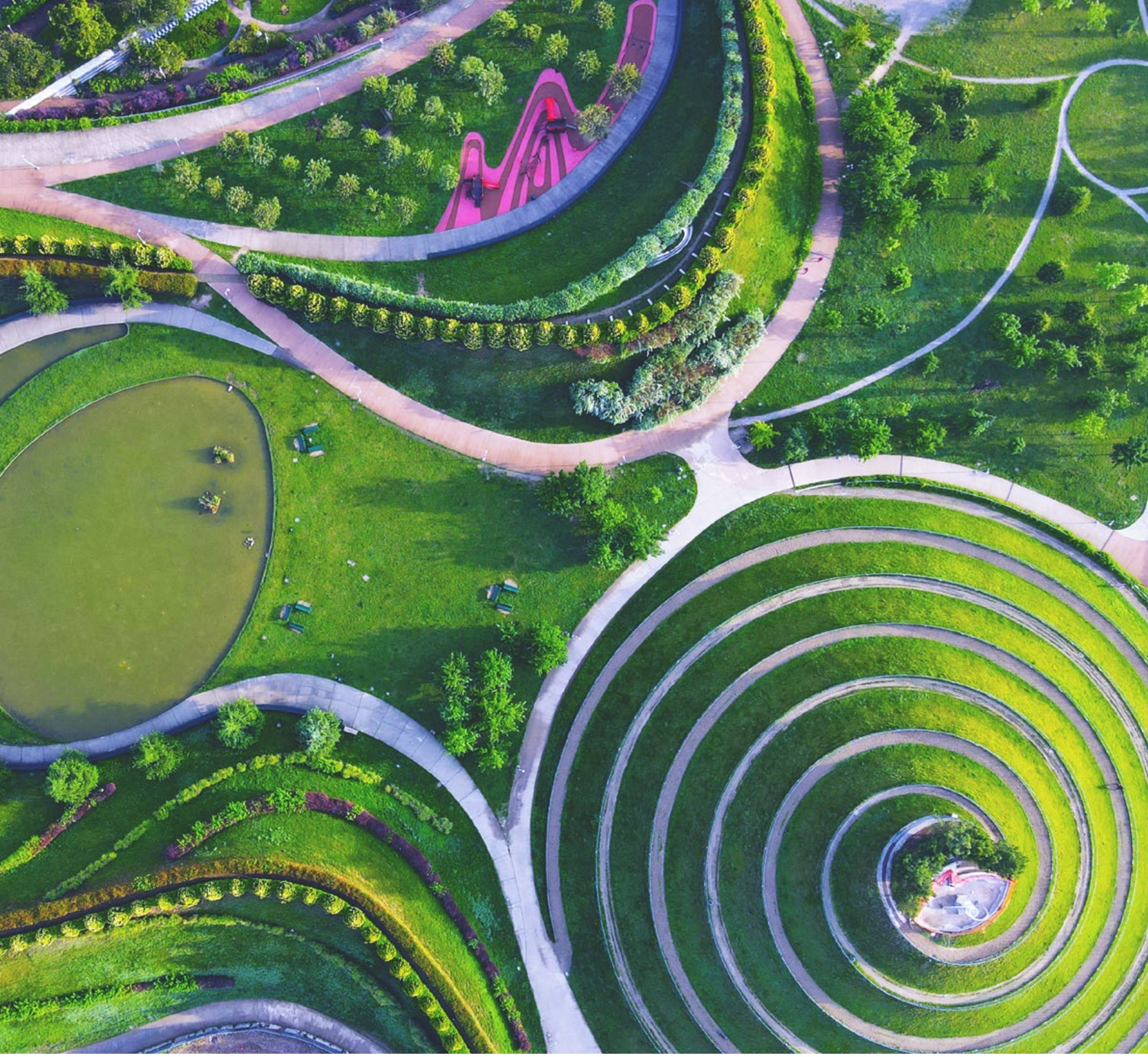
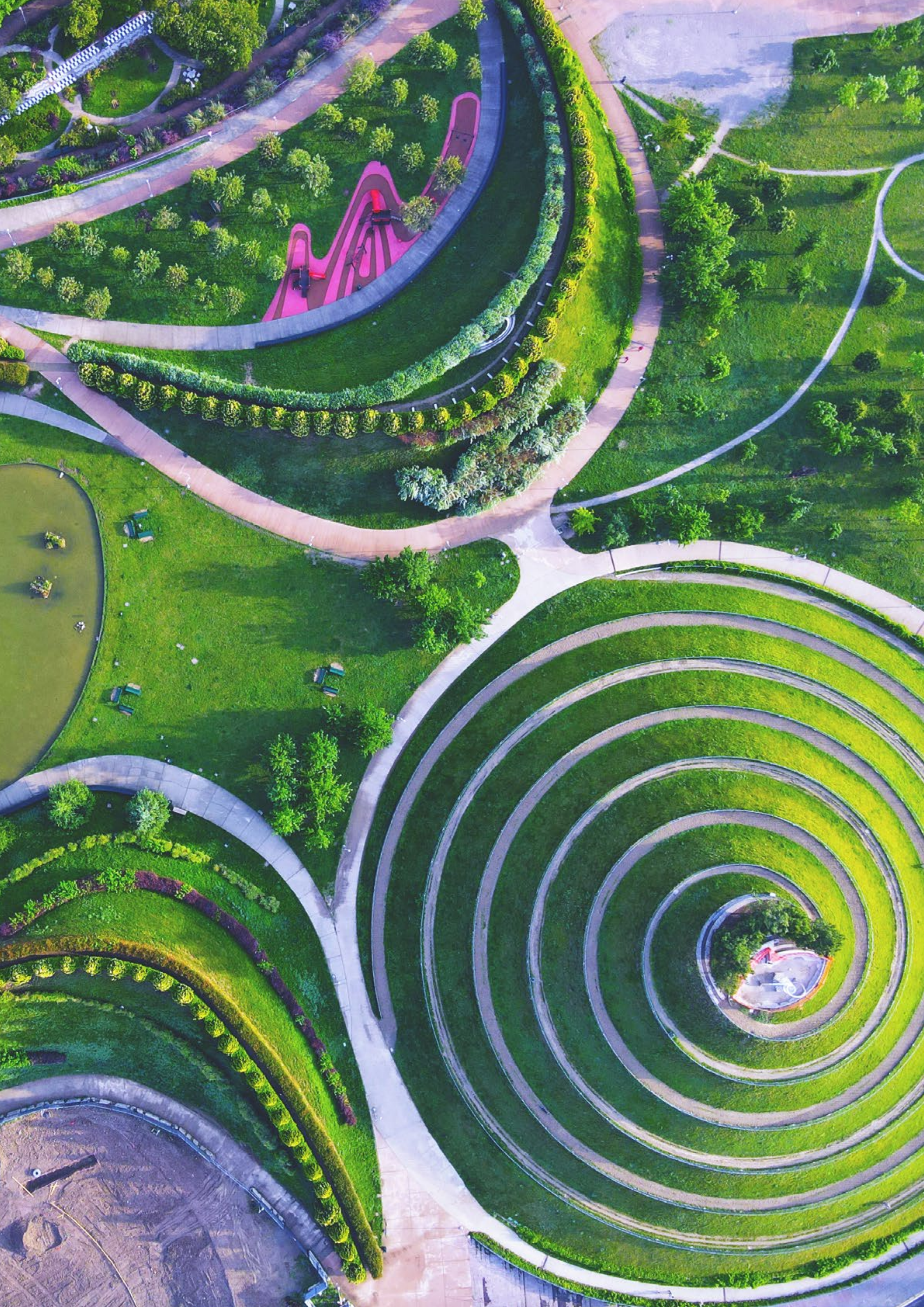


Identifying companies leading the transition to Circular Economy

EURIZON ASSET MANAGEMENT

September 2023



As the world is reaching a tipping point on halting environmental degradation and global warming, the Circular Economy concept is gaining traction among businesses and institutions, as a viable path to build a positive relationship between growth and the restoration of natural systems.

At Eurizon Capital SGR we are committed to playing our role as investors in accelerating the shift from a linear to a Circular Economy. In this work we show the approach that we implemented to identify companies leading the transition, and to grade their efforts. We further show how we integrate this approach in investment decisions, by presenting the investment strategy that guides some of our products with a Circular Economy focus.

Preface

At Eurizon we identify the Circular Economy as a path to promote more sustainable, intelligent, and inclusive growth. Sustainability is one of our core values, shared at all levels of the organization. We are committed to constantly evaluate the consequences of the economic model evolution on the environment, society, and businesses.

There are pressing needs to address the implications of the production and consumption model adopted by advanced economies, a model based on the massive use of scarce natural resources. The situation is even more critical if we consider that, in other areas of the world, billions of people aspire to align their level of consumption with that of some developed countries, and this would imply using three to five times the resources the planet can regenerate.

This path is unsustainable and therefore, the need to correct the current model of consumption and production, to decouple economic growth and prosperity from the intensive exploitation of the planet's resources, appears evident.

It is necessary to undertake a transition from a linear economy, which produces enormous quantities of waste and consumes scarce virgin resources, towards a Circular Economy, where the generation of waste and the consumption of resources are minimized and where natural capital is regenerated. It is a profound transformation that requires the combined action of the public and private sectors.

As investors, in full accordance with our fiduciary mandate, we are very focused on understanding the consequences of this transformation, with reference to the companies that are part of our investable universe, and to how the circular transition could change the competitive scenario in the sectors where the transition will be more material.

Therefore, at Eurizon we have invested with conviction in the development and maintenance of a model to estimate the degree of circularity of companies, based on public information.

The methodology presented in this publication, and the data collected by our team, are already used to improve the investment choices in some of our products and we are considering to adopt this framework to engage in dialogue with companies, encouraging them to publish data and information that would allow a more precise estimate of their degree of progress in the circular transition.

We are proud to be part of the Intesa Sanpaolo Group, a pioneer in the financial sector in embracing the circular economy principles, and with this publication we want to encourage all our stakeholders to join our effort to scale the impact of our initiatives.

Saverio Perissinotto

Chief Executive Officer
and General Manager

Acknowledgments

We would like to thank **Andrea Beltratti, President of Eurizon Capital SGR, Full Professor Department of Finance and Academic Director Executive Master in Finance EMF SDA Bocconi**, for insightful discussions.

We are also grateful to the **Circular Economy Unit of the Intesa Sanpaolo Innovation Center**, and its **Circular Economy desk**, for the comments and suggestions shared.

We finally wish to acknowledge the feedback received from the **Ellen MacArthur Foundation**, which helped improve the quality and consistency of this work.

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1

From Linear to Circular: a necessary shift

1.1 Introduction

Public regulators and private organizations in the profit and non-profit sector are increasingly recognizing the unsustainability of the current economic model, and they are coming to agree that the way to decouple economic development from resource and environmental degradation, is by shifting from a Linear to a Circular Economy (hereafter CE). CE describes an economy where products and resources are maintained in use, and where waste and pollution are minimized by design, by reorienting consumption and production patterns to regenerate Natural Capital.

As a company, and as a member of the Intesa Sanpaolo Group, we believe that a global transition to CE is necessary to avoid an irreversible depletion of natural resources, and to get to the net zero target of carbon emissions by 2050. We further acknowledge that asset managers have a fiduciary duty to play a twofold role to support CE: on the one hand, as active investors, we should engage companies in embracing CE; on the other hand, we need to integrate the estimated financial consequences of the shift to CE into our investment process. However, this role clashes with the lack of a taxonomy and of shared KPIs; though companies, regulators and the financial industries have taken major steps towards the creation of a common language in the field of sustainability, this language is not yet tailored to measure CE from the perspective of an investor.

We contribute to this dialogue by proposing the framework we have developed and implemented. Our approach is modular and adaptable, in that it assesses the degree of circularity of companies across three dimensions: the production process, the business model and the quality of the initiatives adopted. Precisely, within each dimension, we identify and grade the categories of actions that can be undertaken, and we show how they can be weighted to reflect the specific characteristics of a business. Moreover, we only make use of publicly available data, which makes our approach replicable and applicable to any public company. In this paper, we provide a sample analysis of companies in a global equity index, which confirms that our framework effectively makes it possible to categorize and compare the approaches of different companies. Two main results can be underlined: (i) companies are currently focused on the transformation of the production process, though new business models are starting to emerge; (ii) we estimate that the degree of circularity of public companies, operating in sectors highly dependent on raw materials, and with a market for physical products, is only 0.794, which indicates a considerable margin for further improvements.

In what follows we first explore the limit of the current economic system and the opportunities and challenges of CE. We then illustrate the theoretical basis of our framework and how it can be used in practice, after which we present the results obtained from the analysis of companies in a global equity index. Finally, we explain how we integrate CE into investment decision-making, and we discuss the current limitations of our approach.

1.2 An unsustainable path

Natural Capital (NC) can be understood as the Earth's endowment of renewable and nonrenewable resources and of the biodiversity contained within it (Hernández-Blanco and Costanza 2018). The categorization of Nature as a capital asset developed formally during the 1970s-1980s as a concept that expresses the fact that natural assets provide a flow of goods and services that contribute to economic wealth (Barbier 2019). Indeed, not only does NC offer raw materials of production, such as fossil fuels and wood, but it also provides services that make life possible, including food, clean water and carbon sequestration. Though it is now widely accepted that these goods and services are the foundation of our economies and of life itself (European Environment Agency 2015), the economic growth experienced in the last half century has come at their expense.

