
Sustainability in the Evolution of Business Models: The Circular Economy

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doi.org/10.51505/IJEBMR.2026.10926 URL: <https://doi.org/10.51505/IJEBMR.2026.10926>

Received: Sep 10, 2026

Accepted: Sep 14, 2026

Online Published: Sep 24, 2026

Abstract

The current economic, environmental, and social context is constantly evolving and presents increasingly complex global challenges that require greater flexibility, creativity, adaptability, and dynamism in order to pursue sustainable development in the long term. From this perspective, it's crucial for companies to innovate not only the solutions they offer but also how these solutions are managed and processed, changing their business models. The concept of sustainability has had a profound impact on the evolution of business models over the past few decades, significantly contributing to the emergence of new paradigms, like the circular economy. This model represents a real revolution compared to the traditional linear economic model, which follows the take, make, consume, and throw away path. Circular economy, on the other hand, promotes creating long-term value by cutting down waste and making the most of resources. The paper will highlight exactly those aspects

Keywords: circular economy, history, businesses

1 Introduction

The current economic, environmental, and social landscape is constantly evolving, presenting increasingly complex global challenges that demand greater flexibility, creativity, adaptability, and dynamism to foster long-term sustainable development. In this context, it is crucial for businesses to innovate—not only regarding the solutions they offer but also in how those solutions are managed and processed—by transforming their business models. The concept of sustainability has profoundly influenced the evolution of business models over recent decades, contributing significantly to the emergence of new paradigms, such as the circular economy. This model represents a genuine revolution compared to the traditional linear economic model, which follows a "take-make-consume-dispose" trajectory. In contrast, the circular economy promotes long-term value creation by minimizing waste and maximizing resource utilization. For decades, the linear model has underpinned global economic growth. It consists of a sequence of actions with a clear beginning and end: starting with the use of raw materials to manufacture products or provide services, moving through the usage phase, and finally disposing of the remainder as waste at the end of the product's life cycle. However, our planet's resources are finite; consequently, the linear economic model disrupts the natural balance and ultimately

proves unsustainable. Over the years, it has become increasingly clear that this approach is unsustainable in the long term, due to:

- excessive exploitation of non-renewable natural resources;
- massive waste generation and pollution;
- intensive exploitation of the environment to fuel consumer demand;
- global population growth.

The growing demand for resources, combined with the planet's ecological limits, has made it evident that the linear model cannot continue to serve as the foundation for modern economies, driving the shift toward the circular economy model. The circular economy, by contrast, views the end as a new beginning, restarting the cycle. It is a model in harmony with nature's rhythms and respectful of the environment, enabling sustainable development with no time limits. It relies on a continuous cycle of reusing, repairing, recycling, and regenerating materials and products—rather than manufacturing new goods from virgin resources—and encompasses both production and consumption. It involves creating the products and services essential to our lives in a way that minimizes disruption to natural cycles, keeping items in circulation for as long as possible; in other words, it means doing more with what is already available by extending product lifecycles and minimizing waste. Once a product has fulfilled its function, its constituent materials are reintroduced into the production cycle through recycling (wherever possible), creating added value through new business models that use fewer raw materials and generate less waste and fewer emissions. Circular business models can be applied to every stage of a product's lifecycle through a systemic approach that links an ecosystem with diverse needs. In the context of the circular economy, starting with the design of the product or service is crucial to facilitating the subsequent stages of use and recovery. However, there is no single "100% circular" business model that every organization can adopt; instead, there are various options and combinations available to achieve circularity benefits. The circular economy emerges as a fundamental model for ensuring long-term sustainability by integrating social and environmental dimensions into the economic system.

2. The birth of the circular economy

The origins of the circular economy cannot be traced back to a specific moment in history or a single author.

The concept dates back to 1966, with the publication of the article "The Economics of the Coming Spaceship Earth" by economist Kenneth E. Boulding. He defined Earth as a spaceship with limited resources and possibilities, where humanity must make the best use of and carefully manage what has been made available to it in order to survive. Boulding raised public awareness regarding a type of "open economy" in which resources and products are limitless because they are continuously renewable contrasting it with the "closed economy" model, where resource exploitation is intrinsically linked to the economic process itself. This essay is considered the first formulation of the circular economy concept.

In 1971, American biologist and politician Barry Commoner wrote “The Closing Circle”, laying solid scientific and technical foundations for the theory underpinning the circular economy.

