

POLITECNICO DI TORINO

Master's Degree in Management Engineering

Master's Degree Thesis

**Reframing Sustainable Business Models: A
Multidimensional Framework**



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A.A. 2025-2026

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Abstract

The traditional goal of a business is to maximize profits and shareholder returns, as firms have historically been considered as economic entities with just one objective: create financial value for their owners. This way of thinking is considered outdated now a days, and firms are required to take into consideration not only economic performance but also their environmental and social impacts. Extreme climate change, resource depletion, pollution and social issues such as inequality, labor rights and community impact are quickly becoming critical challenges to face to achieve sustainable development and ensure long-term well-being. Sustainable Business Models (SBMs) tackle those challenges by adopting a holistic approach based on the consideration that no business operates in isolation. A wide range of stakeholders is considered including suppliers, employees, local communities and the natural environment. As a result, SBMs seek to create value that extends beyond financial performance by balancing economic objectives with environmental and social goals.

This thesis analyzes SBMs and aims to address existing gaps and challenges in the literature as the field is vast and fragmented, with a wide range of definitions, frameworks, and approaches that often lack conceptual consistency and integration. After conducting a literature review on existing articles on sustainability and business model innovation, a comparative analysis of the most influential classification frameworks is conducted to identify their strengths, limitations, and areas of overlap. The findings highlight the need for a multidimensional classification capable of capturing the diverse aspects of sustainability-oriented practices. Building upon the archetype system proposed by Bocken et al. (2014), this thesis develops a multidimensional classification structured around three interconnected dimensions: environmental, social, and organizational. The proposed framework is designed to better align with widely adopted ESG (environmental, social and governance) principles while providing firms with a practical guide for identifying, developing and implementing sustainability-oriented business models.

To demonstrate the applicability of the classification, a case study of the company Patagonia is presented. Patagonia is widely recognized as one of the leading

examples of SBMs and is also certified as a B-Corporation. This allows for a comprehensive analysis of how a sustainable business model can achieve long-term success while integrating sustainability principles into its operations, also highlighting the role that regulations and certification systems play in supporting and validating sustainability performance.

1 Introduction

The economic and social progress achieved over the last century has been accompanied by environmental degradation that is endangering the systems on which our future development and very survival depend. Global population continues to grow while the planet's natural resources keep diminishing. Projections indicate that if the global population reaches 9.8 billion by 2050, the equivalent of almost three planets will be required to provide the natural resources needed to sustain current lifestyles (United Nations Sustainable Development Goals, 2025). This has led to growing recognition among national governments and multilateral institutions that economic development and environmental issues are inseparable (The Brundtland Report, 1987).

In 2015, world leaders gathered at the United Nations (UN) and committed to an ambitious global agenda aimed at leaving no one behind and transforming the world by 2030. Despite notable progress, the pace of change remains insufficient as many challenges persist. Sustainable development is therefore a continuous journey of innovation, adaptation and commitment rather than a destination to achieve. This crisis can in fact be seen as one of the greatest business opportunities of the present for companies that can transform the business model towards sustainability (Porter & Kramer, 2011). When companies adopt sustainable practices, they set new industry standards, influence consumer behavior, and catalyze broader societal shifts toward sustainability, ultimately transforming how value is created and shared in the economy (Schork, 2025)

However, the question of how financial markets value corporate sustainability has been the subject of intense debate over the past years. Numerous studies have been conducted but the findings to date remain mixed and do not allow for definitive conclusions. Eccles et al. (2014) show that “high-sustainability companies” (basically those that adhere to social and environmental standards exceeding legal requirements) outperform their “low-sustainability” counterparts in both market and accounting terms. In contrast, Pástor et al. (2021) find that brown stocks (shares of firms operating in industries associated with substantial environmental harm) outperform green stocks, which are issued by companies engaged in environmentally responsible activities. For instance, some investors may exclude certain companies based on ethical norms, while others apply positive or negative screening focused

on ESG (Environment, Social and Governance) metrics. Measurement also plays a big factor as validated and verified content is more likely to attract or retain capital. As highlighted by Bubicz et al. (2019), one of the main critical issues in academic and industrial debates is the lack of consensus and standardization in identifying, measuring, and monitoring social sustainability practices. Most studies rely on qualitative methodologies, such as interviews or case studies, and that metrics for social assessment remain limited and fragmented. This thesis discusses challenges such as the need for standardized metrics, regulatory frameworks, and transparent reporting to ensure the credibility and effectiveness of these models and develops a systematic literature review aimed at categorizing business model innovations that promote sustainability.

2 Theoretical Background

2.1 Business model

The term “business model” has been misinterpreted and misused over the years as it’s often confused with other popular terms in the management literature such as strategy, business concept, revenue mode and economic model. A business model is a conceptual, rather than financial, framework that links a firm’s strategy to its activities and execution, with the goal of creating distinctive customer value and capturing a larger share than competitors (Richardson, 2008). It’s defined by 3 key elements: the value proposition, value creation and delivery and value capture. The value proposition is basically the product/service offered to generate an economic return, what will the firm deliver to its customers and why are the consumers willing to pay for it. Value creation and delivery is the core of the business model as it focusses on how the firm will create and deliver value to its customers and it is typically obtained by seizing new markets opportunities. Value capture is about how the firm generate revenue and profit.



Fig.1 Conceptual business model framework adapted from Bocken et al (2014), Linz et al. (2017), Osterwalder et al (2014).

2.2 Sustainability and Sustainable Development

According to the report of the world commission on environment and development (Brundtland Report, 1987), sustainability is defined as “meeting the needs of the present while safeguarding the ability of future generations to meet theirs”. The concept of sustainable development, as outlined in the report through discussions on climate change, economic progress, and global goals, is built around the three pillars (environmental, social, and economic). These dimensions represent the core within which development must operate, highlighting the need to balance ecological integrity, societal well-being, and economic viability. In the literature there are two different schools of thought as some consider the three pillars as distinct perspectives and others prefer to take a systems approach (Purvis et al, 2019). The first approach, following Barbier (1987), conceptualizes three distinct systems—the biological (and other resource) system, the economic system, and the social system—each with its own “goals”, whose interactions must be managed in order to achieve both their individual objectives and the emergent goal of sustainability. The second approach, following Brown et al. (1987) represents a more ecologically driven perspective that puts much more emphasis on environmental health and social well-being while giving less prominence to traditional economic criteria. The crucial aspect of both models is that sustainable development can only be achieved by maintaining a dynamic balance between three fundamental pillars. This concept also provides the foundation for the ESG (Environmental, Social, Governance) criteria used by firms and reporting institutions to assess overall sustainability performance.

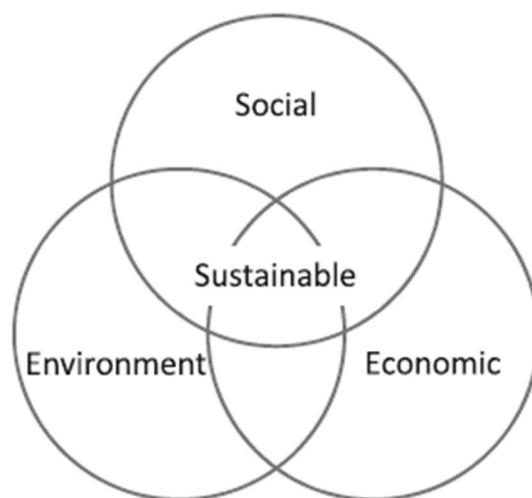


Fig.2 Typical representation of sustainability as three intersecting circles.

2.2.1 Environmental sustainability

Environmental sustainability is about the balanced relationship between human activities and nature to preserve ecosystems and natural resources. The goal is to improve the quality of life without unnecessary strain on ecosystems. It involves policies and actions aimed at securing a sustainable future by managing resources responsibly, minimizing pollution, and maintaining ecological balance. The key components of this pillar are resource conservation, waste management, pollution control, biodiversity preservation and climate action (EcoActive Tech, 2024).

Resource conservation

- Sustainable use of natural resources such as water, minerals and forests.
- Encourage the utilization of renewable energy sources such as hydroelectric, solar, and wind power to reduce dependence on fossil fuels.

Waste management

- Implementation of practices to reduce waste generation, encourage reuse of materials and improve recycling focusing on the full lifecycle of products and services.

Pollution control

- Regulating and managing pollutants in air, water and soil through measures like filtration, treatment systems and stricter regulation.

Biodiversity preservation

- A richer and more diverse environment is ensuring life and prosperity for those who inhabit it, whether humans, animals or plants. Biodiversity is fundamental to the functioning of ecosystems and the well-being of the entire planet (Enel, 2025).

This dimension forms the historical foundation on which most sustainability metrics have been developed and remain the most advanced in terms of standards, methodologies, and traceability tools.

2.2.2 Economic sustainability

This pillar is what guarantees that growth and development occur in a manner that is economically sustainable in the long run ensuring efficient use of resources and equitable distribution of wealth. The key components of this pillar are economic growth, job creation and financial stability.

Economic growth

- It's crucial to invest in innovative technologies to reduce environmental impacts and increase productivity, also adopting creative ways to use resources efficiently increasing profitability and reducing costs (EcoActive Tech, 2024).

Job creation

- Creating employment opportunities that provide equitable compensation, benefits, and secure working conditions providing also training to enhance the skill set of the personnel.

Financial stability

- By implementing robust financial management practices, which include prudent investment strategies and risk management but also transparency and accountability to establish trust with stakeholders and guarantee regulatory compliance.

2.2.3 Social sustainability

This pillar plays a vital role in shaping cohesive societies that thrive across generations. It focuses on human relationships, community development, and institutional trust (Aztech Training, 2025).

According to ISO 26000 of 2010 (an international guidance standard on social responsibility developed by the International Organization for Standardization ISO), the social responsibility of organizations involves “integrating ethical and social considerations into their decisions and activities, taking into account the expectations of stakeholders”.

Social equity

- Encouraging inclusion and diversity in the workplace, in schools, and in communities to guarantee that everyone has equal opportunity regardless of color, gender, age, or socioeconomic background (EcoActive Tech, 2024).
- Upholding all individual's fundamental freedoms and rights, such as their right to security, liberty, and life.

Community development

- Encouraging community involvement and engagement in decision-making procedures that have an impact on regional development and policy. Also, investments in infrastructure improve living conditions, such as recreational centers, affordable housing, and public transit.

2.2.4 Business model innovation for sustainability

Sustainable business model innovation can be defined as the analysis and planning of transformations into a more sustainable business model or from one sustainable business model to another. This includes both the development of an entirely new business model and the transformation of an existing business model (Geissdoerfer et al., 2018). A survey of more than 4,000 senior managers by the Economist Intelligence Unit found that the majority (54%) favored new business models over new products and services as a source of future competitive advantage (Amit & Zott, 2012). That means companies need to focus on “the way they do business” rather than “what they do”. The innovation needs to be brought not only at company level but also through systemic changes involving stakeholders, industries, and governance structures.

Source	Sustainable Business Model Definition
Stubbs and Cocklin (2008)	A business model where sustainability concepts shape the driving force of the firm and its decision making so that the dominant neoclassical model of the firm is transformed, rather than supplemented, by social and environmental priorities.

Lüdeke-Freund (2009)	“A business model for sustainability is the activity system of a firm which allocates resources and coordinates activities in a value creation process which overcomes the public/private benefit discrepancy. That is, a business model for sustainability is the structural template of a business logic which creates the business case for sustainability.
Lüdeke-Freund (2010)	“A business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society”.
Boons and Lüdeke-Freund (2013)	Sustainable business models with a focus on technological innovation are market devices that overcome internal and external barriers of marketing clean technologies; of significance is the business model’s ability to create a fit between technology characteristics and (new) commercialization approaches that both can succeed on given and new markets.
Schaltegger, Hansen, Lüdeke-Freund (2016)	A business model for sustainability helps describing, analyzing, managing, and communicating a company’s sustainable value proposition to its customers, and all other stakeholders, how it creates and delivers this value, and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries.
Evans et al. (2017)	Five propositions that support the creation of SBM in a unified perspective. “1” Sustainable value incorporates economic, social and environmental benefits conceptualized as value forms. “2” SBMs require a system of sustainable value flows among multiple stakeholders including the natural environment and society as primary stakeholders. “3” SBMs require a value network with a new purpose, design and governance. “4” SBMs require a systemic consideration of stakeholder interests and responsibilities for mutual value creation. “5” Internalizing externalities through PSS (Product Service System) enables innovation towards SBMs.

Tab.1 Sustainable Business Model definitions

The definitions in the literature have in common that they see sustainable business models as a modification of the conventional business model concept, with certain characteristics and goals added to it; they either incorporate concepts, principles or goals that aim at sustainability or integrate sustainability into their value proposition, value creation and delivery activities, and/or value capture mechanisms (Geissdoerfer et al., 2018).

Rana et al (2013) show that companies need to be able to identify new business opportunities by mapping value proposition, value destroyed and value missed among multiple stakeholder.

Yang et al. (2017) suggests identifying the "uncaptured value" in the existing BM, translating it into "value opportunities", and thereby forming a new BM with an elevated sustainable value. This has evolved into four different forms: Value surplus (available but not required), value absence (needed but it does not exist), value missed (available, required but not used), and value destroyed (negative impact). Uncaptured value in a business model can represent an opportunity for innovation, driving its transformation toward sustainability.

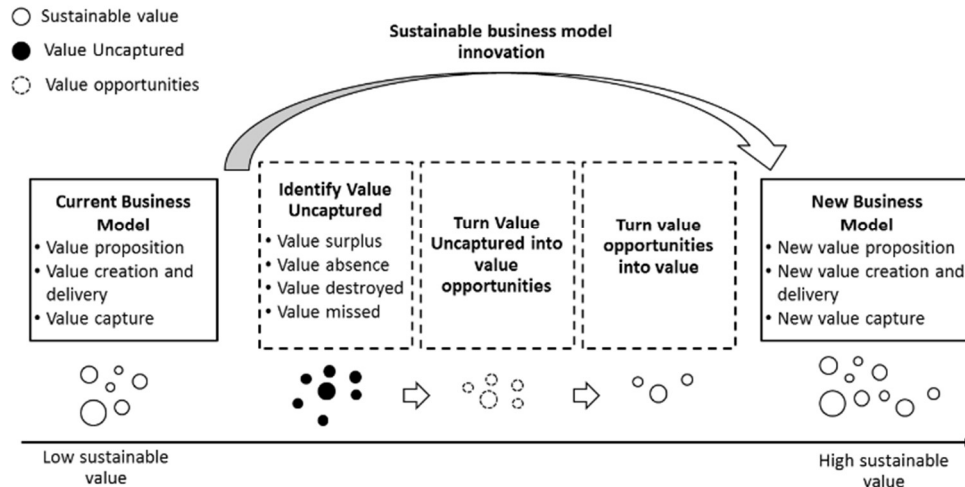


Fig.3 Sustainable business model innovation framework Yang et al. 2017.

- Research and innovation (R&I) is in fact a key aspect to develop sustainable solutions to societal, economic, environmental, and political challenges. R&I is essential to meet climate objectives and build a strong circular economy. New inventions and technologies, organizational innovations and accumulation of human capital have always been the key drivers of improvements in productivity and living standards. This is something that will most likely increase in the future as future growth will largely depend

on productivity improvements. Artificial Intelligence (AI) is expected to play a significant role, given that digital technologies possess the nature of general-purpose technologies (GPTs), which allow them to spread across numerous sectors and potentially revolutionize economic activities (European Commission, Directorate-General for Research and Innovation, 2024).

