

CIRCULAR ECONOMY BUSINESS STRATEGIES

Conceptual Framework to Guide the
Development of Sustainable Business Models



Abstract

In this article, we set out a framework for circular economy business strategies. We argue that the shift to sustainable patterns of consumption and production that is urgently needed can be enabled only by pursuing a set of sustainable business models. We also propose a definition of a sustainable business model and show how value creation happens. Finally, we also suggest a hierarchy among the business models based on retention of value and extension of responsibility.

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Background

Material consumption continues to be taken as a proxy for progress and development. Equity and environmental considerations have been dealt with 'after the event' rather than as integral to economic policy. Over the last few decades, these dominant patterns of production and consumption have led to significant environmental degradation and rising inequalities.

Indeed, our "take-make-waste" production and consumption models have had devastating impacts on our planet. The IRP's *Global Resources Outlook 2019* has found that 90 percent of biodiversity loss and water stress are caused by resource extraction and processing (IRP, 2019). The rise in resource use has been coupled with growth in waste and emissions, contributing to a series of pressure points including climate change, reduced food security, water scarcity and air pollution (Akenji et al., 2015).

A modern lifestyle based on current patterns of consumption and production requires a large amount of natural resources, i.e., 25-30 tonnes of materials per capita, per annum. Few countries would be able to satisfy their material needs with domestic resources, and the current level of national material consumption has only been made possible through a record increase in international trade. With respect to environmental impacts associated with resource extraction, however, it is the net-exporting countries that are at the receiving end. (Wiedmann et al., 2013)

Moreover, the benefits of this type of resource use remain limited to but a few. Inequalities in the material footprint of countries, i.e., in the quantity of materials that must be mobilized globally to meet the consumption of an individual country, are stark. High-income countries maintain levels of per capita material footprint consumption that are 60 per cent higher than upper-middle-income countries and more than 13 times the level of low-income countries (IRP, 2019).

Consequently, in order to prevent permanent impacts on the sustainability of natural ecosystems and societies, an urgent shift towards Sustainable Consumption and Production (SCP) models is required. In fact, this need was first highlighted at the Rio Earth Summit in 1992; reiterated in the outcomes of the Rio+20 summit, with the adoption of the 10-Year Framework of Programmes; and integrated into the 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015 ([Sustainable Development Goal 12](#)).

Recent calls for sustainable consumption and production patterns

In recognition of the accelerating environmental crisis and wealth gap, calls for 'a sustainable and inclusive well-being economy that works for everyone' (EESC, 2020), 'new set of measures for economic and social progress' (OECD, 2019) and suggestions of measures for a 'sustainable green transition' (e.g. the European Green Deal) (EC, 2019) are approaching.

Sustainable consumption and production strategies

As illustrated in figure 1, SCP involves a wide set of strategies to be implemented by various categories of stakeholders:

- Policy-makers should adopt regulatory frameworks enabling SCP
- Industries must adopt resource efficiency, cleaner production and circular economy approaches
- Public and private financial actors have to deploy financial instruments that support SCP
- Civil society ought to promote sustainable consumption solutions and demand sustainable products and services
- Knowledge of SCP should be developed and disseminated
- New companies and start-ups should adopt green and circular innovative business models

Most products and services are provided by the private sector. Businesses therefore play a pivotal role in society's shift towards SCP. While consumers typically have limited knowledge of the full life-cycles of the products they buy, producers are in a much better position to apply a life-cycle perspective. Medium-sized and large companies in particular generally have the capacity to scrutinise their value chains from a sustainability perspective, to compile relevant data, to engage with actors upstream (suppliers) and downstream (waste managers and recyclers) and to initiate improvements. Hence, sustainability can't be achieved without a radical transformation of production processes and industries in all sectors of activities. Given the central role played by the private sector in managing product life-cycles, policymakers need to encourage and incentivise companies to adopt a life-cycle perspective.

Working Definition of SCP

"The use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life-cycle of the service or product so as not to jeopardise the needs of future generations."

Norwegian Ministry of Environment,
Oslo Symposium, 1994
(UNEP, 2010)