Modern economies are linear systems, where resources are taken from the environment and not given back

Soil degradation, water scarcity, biodiversity losses and climate changes represent only a part of a chain of externalities stemming from an economic model that has long ignored the essential role of nature and the price of its degradation (Hernández-Blanco and Costanza, 2018, Barbier 2015). Scholars describe modern economies as linear systems, where resources are taken from the environment and not given back, but rather become waste, after having been used to mass-produce products that are typically disposed of after single use (Esposito et al. 2018). This same linear thinking applies from the reliance on fossil fuels in energy production, to agriculture, where intensive farming and the extensive use of pesticides and synthetic fertilizers have represented the answer to the population growth experienced since the 1950s (McKenzie 2007). While the emergence of a linear paradigm dates back to the industrial revolution (Andrews 2015), over the last 30 years, global material consumption has more than doubled (United Nations 2019a) and renewable resources are now consumed faster than they can be generated, with an annual footprint equivalent to 1.7 Earths (Global Footprint Network 2022). Besides, carbon emissions accumulated since the 1990s equal those generated over the previous two and a half centuries (Stainforth 2020), and are the main cause behind the dramatic rise in temperature experienced in recent decades (Lindsey 2020).

There is an evident paradox in this wasteful mindset. To illustrate, despite the fact that about 8.9% of the global population is currently undernourished, only two thirds of the food produced every year reaches a table, the remaining part going to waste across all levels of the supply chain (Roser and Ritchie 2019, Dora et al. 2020). Likewise, the equivalent of one garbage truck of textiles gets dumped every second, which contributes to make the fashion industry the second most polluting sector after the fossil fuel industry (Chen et al. 2021). The result is that waste far exceeds the levels that ecosystems can tolerate (Farley 2012): considering municipal solid waste alone, about 600 million tonnes of garbage remain unmanaged every year and eventually leakage into the environment, thus putting a strain on natural resources and on the health of both humans and animals (Center for Health, Environment and Justice 2019, Kaza et al. 2018).

Modern economies have also failed to recognize that the consequences of the overexploitation of NC are widespread and interconnected (Homer-Dixon 2011): climate changes provide a tangible example of this complexity. Under normal levels, greenhouse gasses contribute to maintaining Earth habitable by absorbing heat from the sun; but when levels rise, so does heat trapped, thus resulting in increased temperatures (Nunez 2019). In turn, rising temperatures trigger systemic consequences: changes in precipitation patterns, melting of glaciers and changes in the habitat of animals, just to mention a few (National Geographic 2021). Moreover, climate changes and the depletion of natural assets are mutually reinforcing: on the one hand, changes in precipitation and temperatures exacerbate pressure on forests (Woetzel et al. 2020); on the other hand, soil degradation and deforestation reduce the Earth's capability to absorb and store carbon emissions (Stockholm Environment Institute 2018).

The degradation of NC hampers the development of low-income countries, whose economies are highly dependent on agricultural land and forests (Lange et al. 2018); it also raises a question of how to satisfy the demand for energy, food, and raw materials as the global population is expected to hit 9.9 billion by 2050 (Population Reference Bureau 2021). However, this is not only a matter concerning future generations; on the contrary, economic and social consequences are already apparent and significant. For instance, it is estimated that, in Europe, losses in crop productivity due to soil erosion amount to €1.25 billion a year (Panagos et al. 2018); likewise, marine plastic pollution in Europe costs at least €63 million in cleanup expenditures and produces up to €0.9 billion revenue losses from tourism, fisheries and aquaculture (Viool et al. 2019). On the social side, consequences span from the degradation of recreational and leisure areas (Keiser et al. 2019), to the premature death of about 7 million people a year from air pollution (World Health Organization 2021a), to the distress expressed by the youngest in response to climate change (McKeever 2021).

1.3 Towards a circular economy

We are at a tipping point. Half of the World's population could face water scarcity by 2025 (UNICEF 2020) and demand for food is on track to increase 60% by then (Broom and Breene 2020). Scientists further suggest that the current path is leading to a sixth major extinction of biological species, the first in 66 million years, and remark that biodiversity losses combine with environmental degradation to increase the likelihood of pathogen-transferring interactions, and for the emergence of new pandemics (Bradshaw et al. 2021, World Health Organization 2021b). The next decade will also be crucial to halt temperature increases and prevent irreversible and catastrophic consequences from climate changes (United Nations 2019b, IPCC 2021).

Against this backdrop, we recognize CE as an opportunity to overcome the trade-off between economic development and resource depletion. Specifically, we embrace the concept offered by the Ellen MacArthur foundation (EMF) (2020), which describes CE as a restorative industrial economy standing on three core principles: design out of waste and pollution, maintain products and materials in use and regenerate natural systems (EMF 2020). This vision entails a transition to clean energy sources and describes new models of production and consumption, whereby single-use is replaced by extended-use, maintenance and recycling and where the wastage of biological components is prevented through cascaded uses and the return of leftover nutrients to the soil, in a restorative cycle (EMF 2017a).

Companies across geographies are embracing CE; examples span from Renault, which remanufactures automobile parts reclaimed from old or damaged vehicles (EMF 2022a), to Tesco that is redesigning its packaging to phase-out superfluous plastic (EMF 2022b), to Nike that is scaling the use of recycled polyester in its products (Mazzoni 2020). For companies, CE represents an opportunity to reduce risks and improve profitability (Bocconi University, Ellen MacArthur Foundation, Intesa Sanpaolo, 2021). Energy and material inputs represent, in fact, a volatile and significant portion of the total costs incurred by manufacturing companies, which in Europe, can reach up to 55% (Greenovate 2012); moreover, circularity provides a way for all industries to meet the growing public and institutional demand for sustainability and carbon neutrality (Jensen 2022).

Circular Economy is a restorative industrial economy standing on three core principles: design out of waste and pollution, maintain products and materials in use and regenerate natural systems (EMF 2020)

Nevertheless, CE cannot be achieved through isolated actions. The Circularity Gap Reporting Initiative (2023) measures every year the global reliance on virgin materials: latest data show that only 7.2% of all material inputs are cycled back into the economy after their initial use, and highlight that urgent and large-scale actions should be taken to effectively unlock the circular transition. CE implies changing the approach to resources and designing products, services and infrastructures capable of ensuring a circular flow of materials across the entire system. For instance, repair becomes a viable option only when products are

Circular Economy implies designing products, services and infrastructures capable of ensuring a circular flow of materials across the entire system

designed to be repaired and when spare parts are available (De Fazio et al. 2021). Likewise, the creation of a clean energy system should not only involve large-scale electrification and the upscale of renewable electricity, but should also prevent a waste emergency, by ensuring a circular lifecycle for storage batteries and wind turbines (Robertson-Fall, 2021, U.S. Department of Energy 2021).

1.4 Accelerating the transition

Figure 1: elaboration from European Commission (2020)

The good news is that the regulatory framework has already started to evolve in this direction. Member states of the United Nations have recognized CE as a driver for sustainable development (United Nations Environment Programme 2021), and G7 and G20 countries have acknowledged CE as part of the tools to tackle pollution, resource efficiency and to improve economic performance and competitiveness (European Union 2021a). China was the first country to include CE in its development agenda back in 2008, as a response to environmental degradation and resource scarcity (Li and Lin 2016). CE has also been part of the European industrial strategy since 2015, when the European Commission introduced a CE action plan, later extended and strengthened in 2020 under the European Green Deal (European Commission 2020). Further interventions are needed to reform policies that still incentivize linear models and to promote a systemic transformation (World Bank 2022); nevertheless, the efforts of the European Commission pave the way for a regulatory and legislative framework supporting the uptake of CE. In particular, the new CE action plan introduces legislative and non-legislative measures that support circular products and production processes and that facilitate waste reduction and valorization, across the most material and waste-intensive sectors of the Economy, as displayed in Figure 1.

Moreover, the Commission has included CE in the EU Taxonomy for Sustainable Activities (European Commission 2022a) and, though the categorization of CE strategies is still in progress and requires improvements (European Environmental Bureau 2022), its goal is to provide investors with a comprehensive guide that considers all stages of a product's lifecycle. The taxonomy represents a key pillar of the Sustainable Finance Action Plan and of the more general objective to engage the financial community in the transition towards environmental and socio-economic sustainability, which sees the commitment of, among others, the European Commission (European Union 2021b) and the United Nation Environment Programme (2023).

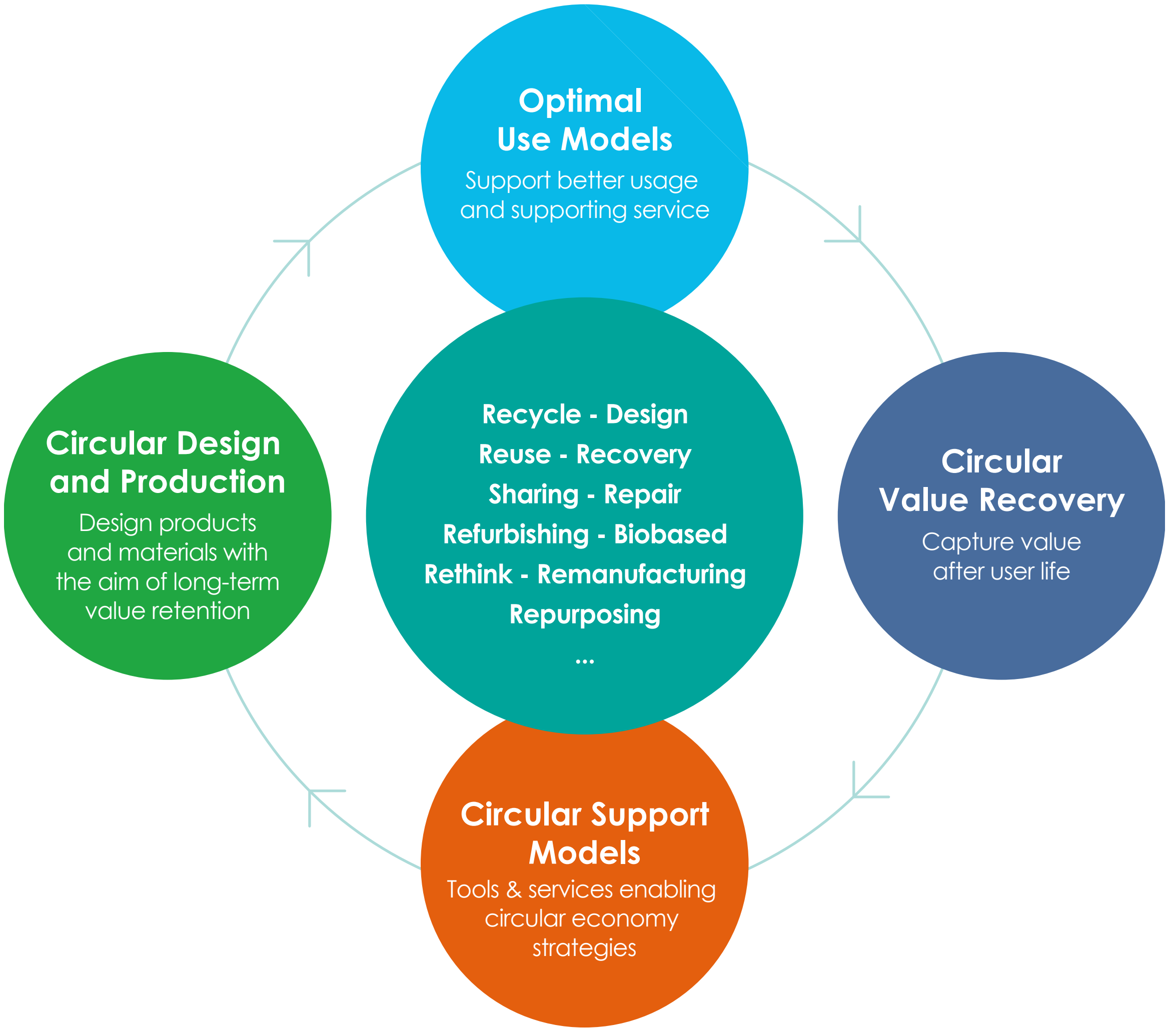


Figure 2: European Taxonomy. Elaboration from European Commission (2022)

Precisely, we investors have the opportunity to facilitate the uptake of CE by leveraging our role as shareholders and engaging companies to transform their businesses; we also have a fiduciary duty to our clients to integrate in our investment decisions the evaluation of the risks and opportunities of this transformation. This role implies going beyond the commitment expressed by companies and measuring the relevance and impact of their initiatives, in a context where the information available to investors is highly unstructured.

Though data providers, led by MSCI (2023), have begun offering CE-related products, their focus is currently on specific aspects, such as the sustainable procurement and management of Energy and Water, and on specific themes such as waste, plastic, and enabling technologies for shared mobility and internet economy. Moreover, the external communication of companies on their circular performance is often inconsistent (WBCSD 2021) for at least two reasons. First, companies are adopting a variety of approaches for assessing their initiatives, which reflect their own understanding of their role in the circular transition (WBCSD 2018). Efforts to build a unified set of metrics are already underway (Circle Economy 2020) and include the Circulytics tool proposed by the EMF (2021), the Circle Assessment framework proposed by Circle Economy (2016) and the Circelligence method developed by the Boston Consulting Group (2023); however, none of them is mandatory or even established. Second, there are currently no shared standards governing the public reporting of CE initiatives; while several reporting agencies, such as the Global Reporting Initiative (2016), have begun to offer advice on CE reporting, guidance still largely recommends a qualitative and discretionary description of the measures implemented (Opferkuch et al. 2021).

The Taxonomy could mark a big step forward in the definition of a common language for investors and companies, and should set the basis for a more transparent communication, by highlighting relevant activities to be undertaken and disclosed; nevertheless, the question of how to measure the systemic contribution of a company to decoupling economic activities from the consumption of finite resources and the depletion of NC is, and will remain, open.