2.2.5 The Triple Bottom Line approach

One of the first concepts about the SBM proposed by John Elkington in 1994 is the Triple Bottom Line (TBL) that extended the corporate performance theory from an economic perspective by including social and environmental performance dimensions. This theory is based on the 3P principle: planet, people, and profit. Isil and Hernke (2017) found two primary viewpoints: weak and strong sustainability. Weak sustainability argues that economic growth can continue even if it comes at the expense of nature given that total capital resources are fixed. In contrast, strong sustainability suggests that economic activity must avoid the loss or degradation of natural resources, ensuring that the natural environment remains intact for future generations (Aztech Training, 2025).

This approach has received substantial criticism in recent years. One of the main critiques around the TBL is that it does not really consider contextual factors such as culture, place, and social dynamics that can significantly influence the outcomes of the framework (Bhatti et al., 2025).

A study from Panneels et al. extends the TBL concept by adding culture and place as additional pillars leading to the so-called Quintuple Bottom Line.

Another limitation of TBL is the non-integration between its three pillars. The economic aspect can be quantifiable, but the social and environmental pillars do not have equally structured and quantitative measures (Isil & Hernke, 2017). Each dimension requires different units to measure them and combining qualitative and quantitative metrics is challenging. Also, Sridhar (2011) pointed out that the TBL operates more as a decision-based algorithm rather than effectively dealing with operational performance.

TBL framework may also deviate from its true purpose since it does not have definite directions on how it should be applied at the organizational and societal levels due to the absence of

strong regulatory oversight (Srivastava et al., 2021). Sustainability does also require a flexible structure allowing hybrid dimensions like socio-environmental, eco-efficiency, and socio-economic which are not really enhanced by this framework (Bhatti et al., 2025).

The success of sustainable operations is strictly dependent on the active engagement of every stakeholder. Ranking them and prioritizing their contributions based on their influence is very important and this is something not usually addressed in TBL (Bhatti et al., 2025).

TBL reporting, by itself, is not a good indicator of sustainability as companies may report their progress on recycling, levels of emissions, and community engagement initiatives, but may not change their underlying business practices that cause environmental and social degradation. On the other hand, companies may not use a TBL reporting format yet still make significant progress towards sustainability.

3 Methodology

This chapter briefly presents the methodology used to conduct the research and outlines the methodical steps undertaken to achieve the study's objectives. The methodology establishes a structural framework for data collection, analysis and interpretation. A comprehensive literature analysis was performed to cover all categories of Sustainable Business Models. A standard bibliometric approach is used to examine the state of the art and identify key trends, influential publications and research gaps.

Bibliometric analysis is a scientific and rigorous method for exploring and analyzing large volumes of scientific data. It considers a multitude of factors such as the volume of publications and citations, patterns in research findings and collaborative networks among authors and institutions. The analysis was carried out by relying on the Scopus database as the main source of scientific publications.

Scopus is widely used as the primary research citation data source by researchers as it's one of the largest databases in several scientific fields and applies rigorous selection standards (Donthu et al., 2021).

Keywords reflecting the different designations of the main topics were used. The search string implemented is the following one:

("sustainable business model" OR "sustainability-oriented business model" OR "social business model" OR "sustainable business model innovation" OR "impact driven business") AND ("sustainability" OR "economic impact" OR "social impact" OR "environmental impact").

3.1 Data analysis

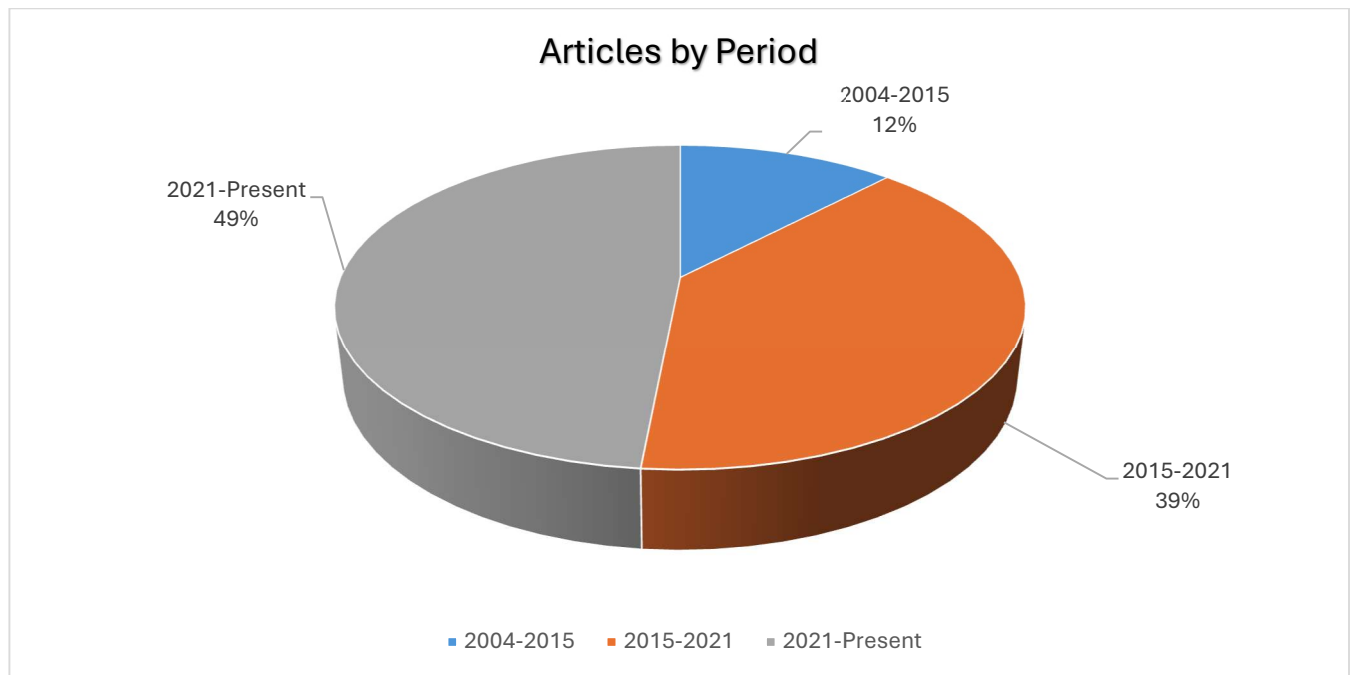


Fig.4 Articles by period

It has been verified that of the 33 articles chosen, the majority, 49%, have been published in the last 4 years, while 39% of the total been published from 2015 to 2021 and only 12% before 2015 (Figure 10). The oldest article considered in the research is dated as of 2004.

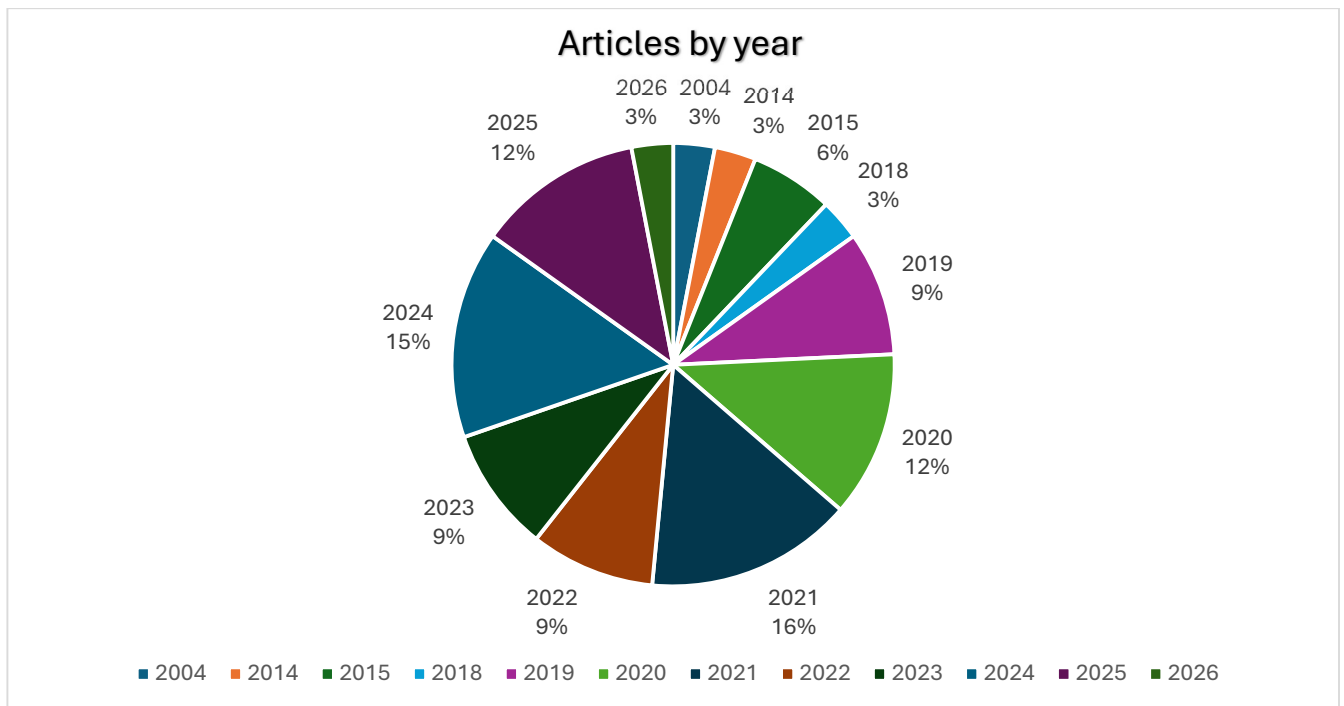


Fig.5 Articles by year

The academic literature on sustainable business models has grown significantly in recent years, as illustrated in Figure 4. In the past decade, governments have increasingly prioritizing sustainability by introducing policies, regulations, and support schemes aimed at promoting sustainable development. This explains why the frequency of publications regards sustainability in the last years increased in all fields.

Cultural aspects can also directly affect firms' decision making; the graph below (Figure 5) shows an even representation worldwide reflecting the global importance of sustainable business practices and the need for diverse perspectives in solving environmental, social, and economic challenges. A good % of articles comes from European countries (Germany, Netherlands and Italy especially) highlighting firm's needs to integrate sustainable practices into their business model.

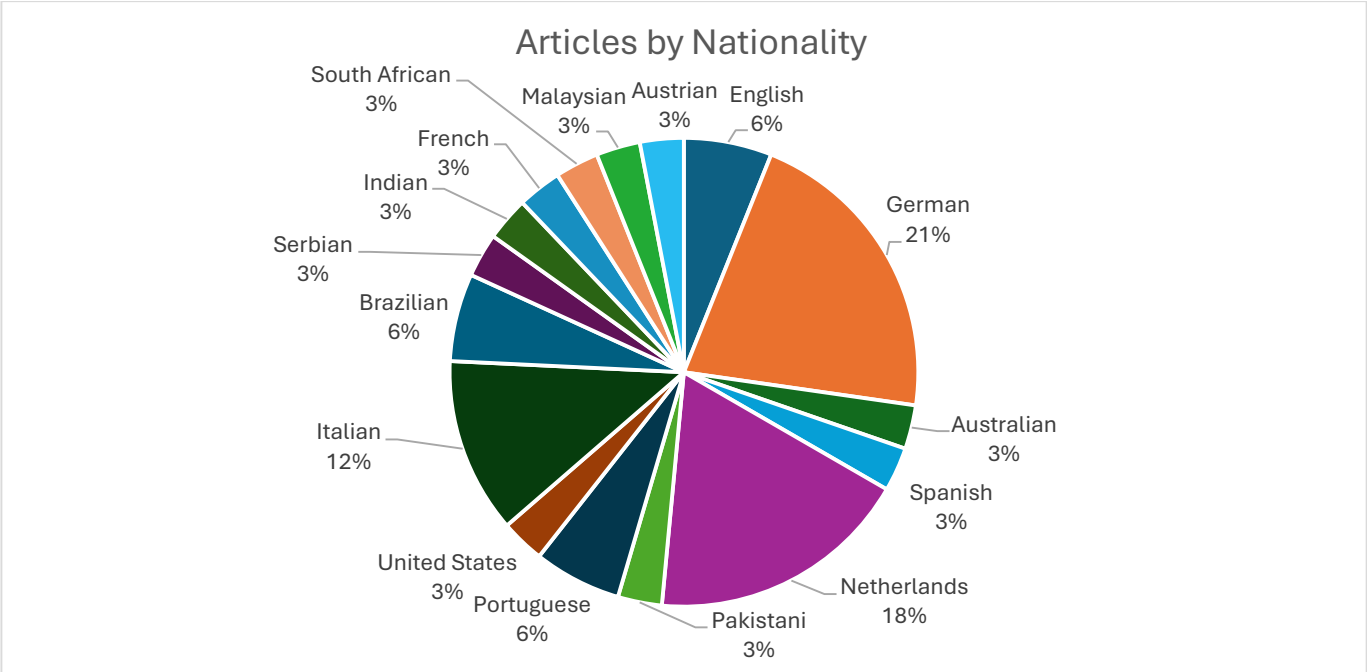


Fig.6 Articles by Nationality

Figure 7 illustrates that majority of the studies adopted literature review and case study analysis as their main research methodologies. Several articles used mixed methodologies, combining qualitative and quantitative techniques, frequently involving expert interviews, surveys, focus groups, and brainstorming sessions to collect and analyze data. A low percentage of studies were conducted using database research given by a specific network/company.