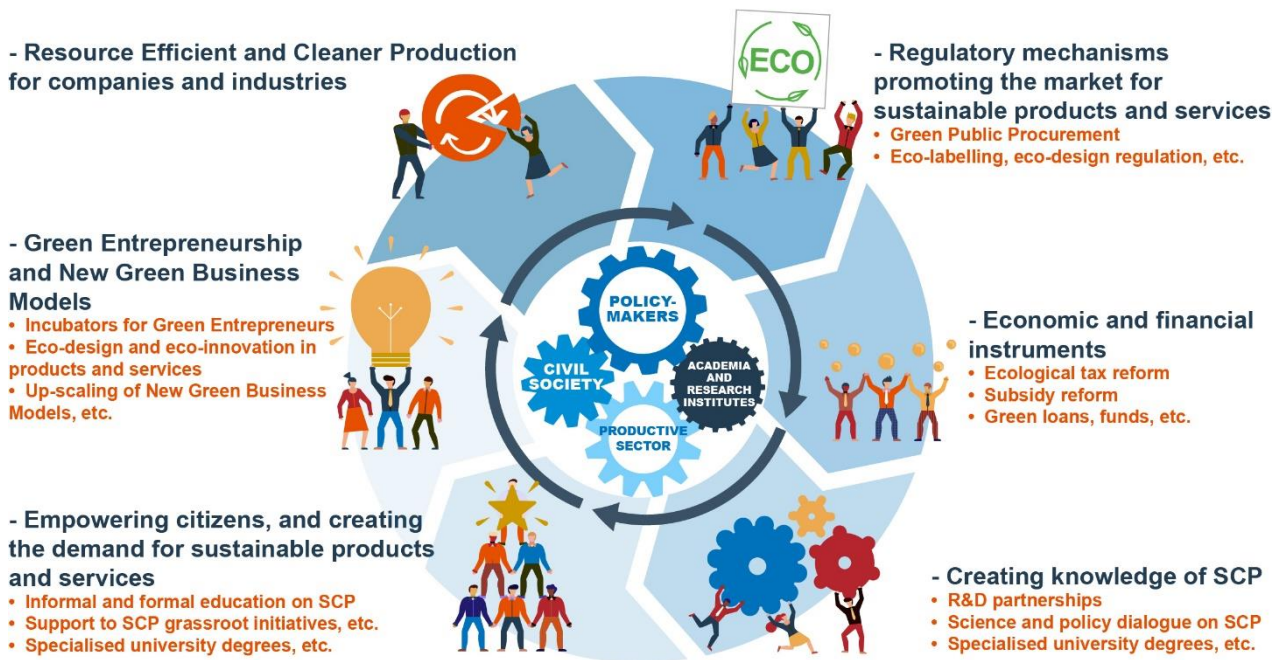


Figure 1. Various strategies and stakeholders involved in SCP.

Among private sector actors, particular attention must be paid to new companies and start-ups. The transition towards SCP requires a radical shift from the current linear economic model to a sustainable model based on principles of pollution prevention and resource preservation. As concluded by the International Resource Panel (IRP, 2019), resource efficiency alone, however, is not enough. What is needed is a move from linear to circular flows through a combination of extended product life-cycles; intelligent product design and standardization; and reuse, recycling and remanufacturing.

In this sense, making existing companies and industries more efficient is far from sufficient given the extent of the change that is required. Doing things better, improving production processes, increasing energy and resource efficiency is indispensable, but not enough. New business models and new economic structures are needed to enable the sustainability transition.

Hence, new companies and start-ups are crucial to shaping and exploring future economic models. They are not only open to doing things better but also exploring how to do things differently. Eco-innovation is the cornerstone of the change that is needed. New companies and start-ups are the main drivers of the new and emerging business models needed for the transition towards sustainability.

Moreover, business model development is a crucial step which greatly determines a company's future environmental performance (for example, it is usually estimated that over 80% of a product's environmental impacts are determined during the design phase).

Current, "business-as-usual" models both shape and are shaped by the linear, "take-make-waste" economic model, which follows the dominant logical series of steps: material

extraction, production, consumption and disposal. This model externalizes and hides the environmental and social costs, undermining the environmental and social sustainability of the economic system. Considering the critical environmental and social challenges and crises we are facing, the current linear economic model is no longer viable, and since only 9% of the global economy is circular at present (Wit et al., 2020), a radical shift of the business models that shape our economic system is urgently needed.

The more environmentally unsustainable the linear economic model becomes, the greater the risk faced by linear business models and the greater the advantages offered by circular business models (see, for example, UNEP, 2014; UNEP, 2017; Lacy et al., 2014; Schaltegger et al., 2011; Geissdoerfer et al., 2018).

Threats to linear business models

Companies operating under linear business models face significant threats linked with environmental crises. Even if some companies don't presently perceive it, "business as usual" jeopardizes the future viability of linear models in all sectors. The following are among the most significant risks:

- *Resource constraints and scarcity*
- *Fluctuating and increasing resource and energy prices*
- *Environmental regulatory requirements and standards*
- *Changing markets demanding sustainable products and services*
- *Environmental degradation impacts*

Resource constraints and scarcity

Under the pressure of the linear economy model, key raw materials are becoming increasingly scarce: resource scarcity and exhaustion will shape the future of the global economy. In terms of energy supply, peak oil (the maximum rate of extraction of petroleum) has already been reached or will be reached in the coming years according to different estimates. From this point forward, the demand for oil consumption will exceed oil production. The shortage will affect raw materials which are critical and strategic for all major economic sectors. Many extractable reserves of key finite minerals will be exhausted within the next decades. The European Union, for instance, establishes a list of critical raw materials that identifies the highest risks for the supplies of European companies (EU Commission, 2017).

Within a context of scarcity and exhaustion of key resources, if we consider that a linear economy simply disposes of 80 to 99% of the raw materials that products are made of (Planing, 2015), "business as usual" companies are doomed to fail.

Fluctuating and increasing resource and energy prices

Resource and energy scarcity inevitably leads to fluctuating and increasing prices. The costs of raw materials and energy are unstable, are rising and will continue to rise in the future. Under these circumstances, current "take-make-waste" models condemn companies to rising costs and a loss in competitiveness. Waste management costs are also expanding.