In 1976, Genevieve Reday-Mulvey and Walter Stahel presented a report to the European Commission titled “The Potential for Substituting Manpower for Energy.” The document outlined a vision for a circular economy, highlighting its principles and impact on the economic system: from job creation, production cost savings, and waste reduction to increased competitiveness.

The concept was termed a “cyclical economy,” characterized by drawing inspiration from self-regenerating natural systems, such as the water cycle. Stahel and Reday-Mulvey envisioned this new approach as a tool for restructuring the industrial system. It was at this point that the theories which would later become the core principles of the circular economy began to take shape.

In 1982, Stahel founded the Product-Life Institute in Geneva, an independent non-profit organization addressing sustainability strategies and policies to explore new circular systems. Its primary objective was to extend the service life of products—making goods last longer, reusing existing assets, and preventing waste. Stahel helped establish the initial concepts and “business models” of the Circular Economy, such as Product-as-a-Service (PaaS) and the concept of the Performance Economy.

In 2003, American architect William McDonough and German chemist Michael Braungart published the book *Cradle to Cradle*. Their theory aims to eliminate the very concept of waste, positing instead that “waste equals food.” It is a design philosophy that views all materials involved in industrial and commercial processes as nutrients capable of “returning to the cradle”—that is, to their origins—thereby nourishing a new life cycle. This milestone in circular economy thinking clearly and specifically delineates the distinction between the circular and linear economies, focusing on the difference between eco-efficiency and eco-effectiveness.

Since 2010, with the establishment of the Ellen MacArthur Foundation—the largest and most significant non-profit organization in this field—the concept has emerged as a guiding paradigm. The foundation actively works to foster the development of circular economy systems.

Operationally, the foundation pursues its mission on two main fronts: on one hand, it supports businesses and educational institutions as they navigate the green transition; on the other, it disseminates information on environmental sustainability to educate stakeholders through the publication of reports and resources, as well as the organization of events. Today, the Foundation focuses on three key areas to pursue its mission:

- thought leadership: as at its inception, the goal is to disseminate the ideas and principles of the circular economy to the general public, raising awareness among as many people as possible about the importance of an economic model that generates well-being for all;
- education: the aim is to inspire future generations and educate young people about an economic system that moves away from current practices. To this end, the Foundation is

committed to supporting public institutions and educators by providing appropriate educational materials;

- business: it works actively to translate the principles of this new model into economic reality.

According to the Ellen MacArthur Foundation, this model defines an economy designed to regenerate itself. In a circular economy, material flows fall into two categories: biological flows, which can be reintegrated into the biosphere, and technical flows, which are intended to be recovered and reused without entering the biosphere. The circular economy is therefore a system in which all activities—from extraction to production—are organized so that one party's waste becomes another's resource. The circular economy has now reached a mature stage and has become an integral part of the strategies adopted by the most forward-looking and sustainability-conscious companies. According to Roger Levett, economic rules must be defined by three dimensions—economic, social, and environmental—while promoting efficient resource management. This approach is based on fundamental principles summarized by the "5 Rs":

- Reduce: minimize consumption and waste;
- Recycle: give new life to waste materials;
- Reuse: view end-of-life products as resources rather than waste;
- Renew: repair damaged items instead of discarding them;
- Compost (Rot): transform organic materials into fertilizer and biofuels.

Furthermore, product design must be rethought to integrate products into a circular cycle right from the design phase. To fully implement the circular economy model, it is necessary to align with five fundamental principles:

1. Sustainable resources: the use of renewable energy sources and biodegradable, recyclable, or renewable materials;
2. Product-as-a-service: companies offer services rather than selling products, maximizing the utilization and lifespan of goods, thereby reducing waste and inefficiencies;
3. Sharing platforms: tools that facilitate sharing and collaboration between users (consumers) and owners (businesses), optimizing the costs of goods, services, and resources employed;
4. Extension of useful life: products designed to last longer, with options for repair and remanufacturing, thereby reducing environmental impact;
5. New life cycles: strategies aimed at preserving the value of an asset at the end of its life cycle through reuse, remanufacturing, and recycling practices.