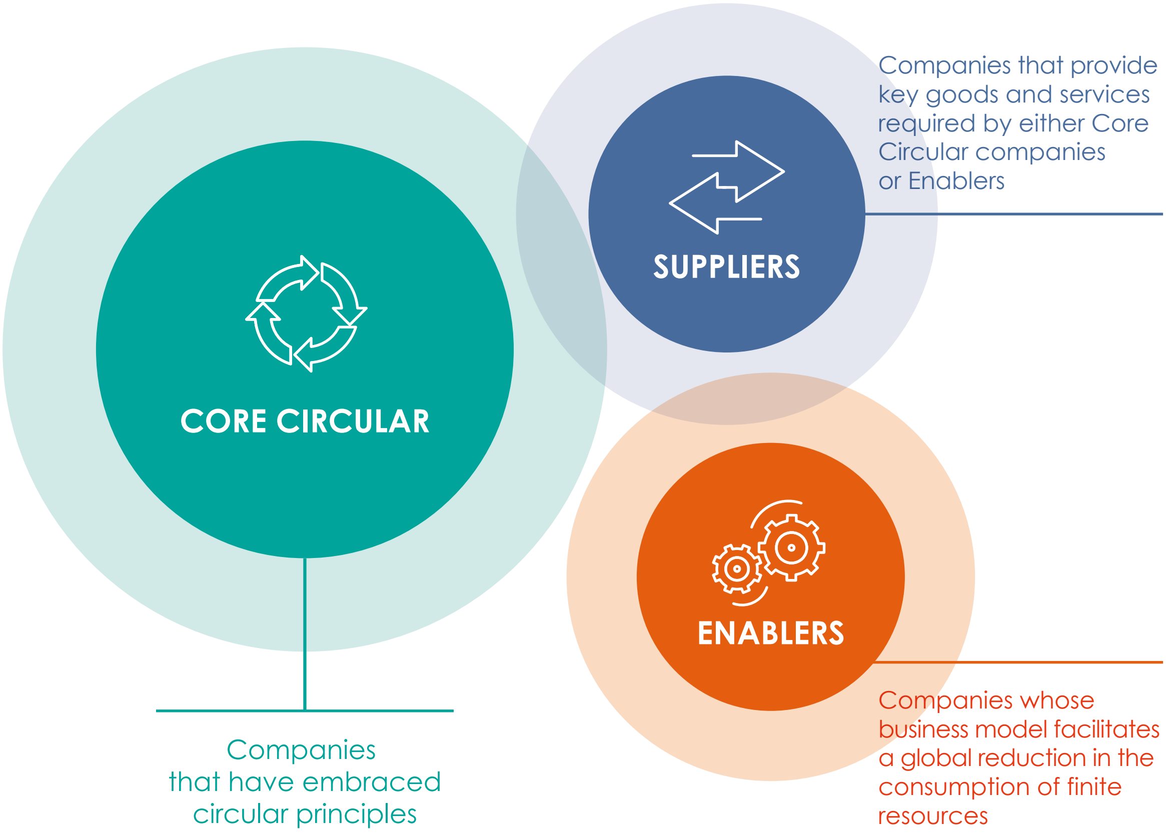
We start from this context to propose a new approach to measuring circularity, by classifying and grading the information published by companies; our focus is on how raw materials are procured and transformed, and on a company's systemic impact on NC. In the definition of this approach, we have benefited from the knowledge gained by our parent company, the Intesa Sanpaolo bank, through its strategic partnership with the EMF, the 8-billion-euro credit plafond set in favor of public and private companies adopting innovative circular economy models, and through its Circular Economy Team in Intesa Sanpaolo Innovation Center, as a competence center for CE within the banking group (Intesa Sanpaolo 2023). Our methodology integrates state-of-the-art knowledge on how to build key performance indicators that can both be used as building blocks for investment strategies, and as tools to engage companies in the definition of targets of improvement, and in the reporting of high-quality data. We believe our approach offers a method that investors can use to estimate the degree of circularity of companies, and we hope it will contribute to the definition of shared indicators of circularity performance, as well as to advancing the diffusion of a CE culture in the financial community.

In this paper, we present our framework as it stands today. We are committed to keeping an open mind and to incorporating new knowledge and approaches as they emerge, while businesses, investors and regulators move towards CE.

2 The Eurizon approach

Three categories of actors can contribute to and thrive in a CE, which we hereafter define as Core Circular, Enablers and Suppliers. Precisely, we define as Core Circular those companies that have embraced circular principles in the selection and procurement of their inputs and in the design, production and distribution of products and services. We further categorize Enablers as companies that facilitate a global reduction (i) in pollution and (ii) in the consumption of finite resources; examples include renewable energy producers, waste-management players, green-building and green-mobility companies. Finally, we describe Suppliers as companies that provide key goods and services required by either Core Circular or Enablers companies.

Figure 3: Key actors in CE implementation



While Enablers and Suppliers can generally be defined by the type of products and services offered, the identification of Core Circular companies involves an evaluation of their inputs, products and processes, which is utterly complicated by the lack of a shared barometer and of a standardized language across companies. For this reason, we present a framework that should guide the estimate of the degree of circularity of Core Circular companies. In so doing, we recognize that the transformation awaiting businesses is complex and involves all levels of their value chain, and of their relationship with suppliers and customers. We also acknowledge that this transformation will be shaped by the speed and direction of technology advancements, which will determine the availability and cost of CE options. We therefore propose that the degree of circularity of companies should be assessed from three angles:

The degree of circularity of companies should be assessed from three angles: the production process, the business model and the quality of the initiatives undertaken

- How circular is the production process?
- How circular is the business model?
- What is the quality of the initiatives undertaken?

Each of these questions describes a pillar of our Circularity Score and, in what follows, we look into the KPIs that should be used to answer these questions and measure the degree of circularity of companies.

Figure 4: Pillars of the Eurizon's Circularity Score

2.1 Assessing the production process

The input-ouput model, first introduced by Leontief (1941) to analyze the structure of the American economy, has long found application at the micro level, to describe the production processes of companies (Xiannuan and Polenske 1998) and to facilitate the evaluation of their environmental performance (Matsumoto and Fujimoto 2008), especially when accounting for the generation of waste as an output, alongside products (Albino and Kühtz, S. 2004).

We build on this model to analyze how raw materials are sourced and transformed by a company; we do not account for energy and water usage here because these dimensions are already covered by standard ESG metrics made available by ESG data regulators and providers (MSCI 2019, MSCI ESG Research LLC 2022). In detail, we propose that a company's production process involves four areas of intervention: inputs, products, waste and packaging, whose relevance depends on the industry of belonging.

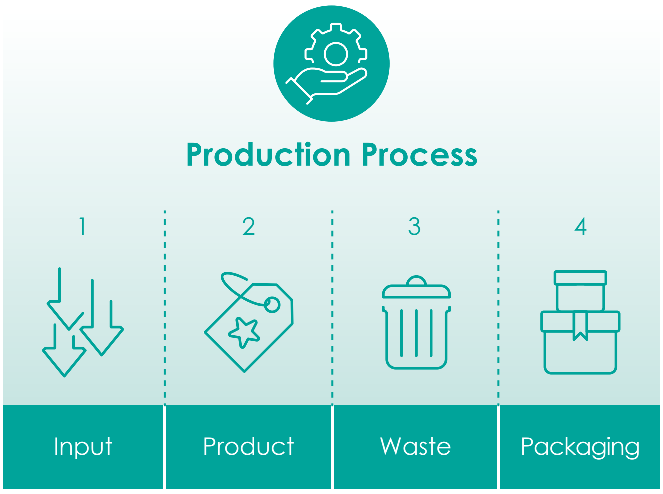


Figure 5: KPIs of Eurizon's Production Process score

Notably, our choice to create a category for packaging alongside products reflects the fact that it requires specific initiatives that affect various levels of the value chain.

Circular inputs

The objective to decouple economic activities from the consumption of finite resources and from the overexploitation of renewable assets implies the adoption of new types of inputs in production processes. In practice, circular inputs can take different forms, which we classify as sustainably sourced renewable materials, recycled materials and reused materials and components (EMF 2020, Lacy et al. 2020). All three are necessary, as none of them alone can reverse the depletion of NC, but they vary in their impact. Reuse represents an ideal option, as it maintains materials in use and does not require a transformation process. However, not everything can be reused and fit back in a production process; recycling represents therefore a sensible alternative, to drastically reduce the consumption of raw materials and save the energy implied in their extraction and processing (EIA 2022). Finally renewable resources can substitute the consumption of fossil fuels and contribute to the restoration of NC, when sourced responsibly and when their nutrients are returned to the soil at the end of usage (EMF 2017); notably the notion of renewable materials extends to the emerging field of man-made biobased materials (Lacy et al. 2020), which we expect will continue expanding the range of possibilities.

Figure 6: Circular Inputs

REUSED 1

Represent an ideal option, as they maintain materials in use and do not require a transformation process

RECYCLED 2

Represent a sensible alternative to drastically reduce the consumption of raw materials and save the energy implied in their extraction and processing

RENEWABLE & SUSTAINABLE 3

Can substitute the consumption of fossil fuels and contribute to the restoration of NC when sourced responsibly and when their nutrients are returned to the soil at the end of usage

Products

In a CE, products should be designed to minimize the usage of resources, waste and pollution and to facilitate the restoration of NC. We extend the ideas of Lacy et al. (2020) and EMF (2013) and identify six categories of strategies that tackle different stages of a product's life cycle, and which companies should embrace and combine, according to the characteristics of their products, as displayed in Figure 7.

> **In a Circular Economy, products should be designed to minimize the usage of resources, waste and pollution and to facilitate the restoration of Natural Capital**

Designing products for circular inputs, a core strategy for reducing dependence on finite resources, involves creating products that enable users themselves to adopt circular inputs. The list of possible applications is long and evolving and extends from electrification appliances and infrastructures, to technologies that make it possible to capture and reuse industrial waste heat.

On the other end of a product's life cycle, designing for disassembly and recycling ensures that valuable materials and components can be recovered. Using circular inputs has limited scope if components cannot be separated to be reused or recycled and if renewable materials cannot be returned to the ecosystem. For instance, glass is a highly reusable and recyclable material, but its recovery can be challenged by the presence of firmly attached collars, or of glued-on decorations (British Glass 2019): by ensuring the feasibility of recovering processes, companies can therefore bring a major contribution to the uptake of CE.

Design for	Regenerate natural capital	Maintain products and materials in use	Minimize waste and pollution
Adaptability		✓	✓
Biological Cycle	✓	✓	✓
Circular inputs	✓	✓	✓
Disassembly, Recycling		✓	✓
Durability, Reliability		✓	✓
Resource saving, Pollution Prevention	✓		✓

Strong Contributor Contributor Conditional Contributor

Figure 7: Design for CE (internal elaborations)

Enhancing the durability and reliability of products further represents a basic step for reducing waste and extracting the most value from employed resources. This theme has already gained the attention of consumers and regulators (Kuppelwieser et al. 2019), following the scandals of planned obsolescence that in recent years have hit almost every sector, from technology to fashion (Kramer 2012). However, as investors, we should properly ponder the efforts of companies in this direction, as durability and reliability generally pertain to the quality of a product, which is a dimension difficult to quantify (HOP 2020) and prone to be misrepresented (Schröder and Vestin 2020).

Enhancing the durability and reliability of products is a basic step, but as investors, we should properly ponder the efforts of companies in this direction

The case for extending a product's life should also be assessed against gains in efficiency and performance, as products differ in how their production and usage affect the environment, and the balance between the two dimensions is far from straightforward (Ardente and Mathieux 2014). Developing products that consume less resources and that prevent pollution is, in fact, a precondition for reducing the impact of a product's use, and for enabling a transition to renewable energy sources and to net-zero carbon emissions. Notably, this theme has long been recognized in sustainability discourses (Kammerer 2009) and we expect most companies to be already ahead of the development in this field.

A complementary strategy that companies should adopt to extend the life of products, while also aiding innovation, is designing for adaptability. For most companies, this requires undertaking novel efforts, because it means designing products that can be upgraded, and which have a modular structure that makes it easy to substitute defective or out-of-date components. Adaptability finds application across sectors: from technology, where software updates can enhance performance and add new functionalities (Bocken et al. 2016), to buildings, where modularity can drastically facilitate adapting a building to a new function (Minunno et al. 2018), to fashion, where a modular design can make it possible to change the style of a piece of clothing and withstand new trends (Chen and Li 2018).

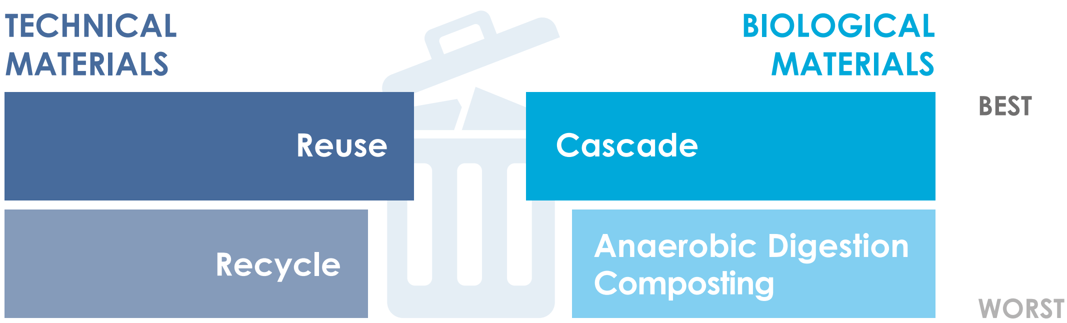
Finally, designing for the biological cycle implies ensuring a safe return of biological nutrients to the environment, thus contributing to its restoration. This constitutes a paradigm shift, especially in the fashion industry, where organic fibers are often blended with non-biodegradable components to enhance functionality, or dyed using toxic chemicals that prevent their recovery (Koszewska 2018). Designing for the biological cycle also implies offering safe-biological alternatives to products that directly interact with the environment, such as pesticides, fertilizers or detergents (Mestre and Cooper 2017).