Environmental regulatory requirements and standards

Public authorities are progressively adopting and implementing increasingly demanding environmental regulations and standards in all industrial sectors. Linear economic models are gradually being questioned and challenged to shift towards sustainable production processes. Adoption of new environmental regulatory requirements can be expected to increase significantly in the coming years, driven, for example, by the EC's Circular Economy Action Plan and policies. Companies trapped in "business as usual" models will face legal barriers to their activities and complex and expensive adaptation processes to comply with emerging environmental regulations.

Changing markets demanding sustainable products and services

The demand for sustainable products and services is increasing among the different stakeholders envisaged by an SCP approach: consumers willing to purchase green products (the number of which has increased; more than a quarter of EU citizens buy environmentally friendly products on a regular basis); the public sector (through green public procurement, regulations, etc.); private companies (demanding sustainable suppliers along the value chain, etc.); and financial actors (impact investment, ethical banking, etc.). Companies relying on linear models are missing out on expanding green markets.

Environmental degradation impacts

Finally, impacts resulting from the increasing pressure that the economic system is putting on the environment, such as climate change and the increasing frequency of natural disasters, are threatening the long-term viability of most companies.

Given the risks we have just laid out, sustainable business models, in contrast, can bring significant competitive advantages and opportunities:

- *Mitigated risks stemming from resource and energy scarcity as well as increased company resilience. Increased resource and energy efficiency and productivity*
- *Reduced costs throughout the whole product life-cycle and increased company profitability and competitiveness*
- *Compliance with increasingly demanding environmental regulatory requirements and standards*
- *Access to the growing markets of the future offering unique and innovative value propositions*
- *Creation of environmental value and consideration of ecological impacts*
- *Access to investments and public subsidies*
- *Increased internal capacities for innovation*

But which are the sustainable business models that should make possible the transition from the linear “take-make-waste” economic model to the circular economy model? What is a sustainable business model¹?

Definition of a business model

Before digging into the concept of a circular business model, let’s briefly define first what a business model is. Following Osterwalder and Pigneur, 2010, a business model consists of several elements – building blocks – which describe how value is created and distributed. The different components answer the main questions which define the nature of the business model:

- *Why? Mission, vision and objectives of the company*
- *Who? Key stakeholders and customer segments*
- *What? The value proposition*
- *How? Key activities and resources; customer relationships and channels; cost structure; and revenue streams*



Figure 2. Business Model (adapted from Osterwalder and Pigneur, 2010).

¹ Although slight differences between the concepts of a sustainable business model, circular business model and green business model can be argued, for the sake of simplicity, we will use them interchangeably in this article.

A business model essentially describes the value proposition of the company and how value is created, delivered to the customers and captured by the company.

Definition of a sustainable business model

Now, what about sustainable business models? What is a circular business model?

In recent years, academic interest in sustainable business models has grown (as shown by this article's list of references) to such an extent that it has become a new field, currently emerging and institutionalizing within academic research (Lüdeke-Freund et al., 2017; Nußholz, 2017). Given the above-mentioned advantages that circular business models provide to companies when compared with linear business models, some authors even “argue that these advantages will make the concept of non-sustainable business models obsolete and sustainable business models will eventually supersede the notion of business models” (Geissdoerfer et al., 2018).

The fundamental difference between a business model and a green business model is that in addition to economic value, a sustainable business model includes environmental and social value creation and distribution. A triple bottom line approach is inherent to circular business models, which are built on the basis of interdependency between the environment, society and the economy.

Sustainable entrepreneurship is not only about reducing the negative environmental impacts of a business with regards to its previous practices and/or when compared to other companies within the sector. The main purpose of green entrepreneurship is to create environmental value and produce positive ecological and social impacts.

Thus, sustainable business models not only create economic value, through the creation of green businesses and employment, but also ecological value by addressing environmental challenges, and social value by addressing social needs.

This changes the nature of the business model and its building blocks. For circular business models, environmental and social challenges and value define the objectives of the company and are therefore embedded in its mission and vision. The value proposition development is driven by eco-innovation. The value proposition targets not only customers but also nature and society. In this sense, circular business models broaden the conventional concept of stakeholders within the business model, taking into account structural interaction between the business, customers, society and the environment. Within the green business model, the environment and society are unequivocally considered stakeholders. Finally, life-cycle thinking and eco-design shape the activities and resources required in order to deliver the value in the most sustainable manner possible. For more in-depth information, the SCP/RAC's step-by-step methodology for developing green business models can be found online, in a [handbook](#) and [workbook](#) (SCP/RAC, 2015a, 2015b).

Definition of sustainable business

Brief definition:

A sustainable business provides commercial solutions to environmental challenges which are economically viable and socially empowering.

Comprehensive definition:

Based on the interdependency between the environment, society and economy, a sustainable business provides innovative viable products and services which create environmental value (addressing ecological challenges and reducing environmental impacts) and social value (addressing social needs) by applying eco-innovation, life cycling thinking and eco-design approaches.

In short, a green business model provides a business solution to environmental challenges which is economically viable and socially empowering (SCP/RAC, 2015a).

How does a sustainable business model create environmental value? Two main means of ecological value creation characterize circular business models: they 1) transform ecological challenges into economic opportunities to create environmental value and 2) reduce environmental impacts. In order to make this happen, the main approaches to be deployed are eco-innovation and life-cycle thinking.