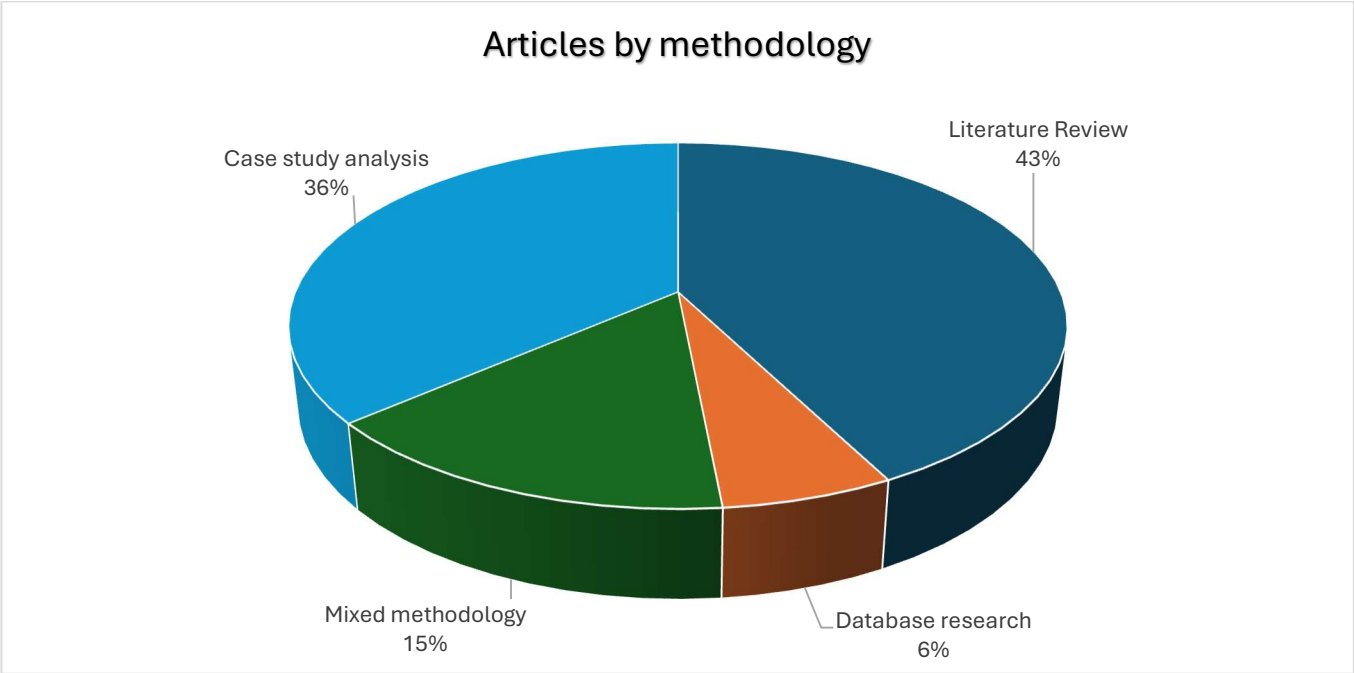


Fig.7 Articles by methodology

The term “author’s keywords” refers to the words selected by the author to summarize the content of the article and highlight the main themes addressed. Looking at Figure 7, it’s clear that most of the articles presents the keyword “Sustainable business model”, and “sustainability”. Of course, even if the term isn't in the keyword list of the article, there might be some references inside the article, or the theme can be treated anyway.

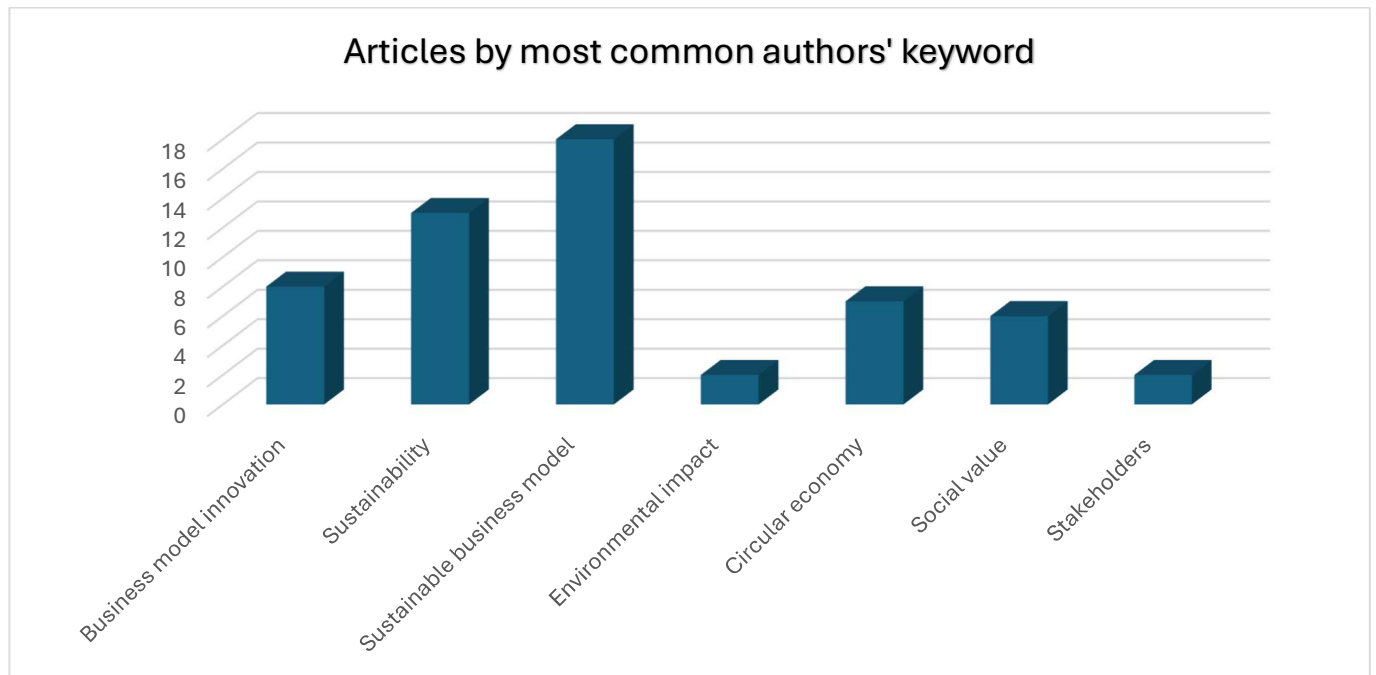


Fig.8 Articles by most common authors' keyword

4. Comparative Analysis of existing Sustainable Business Model Frameworks

This chapter provides a comparative analysis of the selected articles addressing sustainable business models (SBM), business model innovation (BMI), circular economy practices and regenerative business approaches. The purpose of this analysis is to identify the main theories and perspectives of the studies to highlight similarities and differences among them. Several classifications were analyzed to identify the most suitable approach for supporting firms and companies in developing their business models.

The most widely cited classification is the one proposed by N.M.P. Bocken et al. (2014), which provides a foundational framework for categorizing different types of SBMs. It is innovation-based and adopts the “archetype” approach to offer a more detailed and structured categorization. An archetype is a representative model or ideal type often used in academic

research to classify a group of similar concepts or strategies. However, because archetypes are generally derived from historical innovations, they may overlook more recent developments. This classification also places significantly greater emphasis on environmental aspects of BM leaving the social aspect a bit underrepresented.

Another famous contribution is the framework proposed by Lüdeke-Freund et al. (2018), which offers an alternative perspective on the topic using the concept and theory of patterns. A pattern “describes a problem which occurs over and over again in our environment and then describes the core of the solution to that problem in such a way that you can use this solution a million times over without ever doing it the same way twice.” (Alexander et al., 1977). Rather than identifying archetypal strategies, this framework offers a design-oriented approach focusing on the configuration and governance of business models emphasizing how organizations create, deliver, and capture value while integrating sustainability considerations. Both classifications allow firms to combine multiple sustainability objectives, reflecting the multidimensional nature of SBMs. However, both methodologies rely on researchers’ interpretation, which means that potential biases may have influenced the results. The Modified Delphi Card-Sorting method (Paul, 2008) used by Lüdeke-Freund et al. (2018) helps mitigate this effect, but it does not completely remove it due to the interpretative nature of expert-based evaluations. Another limitation, which also points to an important area for future research relates to the assessment of SBMs, is determining the actual sustainability performance of such BMs with rigorous methods and metrics.

A further classification is proposed by Tukker (2004), which focuses on Product–Service Systems (PSS). This framework identifies three main categories: product-oriented, use-oriented, and result-oriented services. Compared to Bocken’s framework, this categorization places greater emphasis on social issues while paying less explicit attention to environmental performance. Importantly, the adoption of PSS models does not automatically guarantee environmental or economic benefits, as outcomes depend heavily on design and implementation. For instance, leasing models may lead to rebound effects due to user behavior. Tukker also acknowledges implementation challenges, noting that firms often begin with product-related services before transitioning toward more advanced service-oriented models.

Dohrmann et al. (2015) focuses on social entrepreneurship, dividing social enterprises based on monetization and market performance. The main point of this research is to investigate how social enterprises finance their mission positioning them along a scale from donation-dependent models to market-oriented models generating commercial revenues. Market revenues can increase by creating new value propositions to further social or market target groups or by using social target groups as resource inputs for new market-oriented value propositions. This framework can be considered complementary to the one proposed by Tukker, as the two approaches provide different insights. Both classifications can be used by social entrepreneurs to identify and structure business models for their companies. The main limitation of Dohrmann's approach is that giving so much importance to the financial aspect may introduce potential bias, as social ventures with high societal value but limited revenue potential may be undervalued.

Another noteworthy approach is the one proposed by Albino and Fraccascia (2015), which centers on the concept of Industrial Symbiosis at the firm level. Unlike Dohrmann et al. (2015), whose framework emphasizes the monetization of social value, this research focuses on inter-firm collaboration. Several business models were studied with both firms producing waste and firms using waste as inputs highlighting strengths and weaknesses related to its implementation from strategic and organizational point of view. The choice of business model is influenced by technical, economic, and strategic factors, and can follow either bottom-up or top-down approaches. While this contribution provides strong environmental insights, it pays less attention to business model design and value creation mechanisms.

Armstrong et al. (2022) extend the analysis to social enterprises in developing countries by incorporating contextual constraints, institutional conditions, and hybrid value creation. This framework highlights how resource deficiency and institutional environments shape SBMs, although its applicability remains context-specific and therefore less generalizable to other contexts.

In contrast to these more specific classifications, Lüdeke-Freund et al. (2024) adopts a broader perspective on SBMs. This study explores not only the value captured or resource flows, but also the organizational activities and design mechanisms that support sustainable value creation. The main idea behind this categorization is that business models are conceived as activity systems; therefore, the dynamic interplay among activities, design themes and value

functions needs to be analyzed to differentiate SBMs from BMs. This approach provides a deeper understanding of how sustainable value is created but requires the ability to disaggregate and analyze complex activity configurations, increasing its level of abstraction and reducing practical applicability.

Another stream of research focuses on innovations that drive sustainability and circularity in business model design. Brenner et al. (2023) propose a dynamic classification that differentiates between sustainability-oriented and circularity-oriented BMIs highlighting the different mechanisms through which firms can achieve sustainable value creation. This framework emphasizes transformation processes through which business models evolve rather than static structures. There is, however, no evaluation of the economic viability of such innovation pathways, which is an important constraint to consider for long-term feasibility. More broadly, this reflects a recurring weakness in the sustainable business model literature, as there is often a tendency to privilege conceptual and normative development over a rigorous evaluation of real-world constraints. The distinction between sustainability and circularity-oriented innovation is also often oversimplified, as in practice these dimensions are highly interdependent and difficult to separate analytically.

Similarly, Mais and Bauernhansl (2024) developed a taxonomy to integrate sustainable and open design options offering a more structured and comprehensive perspective. Nevertheless, while this approach enhances the level of analytical detail, it also increases complexity and does not fully address issues related to economic feasibility and practical implementation.

Chuah, C et al. (2025) propose a more advanced and forward-looking perspective as it shifts the focus from sustainability and circularity toward regenerative value creation. Their approach is conceptually aligned with Lüdeke-Freund et al. (2024) as both adopt a systemic perspective. A related study is offered by Vivas, C. et al. (2025) who introduce a value-mapping-based approach that focuses on aligning stakeholders' values within social innovation processes recognizing the importance of multi-actor interactions and value co-creation. However, despite these contributions, those approaches remain relatively abstract and provide limited guidance on implementation and economic feasibility.

Finally, Süß et al (2025) focus on evaluation methods of SBMs with the goal of categorizing indicators to better assess sustainability performances. Compared to systemic frameworks, this approach is more operational and useful for measurement and comparison. However, it

remains relatively narrow, as it does not fully capture the underlying mechanisms of business model transformation.

Overall, the reviewed classification highlights the multidimensional nature of SBMs and reveals a significant gap between theoretical development and practical applicability. Many studies prioritize the description of structures, processes, or innovation dynamics without sufficiently addressing critical implementation constraints such as economic viability, scalability, and real-world feasibility. SBMs operate within complex ecosystems involving firms, customers, suppliers, institutions, and society at large making it essential to adopt a systematic approach that simultaneously addresses structural configurations, innovation processes, and contextual and economic feasibility.

Classification	Main Focus	Criteria used for the classification	Strengths	Limitations
N.M.P. Bocken et al. (2014)	Business model innovation for sustainability	Archetypes	- Archetypes are flexible, intuitive and allow application across different sectors.	- Archetypes are based on historical innovation and may overlook recent approaches. - The social dimension is relatively underexplored. - Coding process might be influenced by researchers' subjective interpretations.
Lüdeke-Freund et al. (2018)	Sustainable Business Models taxonomy	Patterns	- Patterns are adoptable and can be used in combination with business model instruments such as Business Model Canvas. - New patterns can be added by top-down and bottom-up processes.	- Limited attention to contextual factors such as institutional environments and resource constraints. - Influenced by potential biases related to pattern naming.
Dohrmann et al. (2015)	Social entrepreneurship	Monetization and market performance	- Clear link between social mission and financial sustainability. - Facilitates comparisons between social ventures.	- Overemphasizes financial aspects. - May undervalue social ventures with high societal value but limited revenue potential.
Albino and Fraccascia (2015)	Industrial symbiosis	Resource exchange in firms' networks.	- Developed from the analysis of real cases. - Allows combinations of multiple business models.	- Very specific to industrial systems, cannot be used for service-based or social enterprises. - Value proposition and revenue mechanisms are a bit overlooked.
Tukker (2004)	Product-Service Systems	Archetypes	- Valid framework for value delivery and servitization. - High practical applicability	- Narrow scope as it's specifically designed for PSS. - Lack of dynamic and contextual perspective.
Armstrong et al. (2022)	Social enterprises in developing countries	Resource constraints, institutional context, hybrid value creation	- High practical applicability as it considers resource constraints and institutional conditions.	- Highly context specific, less applicable to developed economies. - Limited structural detail.

			- It considers innovations, sustainability and hybridity.	
Lüdeke-Freund et al. (2024)	Sustainable Business Models	Activities, design themes and value function.	- Holistic perspective that integrates activities, design themes, and value functions into a unified framework. - Adaptable to different industries and organizations.	- High complexity. - Limited practical applicability due to the level of abstraction.
Brenner et al. (2023)	Sustainable and circular Business Model Innovations	Innovation driven transformation	- Strong focus on innovation processes and transformation	- Lacks economic viability assessment. - Limited practical applicability due to the level of abstraction.
Mais and Bauernhansl (2024)	Sustainable and Open Business Models	Integration of Sustainable Business Models and Open Business Models	- Highly detailed and structured taxonomy	- High complexity - Limited focus on feasibility.
Bachmann et al. (2025)	Sustainable Business Model Innovations	Digital and data driven technologies	- Strong integration of innovation processes and sustainability transitions.	- Limited empirical validation and operational clarity.
Chuah, C et al. (2025)	Regenerative Business Models	Regenerative principles, ecosystem restoration, stakeholder integration	- Strong systemic and ecological focus. - Forward-looking perspective	- High abstraction level. - Limited operationalization.
Süß et al. (2021)	Evaluation of Sustainable Business Models	Indicators to make the evaluation	- Allows for assessment and comparisons of different SBMs. - Support for decision making thanks to indicators.	- Limited empirical validation. - Provides limited insight into how SBMs evolve. - Indicators remain partially qualitative
Vivas, C. et al. (2025)	Social innovation	Value mapping, and stakeholder value alignment.	- Practical tool to structure stakeholder value alignment. - Support social innovation processes.	- Mainly conceptual validation - Limited focus on economic feasibility and scalability.