Waste

The strategies to eliminate the concept of waste at the product design stage, should be complemented by actions to extract value from what is not transformed into output. In this regard, waste incineration, either with or without energy recovery, has long been proposed as a solution to divert waste from landfill (European Commission 2022b); however, incineration is not an acceptable option in CE thinking, for at least three reasons. First, it is a source of hazardous and non-hazardous residues, which are often landfilled (Zero Waste Europe 2022); second, CO2 emissions are almost equal to those from landfills (Vahk, 2020); third, incineration eliminates any possibility to recover the value embedded in discarded products and components (EMF 2020).

Companies should prioritize waste management activities that save the most value from what they discard, which can take different forms depending on whether technical or biological materials are involved. In the case of technical materials, value is captured by reusing products and, when this proves infeasible, by reusing their components, and only ultimately by recycling. Recycling is a secondary option to reuse, because it involves an energy-consuming process and, often, a progressive loss of value, as in the case of paper, which can only be recycled up to seven times (Howard 2018). Biological materials should be cascaded across different usages, before being returned to the soil through processes such as anaerobic digestion or composting, which not only produce a digest that can be used as fertilizer, but also offer a renewable source of energy (Hussain et al. 2020, Tessele and van Lier 2020).

Figure 8:
Waste Hierarchy



Packaging

Packaging serves many purposes: it protects and preserves its content and it also represents a marketing tool that attracts customers and provides information (Emblem 2012).

For most companies, packaging is an input produced by an external supplier; however, it also represents an integral, and often major, part of their products, which often determines how they are used. For instance, in the cosmetic industry, the brush of a mascara is as important as the quality of the mascara itself, as different shapes respond to different needs.

In this light, the degree of circularity of packaging depends on both what it is made of and how it is designed. Regarding the former dimension, circular companies should invest in packaging made of renewable and recycled materials, with the same criteria as those used for their own material inputs; it should be highlighted that we do not consider reused materials here because packaging is most likely either reused in its entirety, or not reused at all. Indeed, regarding design, recyclability, reusability and compostability constitute the keywords of circular packaging.

The circularity of packaging depends on both what it is made of and how it is designed

Though reuse might not represent an optimal solution when it involves long transportation distances or intensive cleaning, in most cases it

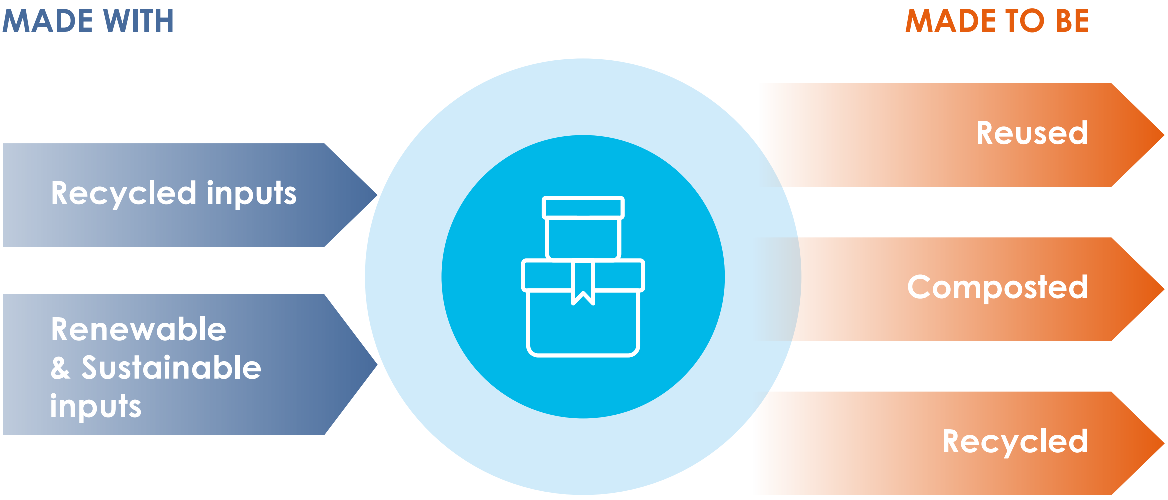


Figure 9: Circular Packaging

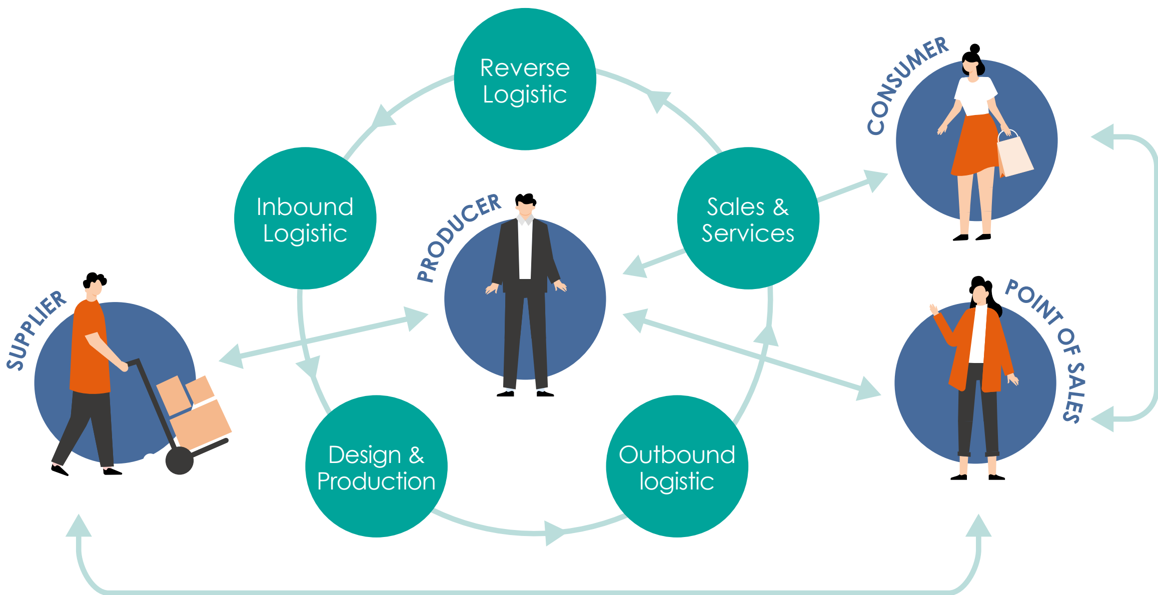
is expected to offer the greatest environmental benefits, especially when packaging is made from circular inputs and designed to be eventually recycled (Megale Coelho et al. 2020). Reuse schemes have already taken-place in the business-to-business market, but they are expected to bring a revolution in the business-to-consumer sector, where companies and consumers should work together to move away from the perceived convenience of single-use and change how they interact with packaging (De Sousa and De Souza 2021, Hugill et al. 2021).

2.2 Assessing the business model

In a linear economy, the sale of a product marks the moment in which ownership and responsibilities are transferred from the producer to the buyer.

A functioning CE requires a different level of interaction, where suppliers, producers and consumers cooperate to ensure a circular flow of products and materials.

Figure 10: Circular Collaborations



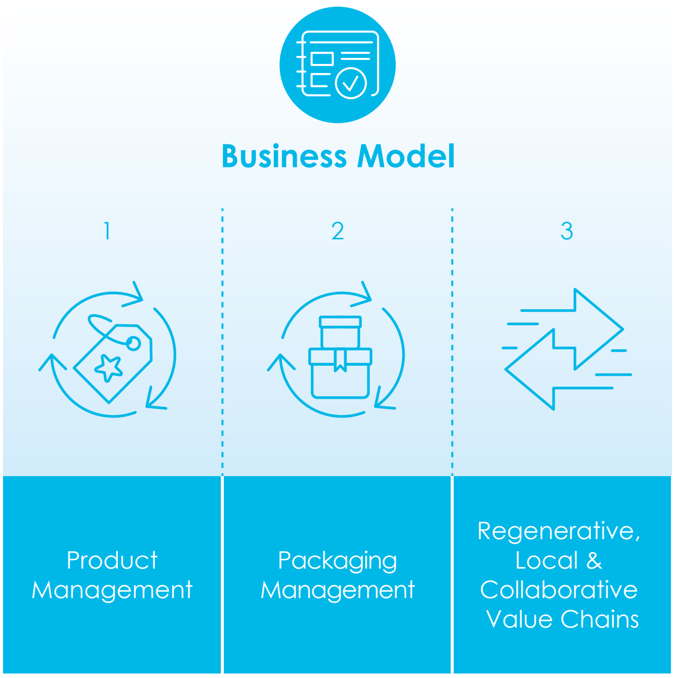


Figure 11: KPIs of Eurizon's Business Model Score

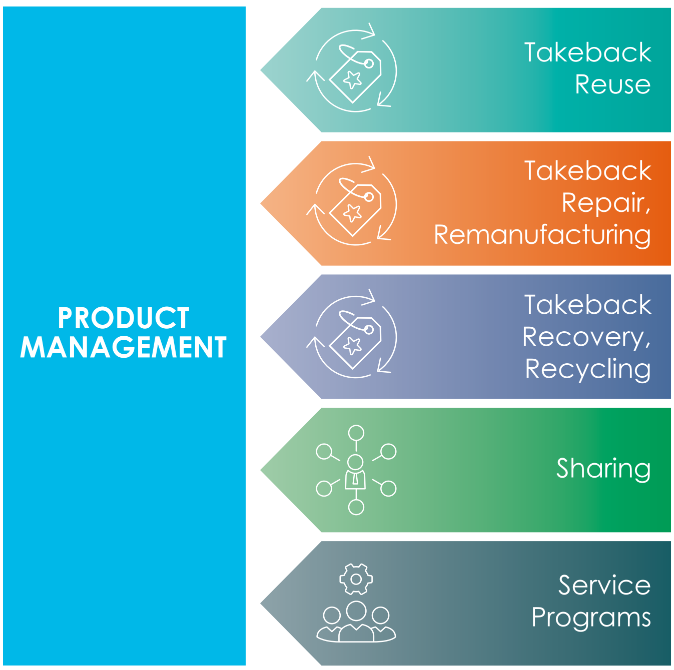
New business models should support and complement the actions undertaken in the production process: creating recyclable products can prove useless if products are not actually recycled; similarly, reuse can only be brought to scale if users have the possibility to share or resell their goods outside their group of friends.

In this vein, we propose that the circularity of a business model should be assessed from two perspectives: how it contributes to maintaining materials in use, in which we distinguish the case of Product Management from that of Packaging Management, and how it affects the systemic impact of inputs, products, packaging and waste, which we name Regenerative, Local and Collaborative Value Chains.

Product management

The strategies available for companies to ensure that products and input materials are maintained in use for as long as possible, vary from different types of take-back programs to service and sharing schemes. The common factor in all these options is that they change the way producers and consumers interact between and among them, and that they reduce the responsibility placed on the shoulders of a single consumer.

Figure 12: Product Management



In a take-back program, companies collect used items, from either their customers or, more generally, from users in their product category. This implies taking responsibility for what happens to a product when it is not used anymore and the establishment of reverse supply chains, which often requires the acquisition of new competences (Agrawal and Singhand 2020). However, take-back also offers the opportunity to enhance the relationship with clients, both by relieving them from the trouble of properly disposing of their items, and by encouraging future purchases, when the program includes a rebate.

From a "circular" standpoint, the quality and efficacy of a take-back program rests on how a company handles collected items: when companies send products to external recycling, they surely contribute to closing the circle of materials, but they often forgo more valuable and profitable opportunities.

Figure 13 ranks the options available for companies based on their ability to preserve the value of collected products. Resale in a secondary market offers the greatest opportunity, as it requires no transformation; there follow repair, remanufacturing and refurbishment, which require different degrees of intervention; finally, recovering of components and recycling for internal usage offer direct access to a source of circular inputs. With this hierarchy in mind, the actions of companies should be valued considering that the possibility to undertake high-value activities depends not only on the quality of collected products, but also on a company's capability to innovate.

The circular flow of products and materials can further be facilitated and enhanced by transforming the relationship between customers and products, not only at the end of usage, but also during the usage phase. In this direction, product service systems (PSS), whereby companies can combine physical products and services, are key elements of CE. Specifically, scholars identify three categories of PSS, based on their degree of "servilization": product-oriented PSS, use-oriented PSS and result-oriented PSS (Tischner and Tukker 2017), as described in Figure 14.