Eco-innovation consists in providing new and alternative solutions, which allow a company to reduce its environmental impacts and/or create environmental value. Three forms of eco-innovation can be differentiated (see figure 3):

1. **Process eco-innovation.** Production processes are cleaned up to significantly improve resource and energy efficiency, which saves resources and prevents pollution. Existing processes and technologies are improved without transforming what is done. For instance, in the automotive industry, a car could be manufactured using less raw materials and energy and producing less waste.
2. **Product eco-innovation.** The innovated solution changes the main characteristics of the product or service. New processes and technologies transform what is being done, for example, shifting from the production of conventional cars to electric cars.
3. **System eco-innovation.** At this stage, eco-innovation implies transformations at the system level in the value chain and regarding consumption patterns. This is where radical business model innovation is required. System eco-innovation embraces complex changes, usually involving non-technological transformations and various stakeholders; it “is more likely to take place beyond the boundaries of one company or organisation as it often requires the transformation, replacement or establishment of complementary infrastructures” (OECD, 2012). Continuing with the same example, system eco-innovation within the car industry could shift the production and sale of cars towards offering mobility services through car sharing systems. Even better, bicycle sharing systems could substitute vehicles to cover mobility needs.



Figure 3. Three forms of eco-innovation.

As these three stages indicate, environmental value creation grows progressively with each eco-innovation step. Generally speaking, we cannot expect process and product eco-innovations alone to make the fundamental shift from the linear economy model to the circular economy model, which is required to address the current environmental crisis. Energy and resource efficiency, cleaner production processes, resource-saving products, etc., are necessary but insufficient strategies. Ultimately, a radical transformation is needed at the system level (involving relationships among the stakeholders in the value chain, infrastructures, consumption patterns, etc.) in order to ensure a shift in functionality or modality (e.g. mobility) from an unsustainable solution (e.g. car) to a sustainable option (e.g. bicycle) and to enable a shift to services that dematerialise as much as possible (e.g. telework).

Under this perspective, business model innovation is an essential step in jumping from the process/product level to the system level that could potentially lead to more environmental value creation. Circular business models could be the missing link between change at a company level and systemic change, particularly as various companies adopting green business models become linked. Systemic change can thus be fostered and new sustainable systems can emerge and be structured around ecosystems of companies interlinked through complementary sustainable business models (for example, Bocken et al., 2014, section 1.3).

Complementing the overall eco-innovation approach, life-cycle thinking and eco-design assist green business model development in reducing businesses' environmental impacts. Life-cycle thinking goes beyond the linear "take-make-waste" economic model and reduces resource use and emissions throughout the entire life-cycle of a product: extraction of raw materials; design and production; packaging and distribution; use and maintenance; and reuse and recycling. Eco-design focuses specifically on all of the environmental aspects of

product development and design (using renewable raw materials, saving resources and energy, promoting reuse and recycling, etc.).

Sustainable business strategies

A combined adoption of eco-innovation and life-cycle thinking approaches can lead to alternative, sustainable business models for the companies of the future. These business models can be grouped into five main business strategies (see figure 4):

1. Prevent pollution and save resources
2. Recover resources after disposal
3. Extend resource use and reduce disposal
4. Increase resource utilisation rate
5. Shift to circular supplies and design

The strategies are numbered one through five in order of resource value retention as well as difficulty of implementation and coordination within value chains, with five being the greatest retention value and effort required for implementation and coordination, and one being the lowest. Retention of resource value means the conservation of resources closest to their original state (Reike et al., 2018).

FIVE AREAS OF SUSTAINABLE BUSINESS STRATEGIES STAGES IN THE LIFE CYCLE OF A PRODUCT

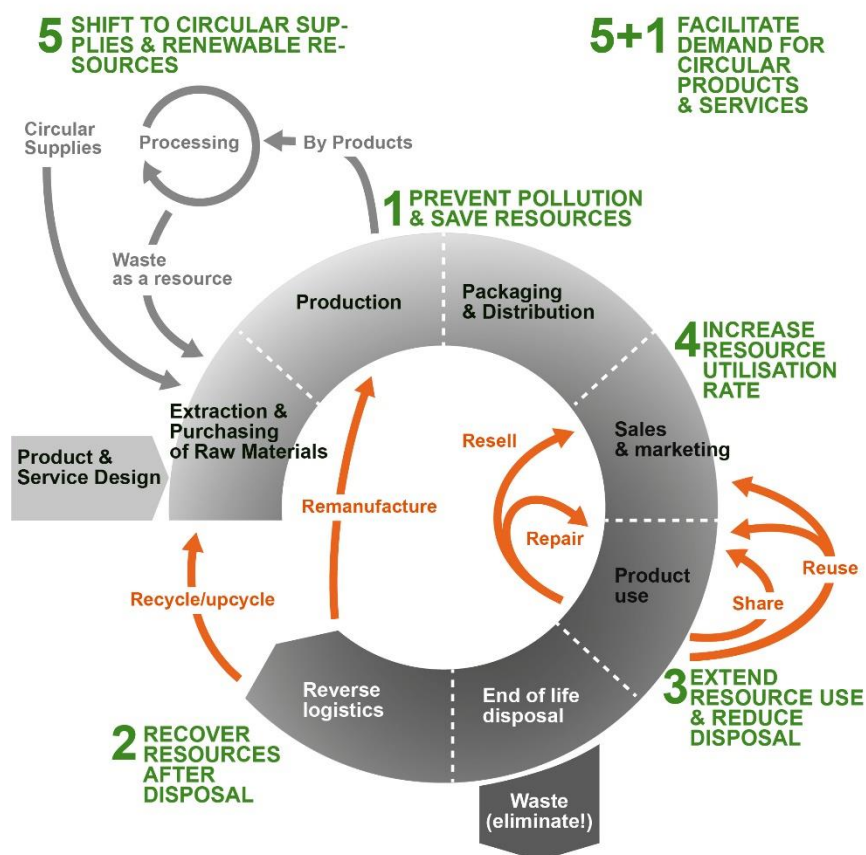


Figure 4. Five areas of sustainable business strategies.