Tab.2 Strengths and limitations of selected frameworks

5. Framework development

5.1 Conceptual approach

Following the comparative analysis of existing classifications, this study proposes an integrated framework for Sustainable Business Models. The literature review has highlighted gaps and limitations across existing approaches as different studies emphasize specific aspects of SBMs, such as structural configurations, innovation processes, stakeholder interactions, or performance assessment, without providing a comprehensive and operational perspective.

Among the existing classifications, the one proposed by Bocken et al. (2015) is widely recognized for its clarity, flexibility and practical applicability as the set of archetypes captures key sustainability-oriented business model strategies. However, despite these strengths, the framework remains predominantly focused on environmental aspects, while offering a more limited treatment of social and organizational dimensions and lacking explicit consideration of implementation constraints and performance evaluation. Moreover, as the classification is based on historical examples of innovation, it may not fully capture emerging or more radical future approaches to sustainable business model development.

For these reasons, this study adopts Bocken's classification as a foundational framework and extends it through a modified structure that reorganizes the archetypes within a broader Environmental–Social–Organizational perspective.

This adaptation preserves the strengths of the original model while enhancing its analytical completeness, updating the classification to reflect more recent and emerging sustainability innovations, and improving its applicability for the design and assessment of SBMs.

Macrogroup	SBM category	Archetypes	Description
Environmental	Efficiency-Oriented models	Maximize material and energy efficiency	Focus on reducing resource use and emissions within existing systems.
	Circular-Oriented Models	- Create value from waste. - Substitute with renewables and natural processes.	Emphasizes closed-loop systems, reuse, recycling and the substitution of finite resources with renewable and natural alternatives.
	Regenerative-Oriented Models	Repurpose for environment/society	Aim beyond neutrality to restore ecosystems and generate net-positive impact.
Social	Access-Oriented Models	Deliver functionality rather than ownership	Improve accessibility and prioritize services over ownership.
	Sufficiency-Oriented Models	Encourage sufficiency	Solutions that actively seek to reduce consumption and production.
	Equity-Oriented Models	Inclusive value creation	Focus on fair distribution of value and opportunities
Organizational	Stakeholder-Oriented Models	Adopt a stewardship role	Focus on responsibility, adaptive strategies and long-term value for stakeholders.
	Scaling and networks Oriented Models	Develop scale-up solutions	Enable diffusion and scaling of sustainable solutions through partnership and network collaboration

Tab.3 The proposed classification

5.2 Structure of the classification

The proposed classification is organized into 3 macro-groups, each representing a distinct dimension of sustainable value creation. This higher-order categorization is inspired by the Triple Bottom Line approach, which emphasizes the integration of environmental, social, and organizational dimensions. Within each macro-group, specific categories are identified to capture different strategic approaches, while maintaining a direct link to the archetypes defined by Bocken et al. (2015).

5.2.1 Environmental Dimension

The environmental dimension focuses on how business models reduce negative environmental impacts and contribute to ecological sustainability. The Sustainable Business Model categories within this macro-group include **Efficiency-Oriented Models**, **Circular-Oriented Models** and **Regenerative-Oriented Models** which encompass different strategies ranging from incremental improvements in resource efficiency to more systemic and restorative approaches.

Efficiency-oriented Models include the “maximize material productivity and energy efficiency” archetype and focus on minimizing resource use and waste through incremental improvements in processes and operations. The goal is to enhance the value proposition and reduce costs to gain a competitive price advantage that increases profits. This archetype captures concepts such as lean, dematerialization and cleaner production approaches:

- Lean thinking is a Japanese philosophy that aims to run operations to meet demand simultaneously with perfect quality and no waste. It's an approach that differs from traditional operations practices as it stresses waste elimination and fast throughput, to provide continuous 'real-time visibility and control' to all elements in the chain (Slack et al., 2016).
- Dematerialization is defined by the United Nations Environment Programme (UNEP) as the reduction of total material and energy throughput required to deliver products and services. Its benefits extend beyond resource conservation and emission mitigation, as it enables the separation of value creation from material consumption (Fang, 2024).

- Cleaner production is a proactive strategy applied to processes, products and services to increase efficiency to reduce waste, environmental and health risks.

It is important to note that improvements in production efficiency may also generate unintended social consequences, such as job displacement, as certain traditional roles may become obsolete. Hence, other archetypes would also need to be considered as complementary (Bocken et al., 2014).

Circular-Oriented Models includes the archetypes “create value from waste” and “substitute with renewable and natural processes” and focus on closing resource loops by extending product lifecycles and reintegrating materials into production systems. The goal is to reduce the environmental impact of industrial activities by lowering the continuous demand for virgin resources, promoting the use of waste streams as inputs for other products and processes, and integrating renewable solutions.

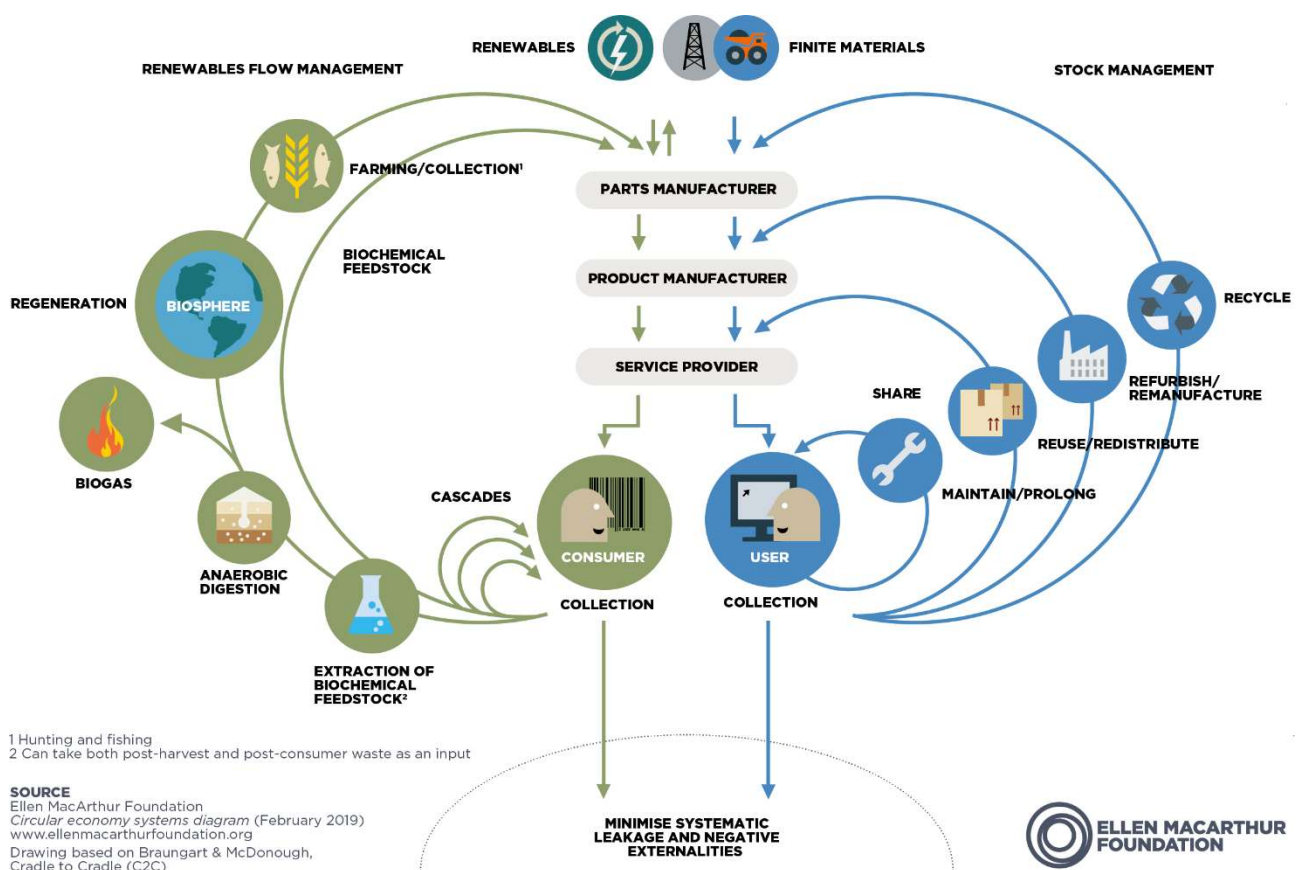


Fig.9 Circular economy system diagram illustrating biological and technical cycles of material flows

(Ellen MacArthur 2019)

Figure 9 illustrates the circular economy system diagram, which provides a comprehensive representation of how materials can be maintained within closed-loop systems. This framework highlights the importance of minimizing resource leakage and reducing reliance on raw materials by optimizing material flows across the entire value chain. A key feature of the diagram is the hierarchy of loops, where inner loops, such as maintenance and reuse, preserve more value and require fewer resources compared to outer loops like recycling. There are two main cycles: the technical cycle, in which products and materials are kept in circulation through processes such as reuse, repair, remanufacture and recycling, and the biological cycle, in which nutrients from biodegradable materials are returned to the Earth to regenerate nature.

Regenerative-Oriented Models include the archetype “repurpose for society/environment” and focus on generating net-positive environmental and social impacts by actively restoring natural system and creating broader societal value. Unlike previous SBMs, which primarily aim to reduce negative impact and optimize resource use, regenerative models seek to enhance ecosystem health, biodiversity and long-term resilience. Hence, this type of model requires a transition from extractive business models into alternatives that can contribute to restoring the natural ecosystems. The traditional mindset centered on profit maximization has proven to stimulate the extraction of resources, the absence of accountability and a lack of focus on sustainability (Impact Hub Amsterdam, 2025). Regenerative models represent a more advanced stage of evolution by shifting away from this perspective toward a purpose driven approach.

Examples of regenerative-oriented models include regenerative agriculture initiatives that restore soil health and biodiversity, ecosystem restoration projects such as reforestation and habitat rehabilitation.

A key aspect to consider is that It’s virtually impossible to ‘be regenerative’ when operating in isolation as it takes collaboration with like-minded individuals and organizations to be successful. In addition, supportive global policy frameworks are necessary to enable, coordinate, and scale regenerative practices across sectors and regions. Within this context, B Corp certification represents an important institutional mechanism. B Corps are defined as “businesses that meet the highest standards of verified social and environmental performance, public transparency, and legal accountability to balance profit and purpose”,

thereby providing a structured governance framework that aligns corporate activity with broader environmental and social regeneration goals.

5.2.2 Social Dimension

The social dimension focuses on how business models address social well-being, equity, and stakeholder value creation, moving beyond purely economic objectives to consider broader societal outcomes. The SBMs categories within this macro-group are **Access-Oriented Models**, **Sufficiency-Oriented Models** and **Equity-Oriented Models**.

Access-Oriented Models include the “Deliver functionality, rather than ownership” archetype that is based on Product Service System (PSS) and Servitization. The goal is to provide services that satisfy users’ needs without having to own physical products. Companies should shift away from profit maximization strategies that rely on scaling mass production and resource-intensive consumption, and instead focus on designing products for longevity, upgradability, and reparability. Examples of this type of approach include car-sharing services, pay per use of product or service, equipment leasing and product extended warranty and maintenance.

Sufficiency-Oriented Models include the “Encourage sufficiency” archetype and focus on solutions that can actively reduce consumption and production. The aim is to address demand-side dynamics by encouraging more conscious and responsible consumer behaviors. Profitability comes from premium pricing combined with recurring sales from long-term customer relationships. This archetype captures the following cases:

- Slow fashion, a manifestation of sufficiency theory applied to the fashion industry as it promotes mindful consumption, high-quality production, and longevity instead of rapid trends and mass production (see appendix A.8)
- Energy Saving Companies (ESCOs) optimize energy consumption of firms and public buildings and in return get paid by part of the savings achieved (FORA, 2010).
- Marketplaces for second-hand goods have experienced significant growth in recent years through platforms such as Facebook Marketplace and eBay. These platforms support sufficiency-oriented consumption by extending product lifecycles, encouraging consumers to take more care of products to ensure higher second-hand value, and incentivizing manufacturers to provide information related to product durability, maintenance, and long-term use.

Equity-Oriented Models include the “inclusive value creation” archetype and focus on ensuring a fair distribution of economic and social value among stakeholders. This archetype was first introduced by Ritala et al. (2018), as it was not explicitly included in the original classification proposed by Bocken. The primary beneficiaries of this archetype are Base of the Pyramid (BoP) populations, referring to low-income communities and underserved markets that have limited access to products, services, and economic opportunities. This approach includes strategies such as:

- Building new markets responsibly involves creating accessible products and services tailored to the needs of specific underserved communities while ensuring positive social impact. This can be achieved through strategies such as developing affordable and context-specific solutions, as well as implementing educational programs that increase awareness and understanding of previously inaccessible or unconventional products and services.
- Microfinance and leasing of necessary goods.
- Differentiated pricing structures enable companies to make products and services accessible to a broader range of customers by adopting pricing strategies tailored to different income levels. In many cases, these models exploit cross-subsidization effects, whereby higher-margin customer groups indirectly support affordability for underserved populations.

5.2.3 Organizational Dimension

The organizational dimension focuses on the internal structures, governance mechanisms, and collaborative capabilities required to implement and scale sustainable business models effectively. This dimension is often overlooked, as firms traditionally concentrate primarily on the economic and financial aspects of business performance. However, as previously mentioned, sustainability cannot be achieved by firms alone, and success depends on the ability to align organizational structures, stakeholder relationships, and strategic objectives with long-term environmental and social sustainability goals. The categories included within this macro-group are **Stakeholder-oriented models** and **Scaling and Network-Oriented Models**, which emphasize stewardship, collaboration, and system-level coordination.

The “Adopt a stewardship role” archetype, included in the **Stakeholder-Oriented Models**, seeks to proactively engage all stakeholders to ensure their long-term health and well-being. It

implies initiatives such as employee welfare and fair wages, community development (education, health, livelihoods), sustainable growing and harvesting, environmental resources and bio-diversity protection. Typically, the consumer pays a premium fee that helps fund improvements across the supply chain, such as requiring suppliers to meet higher environmental and social standards, including certifications and the avoidance of harmful chemicals.

The “Develop scale-up solutions” archetype is in the **Scaling and Network-Oriented Models** category and focus on creating value through expansion and connectivity. These models aim to scale sustainable innovation and maximize their impact by leveraging platforms, partnerships and network effects. This is a crucial aspect to consider, as startups and emerging firms operating according to sustainable principles often face difficulties in securing financial support and accessing growth opportunities due to limited resources, lower market visibility, and the perceived risks associated with innovative business models. There is also a size-related bias in ESG assessments as bigger firms tend to achieve higher ESG ratings just for their greater reporting capacities without necessarily generating substantial positive environmental and social impacts (Drempetic et al., 2020). The archetype better adapts to approaches such as:

- Franchising and licensing, which enable rapid replication and diffusion across different markets and regions.
- Collaborative models such as peer-to-peer models, crowd-sourcing, and open innovation, which facilitate knowledge sharing, resource pooling, and the coordinated scaling of the innovations.