Figure 13: Product Take-Back Hierarchy

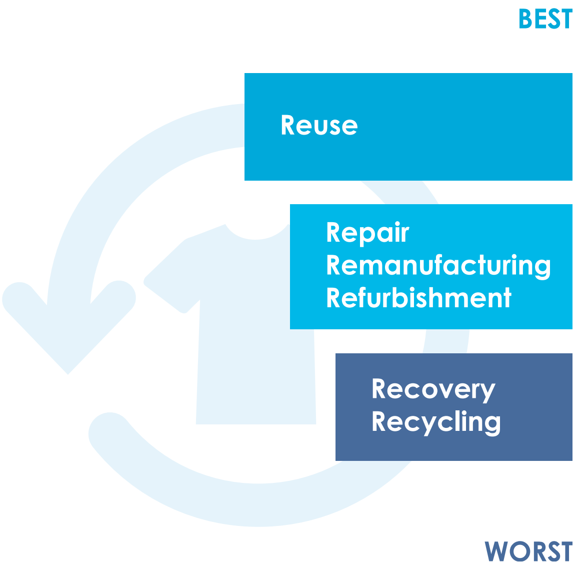
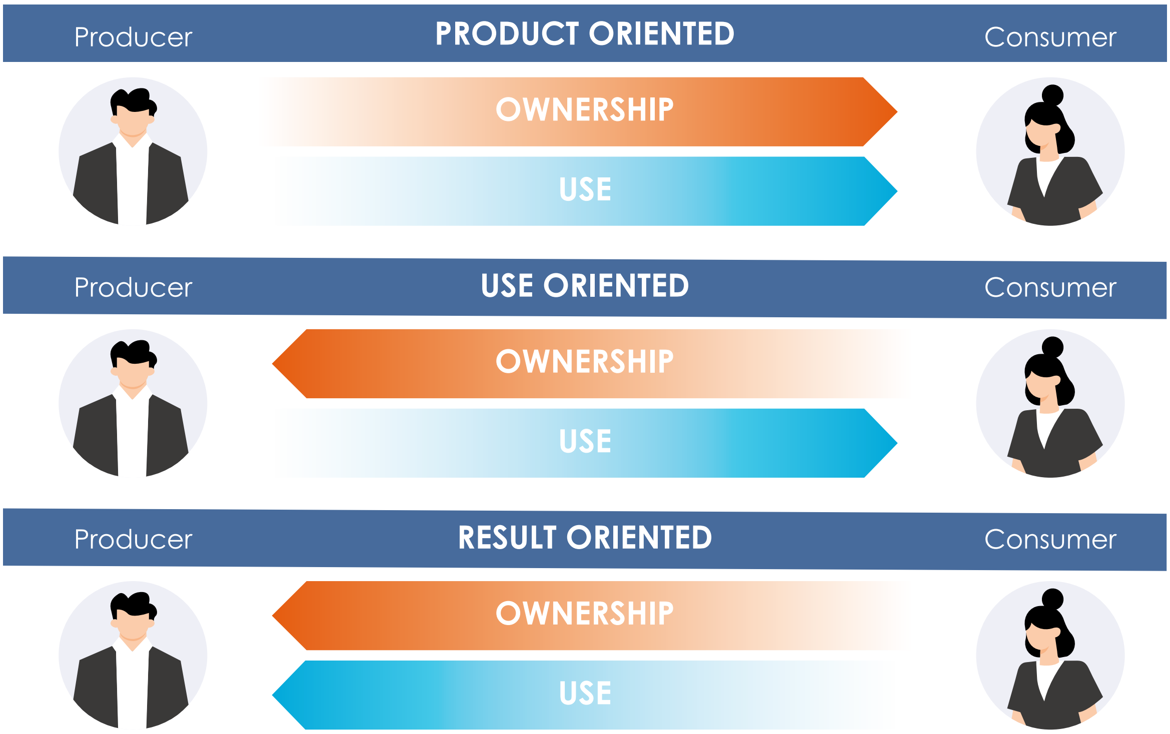


Figure 14: Use and Ownership in CE



In product-oriented contracts, the customer is the owner of the product and of a package of maintenance services; in use-oriented PSS, the producer is the owner of the product and sells use rights to the end-user, as it happens under a renting agreement; finally, in result-oriented PSS, users pay to gain access to the functionalities of a product that is owned and managed by the producer, as when renting a moving company as opposed to a moving truck.

The main improvements are expected to come when the producer remains the owner of the product

Though maintenance services are expected to extend the useful life of the goods involved, as explained by Borg et al. (2020), the main improvements are expected to come when the producer remains the owner of the product. In this framework, producers have an incentive to create durable and adaptable goods and to engage in repair and recovery activities, so as to maximize their return, by spreading unit production costs over multiple customers; this reasoning is brought to the highest level in result-oriented PSS, where producers are the final-users of the product, and customers the receiver of a service.

Finally, companies that provide sharing platforms make it possible for users to collaborate and share access to a product with spare capacity. Collaborative consumption models find application both at the consumer level, such as in car- and bike-sharing schemes, and at the business level, where examples span from heavy equipment (Blaettchen et al. 2020) to farm machinery (Asian et al. 2019). Whatever the case, we suggest that sharing programs should be assessed by considering their effective capability to contribute to CE, as for instance, long-distance sharing can reveal to be a suboptimal choice in terms of GHG emissions (Hüer et al. 2018).

Packaging Management

The previously discussed benefits of take-back programs also extend to packaging; nonetheless, packaging has a lower degree of complexity than products and we expect companies to engage into two main strategies, namely, take-back for recycling and reuse. Indeed, whenever reuse is a reasonable option, the establishment of a take-back program constitutes a sensible strategy, as it offers a way for consumers to reuse their packaging, while also making it possible for companies to engage with customers, as in the case of product take-back. Packaging reuse can actually be described as a modern version of the "milkman model" (Tassell and Aurisicchio 2020): back then, consumers used to return empty containers when products were delivered to their doors and this approach can still work for some products (Hugill et al. 2021); moreover, new schemes can be implemented where, for instance, consumers return packaging in their local stores (Grace 2019).

Figure 15: Packaging Management

Remarkably, we also expect major benefits from take-back for recycling initiatives. Only about 14% of plastic packaging is recycled (EMF 2017b) and the remaining portion is a significant source of marine litter (Bergmann et al. 2015); by ensuring that recyclable packaging gets actually recycled, companies can contribute to reducing the burden on the environment.

Regenerative, Local and Collaborative Value Chains

In a CE, not only should companies control and minimize the externalities of their inputs, products, waste and packaging, but they should also have a positive impact whenever possible. This requires a systemic and collaborative perspective, and a focus on closing the loop along every process.

Figure 16: Regenerative, Local & Collaborative Value Chains

The actions that companies can take in this direction are various and depend on the specific characteristics of the production process and of the materials and products involved, and an exhaustive list is beyond the scope of this work. Instead, we give two examples that illustrate the scope and impact of embracing circular principles: industrial symbiosis and regenerative agriculture.

Industrial symbiosis is the process whereby companies in separated industries interact to turn the by-product of the one into the input of the other; for example, metal scraps from the automobile industry can be used to fabricate metal facade systems for buildings (Ali et al. 2019), while fish sludge can be turned into a biofertilizer (European Commission 2017). In this respect, we remarked that reuse is the most preferable solution, both in the case of inputs and waste, as it preserves the full value of the materials involved and it saves the energy required for recycling. Nevertheless, not all reuse options are the same and waste and inputs reused locally, rather than sent overseas, have a lower environmental impact, because the need for transportation is reduced, or even eliminated.

Regenerative Agriculture describes various food production methods aimed at both improving food quality and regenerating NC. As an illustration, the holistic management proposed by Savory (2013) acknowledges that degraded lands can be restored by grazing strategies that mimic the natural movements of wild herds, as the free grazing, stomping and defecation of animals fertilize the land and make plants grow stronger. The objective to regenerate NC is especially relevant to companies that use renewable resources, and which should be given credit when they do not only source their inputs responsibly, but they also have a net positive impact. Nevertheless, a growing number of companies that do not directly use renewable inputs are embracing regenerative agriculture projects: this is often a way to compensate for the impact of their products or processes, and can amount to greenwashing; however, these efforts should not be disregarded, as long as they are measurable and material.

2.3 Assessing quality

The last pillar of our framework delves into the quality of the actions undertaken by companies; in particular, we identify three KPIs: the degree of disclosure, the level of leadership and the consistency of actions.

Figure 17: KPIs of Eurizon's Quality Score

Disclosure

As investors we have a duty to incorporate all relevant information in our investment decisions; this requires valuing and weighting risks and opportunities implied by how companies manage and interact with their business environment, both within the organization and in the external environment. For their part, companies have a duty to make relevant information available to their stakeholders and, in the realm of financial data, this represents a consolidated and regulated process, marked by the periodic publication of annual and interim standardized reports.

Though recent years have seen the advancement of sustainability reporting initiatives and standards, there are currently no established criteria that companies should use to disclose their circular initiatives. In this context, companies should be positively assessed for providing measurable and exhaustive data, as opposed to an illustrative narration of their steps. In detail, we suggest that data availability should be checked against the whole list of actions involved in the transformation of both the production process and the business model; moreover, in this metric, we also track the availability of measurable targets, which, while not a guarantee of future results, indicate a plan to progress further.

Leadership

In this work we have highlighted that, on the one hand, the relevance and impact of the strategies implemented by companies depend on the type of products and materials involved; on the other hand, the range of strategies available for companies relies on current technologies and on the capability to overcome their limits. For example, aluminum is a highly recyclable material, and, in Europe, aluminum products already have, on average, 52% recycled content (Vaders 2017); in this light, companies should be appreciated when exceeding this threshold, instead of being content with the status quo.

Accordingly, we give an extra score for companies that are beyond average within each industry. Specifically, we use a linear scale between 0 and 10 to measure the distance between companies within each industry, along each KPI of the business model and production process; we then translate this measure into a score that is scaled by both the dispersion of scores and the weight of each KPI and pillar.

Consistency

The transformation awaiting companies is complex and requires long-term investments and efforts; hence, companies should be given merit for taking actions consistent in time and purpose. To this objective, the final dimension of our framework evaluates the consistency of a company's operations from three perspectives: the yearly evolution of the actions taken to convert the production process and the business model, and the year over year relative change, versus industry, in the amount of waste produced. While the first two components of this KPI express the commitment of companies to step up their efforts, the change in waste generation indicates the degree of coherence in the actions taken. Precisely, the objectives of closing the loop for products and resources, and of extracting the most value from them at every stage, should be pursued alongside the goal of simply avoiding the production of waste. It should be noted that the evaluation of waste-avoidance initiatives would ideally belong to the valuation of waste management practices, as suggested, among others, by the European Commission (2022b), which classifies them as top priority in the context of the EU waste directive; however, the information published by companies does not currently suffice to determine the amount of waste generated per unit of input used, and we therefore prefer to limit this analysis to an assessment of quality improvement.

Putting our framework to work

The diagram in Figure 18 shows our framework in its entirety and maps how each metric, KPI and pillar contributes to the final Circularity Score; in the appendix we further share a case study of how this works in practice for a company in our investment universe.

KPI	Metric	Score	KPI Score	Industry Weight	Pillar Score	Pillar Weight	Final score
INPUT	Reused	10	Input score	40%	Production process score	65%	Circularity Score
	Recycled	9					
	Renewable & Sustainable	7.5					
PRODUCT DESIGN	Adaptability	8	Product design score	20%			
	Biological Cycle	10					
	Circular inputs	10					
	Disassembly, Recycling	8					
	Durability, Reliability	5					
	Resource Saving, Pollution Prevention	6					
WASTE	Reuse / Cascade	9.5	Waste score	20%			
	Anaerobic Digestion, Composting	8.5					
	Recycle	6.5					
PACKAGING	Recycled Input	10	Packaging score	20%			
	Renewable & Sustainable Input	8					
	Design for Reuse	10					
	Design for Composting	9					
	Design for Recycling	8					
PRODUCT MANAGEMENT	T/B Reuse	10	Product management score	30%	Business model score	25%	
	T/B Repair, Remanufacturing	8.5					
	T/B Recovery, Recycling	7					
	Sharing	10					
	Service Programs	10					
PACKAGING MANAGEMENT	T/B Reuse	10	Packaging management score	30%			
	T/B Recycling	7					
REGENERATIVE, LOCAL & COL-LABORATIVE VALUE CHAINS	Management of Inputs	10	Regenerative, local & collaborative value chains score	40%			
	Management of Products	10					
	Management of Waste	10					
	Management of Packaging	10					
QUALITY	Percentage of measurable and exhaustive data		Disclosure Score	25%	Quality score	10%	
	Performance versus Industry peers		Leadership Score	50%			
	Progresses through time		Consistency Score	25%			

QUALITY ASSESSMENT

Looking at the diagram from left to right, we start from the collection of data from company reports, which include sustainability reports, financial statements and additional information made available by companies on their corporate website. We have developed a taxonomy of keywords that guides the quick identification of pertinent sections in the text, which we then analyze in detail to categorize and extract relevant information for each metric in our framework. This process should ideally involve the collection of raw data but, due to the current lack of reporting standards, it requires in many cases the combination and elaboration of different data points. It is also worth noting that we express all metrics as percentages of the total for each corresponding KPI, as shown in Table 1.

Figure 18: Eurizon Circular Economy Scoring Framework

Table 1:
Unit of measurement

KPI	Metric	Unit of measurement
INPUT	Reused	% of total material input
	Recycled	
	Renewable & Sustainable	
PRODUCT DESIGN	Adaptability	% of revenues
	Biological Cycle	
	Circular Inputs	
	Disassembly, Recycling	
	Durability, Reliability	
	Resource Saving, Pollution Prevention	
WASTE	Reuse / Cascade	% of waste
	Anaerobic Digestion, Composting	
	Recycle	
PACKAGING	Recycled Input	% of input in packaging
	Renewable & Sustainable Input	
	Design for Reuse	% of packaging
	Design for Composting	
	Design for Recycling	
PRODUCT MANAGEMENT	T/B Reuse	% of revenues
	T/B Repair, Remanufacturing	
	T/B Recovery, Recycling	
	Sharing	
	Service Programs	
PACKAGING MANAGEMENT	T/B Reuse	% of packaging
	T/B Recycling	
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	% of Inputs, normalized by weight of Inputs in Production Process
	Management of Products	% of Products, normalized by weight of Products in Production Process
	Management of Waste	% of Waste, normalized by weight of Waste in Production Process
	Management of Packaging	% of Packaging, normalized by weight of Packaging in Production Process

We then aggregate these metrics into KPIs that describe the Production Process and the Business Model, by applying scores between 0 and 10 that reflect the ability of each type of initiative to contribute to CE. The rationale of these scores is summarized in Table 2 and 3, where each of them is linked to the key concepts expressed earlier in this paper.