From the producers' perspective, the value of finished, marketed and sold products can be retained as long their functionality is maintained and they can be reused and given successional lives. Keeping a product's value high over a long period of time requires a shift at the managerial, organisational, political and mindset levels as well as high-level coordination within product value chains. Hence, the strategies at the higher end of the list would normally come at a higher cost and with extended responsibilities for traditional companies and businesses operating in a linear economy (see the table at the end of the article for a elaborated comparison).

From the consumers' perspective, the business strategies at the higher end of the list would provide a different customer experience compared to the traditional product purchase, with an emphasis on the functionality and the intangible value behind the product. Studies proposing long-term targets for lifestyle carbon footprints comparable with the Paris Agreement's aspirational target of 1.5°C characterise these as most preferable yet more challenging to implement (Lettenmeier et al., 2019).

Higher numbered strategies would require higher degree of orchestration and more complex partnerships. Keeping the materials circulated in production and consumption systems at their highest value calls for entrepreneurial solutions for registering, keeping track of materials, collection, separation as well as consumers' high-level engagement and awareness.

1. Prevent pollution and save resources

The first strategy is principally related with the manufacturing stage and aims at saving resources (i.e. raw material, water, energy) and preventing pollution. Usually, this strategy is linked with eco-innovations that affect production processes, including making those processes cleaner and more efficient (e.g. recycling on-site scraps, recycling wastewater inside the factory) so that they generate less waste and need fewer resource inputs, i.e. water, energy, chemicals (UNIDO, 2019).

The **business models** to implement this strategy:

- Cleaner and Resource Efficient Production
- Zero-waste production

On the one hand, products and services are designed and production processes are organized in order to minimize all sources of waste and emissions. The aim is to eliminate air, water and ground pollution linked with production processes. The most common pollutants that industries release are CO₂, petroleum hydrocarbons and petrochemicals, solvents, agrochemicals (pesticides, fertilizers, etc.), heavy metals, microplastics, sulphur and nitrogen oxides, and persistent organic pollutants (POPs), etc.

On the other hand, the strategy seeks a maximum reduction in the materials and energy needed to produce something. The intention is to produce the same product/service using significantly less raw materials and energy, or transform the product/service to maximise resource and energy efficiency in the production process (reduce the use of resources, reduce diversity of materials used, design smaller and lighter products, reduce steps in production processes, reduce packaging, etc.).

The major tools linked with this strategy are eco-design, resource efficiency and energy efficiency measures, and cleaner production processes and technologies. Eco-design is key in order to ensure in the conception stages that the product can be made through the most efficient processes available in terms of resource and energy use and through zero waste and emissions production.

Among current trends, 3D printing technologies can help save resources and energy and bring production closer to the end consumer. To ensure that these new technologies contribute to a positive environmental impact, they should use renewable or recycled raw material and avoid mixing multiple components.

2. Recover resources after disposal

The second strategy seeks to prevent resources from being discarded during the life-cycle of a product, especially at the end of its life. The end-of-life goal is to systematically replace disposal and landfill with reuse and recycling.

At this level, synergies and complementarities between companies and sectors become critical. Applying industrial symbiosis strategies can cover companies' complementary needs, matching and harmonizing their production processes: the waste management requirements of one firm meet the resource needs of another company. Thus, the by-products, wastes and emissions of a production process become the inputs for another process.

The **business models** to implement this strategy:

- Design for disassembly, reassembly and recycling
- Collection and Recycling
- Upcycling

Regarding the end-of-life stage, the conceptual aim is to put an end to the idea of waste, a concept that doesn't exist in nature. Biomimetics, or biomimicry, would have us shape our business models after nature's strategies to solve complex problems and meet needs in a sustainable way.

"Waste is material without an identity": products should be seen as deposits of raw materials which, properly identified, can be valued and available for future use (see <http://turntoo.com>). Once a product ceases to be functional, all the materials are identified and properly valued and integrated into new production processes. Nothing is wasted.

Often, leak of resources occurs while the product is used by consumers. Often, the materials that make up a product are not easily identifiable and as a result are wasted at the end of the product's life. Product-as-a-service business models (see strategy number four, increasing resource utilisation rate) can successfully help to identify the raw materials in products and ensure a closed-loop management of resources.

3. Extend resource use and reduce disposal

The third strategy aims, to the greatest possible extent, to extend a product's lifetime and avoid disposal. This strategy is primarily linked with the use and maintenance stage, and with eco-innovations related to product conception.