6. Case Study: Patagonia as a Sustainable Business Model

6.1 Introduction

Patagonia represents one of the most widely recognized examples of a company integrating sustainability into its core business model. The company was founded in 1973 in California by Yvon Chouinard, a rock climber passionate about the environment, and operates within the outdoor apparel and equipment industry. Chouinard's first business venture focused on producing and selling steel pitons for rock climbing, which became highly appreciated among climbers for their durability and reliability. However, the widespread use of these products also revealed their negative environmental impact on rock surfaces, contributing to the development of Chouinard's environmental awareness and ultimately influencing the sustainability-oriented philosophy that later became central to Patagonia's business model. Over time, the company expanded its product lines even further to offer outerwear, long underwear, backpacks, camping accessories, food items, and more outdoor essentials. Currently, Patagonia operates more than 70 stores globally and two distribution centers. The brand has an estimated value of \$3 billion and brings in \$100 million in revenue per year. Chouinard's philosophy significantly contributed to the company's success, as he progressively moved away from a purely profit-oriented mindset toward a purpose-driven business approach.

This company is particularly relevant for the analysis as sustainability principles are embedded throughout its value chain, governance structures and relationships with stakeholders.



Fig.10 Patagonia official logo with the iconic mountain skyline (Patagonia, 2026)

6.2 Patagonia's Philosophy

Since its establishment in 1973, Patagonia has consistently demonstrated a strong commitment to sustainability through numerous environmental initiatives and advocacy campaigns. In the early 1970s, the company made its first environmental donation to support the protection of the Ventura River and its fish habitat from a proposed development project. In 1985, Patagonia pledged 10% of its profits to environmental conservation groups, reinforcing its long-term commitment to environmental activism. The company further expanded its efforts in 1988 through a major campaign aimed at protecting Yosemite Valley. Later, in 2001, Patagonia co-founded the 1% for the planet initiative, through which participating companies commit to donating 1% of annual sales to environmental organizations and sustainability-related causes. Some of the most significant programs were launched in recent years and include:

- “Don’t Buy This Jacket” (2011) – A widely recognized advertising campaign published in The New York Times, in which Patagonia encouraged consumers not to purchase products they did not truly need. The campaign promoted conscious consumption and challenged traditional consumerist business logics.



Fig.11 'Don't Buy This Jacket' print advertisement (Patagonia,2026)

- In 2013, the “Worn Wear” campaign was launched ahead of Black Friday. Patagonia showed a short film at certain retail stores in the United States that featured customers who had their Patagonia gear for years. Its goal was to encourage shoppers to keep their old clothing rather than buying new (and unnecessary) items.
- In 2016, Patagonia launched the “Vote Our Planet” ad campaign nationally committing nearly \$1 million to support political candidates promoting environmental protection.
- In 2020, the “Buy Less, Demand More” ad campaign was launched to raise awareness about the growing climate crisis. The ad urged consumers to buy fewer products and reduce their environmental impact while also emphasizing the need for broader systemic changes in corporate practices and sustainability policies (MarcomCentral, 2025).

6.3 Patagonia as a certified B-Corp

Patagonia’s relevance within the sustainability landscape is further recognized through its certification as a B-Corp (Benefit Corporation), which confirms the company’s commitment to meeting high standards of social and environmental performance, accountability, and transparency. The certification is awarded by B Lab, a non-profit organization that assesses companies’ impact through various indicators, including sustainability performance, social equity, governance standards, and commitment to employee well-being. B-Corp certification is increasingly valued by both consumers and companies, especially in the fashion industry as it reflects a company’s ability to combine business success with environmental and social responsibility.



Fig.12 B-Corp certification (B Lab, 2026)

Patagonia obtained the certification in December 2011, becoming one of the first large companies in California to achieve B Corp status and further reinforcing its position as a leading sustainability-oriented company.

There are five impact areas that businesses are assessed on when it comes to their positive impact: **Governance, Community, Environment, Customers and Workers.**



Fig.13 Impact areas of the B Impact Score (B Corporation Australia, 2022)

The Governance impact area evaluates a company's overall mission, ethics, structure, transparency and engagement around its social and environmental impact. Typically, companies can obtain between 10 and 15 points within this category; however, Patagonia achieved an exceptionally high score of 17.8, reflecting the company's strong integration of sustainability principles into its governance framework (Patagonia Report, 2024). Key factors contributing to this result include:

- Establishing a Board of Directors.
- Carrying out regular independent impact reporting.
- Providing a detailed investment strategy that is available to anyone on their website.

The Workers impact area evaluates how a company contributes to their employee's financial security, health, wellbeing, safety, career development, and engagement satisfaction. In this category, Patagonia has a score of 23.7 out of 50 available, reflecting the company's strong commitment to its employees and their quality of life as they offer very strong healthcare

benefits; a generous amount of paid time off; and many non-traditional benefits such as on-site and subsidized childcare (Patagonia Report, 2024).

The community impact area looks at a business' impact on the communities in which it operates evaluating the relationship with external stakeholders such as suppliers, charitable organizations and broader society. In this area, Patagonia has an incredibly high score of 79.2, reflecting strong supply chain risk assessment and management, tracking and traceability, and Supplier Code of Conduct. The company is also known to intentionally purchase from small-scale factories and fair wage/labor certified plantation/estate farms in underserved markets (Patagonia Report, 2024).

In the environment area, the company has obtained a score of 40.4 out of 45, an extraordinary result showing the company's effort to measure and manage the environmental impacts of its own operations and throughout its supply chain. The company has established ambitious environmental targets such as eliminating virgin petroleum material in their products and using 100% recycled or easily recyclable materials (Patagonia, 2026).

Lastly, in the customers impact area, the company achieved a score of 4.7 out of 5, reflecting Patagonia's strong commitment to responsible customer stewardship and product quality. This result is supported by the implementation of several best practices, including product guarantee policies, formal quality control mechanisms, ethical marketing standards, customer satisfaction monitoring systems, and responsible management of customer data privacy (Patagonia Report, 2024).

According to B Lab's assessment (2026), Patagonia currently holds an overall B Impact Score of 166.0, significantly above the minimum score of 80 required for certification and well above the average score of ordinary businesses, which is approximately 50.9. These results reinforce Patagonia's position as one of the leading sustainability-oriented companies within the apparel industry and demonstrate how environmental, social, and organizational sustainability principles can be integrated into a company's governance structures and strategic objectives.

However, the score should not be interpreted as evidence of complete sustainability achievement but rather as an indicator of continuous improvement and long-term commitment. Sustainability remains an evolving process requiring ongoing innovation, stakeholder collaboration, and continuous adaptation to emerging environmental and social challenges.

6.4 Analysis and Classification of Patagonia's Business Model According to the Proposed Framework

Patagonia can be considered the perfect example of a Sustainable Business Model, as sustainability principles are deeply integrated into the company's environmental practices, governance structures, stakeholder relationships, and long-term strategic objectives. In order to better understand the company's impact from a holistic perspective, this chapter applies the "Triple Layered Business Model Canvas" tool (TBLC), with a particular focus on the environmental and social layers (Joyce & Paquin, 2016).

Key Partners - Global network of certified suppliers and manufacturers. - Fair Trade Certified Factories	Key Activities - Design and development of outdoor apparel and equipment. - Sustainable sourcing and supply-chain management - Product repair, reuse and resale (Worn Wear)	Value Proposition - High-quality durable products sold at a premium price - Value added by technical performance, durability and longevity, brand reputation and trust, sustainability leadership.	Customer Relationship - Community engagement - Transparency and stakeholder communication. - Strong brand community and customer loyalty, after-sales services	Customer Segment Environmentally conscious consumers, outdoor enthusiast, premium outdoor apparel market
	Key Resources Skilled workforce, good repair infrastructure and great product design		Distribution Retail stores, e-commerce platforms, website and repair centers.	
Cost Structure - Material costs (organic cotton and recycled materials) - Fair labor practices - R&D for innovative materials and new technologies			Revenue Streams - Primary revenues come from product sales - Worn wear program, repair and reselling used clothes	

Marketing expenses and consumer education initiatives	
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Tab.4 Economic business model layer of Patagonia

Patagonia, like most of the companies in the fashion industry, does not directly manufacture their products; the company very much relies on suppliers to deliver their core product. The company strategy is to differentiate themselves from competitors by offering premium, organic and sustainable outdoor apparel. The target consumer is a sports person that is willing to pay a premium price for a product with those characteristics. The company basically designs its products in-house, then assigns the production to partners, and then sells them through their distribution channels. The global clothing industry is valued at roughly \$20 billion and is projected to have a 7,3% CAGR. Analyzing the market using Porter's five forces, several factors can be outlined.

- Suppliers have relatively high bargaining power as companies ask for sustainability and high-quality materials.
- Consumers also have quite a bit of bargaining power as there are no switching costs and numerous substitute products are available.
- Competition in this sector is very intense; companies adopt substantial marketing and advertising campaigns as brand reputation is a key factor since products are usually very similar.
- The threat of newcomers is relatively low as there is high entry cost and brand building requires lots of time and effort.
- The threat from substitutes product is high as there are lots of options.

Even though the market is quite large and has potential for steady growth, there is intense competition between brands making it difficult to acquire and maintain a substantial market share. Patagonia addresses this challenge by targeting a specific customer segment and differentiating itself through high-quality, durable products joint with a strong brand identity and a well-established commitment to environmental and social sustainability.

Supplies and Out-Sourcing • Low % of local suppliers • Global network of certified suppliers (Fair Trade Certified Factories) • Textile exchange • 4-Fold vetting system screening supply chain partners and factories	Production Outsourced manufacturing, use of recycled and regenerative organic materials	Functional Value • High performance outdoor apparel designed for durability and longevity. • Repairability as a core product feature. • Design for extended lifecycle use to reduce replacement frequency).	End-of-Life Worn wear program and recycling worn-out products.	Use Phase Extended life of clothing by statistically 9 additional months.
	Materials Recycled polyester 93%, recycled nylon 89% and Regenerative Organic Certified Cotton		Distribution Global retail network and online platform, packaging 100% recycled or easily recyclable.	
Environmental Impacts • Reduced resource extraction through recycled materials • Garments sold through the worn wear program generate around 60% lower emissions compared to newly produced ones.			Environmental Benefits • 240 million \$ in total donated to grassroots environmental nonprofits entities. • 3t CO2 reduced from the air per hectare of restored agricultural land.	

Tab.5 Environmental business model layer of Patagonia

From the upstream perspective, Patagonia relies on a global network of certified suppliers and incorporates recycled materials, supported by rigorous supplier screening processes. Even though local sourcing remains limited, the emphasis on ethical sourcing and material innovation reduces dependence on virgin resources. The value proposition focuses on durability, repairability, and product longevity rather than frequent replacement focusing on end-of-life phase of the product while regenerative agriculture and financial support contribute to ecosystem restoration at the beginning of the value chain.

Local Communities - Funding of environmental and community-based NGOs - Investments in local conservation and restoration initiatives	Governance - Mission-driven governance model (“Earth is our only shareholder”) - Certified B Corp structure and stakeholder accountability - Strong ethical oversight of supply chain and operations	Social Value - Developing long term value from mutual relationship with stakeholders. - Provision of high-quality durable products realized in an ethical and sustainable way.	Societal Culture Ethic work conditions and respect for the environment	End-User Market composed of consumers seeking high quality, durable and performance oriented outdoor products that are also sustainable
	Employees 3000 employees (approx. 50% woman) - No turnover - Self-management - Flexible working hours		Scale of Outreach Global brand with strong environmental advocacy presence.	
Social Impacts Fair Wage up to 2/3 times minimum one (Fair Labor Association)		Social Benefits - Increased awareness of environmental and social issues. - Community funding through environmental and social programs.		

Tab.6 Social business model layer of Patagonia

Tab. 6 shows how Patagonia embeds social sustainability throughout its business model by creating value for multiple stakeholders rather than focusing solely on customers or shareholders. The company's mission-driven governance and B Corp structure ensure

accountability and ethical decision-making while also promoting employee well-being through flexible working conditions and a strong purpose-driven culture.

The company therefore represents an ideal case study for applying the multidimensional Environmental–Social–Organizational framework proposed in this thesis. It’s important to note that Patagonia’s business model combines multiple sustainability-oriented practices simultaneously; consequently, it cannot be easily assigned to a single category or archetype. Instead, the company reflects an integrated and multidimensional approach in which environmental, social, and organizational sustainability principles overlap and mutually reinforce one another.

The company can, however, be more strongly associated with the Regenerative-Oriented Models category and the “Repurpose for environment/society” archetype.



Fig.14 Conceptual business model of Patagonia

The company strongly believes in creating a robust social-responsibility program that analyzes and manages the impacts the business has on the workers, the environment and communities. The goal is not only to minimize harm, but also to create a positive benefit to both the environment and the communities it operates in, by actively restoring ecosystems, improving worker well-being, and supporting long-term social and environmental resilience.

Over 90% of the products are made in a Fair Trade Certified factory and a premium price is paid on every item made in one of those factories. This extra money goes directly back to factory workers in the form of a Community Development Fund that they fully control, and they can decide how to use the funds (Patagonia, 2026).

The company has also pledged to use 100 % of virgin cotton grown using organic practices and has also started to invest in farms adopting regenerative techniques with over 2.000 farmers benefiting from the program.

In the business model there are also elements of other categories:

- Sufficiency-Oriented Model, “Encourage sufficiency” archetype as Patagonia actively promotes reduced consumption by encouraging customers to buy only what they need (Don’t buy this jacket advertisement) and extend product lifecycle through repair and reuse.
- Circular-Oriented Model, “create value from waste” archetype as the company promotes the use of recycled and reclaimed materials, transforming waste streams into valuable inputs for new production processes while simultaneously reducing virgin resource extraction and environmental impacts.
- Stakeholder-Oriented Model, “Adopt a stewardship role”, as the company seeks to maximize the positive social and environmental impacts on society by ensuring long-term well-being of stakeholders, employees in the first place (through initiatives such as employee welfare and fair wages), but also local community, partners and suppliers. Production systems and suppliers are carefully selected to deliver social and environmental benefits.

Conclusions and perspectives

This thesis explores the evolution of Sustainable Business Models (SBMs) through the development of a multidimensional framework aimed at providing a more comprehensive understanding of how businesses integrate environmental, social and organizational aspects to create long-term sustainable value. The literature review on Sustainable Business Models can be defined as vast and fragmented, with many different approaches being developed across academic disciplines, resulting in a wide range of interpretations, frameworks, and conceptualizations of how sustainability is embedded within business models. Overall, the analysis highlights how sustainability cannot be achieved by solely focusing on a single dimensional aspect; firms are required to consider the dynamic interaction between ecological restoration, social well-being and organizational governance.

This study demonstrates that SBMs increasingly combine multiple archetypes simultaneously making rigid classifications difficult. In this regard, the case study of Patagonia shows how companies can successfully integrate different sustainable practices within a single business model. At the environmental level, the research highlights the growing relevance of regenerative and circular strategies while. From a social perspective, it shows the importance of stakeholder engagement, ethical supply chains, employee well-being, and more responsible consumption patterns. Finally, the organizational dimension underlines how governance mechanisms, mission-driven structures, and collaborative networks play a crucial role in ensuring the long-term viability, scalability and effectiveness of SBMs. Furthermore, this thesis also challenges the misconception that a sustainable company cannot achieve strong economic performance, demonstrating instead that sustainability and long-term profitability can coexist and even mutually reinforce one another.