Table 2:
Rationale of scores used
for KPIs in Production Process

KPI	Metric	Rationale for score	Score
INPUT	Reused	Reuse preserves the highest value of products and requires no transformation process.	10
	Recycled	Recycling maintains materials in use and requires much less processing than production from raw materials; nonetheless, it is an energy consuming process that often reduces the quality of materials.	9
	Renewable & Sustainable	Renewable inputs can reduce dependence on finite resources but must not be overexploited.	7.5
PRODUCT DESIGN	Adaptability	Design for adaptability is a complementary strategy that can make it possible to combine innovation with the extension of a product's life cycle.	8
	Biological Cycle	Ensuring that components in the biological cycle can be safely returned to the soil is a key to unlock the restoration of natural capital.	10
	Circular Inputs	Design products for reused, recycled and renewable inputs is a core strategy to enable a circular flow of materials.	10
	Disassembly, Recycling	Design for disassembly and recycling is an enabling strategy that facilitates the effective recovery of components and materials.	8
	Durability, Reliability	Design for durability and reliability is a basic strategy for reducing waste and extracting the most value from employed resources, but efforts in this direction can sometimes be misrepresented.	5
	Resource Saving, Pollution Prevention	Design for resource saving and pollution prevention is a basic strategy for reducing the impact of a product's use.	6
WASTE	Reuse / Cascade	Reuse of technical materials and cascading of biological resources retain the most value.	9.5
	Anaerobic Digestion, Composting	Anaerobic Digestion and Composting make it possible to return nutrients to the soil, while producing renewable energy.	8.5
	Recycle	Recycling involves an energy-consuming process and a progressive loss of value.	6.5
PACKAGING	Recycled Input	Recycling maintains materials in use and requires much less processing than production from raw materials.	10
	Renewable & Sustainable Input	Renewable inputs can reduce dependency on finite resources but must not be overexploited.	8
	Design for Reuse	Reuse of packaging is expected to have the greatest environmental benefit.	10
	Design for Composting	Compostable packaging is a secondary option because it involves the processing of raw materials and its decomposition often requires infrastructures that are not yet at scale.	9
	Design for Recycling	Recycling of packaging is a key to maintaining materials in use.	8

Table 3:
Rationale of scores used
for KPIs in Business Model

KPI	Metric	Rationale for score	Score
PRODUCT MANAGEMENT	T/B Reuse	Resale allows direct reuse and therefore preserves the highest value of products.	10
	T/B Repair, Remanufacturing	Repair and remanufacturing require a level of intervention that make them intermediate options between Resale and Recovery & Recycling.	8.5
	T/B Recovery, Recycling	When more value-preserving options prove unfeasible, Recover & Recycling still contribute to closing the circle of materials.	7
	Sharing	Sharing can reduce the need for new products and extend their useful life.	10
	Service Programs	Service programs, where the producers keep ownership of products, can facilitate the circular flow of materials.	10
PACKAGING MANAGEMENT	T/B Reuse	Reuse preserves the highest value of packaging.	10
	T/B Recycling	When reuse proves unfeasible, recycling still contributes to closing the circle.	7
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	Strategies that move from zero to positive impact accelerate CE and the regeneration of Natural Capital.	10
	Management of Products		10
	Management of Waste		10
	Management of Packaging		10

We consider the transparency, innovation and coherence of the actions taken as necessary conditions for the transition to Circular Economy

In Product Design and Packaging, metrics describe properties that can coexist in the same item: products can both be designed for disassembly and for circular inputs and, in some industries, for all purposes at once; likewise, packaging can be made of circular inputs and be designed to be first reused and then recycled. Consequently, we compute the Product Design and Packaging KPI by rescaling by the maximum score obtainable in each specific industry.

From the KPIs calculated in the previous step we obtain the Production Process and Business Model pillars, using weights that indicate the relative contribution of each KPI to effectively reverse the exploitation of NC and reduce waste and pollution. We set these weights at the industry level, as the relative impact depends on the type of business and on products and materials involved. For instance, we give a weight of zero to packaging whenever it can be considered irrelevant, such as in the case of Homebuilding companies; likewise, waste management and reduction initiatives can have a greater impact in the production of Specialty Chemicals, as opposed to Soft Drinks, and we hence set a higher weight to the Waste KPI in the former case than in the latter.

The Quality pillar follows a different path. In this case, the three underlying KPIs are obtained using formulas that combine cross-sectional and time-series information in the other two pillars. Specifically, the Disclosure score evaluates the percentage of metrics available for a company, relative to the set of metrics proposed by our framework; the Leadership score is a weighted average of the within-industry percentiles of each KPI in the Production Process and Business Model pillars, with weights equal to the weight of each KPI in the industry; lastly, the Consistency score indicates the evolution in time of the Production Process and Business Model scores, and of the relative level of waste produced. We then combine these three KPIs to obtain the Quality score by giving a 25% weight to both Disclosure and Consistency and the remaining 50% to Leadership, as it is the most tangible indicator of a company's commitment to go beyond the efforts of peers.

In the last step, each pillar contributes to the Circularity Score with a weight that reflects its materiality in the transformation awaiting companies. Precisely, we give a weight of 65% to the Production Process, which is consistent with our belief that CE can only be achieved by rethinking the way materials are procured and by changing how products are designed and produced. The Business Model is nonetheless important and has a 25% weight in our framework, because it is the key that unlocks the possibility to ensure that products, materials and components can be maintained in use, through the cooperation with distributors, suppliers and consumers. The last 10% goes to Quality: though this dimension does not have a direct impact on the flow of materials, we consider the transparency, innovation and coherence of the actions undertaken as necessary conditions for the transition from linear to circular economy.

3.1 Evidence from a Global Equity Index

The framework presented in this paper offers a tool to categorize the information published by companies regarding the steps taken towards CE; however, two questions arise: how much information do public companies currently disclose and what is their degree of circularity? In this section, we provide an answer, by presenting the result of the analysis of a sample of Core Circular companies in a global equity index, where we use the data we collected from public company reports, concerning fiscal year 2021.

Sector Name	High Circularity Potential	Included in Analysis
Energy		
Materials	x	●
Industrials	x	●
Consumer Discretionary	x	●
Consumer Staples	x	●
Health Care	x	
Financials		
Information Technology	x	●
Communication Services		
Utilities		
Real Estate		

Table 4: Selection of sectors with high potential for Core Circular companies (internal elaborations)

For the purpose of this analysis, we restrict our attention to sectors with high potential for CE; in detail, we expect that circular Business Models and Production Processes can bring the most material contribution to the reduction of waste and pollution, and to the restoration of NC, in sectors highly dependent on raw materials, and with a market for physical products. As presented in Table 4, this excludes the Energy, Financials, Communication Services, Utilities and Real Estate sectors from our sample. We further eliminate the Health Care sector from our sample, because we expect companies in this market to face safety and perception barriers to the application of CE principles, such as the promotion of recycling and extended-use initiatives to medical implants. We finally eliminate selected industries or companies that do not comply with either of the two criteria; for instance, this is the case of Human Resource and Employment Service companies in the Industrials sector, and of companies that offer Education Services. This provides a sample of 470 companies, distributed as in Table 5.

Table 5: Sample Structure

Sector Name	Number of companies in the sample
Materials	75
Industrials	119
Consumer Discretionary	111
Consumer Staples	92
Information Technology	73
Total	**470**

We begin by observing, in Table 6, that about 14% of companies in the sample provide no relevant data, with a pattern that sees Industrial and Information Technology firms as the bottom performers. The cause is either that they do not currently publish any information regarding their sustainability performance, or that, though they offer a narrative description of their steps, they fail to provide any measurable indicator. These percentages imply that the results presented here may partially under-estimate the actual range of actions undertaken by companies, and also confirm the need to improve communication between companies and investors, and more generally, all stakeholders.

Table 6: Percentage of companies with no data

Sector Name	Percentage of companies with no data
Materials	6.67%
Industrials	24.37%
Consumer Discretionary	10.81%
Consumer Staples	5.43%
Information Technology	19.18%
Total	**13.83%**

Despite limitations, the circular transition has begun, and a significant number of companies are providing useful data. This can be seen in Table 7, where we show the availability of data, for each metric of the Production Process and Business Model: all dimensions find application across the analyzed sample, which validates the feasibility of the proposed method to estimate the degree of circularity of companies. It is also worth mentioning that waste management is by far the area where companies offer the greatest transparency, with 74% of the sample reporting data on waste recycling and 22.1% disclosing reuse initiatives. Concerning Inputs, 27.9% of companies report some percentage of recycled materials, and 13% publish data on the sustainable procurement of renewable resources; reuse is a less mentioned option, disclosed only in 3.8% of the cases. Packaging is a popular topic among companies, which is in line with the increased public attention towards achieving sustainability in this field; however, though about one fifth of the sample discloses the use of recycled inputs and of recycling principles in design, only 6.6% can be evaluated on reuse criteria. The transformation of the Business Model is receiving less attention, but it is nonetheless important to underline that several companies have begun to take measurable steps, especially with regard to product take back.

Table 7:
Percentage of disclosure by metric

KPI	Metric	Percentage of companies in sample that disclose measurable data
INPUT	Reused	3.8%
	Recycled	27.9%
	Renewable & Sustainable	13.0%
PRODUCT DESIGN	Adaptability	0.6%
	Biological Cycle	1.3%
	Circular Inputs	12.6%
	Disassembly, Recycling	10.9%
	Durability, Reliability	2.6%
	Resource Saving, Pollution Prevention	10.9%
WASTE	Reuse / Cascade	22.1%
	Anaerobic Digestion, Composting	3.8%
	Recycle	74.0%
PACKAGING	Recycled Input	21.5%
	Renewable & Sustainable Input	10.9%
	Design for Reuse	6.6%
	Design for Composting	1.3%
	Design for Recycling	22.1%
PRODUCT MANAGEMENT	T/B Reuse	6.2%
	T/B Repair, Remanufacturing	6.6%
	T/B Recovery, Recycling	10.2%
	Sharing	1.9%
	Service Programs	1.9%
PACKAGING MANAGEMENT	T/B Reused	4.9%
	T/B Recycling	1.9%
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	4.0%
	Management of Products	2.6%
	Management of Waste	0.0%
	Management of Packaging	0.2%

Table 8 depicts how the actions disclosed by companies vary across sectors. For instance, the use of recycled inputs exceeds 40% in Materials and Consumer Discretionary, while Consumer Staples companies display the highest attention towards recycling and recyclability of packaging, but lag behind in the usage of recycled materials for products.

Table 8:
Percentage of disclosure by metric and sector

KPI	Metric	Materials	Industrials	Consumer Discretionary	Consumer Staples	Information Technology
INPUT	Reused	4.0%	3.4%	2.7%	3.3%	6.8%
	Recycled	41.3%	25.2%	45.9%	5.4%	19.2%
	Renewable & Sustainable	21.3%	2.5%	21.6%	16.3%	4.1%
PRODUCT DESIGN	Adaptability	0.0%	0.0%	1.8%	0.0%	1.4%
	Biological Cycle	2.7%	0.0%	0.0%	4.3%	0.0%
	Circular Inputs	17.3%	7.6%	27.0%	3.3%	5.5%
	Disassembly, Recycling	10.7%	6.7%	27.0%	0.0%	6.8%
	Durability, Reliability	2.7%	0.8%	3.6%	0.0%	6.8%
	Resource Saving, Pollution Prevention	10.7%	13.4%	8.1%	9.8%	12.3%
WASTE	Reuse / Cascade	28.8%	12.6%	19.9%	29.9%	26.0%
	Anaerobic Digestion, Composting	8.5%	0.0%	1.7%	9.2%	0.0%
	Recycle	81.3%	66.4%	75.7%	77.2%	72.6%
PACKAGING	Recycled Input	8.0%	5.0%	30.6%	50.0%	12.3%
	Renewable & Sustainable Input	0.0%	2.5%	17.1%	22.8%	11.0%
	Design for Reuse	2.9%	5.0%	8.4%	13.4%	2.7%
	Design for Composting	1.1%	0.0%	0.6%	4.0%	0.0%
	Design for Recycling	2.7%	5.9%	23.4%	65.2%	12.3%
PRODUCT MANAGEMENT	T/B Reuse	1.3%	5.0%	12.6%	1.1%	9.6%
	T/B Repair, Remanufacturing	0.0%	10.9%	9.0%	0.0%	11.0%
	T/B Recovery, Recycling	2.7%	9.2%	17.1%	3.3%	17.8%
	Sharing	0.0%	0.0%	7.2%	0.0%	1.4%
	Service Programs	0.0%	7.6%	0.0%	0.0%	0.0%
PACKAGING MANAGEMENT	T/B Reuse	6.7%	4.2%	0.9%	8.7%	5.5%
	T/B Recycling	0.0%	0.8%	0.0%	7.6%	1.4%
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	5.3%	0.8%	4.5%	8.7%	1.4%
	Management of Products	0.0%	3.4%	1.8%	4.3%	2.7%
	Management of Waste	0.0%	0.0%	0.0%	0.0%	0.0%
	Management of Packaging	0.0%	0.0%	0.0%	0.0%	1.4%

The existence of a variety of approaches to CE is even more evident at the industry level, as portrayed in Table 9, where we provide statistics for three industries of the Industrial sector.

Table 9:
Percentage of disclosure by metric and Industry

KPI	Metric	Construction Machinery	Agricultural & Farm Machinery	Industrial Machinery
INPUT	Reused	7.7%	25.0%	2.8%
	Recycled	15.4%	25.0%	11.1%
	Renewable & Sustainable	0.0%	0.0%	0.0%
PRODUCT DESIGN	Adaptability	0.0%	0.0%	0.0%
	Biological Cycle	0.0%	0.0%	0.0%
	Circular Inputs	15.4%	25.0%	0.0%
	Disassembly, Recycling	15.4%	0.0%	2.8%
	Durability, Reliability	0.0%	0.0%	0.0%
	Resource Saving, Pollution Prevention	15.4%	75.0%	8.3%
WASTE	Reuse / Cascade	23.1%	25.0%	8.3%
	Anaerobic Digestion, Composting	0.0%	0.0%	0.0%
	Recycle	61.5%	75.0%	72.2%
PACKAGING	Recycled Input	0.0%	25.0%	8.3%
	Renewable & Sustainable Input	0.0%	0.0%	0.0%
	Design for Reuse	7.7%	25.0%	2.8%
	Design for Composting	0.0%	0.0%	0.0%
	Design for Recycling	0.0%	0.0%	8.3%
PRODUCT MANAGEMENT	T/B Reuse	15.4%	0.0%	2.8%
	T/B Repair, Remanufacturing	38.5%	50.0%	0.0%
	T/B Recovery, Recycling	15.4%	0.0%	2.8%
	Sharing	0.0%	0.0%	0.0%
	Service Programs	30.8%	0.0%	0.0%
PACKAGING MANAGEMENT	T/B Reuse	0.0%	50.0%	0.0%
	T/B Recycling	0.0%	0.0%	0.0%
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	0.0%	0.0%	0.0%
	Management of Products	7.7%	0.0%	0.0%
	Management of Waste	0.0%	0.0%	0.0%
	Management of Packaging	0.0%	0.0%	0.0%

The Business Model case is emblematic: a significant number of companies in the Construction Machinery, and in the Agricultural and Farm Machinery industries are implementing repair and remanufacturing programs, but this practice has not yet taken off in the Industrial Machinery industry; similarly, packaging take-back currently finds application only in the Agricultural and Farm Machinery industry.