A wide set of measures can help us to achieve this goal, among them the following:

- Eliminating or reducing packaging or implementing returnable packaging schemes
- Offering a product that is reusable
- Offering maintenance and repair services
- Promoting reuse and reselling (second-hand commerce, etc.)
- Remanufacturing/refurbishing (restoring the product to its initial functionality)
- Upgrading (upgrading an older product, for instance, by replacing a component)

The **business models** to implement this strategy:

- Design for Durability, Long Lasting and Modularity
- Collection and Recycling
- Repairing and Upgrading
- Reuse and Reselling

Again, eco-design is crucial to boosting this strategy since product life is essentially determined by the conception stage. Modular design, for instance, can facilitate the repair and substitution of a product's components, extending its life. All products should be easily disassembled and all the materials that it contains should be identified and easy to separate.

4. Increase resource utilisation rate

The fourth strategy's main objective is to increase the utilisation rate of resources. Thus, it is essentially linked with the use and maintenance stage. This strategy can involve process-level and product-level eco-innovations, but its greatest potential lies at the system level: it is the green business models focused on increasing their resource utilisation rate that have the greatest capacity for transforming and substituting existing solutions, giving birth to new and alternative sectors based on the shift from ownership to functionality.

The **business models** to implement this strategy:

- Rental - subscriptions
- Leasing - subscriptions
- Servitization - selling the functionality

The most effective way to increase resource utilisation rate is to focus on functionality instead of the product. In fact, one of the fundamental elements which distinguish a circular economy from a linear economy is precisely that – placing emphasis on functionality. In the linear economic model, the source of value creation itself is the product, while for the circular economic model, it is functionality/performance (EEA, 2017).

One essential strategy for selling functionality instead of ownership of products is servitization. Companies evolve from selling products towards “product as service” models which provide functionality through a combined delivery of products and services. To implement servitization, firms must shift from product-oriented business models to use-oriented. As an example, a value proposition may sell lighting services instead of lamps and

electricity, or clothes washing instead of washing machines. Such use-oriented business models are diverse and known by different names, such as performance business models, result-based business models or access-based business models.

These kinds of models offer significant environmental improvements as well as competitive advantages in attracting customers.

In a linear economic model, in order to maximise profits, companies are motivated to sell the maximum amount of products. They don't have an incentive to maintain and repair these products, and in its most perverse form, this thinking leads to planned obsolescence at the product or even system level. Profit and waste of resources are thus often deeply intertwined.

Instead, if the value proposal is focused on functionality/performance, profits will increase while product lifetime is extended; there is an economic incentive to extend the life of a product which is owned by the firm. In this case, the economic viability of the company relies on the environmental sustainability of the products.

A service-based business model encourages the companies, which maintain ownership of the products and assets, to eco-design their products, guaranteeing maximum efficiency in the production processes, closed loops in resource management and the longest possible life for the products.

This kind of business model can also offer a competitive advantage in attracting customers. Users only pay for the functionality they need, avoiding initial investment and costs and inconveniences linked with maintenance and repair. These models have the potential to expand their initial markets since a larger number of consumers could afford a monthly subscription rather than investing in expensive products.

One tool often used to implement business models that seek to increase resource utilisation rate is sharing. Inefficient ownership is avoided, making the products available to customers according to their needs and guaranteeing the maximum use of resources. Shared use or shared ownership is often made possible through on-line platforms. A large and growing number of products and services are shared among multiple users, a phenomenon which is referred to as the sharing economy or collaborative economy.

The ownership model is completely transformed: customers don't need to buy and own the products anymore, paying instead per use according to the service functionality which the company provides.

5. Shift to circular supplies and design

The fifth strategy aims at shifting from finite resources and energy to renewable resources and energy, respecting natural regeneration cycles. It concerns not only the raw material extraction stage but also all other life-cycle stages of a product/service. The strategy is linked with eco-innovation at all stages and, if ambitious enough, can lead to significant system-level transformation towards sustainability.

The **business models** to implement this strategy:

- Alternative low impact fibre or recycled material driven value chains
- Slow living products and services with full control over the value chains (eco-design brands, slow food brands, slow fashion brands, slow cities)

The objective is for all of the life-cycle stages of products and services to use renewable energies and bio-based, local and fully recyclable materials in closed loops, not just at the extraction of raw materials and production stages but also at the use and maintenance stage.

The strategy seeks to ensure renewable use of biological materials at all of these life-cycle stages, in accordance with the rhythms of natural processes as well as the management of technical materials in closed loops.

The five main strategies for developing sustainable business models that we have reviewed need a complementary **5+1** strategy, which is a condition for their viability: the **demand for circular products and services** should be facilitated and increased. Without a radical change in consumers' behaviours and lifestyles, most of the green business models will not be viable. More fundamentally, the transition towards sustainability cannot rely on the transformation of the business models and economic models alone, but will also require a reduction of consumption and increasing self-sufficiency at community and personal levels, especially in countries with the greatest footprint indexes.

Of course, supporting policies and regulations are also imperative to the progressive implementation of sustainable business models and the shift from a linear to a circular economy model. Encouraging examples can be identified and must be mainstreamed (such as the strong impulse by the EU Strategy for Circular Economy, or specific regulations, such as the Swedish tax system which promotes business models focused on maintenance and repair).