However, this study presents some limitations and challenges. Given that sustainable practices often overlap and interact, any classification framework is inherently influenced by a degree of subjectivity and contextual interpretation, which may affect the consistency and generalizability of the findings. Also, sustainability assessments can be affected by biases linked to firm size, reporting capacity, and ESG evaluation methodologies, potentially disadvantaging smaller and emerging firms despite their innovative sustainability practices. It would also be interesting to conduct an in-depth examination on how B-Lab evaluates and certifies companies, particularly about the reliance on self-reported data, the weighting of

different impact categories, and the complexity of comparing firms across diverse industries and operational contexts.

In conclusion, the thesis supports the idea that truly sustainable business models cannot rely on isolated sustainability initiatives, but instead require systemic, integrated, and purpose-driven approaches capable of generating long-term value for both society and the environment.

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Appendix A – Summary of Reviewed Articles

A.1 The Sustainable Business Model Archetypes developed by N.M.P. Bocken et al. (2014)

This classification is one of the most influential and frequently cited frameworks in academic literature as it has proved to be more effective in understanding the underlying mechanisms within the business model innovations. 8 “archetypes” are introduced to describe groupings of mechanisms and solutions; the aim is to create new development paths or a capability to innovate moving the focus towards creating new systems and generating value across the value network. They are classified in three different macro groups: social, technological, and organizational, representing the three streams of innovation. The technological segment includes archetypes (1) maximize material and energy efficiency; (2) create value from waste; and (3) substitute with renewables and natural processes. The social segment has the archetypes (4) deliver functionality rather than ownership; (5) adopt a stewardship role; (6) encourage sufficiency; and lastly, the organizational group consists of (7) repurpose for society or the environment; and (8) develop scale-up solutions. The archetypes were selected to link the theoretical concept of business model innovation to the practical transformation mechanisms emerging for delivering industrial sustainability. Different archetypes may be combined within a single firm to pursue multiple sustainability goals at the same time.

Groupings	Technological			Social			Organisational	
	Archetypes			Archetypes			Archetypes	
Examples	Maximise material and energy efficiency	Create value from waste	Substitute with renewables and natural processes	Deliver functionality rather than ownership	Adopt a stewardship role	Encourage sufficiency	Repurpose for society/ environment	Develop scale up solutions
	Low carbon manufacturing/ solutions Lean manufacturing Additive manufacturing De-materialisation (of products/ packaging) Increased functionality (to reduce total number of products required)	Circular economy, closed loop Cradle-2-Cradle Industrial symbiosis Reuse, recycle, re-manufacture Take back management Use excess capacity Sharing assets (shared ownership and collaborative consumption) Extended producer responsibility	Move from non-renewable to renewable energy sources Solar and wind-power based energy innovations Zero emissions initiative Blue Economy Biomimicry The Natural Step Slow manufacturing Green chemistry	Product-oriented PSS - maintenance, extended warranty Use oriented PSS- Rental, lease, shared Result-oriented PSS- Pay per use Private Finance Initiative (PFI) Design, Build, Finance, Operate (DBFO) Chemical Management Services (CMS)	Biodiversity protection Consumer care - promote consumer health and well-being Ethical trade (fair trade) Choice editing by retailers Radical transparency about environmental/ societal impacts Resource stewardship	Consumer Education (models); communication and awareness Demand management (including cap & trade) Slow fashion Product longevity Premium branding/ limited availability Frugal business Responsible product distribution/ promotion	Not for profit Hybrid businesses, Social enterprise (for profit) Alternative ownership: cooperative, mutual, (farmers) collectives Social and biodiversity regeneration initiatives ('net positive') Base of pyramid solutions Localisation Home based, flexible working	Collaborative approaches (sourcing, production, lobbying) Incubators and Entrepreneur support models Licensing, Franchising Open innovation (platforms) Crowd sourcing/ funding "Patient / slow capital" collaborations

Fig.15 Sustainable business model archetypes developed (Bocken et al.,2014)

Firms can use one or multiple business models archetypes for shaping their own transformation and to explore new ways to create and deliver sustainable value and develop the business model structure. The proposed classification has limitations, as the archetypes are based on historical innovations and may therefore overlook more recent approaches, highlighting the need for ongoing revision. The approach mainly focuses on the environmental aspect of businesses; further emphasis on the social dimension is needed to provide a more comprehensive perspective on sustainability.

Another key aspect to consider is that the classification is derived through a coding process that can be influenced by researchers' subjective interpretations; a more robust and empirical procedure would be desirable to enhance reliability and validity.

A.2 The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation (Lüdeke-Freund et al., 2018)

This taxonomy uses the concept of “pattern” as a tool to classify the existing knowledge on SBM. A pattern can be defined as describing a problem which occurs over and over again in our environment and then describing the core of the solution to that problem in such a way that you can use this solution a million times over without ever doing it the same way twice (Alexander et al., 1977). The methodology used is a mix of qualitative and quantitative methods as it was made by applying a five-step approach consisting of (1) identifying and reviewing literature, (2) extracting SBM patterns from the literature, (3) developing initial pattern groups, (4) creating SBM pattern groups using the Modified Delphi Card-Sorting method (Paul, 2008), and finally (5) associating the SBM patterns and groups to sustainable value creation.

Code	Group	Definition	Included patterns
G1	Pricing and revenue patterns	Address the revenue model of a business model, how offerings are priced and revenues generated.	Differential pricing; Freemium; Innovative Product Financing; Subscription Model
G2	Financing patterns	Addresses the financing model, how equity, debt, and operating capital are acquired.	Crowdfunding; Microfinance; Social Business Model: No Dividends
G3	Eco-design Patterns	Integrate ecological aspects into key activities and value propositions, i.e., how processes and offerings are designed to improve their ecological performance over their entire life cycle.	Hybrid Model / Gap-Exploiter Model; Maximize Material Productivity and Energy Efficiency; Product Design; Substitute with Renewables and Natural Processes

G4	Closing-the-Loop Patterns	Incorporates circular material and energy flows into partnerships, activities, and channels.	Co-Product Generation; Industrial Symbiosis; Online Waste Exchange Platform; Product Recycling; Remanufacturing / Next Life Sales; Repair; Reuse; Take-Back Management; Upgrading.
G5	Supply Chain Patterns	Modifies upstream and or downstream components—how inputs are sourced, and target groups are reached.	Green Supply Chain Management; Inclusive Sourcing; Micro Distribution and Retail; Physical to Virtual; Produce on Demand; Shorter Supply Chains
G6	Giving Patterns	Help donate products or services to target groups in need, how costs are covered and how social target groups are reached.	Buy One, Give One; Commercially Utilized Social Mission
G7	Access Provision Patterns	Create markets for otherwise neglected target groups, involving modified value propositions, channels, revenue, pricing and cost models	Building a Marketplace; e-Transaction Platforms; Experience-Based Customer Credit; Last-Mile Grid Utilities; Value-for-Money Degrees; Value-for-Money Housing
G8	Social Mission Patterns	Integrate social target groups in need, including neglected groups, either as customers or productive Partners	Expertise Broker; Market-Oriented Social Mission; One-Sided Social Mission; Social Business Model: Empowerment; Two-Sided Social Mission
G9	Service & Performance Patterns	Transition from product sales perspective towards performance/service-based value delivery.	Pay for Success; Product-Oriented Services; Result-Oriented Services; Use-Oriented Services

G10	Cooperative Patterns	Integrates a board range of stakeholders as co-owners and co-managers.	Cooperative Ownership.
G11	Community Platform Patterns	Substitute resource or product ownership with community-based access to resources and products.	Sharing Business.

Tab. 7 Table with sustainable business model pattern group (Lüdeke-Freund et al., 2018)

The proposed taxonomy does offer practical guidance as it helps firms explore alternative ways of creating, delivery and capturing sustainable value. It also supports systematic searches for new patterns through top-down (from Sustainability challenges → Pattern group → Patterns → Examples) and bottom-up processes (from Examples → Patterns → Pattern group → Sustainability challenges). The main advantage of this classification is that patterns are adaptable to different sectors and contexts, and this is important to facilitate adoption and application by firms specifically in combination with business model instruments such as Business Model Canvas (Osterwalder & Pigneur, 2010). Despite its contributions to SBM research and practice, the classification presents several limitations. Experts were asked to group patterns to create the main structure but the additional survey on expected value effects was taken with another rationale of characterizing the same sample, which could create some controversy in some cases. In particular, the supply chain group (G5) shows a mixed composition. Potential biases related to pattern naming may also have influenced the outcomes, as the overuse of certain words could have steered the experts toward specific classifications. While the Delphi card sorting system (which consists in running different rounds of meeting with experts who have an in-depth knowledge of the complex issue under investigation) helps mitigate subjectivity, it cannot completely remove it due to the interpretative nature of expert-based evaluations.

A.3 Monetizing Social Value Creation – A Business Model Approach by Dohrmann et al. (2015)

This classification does focus on social entrepreneurship who describes a business field that is oriented towards efficiently serving human needs which existing market and institutions have failed to satisfy. It describes how social value creation can be monetized by strategically shifting the financial focus from revenues **for** the social missions to revenues **with** the social missions.

Social business models are ordered according to monetization and market performance into 4 different classes.

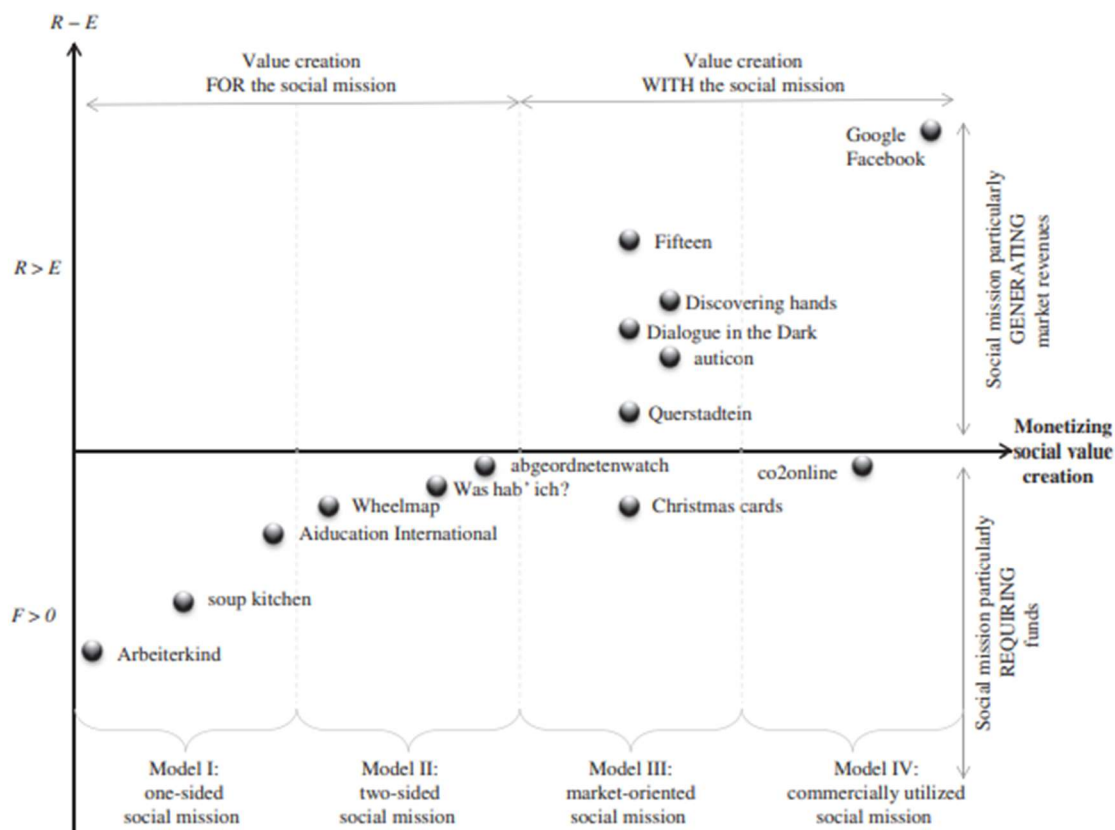


Fig.16 Social business models classified according to monetization and market performance.
Dohrmann et al. (2015)

Model I is called the one-sided social mission; the central value proposition consists of the social mission such as supply, personnel and infrastructure targeting low-income populations. Revenues usually fall short of expenditure, and funds by social investors are required ($F > 0$). An

example is the soup kitchen largely funded by companies or institutions whose mission is to supply food to recipients who are extremely poor.

Model II is the two-sided social mission that is addressing both the production and consumption side. Like the first model, the value created by the venture is entirely for the social mission. The group on the production side is used as a business model resource input (free production support is offered) in order to satisfy the consumption need of the social target group on the consumption side. An example is given by Wheelmap, a social enterprise which represents the first crowd-sourced online map of wheelchair accessible and inaccessible places around the world supporting inclusion and awareness of urban wheelchair users. The information on the website is free and easily accessible, revenues are generated from alliances with wheelchair manufacturers, city authorities and event managers, and there are as well donations, awards and incentives.

The third generic business model emphasizes the production side, which is paid for creating new value propositions, with funding largely derived from market revenues to meet consumption needs. An example of this model is Jamie Oliver's social enterprise Fifteen, which consists of several high-quality restaurants offering professional training and opportunities to disadvantaged young people such as homeless and unemployed or those overcoming drug or alcohol problems.

The fourth model is the commercially utilized social mission featuring enterprises with the highest degree of monetization of social value creation. A social group on the consumption side is targeted as a resource input to satisfy the specific needs of a different market segment. In contrast to the previous model, donations are not intended within this business model. An example is the social enterprise co2online, an online platform providing free online tools that enable customers to track their energy consumption, CO2 emissions and costs. An analysis on consumers' energy bills determines possible savings potential. The social enterprise generates revenue by selling information and statistics to companies.

This framework distinguishes social business models based on the composition and origin of their revenue streams, which reveals a positive correlation between monetization of social value creation and the generation of market revenues. Social entrepreneurs can use this framework as a support tool to identify and structure business models for their companies. By focusing on the monetization of social value creation, this classification facilitates comparison

across social ventures; however, it does not provide a comprehensive overview of Social Business Models based on holistic sustainability criteria. Emphasizing market and revenue generation may also introduce potential bias, as social ventures with high societal value but limited revenue potential may be undervalued.

A.4 The Industrial Business Model Approach: A Classification Of Business Models by Albino and Fraccascia (2015)

This article addresses industrial symbiosis as a whole system and, through the analysis of actual cases, develops a classification of business models oriented toward this approach. Industrial symbiosis is a system-oriented concept that engages traditionally separated industries in a collective approach promoting physical exchange of materials, energy and services (Gopalakrishnan & Bakshi, 2024). Collaboration and the synergistic possibilities offered by geography proximity allow the optimization of the entire material cycle, from raw material extraction to component production, final products, obsolete products, and ultimate disposal. This approach enables firms to achieve environmental, social and economic advantages.

Two main models can be identified: waste exchange and co-product generation. Those can be subdivided into six different models: waste exchange, co-product generation, co-product generation destined to the internal consumption, co-product generation from external wastes, online waste exchange platform, IS-based business oriented to product generation.