This analysis confirms the necessity of taking into account the specific characteristics, opportunities and challenges of each category of business, which is something that we do, by setting KPI weights at the industry level. Also, the data disclosed indicate which categories of actions are currently implemented and, therefore, provide a preliminary answer to the second question, concerning the degree of circularity of companies: it appears that companies are currently focused on the management of inputs, waste and packaging, while initiatives involving the design of products and the definition of new models of business are still in their infancy.

Table 10: Average Scores

Sector Name	Production Process Score	Business Model Score	Quality Score	Circularity Score
Materials	0.985	0.036	2.502	0.899
Industrials	0.590	0.133	2.562	0.673
Consumer Discretionary	0.870	0.046	2.996	0.877
Consumer Staples	1.092	0.071	2.830	1.011
Information Technology	0.248	0.048	2.200	0.393
All Companies in Sample	**0.785**	**0.069**	**2.662**	**0.794**

Table 10 finally completes this picture, by showing the Circularity Score and the scores at the three Pillar levels obtained by companies that publish any data. On a scale between 0 and 10, the average Circularity Score is 0.794, and stems mainly from changes in the Production Process and, partially, from the Quality of the initiatives undertaken. Consumer Staples companies are leading the way, with a 1.09 in Production Process and 0.07 in Business Model, followed by the Materials sector. These findings support those of the Circularity Gap Reporting Initiative (2023) in that further major steps are needed; moreover, they confirm the opportunity of using our framework in two ways: first to identify the leaders of this transition, which we expect will benefit from a competitive advantage, and, second, to engage companies in constructive and informed conversations on the need to embrace CE practices.

3.2 Our investment strategy

At the beginning of this paper, we stated our belief that it is part of our fiduciary duty to take an active role in the transition towards CE, and that this implies not only engaging companies towards CE, but also integrating the implications of the shift to a Circular Economic Model into our investment decisions. So far, we have shown that our framework offers a viable tool that applies to both tasks; in this final section we provide an example of how CE investments can be put into practice. Precisely, we describe the investment approach that we adopt in some of our products with a CE focus.

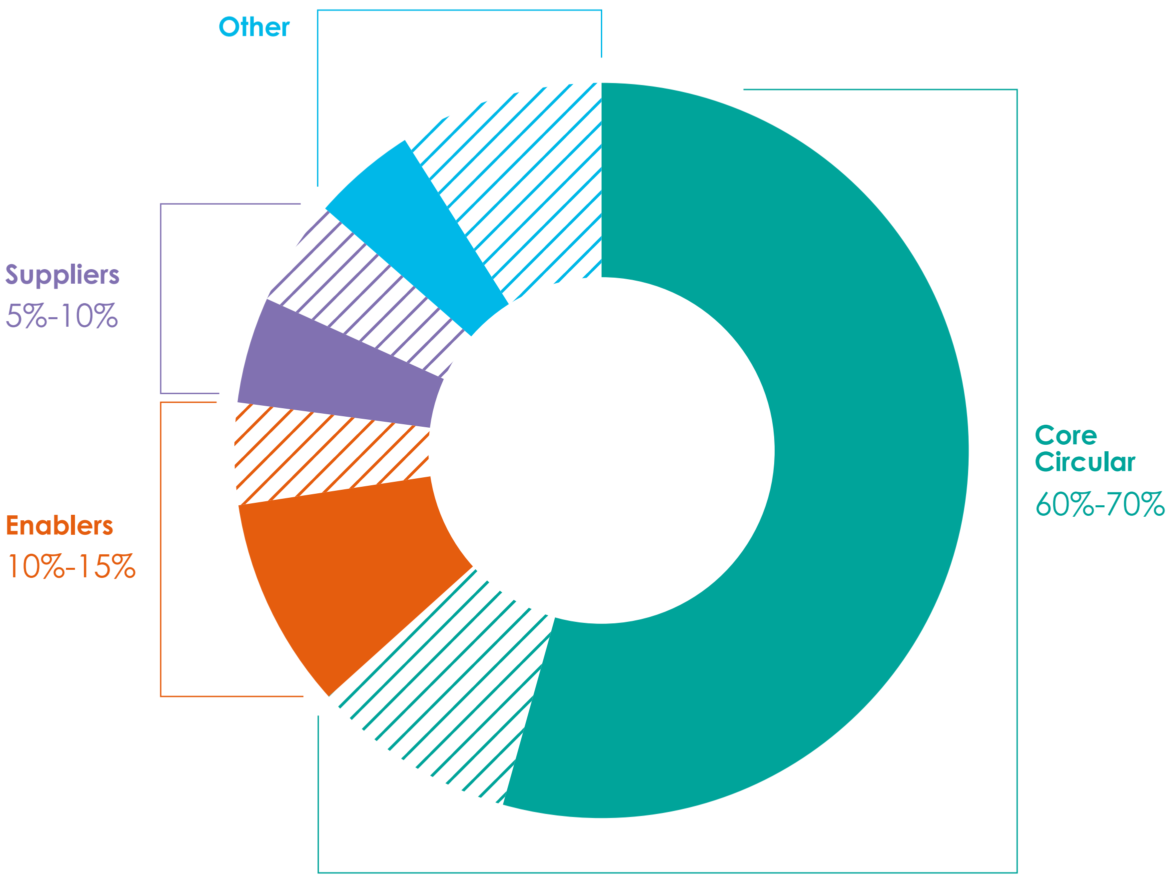
In this kind of products we invest in companies that, in various ways, are contributing to bringing CE to scale and that, in so doing, are gaining a competitive advantage. As aforementioned, we recognize that the shift to CE requires the contribution of three key players: first and foremost, Core Circular companies that embrace CE principles across their production process and business model; second, Enablers that facilitate the reduction of waste and pollution and the preservation of finite resources, as in the case of waste-management companies and renewable energy producers; finally, Suppliers that provide key goods and services for the transition, such as electric vehicle batteries. These categories are non-exclusive, meaning that Suppliers can also be Enablers: for instance, renewable energy producers often also produce storage batteries for both own use and sale; moreover, we expect to see more and more Enablers and Suppliers embracing circular principles in the context of their business.

We invest in companies that are contributing to bringing Circular Economy to scale and that, in so doing, are gaining a competitive advantage

We further acknowledge a fourth category of Other companies that, due to technological or structural reasons, currently have limited capabilities to switch to CE in their operations; as an example, Life and Health Insurance companies have limited scope for integrating CE principles in their services. Despite constraints, these companies need nonetheless to adapt to and support the transition.

Figure 19 portrays how we allocate investments to these categories, and highlights our view that all businesses are involved, though they differ in their impact and socio-economic relevance.

Figure 19: Portfolio allocation between categories of companies



Within each of these four categories, we then pinpoint companies that can lead the transition. This process has two dimensions: the evaluation of the initiatives undertaken, and the appraisal of how companies manage their activities, so as to sustain and increase their profitability in the medium-long term. Regarding the former dimension, the framework presented in previous pages guides the selection of Core Circular companies; the categorization of Enablers and Suppliers focuses, instead, on the type and relevance of products and service offered, which rests on both proprietary analysis and data obtained from specialized data providers. Finally, we grade Other companies based on a set of proprietary metrics that evaluate their capability to operate sustainably in a CE.

Regarding the latter dimension, we evaluate the fundamental and overall ESG profile of companies, and in this activity we leverage the proprietary measures of Free Cash Flow and ESG Risk, which characterize our range of investment funds.

Finally, we use an optimization approach to maximize exposure to the leaders of the transition within each category, while controlling for unintended sources of risk.

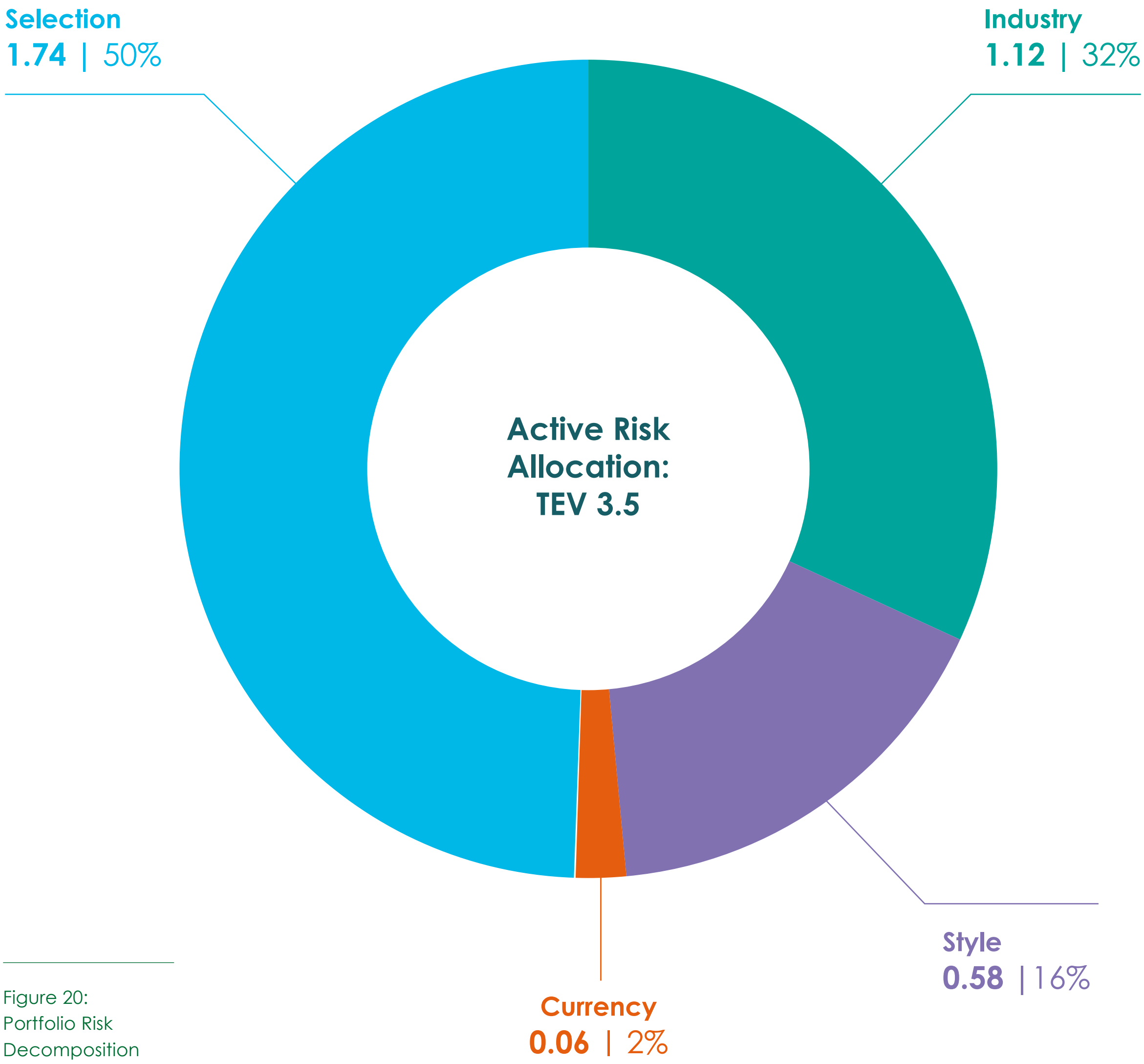


Figure 20:
Portfolio Risk
Decomposition

Figure 20 provides a snapshot of the typical risk allocation resulting from this process: security selection generates about 50% of the total active risk, which is in line with the goal of maximizing exposure to companies that are making a significant contribution to CE. Table 11 finally shows that the portfolio scores higher than the benchmark in all circularity metrics; moreover, it offers higher cash flows and better exposure to ESG issues.

Table 11: Portfolio Information. Data as of March 2022

Score	Global Equity Index	Portfolio	Portfolio VS Benchmark
Circularity Score	0.77	1.47	90.1%
Supplier Score	0.22	0.28	26.8%
Enabler Score	0.29	1.12	287.9%
Free Cash Flow Yield	3.85%	5.60%	45.5%
Eurizon ESG Risk Score	5.60	5.94	6.1%

Circularity scores for portfolio and benchmark are computed on analyzed companies

We expect that this approach to portfolio construction can offer a way to increase the value of investment over time, while also contributing to rebuilding a positive relationship between the Economic System and the Natural Environment.

3.3 Limitations and future directions

This work stems from our commitment to play our part to accelerate the transition to CE, and presents our approach to identify the steps taken by companies in this transformation, as it stands today. As such, it has three main limitations.