A company's transition to the circular economy entails a range of benefits and challenges. Adopting the circular economy offers multiple benefits in terms of environmental, economic, and social sustainability, such as:

- Cost reduction: it enables a reduction in costs associated with raw material procurement and waste management. Resources are reused and recycled, creating a virtuous cycle of operational cost reduction. This results in financial savings for companies and citizens, as well as job opportunities driven by the creation of new markets and business models;
- Innovation and new business opportunities: companies can develop new business models—such as "product-as-a-service" (where customers lease or use the product as a service rather than purchasing it) or repair and remanufacturing models. These new models allow companies to diversify and enter new markets, boosting their competitiveness and enabling exponential growth;
- Resilience and long-term sustainability: enables companies to become less vulnerable to risks associated with natural resource scarcity and raw material price fluctuations;
- Image and reputation: businesses enhance their reputation, boosting consumer and investor confidence. The growing demand for sustainable products makes the circular economy a draw for consumers and stakeholders;
- Reduction of environmental impact: achieved through a decrease in waste and greenhouse gas emissions;
- Social benefits: a cleaner environment contributes to improved public health and quality of life.

Particularly in the wake of the COVID-19 pandemic, the circular economy has proven to be a driver of recovery for many organizations, enabling production activities to commit to sustainability and environmental stewardship—thereby securing a positive role within their operating communities and generating new business value.

Indeed, for businesses, adopting the circular economy is a choice that can drive new economic growth; it enables a more rational use of resources, extends product lifespans, and facilitates product refurbishment at the end of their use—all of which also lead to cost reductions. These principles can foster innovation in corporate business strategies and, among other benefits, enhance supply chain resilience by shortening supply chains and increasing their transparency.

However, the challenges associated with adopting the circular economy must also be considered. Specifically, these include:

- o Initial investments: transitioning to a circular model can entail significant upfront costs, particularly regarding product design, the creation of recycling infrastructure, and the management of material flows;
- o Cultural shift: companies must undergo a profound cultural shift, as the circular model requires rethinking how products, services, and business processes are designed and managed. Not all companies are prepared to embark on this journey;
- o Regulations and infrastructure: a lack of clear laws and regulations in certain regions, combined with inadequate infrastructure for recycling and material management, can hinder the transition to a circular economy.

The following table analyzes the challenges and opportunities of the circular economy across various economic and industrial sectors.

Sector	Opportunities and challenges for the circular transition Energy
Energy	• European goals for economic decarbonization. • Increased electricity generation from renewable sources. • Grid reorganization based on distributed generation principles. • Integration of new digital technologies into production, distribution, and consumption systems. • Development of integrated energy projects at the territorial level. • Adoption of smart, interactive, and regenerative energy resource models and systems (smart energy). • Initial adoption of circular solutions within business models that remain predominantly linear.
Agriculture	• Increased awareness of agriculture's environmental impacts. • Initial adoption of regenerative farming schemes. • Optimization of production cycles. • Dynamic development of the bio-economy. • Circular integration with other value chains (energy, textiles, etc.).
Chemical- Pharmaceutical	• Develops new materials and intermediate goods for all manufacturing sectors according to circularity principles. • Increases research and development activities to modify production processes to reduce environmental impacts and "close the loop" of the product life cycle. • Disseminates and transfers the results of research and development activities to other production sectors, providing them with the tools to convert their production processes to a circular approach. • Builds, implements, and develops circular supply chains based on the adoption of biotechnologies and the interaction between activities belonging to different economic and production sectors.
Food & Beverage	• Widespread focus on reducing food waste. • Reuse and valorization of production waste. • Integration and consolidation of supply and distribution chains. • Replacement of materials from non-renewable sources for packaging and combating overpackaging. • Increased integrated systems for exchanging materials and energy with other supply chains and production sectors.
Mechanical	• Redesign of production cycles and processes. • Reduction of material and energy consumption. • Increased use of recycled materials and reintroduction of manufacturing waste into production cycles. • Implementation of integrated supply chains and reverse logistics solutions. • Product redesign geared towards repair, regeneration, and reuse. • Combating planned obsolescence and extending life cycles. • Providing other sectors with technological solutions to increase the use of