Waste exchange is the most common strategy adopted as the waste produced by a given company becomes an input for another production process. It's called an internal exchange if all processes remain within the original firm; external exchange if another firm is involved. Internal waste exchange is easier to implement as it avoids problems arising from inter-firm relationships, external exchange has higher potential as the diversity among firms increases the number of symbiotic exchanges, technically feasible and then potentially implementable. An example is a firm giving exhaust tires to another firm who uses them as a substitute of coal in cement production. The firm collecting tires reduces its waste disposal costs whereas the cement producer avoids sustaining the coal purchase costs.

Co-product generation involves the creation of multiple products from a single production process that are then sold in the market. An example is British Sugar, a sugar producer company in UK, using wastes from sugar production process, such as residual resin, pulp, and soil stones for the production of chemical products, animal feed, and aggregate.

Co-product generation destined to the internal consumption combines the internal waste exchange model and the co-product generation one. The key characteristic is that companies use their waste to generate new products that are then exploited within the company. For example, McDonald's project to produce biodiesel from fried oil generated in its restaurant, then used to power the company's trucks.

Co-product generation from external waste is a business model in which companies produce and sell new products on the market using waste obtained from other firms. Production volume is strictly dependent on the amount of waste received by the firm. An example is CSC S.R.L., an Italian firm that's producing a new product from plastic municipal waste.

Finally, the industrial symbiosis approach that can be divided into two different types; Online waste exchange platform and IS-based business oriented to product generation.

Online waste exchanging platforms help match supply and demand for waste materials and gains from this service from commissions on transactions.

IS-based businesses oriented to product generation refer to firms specifically created to generate value by transforming waste into new products. Kazmok, for instance, is a Dutch company that produces bags and accessories made from used conveyor belts which had a previous life in other industries.

This research provides a guide for existing firms on how to integrate the IS approach in their current business model, and can also help new business initiatives completely based on IS. The framework is developed from the analysis of real industrial cases, increasing practical relevance and validity. The models are not mutually exclusive; combinations of multiple business models are possible, but this may create ambiguity in certain cases.

A.5 Eight Types Of Product–Service System: Eight Ways To Sustainability? Experiences From Suspronet by A. Tukker (2004)

This article proposes a classification of (PSS) Product-Service System as it identifies 8 different archetypes grouped into three macro-categories 1) product-oriented services 2) use-oriented services 3) result-oriented services. PSS can be defined as a market offering that combines tangible products and intangible services with the aim of fulfilling client needs in an integrated and customized way.

Product oriented services	Use oriented services	Result oriented services
1) Product-related services Companies offering services along with the product such as a maintenance contract, financing scheme or also a take-back agreement for the end-of-life product. 2) Advice and consultancy Provider giving advice on the most efficient use of the product sold (advice on the organizational structure or logistic optimization in a factory where the product is used as a production unit for example)	3) Product lease Business model in which customers pay a recurrent fee for the unlimited and individual access to the product, but the provider retains ownership. 4) Product renting or sharing Same concept as product leasing but users do not have unlimited and individual access; the same product is sequentially used by different people. 5) Product pooling Similar to product renting or sharing but products are collectively used by several customers at the same time.	6) Activity management/outsourcing Companies outsource part of their activities to third-party providers, using performance indicators to monitor and control the quality of the outsourced services. 7) Pay per service unit Customers buy the output of the product according to the level of use (e.g. copier producers making pay-per-print offers) 8) Functional result Business model in which the customer purchases a guaranteed delivery of a result. Providers are completely free as of how to reach the result.

Tab.8 PSS classification (A. Tukker, 2004)

For companies, Product-related services and advice and consultancy are the easiest business model to implement while also offering the potential for a reduction in environmental impacts; similarly, activity management/outsourcing generates environmental benefits if efficiency improvements are related to materials, and not to time input of humans. Product lease may instead lead to less responsible user behavior resulting in higher environmental impact.

Product sharing, renting and pooling have high potential but a lower market value than the competing product. The functional result one can also theoretically give especially environmental benefits, but it does bring some challenges: in some cases, the functional result cannot be defined in concrete terms, liabilities may be too high in relation to the promised result, or the provider simply has insufficient control over the result reachability.

Overall, this classification gives a clear overview of PSS, covering all types of business models with different economic and environmental impacts. It serves as a guide for firms to identify innovative pathways for business model transformation offering a clear progression from a “product-oriented” logic to “result-oriented” one. As PSS are highly user-oriented, they also contribute to increase customers loyalty. A key aspect to consider is that by decreasing reliance on the product as a core component, client needs can become more abstract making them difficult to translate into concrete indicators. Providers can’t determine precisely what they have to supply, and it’s difficult for clients to know whether they have got what they asked for.

A.6 Regenerative business strategies: A database and typology to inspire business experimentation towards sustainability by A.Das and N.Bocken (2024)

This article explores the concept of regenerative business strategies moving beyond traditional sustainability approaches that only reduce negative impacts. Regenerative businesses also look at the positive changes their products and services can create to the ecological system (the handprint). A typology of six archetypal regenerative business strategies was also derived, including: (1) regenerative leadership, (2) nature regeneration, (3) social regeneration, (4) responsible sourcing, (5) human health & wellbeing focus, and (6) employee level focus.

Regenerative Business Strategy Archetypes	Definition	Examples
Regenerative Leadership	Leadership approach that aims to create positive systemic change by restoring and enhancing ecological, social, and economic systems in a broader sense throughout the company.	Lush, a cosmetic company that actively use their purchasing power and supply chains to achieve regenerative outcomes such as the protection of biodiversity, or rewilding projects.
Nature regeneration	Strategies that aim to improve the health of the natural world.	CarbonEthics, company that restore mangroves in Indonesia which in turn restores marine and coastal ecosystems while also sequestering carbon.
Social regeneration	Strategies that aim to regenerate human ecosystem.	Fair-afric, a company who place manufacturing facilities of chocolate in Ghana to generate more wealth where cocoa is grown.
Responsible sourcing	Series of sourcing practices to empower and strengthen suppliers and their communities (especially those involved in raw materials provision)	Albert Heijn's True Pricing scheme, where a customer can choose to pay the "true" price of a product, as it would be if everyone was fairly remunerated all along the supply chain.
Human health and well-being	Companies focus on human health and well-being to create products and services	Health insurance provider Bupa's Healthy Cities initiative that aims to

	that have a positive effect on their customers.	promote better human health so that there is a smaller illness load on healthcare services.
Employee level focus	Businesses that are looking to improve the working conditions, lives, and wellbeing of their employees.	Greyston Bakery's, a baking company hiring and reskilling former convicts and addicts to help them on to new careers.

Tab.9 Regenerative business strategies (A.Das and N.Bocken, 2024)

This classification offers a detailed overview of regenerative strategies highlighting the diverse ways in which businesses can create a positive ecological, social and economic impact. It's designed to inspire experimentation; there is no constraint imposed as regeneration is not something an organization does in isolation and it is most effective through collaboration and being embedded within local contexts. Regarding size of the organizations involved, both small enterprises and very large companies were the most represented in the database studied. Larger organizations with well-established revenue streams can afford to experiment with new business model strategies that smaller organizations would be unable to support. Instead, small companies have a need to establish themselves in the marketplace and find new ways to create value.

It is important to note, however, that the cases included in the research were identified through purposive sampling; therefore, although data collection continued until saturation was reached, the results may still be subject to bias.

The framework is more conceptual than operational as it lacks precise metrics or implementation guidelines. Boundaries between archetypes can be blurred as, for example, both responsible sourcing and social regeneration address the relationship between companies and local suppliers.

A.7 Driving Sustainable Innovation: A Review of Data-Driven Technologies in Sustainable Business Model Innovation by N. Bachmann et al. (2025)

This article examines how digital and data-driven technologies enable the development of sustainable business models. It highlights the role of big data analytics, artificial intelligence, IoT, blockchain, and digital platforms in improving transparency, resource efficiency, and circularity.

In particular, five distinct research areas were identified: digital platforms, circular economy, smart manufacturing and supply chains, blockchain, and servitization.

Digital platforms can contribute to sustainable business models by promoting the peer-to-peer sharing of underutilized assets and creating value for internal and external stakeholders. Circular economies are very much influenced by data-driven and digital technologies as these tools enable firms to transition from linear production and consumption systems to more sustainable circular business models. Collaborations between product manufacturers, users and remanufacturers promote open innovation and co-creation, emerging as critical success factors for aligning and integrating stakeholder interests. Changes in value creation caused by digital technologies impact the entire supply chain and lead to considerations regarding how value is shared along the supply chain. Adopting a dynamic capabilities lens, this study identifies the data-driven and sustainability-oriented capabilities that firms need to leverage to create value through business model innovation.

A.8 Business Model Innovation for Strong Sustainability: Conceptualizing Degrowth Value Creation in the Dutch Fashion Industry by N. Chevroliier et al. (2025)

This article explores how business model innovation can support sustainability by applying ù b degrowth principles within the Dutch fashion industry. The examined companies are implementing a different approach to their operations shifting their focus mass production to durability and longevity. Ownership of products and resources is rethought through deposit models, where customers receive a new item upon returning used products, and subscription models, in which the company retains ownership while granting customers access to use the

product. Empirical findings show that growth in size and influence are key aspects to create change and outperform unsustainable competitors. There are also alternative ways to create impact that do not rely on growth such as advocating for changes in laws and policies, establishing networks with other companies to encourage similar business models, and working on qualitative changes in product or service offerings.

Working with other companies, as well as with producers and consumers, allows companies to improve product life cycles, create second-life products, prevent and reduce waste, and improve efficiency through the sharing of materials, knowledge, skills, and experience. In conclusion, the adoption of degrowth principles can reshape value creation positioning companies as sustainability influencers while demonstrating transparency regarding the sustainability of their operations and products.

A.9 What Makes a Business Model Sustainable? Activities, Design Themes, and Value Functions by Lüdeke-Freund et al. (2024)

The aim of this paper is to define what distinguishes a business model for sustainability from a conventional business model. It proposes a classification of 26 BMfS activity groups sorted in 12 BMfS design themes and 3 BMfS value functions.

BMfS activity groups that support BMfS design themes	BMfS design themes that support BMfS value functions	BMfS value functions
- Assessing impact - Bundling offers - Collecting - Designing products - Disposing - Offering services - Pricing - Producing - Recycling - Renewing	- Avoiding harmful substances that potentially can harm the natural environment, both directly and indirectly. - Avoiding waste - Extending life cycles - Reducing resource consumption	Maintaining value Ensuring the integrity and functionality of the natural environment and man-made artifacts.

• Reselling • Selecting and offering products • Sharing resources • Using eco-friendly inputs • Using smart technologies		
• Collecting • Cooperating • Disclosing and reporting • Offering services • Promoting • Redistributing and reinvesting profits • Renewing • Reselling • Selecting and offering products • Sharing resources • Sourcing	• Facilitating informed decision-making • Influencing purchasing behavior • Influencing user behavior • Making sustainable offerings accessible • Stimulating demand for sustainable offerings	Unlocking value Utilizing untapped potential for sustainable value creation beyond an organization's boundaries, specifically at the interfaces with customers and markets.
• Co-governing • Connecting • Cooperating • Employing • Empowering • Giving • Offering financing • Pricing • Redistributing and reinvesting profits	• Improving stakeholders' socioeconomic conditions • Offering access/opportunity • Supporting environmental/ social causes	Sharing value Involving, engaging, and supporting stakeholders to ensure that the benefits from value creation processes are shared equitably and Responsibly

Tab.10 Classification of Business Model for Sustainability (Lüdeke-Freund et al., 2024)

From a preliminary point of view, it is quite challenging to explain in more specific terms how BMfS differ from conventional business models as both classes involve sets of activities, designs, and ways of contributing to value creation that may seem similar. For a BMfS to be distinguishable from a conventional business model it's necessary that specific activities, design themes and value functions occur simultaneously and interdependently. The crucial aspect is how the organization proposes, delivers, captures, maintains, unlocks, and shares value with and for its stakeholders. A related issue is the need to develop a much more nuanced understanding of how stakeholders perceive value. Total value creation, a term used by Amit (2007) and Morioka et al. (2017), refers to the overall value a business model generates for all participants including all sorts of effects (ecological, social, economic, cultural, etc.). It can be used in combination with the above framework as an helpful starting point.

A.10 Challenges of business models for sustainability in startups (Nunes, A.K.S. et al. 2022)

This study contributes to the literature by analyzing challenges and barriers startups have to face in implementing business models for sustainability. The sustainable value exchange matrix (SVEM) is applied on two different startups located in Brazil, an emerging country that faces institutional gaps and sustainability paradoxes. The SVEM tool is developed to provoke reflection to support brainstorming for improvement opportunities and enhance performance towards sustainability. Stage A, B and C seek to promote a description of the main aspect that represents the organization while stage D provides insights into potential innovations that can enhance sustainability by explicitly aligning business model elements to address sustainable development challenges.

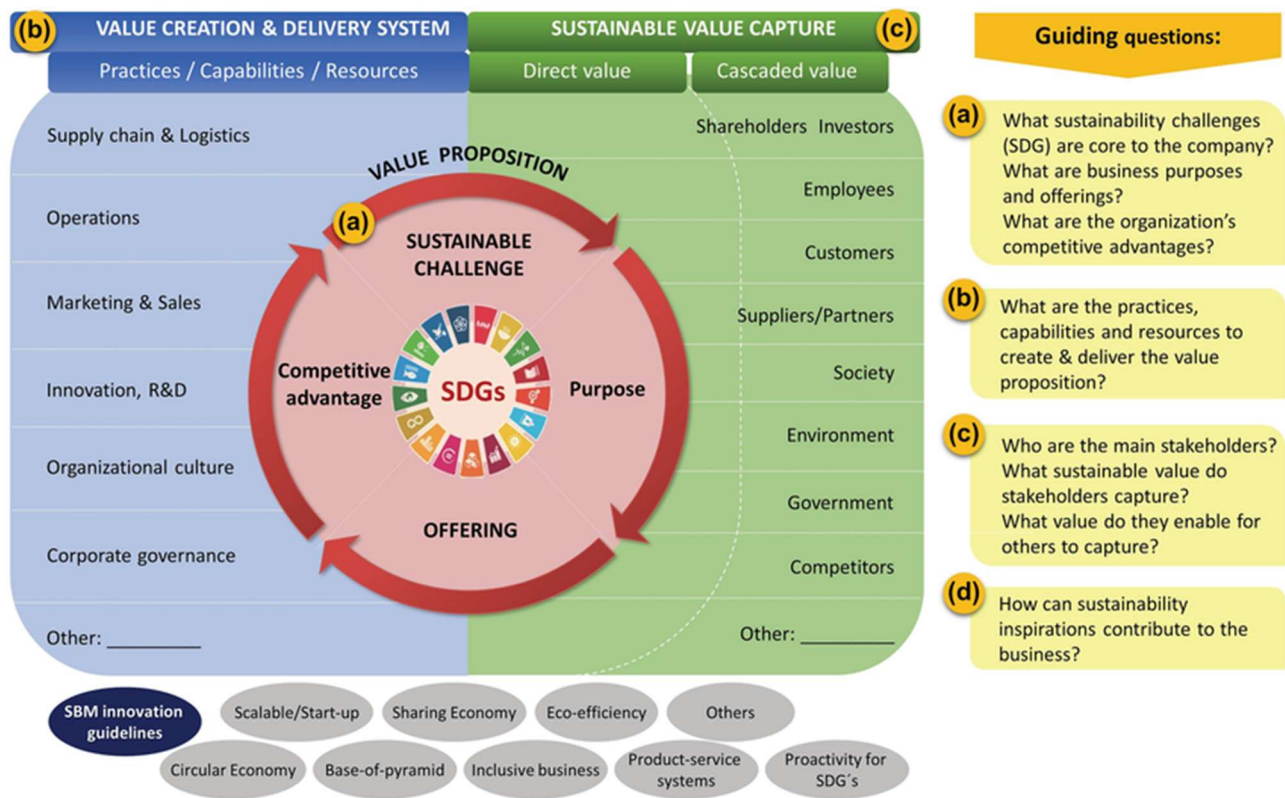


Fig.17 Sustainable value exchange matrix (SVEM) (Morioka et al., 2018).