First, the granularity of the metrics that we propose is shaped by the level of detail offered by company reports but should be improved to obtain a more precise representation of the impact of CE initiatives. This is especially true for metrics in the Input and Waste KPIs. Regarding inputs, we currently adopt three broad categories, renewable, recycled and reused, which should be further divided by type of material, to account for the specific problems inherent in the use of each fiber, metal, polymer or other matter. Likewise, we categorize waste by method of treatment, but a more accurate picture would be obtained by measuring waste by type and disposal; moreover, as aforesaid, the waste KPI should also measure improvements in the amount of waste generated per unit of input. Though we have already begun to collect this level of information, data is scarce and incomplete, but we expect significant improvements, as companies and regulators move forward in the definition of a common language. In particular, the development of the EU Taxonomy for Sustainable Activities offers a big opportunity in this direction, and we hope the regulator will provide specific guidance for the reporting of consistent data for the input-output analysis of material flows.

Second, the scores we assign to each metric reflect the current status of technology and the efficacy of each option; yet, these scores cannot be used as fixed parameters, but should rather evolve as new knowledge becomes available. By way of illustration, we give a score of 5 to design for durability and reliability, as efforts in this direction are not easily quantifiable and can often be misrepresented; however, we will increase this number as soon as new technologies become available that provide measurable and demonstrated improvements in the quality and longevity of products.

Finally, we define how each KPI contributes to the corresponding Pillar score by using weights set at the industry level. This approach makes it possible to discriminate between different classes of business but disregards the uniqueness of each company. An example is offered by the Accessories and Luxury industry, where we find both companies that derive almost all their revenues from the watches and jewelry segment and diversified companies, with minimal or no presence in this product category. An even better result could, therefore, be obtained by setting weights at the company level, so as to reflect the actual relevance of each dimension in a company's production process and business model.

4

Conclusions

While the world is approaching a tipping point on climate change and environmental degradation, CE is emerging as an alternative and sustainable economic model, which offers a path to decouple economic prosperity from the consumption of finite resources. As businesses and institutions are starting to embrace Circularity, asset managers have a fiduciary duty to engage companies in the transition and to integrate CE considerations into investment decisions. The challenge is the current lack of shared KPIs to measure circular activities and to open a dialogue between investors and businesses. In this work we propose a framework to categorize and evaluate the steps taken by companies, along three directions: the degree of circularity of the Production Process, the degree of circularity of the Business Model and the Quality of the actions undertaken. Our framework aims at providing a feasible and adaptable method to identify the companies that are leading the way on circularity, and also at offering a vocabulary to build a constructive dialogue on areas of improvement.

Our framework provides a feasible and adaptable method to identify the companies that are leading the way on circularity

In this work we show a practical application of our framework to companies in a Global Equity Index that operate in sectors highly dependent on raw materials, and with a market for physical products, which we expect to have the highest potential for Circularity. Results indicate that the transition to CE is still unfolding: (i) company's initiatives have so far prioritized the transformation of the Production Process, through changes in input, waste management and packaging practices, while less attention has been directed to the application of new Business Models; (ii) in a scale between 0 and 10, companies in our sample have an average circularity score of 0.794. We conclude that there is an opportunity for investors to take an active role in accelerating the transition, and we show that CE investments do not require a compromise on the expected financial profitability of companies, and on their overall sustainability profile.

Appendix

Below we provide an application of our framework to a technology company, operating in the personal system and printing market, hereafter company Z. Data are obtained from the company's 10-K 2021 and from its Sustainable Impact Report 2021.

As shown in Figure A.1, the company has taken initiatives both in relation to the Production Process and the Business Model. Precisely, recycled materials represent about 14.9% of Z inputs and sustainably sourced renewable materials add up to another 23.8%, and approximately the same percentages apply to inputs used in packaging. Regarding Waste, the company recycles about 50% of what it discards; the remaining goes to landfill or incineration and therefore does not contribute to the circularity score. Z has also implemented a take-back program, thanks to which 12.5% of the sold products are recycled, 4.1% repaired and 1.4% sold again as used items. Finally, Z compensates part of the footprint caused by Z and non-Z paper used in its products and print services, which counts towards achieving circularity across the value chain.

Figure A.1: Circularity Score of Company Z

For illustrative purposes

KPI	Metric	Percentage	Score	KPI Score	Industry weight	Pillar Score	Pillar Weight	Final Score
INPUT	Reused	0.0%	10	INPUT SCORE 3.13	45%	PRODUCTION PROCESS SCORE 1.59	65%	1.72
	Recycled	14.9%	9					
	Renewable & Sustainable	23.8%	7.5					
PRODUCT DESIGN	Adaptability	0.0%	8	PRODUCT DESIGN SCORE 0.00	42%			
	Biological Cycle	0.0%	10					
	Circular Inputs	0.0%	10					
	Disassembly, Recycling	0.0%	8					
	Durability, Reliability	0.0%	5					
	Resource Saving, Pollution Prevention	0.0%	6					
WASTE	Reuse /Cascade	0.0%	9.5	WASTE SCORE 3.26	3%			
	Anaerobic Digestion, Composting	0.0%	8.5					
	Recycle	50.1%	6.5					
PACKAGING	Recycled Input	14.4%	10	PACKAGING SCORE 0.74	10%			
	Renewable & Sustainable Input	23.8%	8					
	Design for Reuse	0.0%	10					
	Design for Composting	0.0%	9					
	Design for Recycling	0.0%	8					
PRODUCT MANAGEMENT	T/B Reuse	1.4%	10	PRODUCT MANAGEMENT SCORE 1.36	48%	BUSINESS MODEL SCORE 0.73	25%	
	T/B Repair, Remanufacturing	4.1%	8.5					
	T/B Recovery, Recycling	12.5%	7					
	Sharing	0.0%	10					
	Service Programs	0.0%	10					
PACKAGING MANAGEMENT	T/B Reuse	0.0%	10	PACKAGING MANAGEMENT SCORE 0.00	12%			
	T/B Recycling	0.0%	7					
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	0.0%	10	REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS SCORE 0.18	40%			
	Management of Products	1.44%	10					
	Management of Waste	0.00%	10					
	Management of Packaging	0.35%	10					
QUALITY	Percentage of measurable and exhaustive data			DISCLOSURE SCORE 6.29	25%	QUALITY SCORE 5.05	10%	
	Performance versus Industry peers			LEADERSHIP SCORE 4.70	50%			
	Progresses through time			CONSISTENCY SCORE 4.53	25%			

It is worth noting that not all metrics are directly available in the company's report. For instance, the 1.4% in product-take back for resale is obtained by combining information in both the Income Statement and the Sustainability Report, as illustrated in Figure A.2

For illustrative purposes

Figure A.2:
Derivation of the percentage of products taken back and resold by Z in 2021

Source: Z 2021 Form 10-k

	2021
Net revenue:	
Notebooks	$ 30,522
Desktops	9,381
Workstations	1,669
Other	1,787
Personal System	43,359
Supplies	12,632
Commercial	4,209
Consumer	3,287
Printing	20,128
Corporate Investments	3
Total segment net revenue	63,490
Other	(3)
Total net revenue	$ 63,487

For example, in order to derive the **percentage of recovered and resold products** you need:

1. The **percentage of hardware products recovered** for 2021 by Z, Derived from the Sustainability Report, equal to 6.8%
2. The **percentage of hardware recovered and resold** out of the total recovered:

   2.15 / (2.15 + 6.29) = 25.5%
3. The 2021 **percentage hardware** sales can be deducted from the 10-k

   (63,487 - 12,632) / 63,487 = 80.1%
4. Using this information, the percentage of recovered and resold products to total sales can be calculated as

   6.8% * 25.5% * 80.1% = 1.4%

Source: Company Z Sustainable Impact Report 2021

Progress in 2021

6.29 million units of hardware repaired (35,300 tonnes)

2.15 million units of hardware reused (7,200 tonnes)

6.8% overall repair and reuse rate of relevant hardware sales worldwide

KPI	Metric	Percentage		Score		KPI Score			Industry weight		Pillar Score
PRODUCT MANAGEMENT	T/B Reuse	1.4%	x	10	Σ	PRODUCT MANAGEMENT SCORE	1.36	x	48%	Σ	BUSINESS MODEL SCORE 0.73
	T/B Repair, Remanufacturing	4.1%		8.5							
	T/B Recovery, Recycling	12.5%		7							
	Sharing	0.0%		10							
	Service Programs	0.0%		10							
PACKAGING MANAGEMENT	T/B Reuse	0.0%	x	10	Σ	PACKAGING MANAGEMENT SCORE	0.00	x	12%		
	T/B Recycling	0.0%		7							
REGENERATIVE, LOCAL & COLLABORATIVE VALUE CHAINS	Management of Inputs	0.0%	x	10	Σ	OPERATIONS, SUPPLY CHAIN & LOCAL MANAGEMENT SCORE	0.18	x	40%		
	Management of Products	1.44%		10							
	Management of Waste	0.00%		10							
	Management of Packaging	0.35%		10							

From these metrics we calculate the Production Process and Business Model KPIs, by applying the scores described in the methodology section, and we further derive the Quality KPIs as a combination of this information. In particular, Z discloses a relevant subset of data and is pursuing more innovative initiatives than its peers, and it is also taking consistent actions with both regard to the evolution of its Production Process and Business Model, and to the objective of reducing the amount of waste produced.

As previously described, the weights assigned to the Quality KPIs are fixed and are as follows: 25% to both Disclosure and Consistency and 50% to Leadership, which reflects our view that building a CE requires companies capable of going beyond the efforts of their competitors. The weights used for the Production Process and Business Model KPIs reflect, instead, the specific characteristics of the industry to which company Z belongs. In detail, we give a 10% weight to Packaging, as it plays a key role in this market, especially in protecting products. We then give a low weight to waste (3%) and a significantly higher weight to the design of products (42%), because in this industry, as well as in most industries related to electronic products, waste mostly happens at the consumption and post-consumption stage, and can only be prevented by creating products that can be adapted and used for longer, and whose components can be easily recovered (Bovea and Pérez-Belis 2018). In line with this idea, Product Management has a 48% weight in the Business Model, as companies need to take extended responsibility for their products, as set out in the European Directive 2012/19 on waste electrical and electronic equipment (European Commission 2012).

The Circularity Score resulting from these data and assumptions is 1.72, which suggests that Z should take further major steps towards CE; however, when compared to companies in a Global Equity Index, which currently have an average score of 0.794 (as reported in Table 10 in the paper), Z emerges as a potential leader of this transition.

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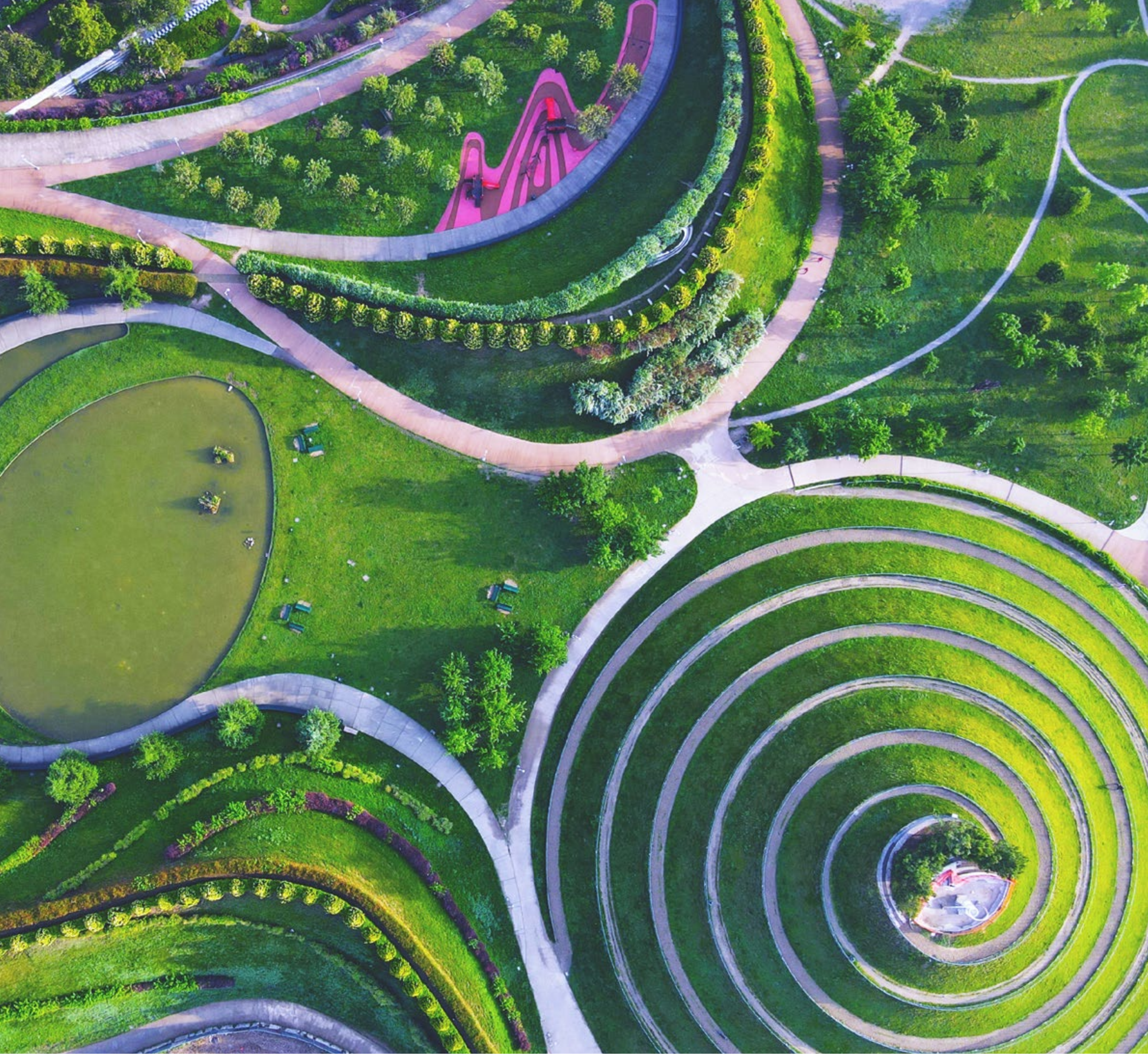

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September 2023