	secondary raw materials. • Large-scale dissemination of experiences in the recovery, regeneration, and reuse of electrical and electronic consumer products.
Automotive	• Design and production of low-emission or zero-emission vehicles. • Redesign of production processes based on circular economy principles in the management of resources materials, energy, and waste. • Implementation of circular supply chains and reverse logistics systems. • Increased remanufacturing potential and applications. • Development and deployment of new business models based on servitization, sharing, and rental.
Building and Construction	• Rethinking urban planning, housing models, and building use (co-housing, sharing, etc.). • Reducing the ecological footprint of buildings (passive homes, insulation, solar roofs, water recycling, etc.). • Designing and constructing regenerative buildings. • Developing applications to increase the value and identification of materials. • Designing new materials from recycled aggregates. • Reusing, repurposing, and enhancing existing buildings.
Textiles, Clothing, Fashion	• Enhancement of industrial symbiosis supply chains for the recovery and reuse of materials in textile production. • Use of non-polluting and non-plastic materials (nylon and polyester) to prevent microfibers from entering the oceans. • Promotion of more efficient use of resources and renewable energy within production processes. • Increased lifespan of clothing, focusing on quality. • Development of commercial proposals through formulas that include the option of exchanging and returning unused clothing and accessories. • Development of systems for the reuse and recycling of finished goods, focusing on increasing consumer awareness and environmental ethics. • Interest in the circular economy among major fashion brands.
Tourism	• Social focus on an eco-sustainable and socially responsible tourism offering. • Renovation of accommodation facilities based on circular economy principles (see construction). • Urban regeneration through eco-friendly hospitality solutions. • Development of sharing platforms for vacation rentals within sharing communities for sustainable tourism.

The necessary transition to a circular economy stems from factors that are now widely recognized. Humanity is currently facing rising demand for raw materials and the crisis of scarcity regarding certain finite natural resources, driven by a growing global population.

One consequence of this dynamic is that raw material scarcity—if not addressed with a proper focus on resource reuse and recycling—fuels the dependency of some nations on others. Consideration must also be given to the climate and environmental impact of the linear economy,

necessitating a raw material usage strategy aimed at reducing atmospheric carbon dioxide emissions.

The transition to a circular economy requires a detailed analysis of operational principles, categorized into three groups:

1. Goal-oriented principles: these focus on two key stages of the production process—the beginning and the end—adopting a "gate-to-gate" perspective. These include:
 - Input adaptation: distinguishing between renewable (reusable) and non-renewable (to be used cautiously) resources, prioritizing renewable ones to develop a sustainable system;
 - Output adaptation: optimizing and valorizing by-products and residues by reintegrating them into the production cycle to strengthen the circular economy.
2. Core principles: these represent best practices to be adopted, namely:
 - System closure: integrating the management of products and residues with resource management to reduce environmental impact and ensure resources are reintegrated into the system;
 - Value retention: favoring designs that enhance durability and enable disassembly, thereby avoiding simple disposal;
 - Reduction of system scale: minimizing resource flows by using fewer resources or opting for more sustainable solutions, such as renewable energy.
3. Cross-cutting principles: essential principles for fostering a culture of circularity:
 - Eco-design: designing sustainable products to reduce environmental impact;
 - Circular economy education: promoting responsible behavior among businesses and consumers while raising environmental awareness.

Collaboration among businesses, institutions, and civil society is essential to fostering circular innovation. These partners can share knowledge, resources, and ideas to address common challenges and accelerate innovation and the transition to a circular economy. Only by adopting a holistic view and seeking shared solutions that benefit various stakeholders can the circular economy model—which is inherently based on the interrelationship between elements—be effectively realized.

In a survey conducted between December 2023 and January 2024, the CNN highlighted seven steps to accelerate the transition to a circular economy. The survey confirms that small businesses can play a leading role in this transition. Italy's production system—characterized by a long-standing, deep-rooted commitment to efficient resource use—offers fertile ground for developing this potential. To this end, public policies must also be increasingly aligned with this direction.

3. Conclusion

Over the years, the European Union has also taken an interest in the circular economy, promoting various initiatives such as:

- Waste hierarchy: prioritizing waste reduction and recycling;

- Funding: financial support for circular economy projects through European funds;
- Regulations: adoption of directives for the eco-design of products;
- Incentives: creation of a regulatory framework encouraging the sustainable use of resources;
- Stakeholder engagement: collaboration with NGOs, businesses, and citizens to raise awareness and facilitate the transition toward more sustainable practices.

In conclusion, the future of the circular economy is highly promising, with forecasts indicating increasing adoption by governments and companies. Greater consumer awareness, stricter regulations, and technological advancements will make the circular economy an achievable goal for many businesses, which will view it not merely as a responsibility but also as an opportunity for innovation and growth.

This model represents a strategic response to the need to build a more sustainable future by reducing environmental impact and promoting resource efficiency.

The circular economy has become a key paradigm for companies worldwide, thanks to its clear social, environmental, and economic benefits; it thus opens up new avenues for sustainable innovation and continuous evolution—a process that, like a circle, has neither a beginning nor an end.

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