Finally, public and private financial investments should support the implementation and scaling-up of all forms of sustainable business models.

Rebound effects

It is important to bear in mind that rebound effects are a constant threat to the different strategies for sustainable business model development which have been reviewed in this article.

A rebound effect is an unexpected negative environmental impact which counters the desired ecological benefit (see EEA, 2017), as the following examples illustrate:

- Resource and energy efficiency measures are always endangered by potential unexpected environmental impacts which can exceed the estimated savings (for example, the increased energy efficiency of a vehicle can lead to increased use and distances which could increase the total use of fuel)
- A product as a service business model can attract new users which were previously using more sustainable alternatives (a car-sharing system, for example, has an environmental positive impact if new users are forgoing their private cars, but the ecological impact is negative if new users were already using public transport or bicycles)
- A product as a service business model can unexpectedly increase resource use due to the user-intensive pattern
- A collaborative/sharing economy business model can unexpectedly increase consumption and impacts (couchsurfing, for example, could result in more long-distance travel due to increased access to low-price accommodation)
- Any business model which reduces prices and increases accessibility to products and services incurs the risk of increasing consumption and therefore resource and energy use and waste production

A circular business model's vulnerability to rebound effects is inversely correlated to the number of strategies it uses. That is, the most effective antidote to unexpected negative environmental impacts is to implement as many of the previously outlined strategies as possible, and to thoroughly apply system-level eco-innovations and life-cycle thinking, to as many life-cycle stages of its products and services as possible.

We have proposed and examined the main strategies for developing business models aimed at reducing environmental impacts and maximising ecological value creation. However, creating environmental value is not enough. As said previously, a sustainable business model should also create and distribute social value.

Tomorrow's economy should operate within the "safe and just space for humanity", between the ecological ceiling (the environmental boundaries) and social foundation (guaranteeing life's essential needs – food, healthcare, housing, democracy, etc. – for all) (Raworth, 2017). Correspondingly, sustainable business models should help bring the economic system as a whole back within safe ecological boundaries while enhancing human well-being.

In this regard, the shift towards sustainable economic systems may also lead to significant positive social impacts. The circular economy transition could help achieve several SDGs (see Preston et al., 2017; Schroeder et al., 2018; Schroeder et al., 2019; Williams et al., 2018), and the potential for job creation, for example, is huge. The ILO has estimated that "a transition to more sustainable economies could generate up to 60 million new jobs worldwide over the next two decades" (ILO, 2017). And in the case of the European Union, a study commissioned by the Directorate-General for Environment has projected that every

percentage point reduction in resource use could lead to up to 100,000 to 200,000 new jobs (Meyer, 2011).

It can be said that sustainable economies and employment are often mutually beneficial. In order to promote both goals, human work should be re-established as the centre of the economic system. Human labour (which can be seen as “renewable”) should, to the greatest extent possible, replace scarce resources as the essential element on which our economies are based. As an example, recycling, repairing and remanufacturing sectors are usually more labour intensive than traditional production sectors and are thus beneficial both to sustainability and to the creation of meaningful jobs. And taxation should progressively shift from labour to resource use and emissions/pollution.

However, job creation is not always an automatic result of sustainable businesses. And of course, the creation of social value cannot be limited to employment creation. Even though sustainable business practices can have numerous positive social impacts and help achieve several SDG targets, this is certainly not the case every time. In fact, the emerging circular economy paradigm may produce specific threats in terms of social impacts, since it tends to focus on technological aspects while often neglecting social, political and cultural dimensions.

As such, sustainable business models should place social challenges and social impacts at the core of their missions and value propositions, just as they would with nature. Social impacts and social value creation should therefore be systematically analysed similarly to how life-cycle thinking addresses environmental aspects.

The following table proposes key aspects and guiding questions to systemically assess the social value creation potential and expected social impacts of each building block of the business model. The final objective is to maximise social value creation and to avoid and mitigate any negative social impacts.

Building blocks of the business model	Social value of sustainable businesses: aspects to be considered / guiding questions
Why?	
Mission and vision	<ul style="list-style-type: none"> • The company’s mission and vision solve social challenges and enhance human wellbeing. How? • The creation of environmental and social value is at the core of company’s mission and vision. Environmental and social missions come before profit, which is not the primary goal of the project • The company contributes to creating value and benefits for society as a whole and for local communities, beyond its key stakeholders. How?
Objectives	<ul style="list-style-type: none"> • The objectives of the company directly tackle societal challenges and promote social value creation. Which ones? • How is the achievement of environmental and social objectives be measured?

Who?	
Key stakeholders	<ul style="list-style-type: none"> The sustainable business model is co-created with key stakeholders and local communities and their active engagement Relationships with all stakeholders are based on the principles of reciprocity and cooperation Transparency: what information about the company (e.g. environmental and social performance) is publicly available and how? <p><i>Providers and suppliers:</i></p> <ul style="list-style-type: none"> In working with providers and suppliers, priority is given to sustainable and social businesses and non-profit organizations The company's needs are essentially outsourced locally, prioritising local providers and suppliers How does the business model promote social responsibility among suppliers and the fair distribution of benefits along the value chain? <p><i>Local community and society:</i></p> <ul style="list-style-type: none"> The project creates local job opportunities The project has the potential to create job opportunities for people at risk of social exclusion The project contributes to a healthy environment (for example, improving air quality, reducing impacts from pollution and waste, reducing the presence of toxic chemicals, etc.) The company is involved in the local community and social initiatives and/or promotes the engagement of the local community in environmental and social causes The business model doesn't affect local communities' access to material resources (such as water and other natural resources) The project contributes to the promotion of and brings added value to local culture, traditions and knowledge
Customer segments	<ul style="list-style-type: none"> The value proposition covers the social needs of various customer segments, adopting equality and equity perspectives (for example, targeting groups at risk of social exclusion) Potential clients representing a variety of segments have been engaged and/or consulted for the development of the business model
What?	
Value proposition	<ul style="list-style-type: none"> The value proposition directly creates social value, solving social challenges, addressing social needs and/or empowering communities <ul style="list-style-type: none"> E.g. contributing to a healthier and safer environment by reducing air, water and soil pollution, etc.; contributing to meeting basic life needs by offering affordable and sustainable basic supplies such as water or energy, etc. The value created will be fully or partly available as public domain (for example, through Creative Commons licences)
How?	
Key activities and resources	<p><i>Workers:</i></p> <ul style="list-style-type: none"> The business model's calculated cost of human resources takes into account fair and equitable working conditions (salaries, working time, salary scales, etc.)

	<ul style="list-style-type: none"> • The business model is based on production processes which guarantee safe and healthy working conditions and environment • The business model is rooted in a labour perspective, favouring integration (guaranteeing gender equality, integrating workers at risk of social exclusion, etc.). Particular attention should be paid to any elements of the business model that risk employment discrimination in terms of sex, age, etc. <p><i>Production processes:</i></p> <ul style="list-style-type: none"> • Production processes reduce health impacts from pollution and waste • Materials used do not endanger health and safety (avoiding toxic materials, etc.) • Priority is given to local resources within production processes and operations <p><i>Organizational and governance structure:</i></p> <ul style="list-style-type: none"> • The legal form and the organizational structures of the sustainable business enhance democratic and horizontal governance and ownership (adopting, for example, cooperative forms, integrating the social and solidarity economy sphere, being a non-profit organization, or being established as a social or green enterprise when recognized by the legal frameworks)
Customer relationships and channels	<ul style="list-style-type: none"> • Sales is not the only objective in engaging the customers. In addition to sales, customer engagement meets the initiative's environmental and social mission. How? • Communication and relationship channels have positive social impacts. What are they? • Communication and relationship channels consider customers with special needs. How?
Cost structure	<ul style="list-style-type: none"> • Estimations of the personnel needed and the human resources cost do not result in significant wage disparities and foresee equality of salaries for women and men • Social negative impacts and costs have been assessed. If any, how will they be remedied? • Potential social negative costs have been weighed against the social benefits of the initiative
Revenue streams	<ul style="list-style-type: none"> • The company generates important environmental and social value in addition to economic revenues • The initiative plans to invest part of the profits for the benefit of the workers/members, the community's wellbeing and/or the environment • The company plans to invest any economic surplus or benefits in ethical finances • The company's legal form promotes the investment of profits and surplus according to social and environmental criteria (cooperative, social and solidarity economy entity, non-profit organization, social or green enterprise, etc.).

As we have seen throughout this article, the systematic application of eco-innovation and life-cycle thinking to all stages of a product or service can help us to identify and assess their environmental, social and economic impacts as well as to create and deliver environmental, social and economic value. The main strategies for the development of sustainable business models are summarized in the following table.

Direction of increase for production and consumption system change →

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Eco-innovation stages Circular business strategies	Process-level eco-innovation	Product-level eco-innovation	System-level eco-innovation
Prevent pollution and save resources	<i>More efficient production processes in terms of resource/energy use and waste/emissions</i>	<i>New product/service maximises resource/energy efficiency and reduces waste/emissions</i>	<i>Business model eco-innovations linked with saving resources and preventing pollution in the supply chains while <u>taking no responsibility after sales.</u></i>
Recover resources after disposal	<i>By-products and waste are reintegrated as inputs in production processes</i>	<i>Product/service eco-designed to ensure closed-loop management of resources</i>	<i>Industrially symbiotic, complementary business models. Business models promoting recycling infrastructures and systems and <u>taking responsibility for materials after sales.</u></i>
Extend resource use and reduce disposal	<i>New processes and technologies facilitate the production of long-lasting products</i>	<i>Product/service eco-designed, produced and maintained to ensure its longest possible life</i>	<i>Business model eco-innovations favour the emergence of infrastructure and systems for repair, reuse and remanufacture hence <u>taking responsibility for product performance after sales.</u></i>
Increase resource utilisation rate	<i>Resource utilisation rate is maximised in production processes</i>	<i>Product/service eco-designed to facilitate servitization and sharing of functionality/performance</i>	<i>Functionality based eco-innovative business models hence <u>taking full product responsibility and ownership after sales.</u></i>
Shift to circular supplies and design	<i>Production processes rely on renewable resources and energy</i>	<i>Product/service eco-designed to use renewable energies as well as bio-based and recyclable materials in closed loops</i>	<i>Business models allowing renewable management of biological materials and closed loop management of non-organic raw materials at system level hence <u>taking responsibility to achieve full circularity.</u></i>

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