Several barriers and challenges emerge across different categories: institutional and organizational, market and sales, innovation, research and development, supply chain, operations and logistics. Regarding the institutional and organizational dimension, there is a need to reformulate public policies and to have a greater participation of the actors involved. It's often quite difficult for companies to make the business model economically viable. Innovation and technologies are a big factor as well for the development of new solutions and continuous improvements; at least one of the CEO's of the companies is pursuing a Master's/PhD degree in parallel to the entrepreneurial activity. Challenges found in both startups regarding organizational culture are related to short-termed expectations as corporations seek to realize quick profits to satisfy shareholders whereas sustainability initiatives typically require long-term commitment and investment.

A.11 Sustainable business models for social enterprises in developing countries: a conceptual framework by Armstrong, M.R. et al. (2022)

This paper proposes a conceptual framework to capture the concepts relevant to the sustainable management of Social Enterprises (SEs) with the goal of achieving both social and financial value creation. The framework presents 2 layers, the social enterprise and business model layers to make a clear distinction between aspects that are unique to SEs when compared to for-profit enterprises and aspects that are often employed by for-profit enterprises but are just as applicable to SEs.

The **social enterprise layer** consists of 4 categories: (1) enterprise considerations, (2) social considerations, (3) maturity and growth and finally (4) hybridity.

Social Enterprise			
Enterprise Considerations	Social Considerations	Maturity & growth	Hybridity
Traditional Business Practices	Social Intervention	Endurance Innovation	Bottom Lines
Financial Orientation	Poverty Disadvantage	Scale	Organizational Design
Ecosystem	Fellowship & understanding		Target market
Organizational Culture			Duality Management
			Stakeholder Orientation
			Target Beneficiary

Tab.11 Social enterprise layer (Armstrong, M.R. et al, 2022)

Category 1: Enterprise Considerations

Traditional Business Practices emphasize organizational autonomy (enterprises are free in terms of use and allocation of resources), the delivery of goods or services, professionalized management structures (to create awareness of the product/service and its benefits), a profit-oriented logic, and market-driven strategic positioning.

Financial Orientation concept is composed of financial mission (to ensure that it is self-sustainable in the long term), start-up risk, limited profit distribution (so that there is no profit-maximization as it could lead to decreased social impact and legitimacy), profit and economic value creation.

Ecosystem category composed of business ecosystem (to describe how the environmental context, customers and the competition interact), business ecosystem landscape (local conditions, regulatory environment, institutional environment, and policy), infrastructure (electricity, roads, water, technology and transportation), eco-system adaptation, eco-system shaping and supply chain.

Organizational culture concept is also important as It has been shown that companies that have a formal vision are more successful; rules and boundaries are helpful in guiding companies' decisions.

Category 2: Social Considerations

Social Intervention concept consisting of social need (defined as the gap between the current reality and the desired social condition), social impact (the value created for the society), beneficiary (individuals who benefits from the social mission, not necessarily customers), social cost (negative impacts that the enterprise has had on community) and social value.

Poverty Disadvantage constituted by poverty penalty (beneficiaries are either priced out of the market, or the quality is so bad that they chose not to use the product), opportunity accessibility and affordability.

Fellowship and understanding composed of community engagement (to obtain local knowledge and expertise of the community), local embeddedness, legitimacy, public legitimacy and market legitimacy.

Category 3: Maturity and Growth

The maturity and growth category consists of scale and endurance innovation as it's important to scale the social impact that the SE creates and to overcome hostilities and limitations of the markets within which they operate and the innovation that is required to overcome the challenges encountered in this process. A key milestone is reaching the capital stage, where revenues are enough to cover costs. This allows SEs to continue meeting their social mission while being profitable enough to scale up in the long term. There are several strategies to do so:

- 1) Gradual market building and expansion: focus on the initial phase at a few target locations before growing and expanding across different locations
- 2) Scalability by market penetration: expanding the range of value offerings to enter specific markets.
- 3) Scalability by replication: capacity of the firm to replicate and implement its initiatives in different locations.
- 4) Scale impact through consultancy services.
- 5) Use multiple business models to scale and address diverse customers groups and revenue streams.

Every aspect of the business model and social interventions is open to innovation; the key is to innovate the aspects of the business model that have been identified as problem areas, as well as adding capabilities and aspects that are missing.

Category 4: Hybridity

The final category to consider is hybridity with bottom lines, organizational designs, duality management, stakeholder orientation, target market and target beneficiary as sub-categories. The hybridity aspect of SEs can cause tensions as each stakeholder group has different interests in the organization; investors want ROI, employees seek social impact and compensation, while beneficiaries seek improved quality of life.

It is found that a single-minded pursuit of a single goal enables enterprises to obtain competitive advantage while also protecting against potential social mission drift. SEs may form partnerships with for-profit businesses; however, such collaborations can risk undermining their legitimacy and autonomy as the for-profit gains more control. Community engagement and impact sourcing are keys to ensure that social and economic value creation activities are successful in the community. Another thing to highlight is that beneficiaries and customers are not always the same people; when the beneficiary is also the client, additional challenges arise such as low ability to pay, which requires SEs to reduce prices and results in low margins.

The **business model layer** consists of 5 categories (1) market orientation, (2) organisational design, (3) business design, (4) impact creation and (5) planning.

Business Model				
Market Orientation	Organizational Design	Business Design	Impact Creation	Planning
Market Considerations	Governance	Economic Model	Value Spillover	Growth
Value Proposition	Legal Forms	Value Chain	Beneficiary Intervention	Strategy
Customer Interaction	Enterprise Coherence	SE Archetypes		Innovation
	Distinctiveness			

Tab.12 Business model layer (Armstrong, M.R. et al, 2022)

The **Business Model layer** consists of 5 categories: (1) market orientation, (2) organizational design, (3) business design, (4) impact creation and finally (5) planning.

Category 1: Market Orientation

Value proposition needs to be specific to the customer segment targeted; Consumer goods are bought for their value, not their ethics.

Market considerations consist of market orientation (details how an organization meets the needs of its customers), positioning (how the target audience visualizes an organization), target market research (to determine all the different information on the market like size, market need the value chain in which the SE operate etc.), marketing (to create awareness of the product/service and its benefits), adaptive learning (ability to build capabilities based on the local resources and conditions), adaptive shaping (ability to intentionally shape the environment in favor of the enterprise), penetration rate (measure to determine how well the value proposition has diffused) and customer segments.

Category 2: Organizational Design

Governance elements are the board (responsible to ensure that the SE meets its commercial and social missions), governance (expanded as a concept, direction, control and accountability), organizational structure and ownership.

Legal Forms to make a distinction between for-profit, non-profit, cooperatives and mixed entities.

Enterprise Coherence evaluates how well the core elements of the business model interact within each TBL layer, ensuring that social, financial, and environmental objectives are mutually aligned rather than conflicting.

The distinctiveness concept centers on internal competencies and competitive advantage as those are strictly connected. A successful business model is insufficient to assure competitive advantage as it can be imitated. Innovations can help to maintain the competitive advantage.

Category 3: Business Design

The economic model concepts are based on cost structure, investment model, value capture (how revenue is generated from the value proposition, how costs are structured and how capital is employed) and revenue model.

There are 4 types of investment models:

- 1) The subsistence model, where the objective is to survive and meet financial needs.
- 2) The income model, where the business is able to generate ongoing and stable income for its dual mission.

- 3) The growth model, where investments are used to grow the value of firm to create return for investors.
- 4) The speculation model with a clear goal in mind, to show venture potential and sell out to an acquirer.

Revenue models can basically be subdivided into:

- 1) Revenue from the sale of goods and services.
- 2) Donations
- 3) Grants from third parties.

Concepts related to the supply chain category are partnerships (mutually beneficial and usually leveraged for market reach, market acceptance, resources, expertise and to reduce risks), value network (partners involved can provide resources and capabilities), and key resources.

SE archetypes are distinguished by their funding sources and the degree of control they exercise over their operations and strategic decisions.

Category 4: impact creation

Value spillovers refer to the social impact required to achieve the social mission and can be subdivided in automatic value spillovers (social value is automatically created alongside economic value, through the provision of the value proposition and there is no need for additional interventions) and contingent value spillovers (social value is created through external economic activities).

Beneficiary interventions consist of end-to-end solutions (to meet the need of BoP customers), value proposition, customer deep truth (to understand the fundamental needs of the consumers), local embeddedness (SE integrating itself into the daily life of people in the community) and overlap clients and beneficiaries (to fulfil the commercial and social mission with one value proposition).

Category 5: planning

Growth subcategory is composed of stage of business model development, imitation and micro-franchise. It's important to conceptualize the social problem and then design an intervention or strategy to tackle this problem. Imitation is encouraged as a third-party

replication can help with the SEs social mission of creating social impact and creates a viable way for the initiative to scale.

Strategy subcategory is formed by competitive strategy, rules, strategic level and integrated activities. The strategic aspect is very important as it helps with market positioning, partnerships, and growth opportunities. Innovation subcategory constituted by challenge conventional wisdom (to think outside the box and create new strategies to tackle old problems), experimentation and iteration and finally business model innovation (to transform or create BM that can balance economic, social, and environmental value creation).

A.12 Mapping regenerative business: a conceptual framework building upon systems thinking in Southeast Asia by Chuah. C et al. (2025)

This study explores regenerative business in underdeveloped countries highlighting how firms can create positive ecological and social impact through interconnected and locally embedded strategies.

The analysis identifies 4 primary clusters: 1) Innovation Practices, 2) Regenerative Business Models, 3) Impact to Society, and 4) Impact to Environment.

A crucial consideration is that Regenerative companies do not merely implement sustainable innovations; they reconfigure business models to drive systematic change. It's important to avoid focusing on efficiency gains only as adaptive mechanisms can help to have a proper response to socio-ecological changes.

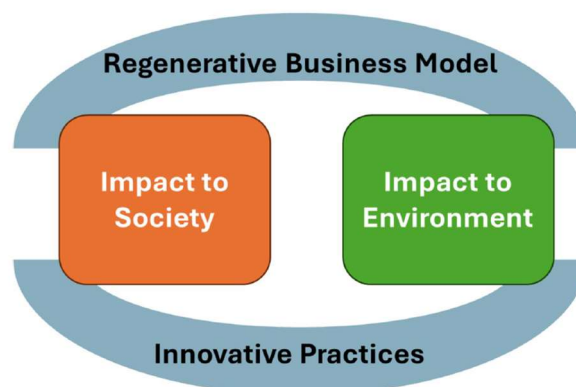


Fig.18 Regenerative Business Framework (Chuah. C et al., 2025)

Environmental restoration and social contribution are the core component of Regenerative Business with innovative practices and regenerative business models acting as structural enablers. The dynamic interaction between these enablers amplifies impacts across both environmental and social domains. While existing literature considers business models and innovation as primary factors, their influence is structural rather than direct. Regeneration can be seen as an iterative process that needs a dynamic application to ensure long term viability through continuous learning and systematic integration.

Policymakers should leverage this system perspective to design incentives and regulations that encourage regenerative practices while businesses should adopt strategies that align with long term sustainability and social impact.

A.13 Innovating for impact: Harnessing business model innovation to tackle grand challenges by Bocken, N.M.P. et al. (2025)

This article investigates how business model innovation (BMI) can help with global challenges including artificial intelligence (IA), business and global unrest, and climate change captured in a proposed “ABC” classification.

Category A refers to misinformation and the possible adverse outcomes of AI. ChatGPT and AI technologies have experienced a huge rise in popularity in recent years, and policy makers are struggling to keep the pace and implement appropriate regulations.

Category B refers to risks for businesses arising from polarization, economic uncertainty, inflation and from disrupted supply chain for food and energy due to wars.

Category C refers to risks related to climate change and disasters due to extreme weather.

The framework integrates three grand challenges (GC), three key aspects of business models (antecedents, outcomes and processes) and three possible interactions between BMI and GC.

	How can instability be leveraged for BMI?	How can BMI help counter threats & mitigate AI risks?	How can instability spur innovation in business models that help alleviate grand challenges?
BMI Antecedents	What contextual factors trigger BMI during periods of business and global unrest? (Talebian et al., 2025)	What internal and external resources facilitate risk mitigation through BMI? (see Wang et al., 2025)	How do firms identify and mobilize resources to create new value propositions that address societal challenges during crises? (see Esau et al., 2025)
BMI Outcomes	What competitive advantages do firms gain by leveraging business and global unrest for BMI?	What governance and structure adaptations are most effective in minimizing disruptions?	How do crisis-driven business models enhance sustainability and societal value? (see Wang et al., 2025)
BMI Processes	How do firms conceptualize and execute BMI processes in response to business and global unrest? (See Talebian et al., 2025)	How can businesses seamlessly integrate crisis-responsive BMI to improve adaptability and resilience? (see Esau et al., 2025)	What iterative processes help businesses pivot to socially driven business models during crises?

Tab.13 Research questions for BMI and AI

	How can instability be leveraged for BMI?	How can BMI help counter threats & mitigate risks due to instability?	How can instability spur innovation in business models that help alleviate grand challenges?
BMI Antecedents	What contextual factors trigger BMI during periods of business and global unrest? (see Talebian et al., 2025)	What internal and external resources facilitate risk mitigation through BMI? (see Wang et al., 2025)	How do firms identify and mobilize resources to create new value propositions that address societal challenges during crises? (see Esau et al., 2025)
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BMI Processes	How do firms conceptualize and execute BMI processes in response to business and global unrest? (See Talebian et al., 2025)	How can businesses seamlessly integrate crisis-responsive BMI to improve adaptability and resilience? (see Esau et al., 2025)	What iterative processes help businesses pivot to socially driven business models during crises?
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Tab.14 Research questions for BMI and business and global unrest

	How can climate change be leveraged for BMI?	How can BMI help counter climate-threats and risks?	How can instability spur innovation in business models that help alleviate grand challenges?
BMI Antecedents	What climate risks are the major drivers for BMI? How can various organizational functions start addressing climate risks and opportunities more profoundly?	How can BMI drive virtuous cycles toward climate solutions, and break-down vicious ones? (see Wang et al., 2025) How does environmental dynamism shape BMI choices that address global challenges? (see Talebian et al., 2025)	What new BMI territories need to be explored triggered by climate change? How can climate risk can become the driver for BMI? (see Talebian et al., 2025)
BMI Outcomes	How can companies create a competitive advantage by leveraging the need to mitigate and adapt to climate change? (see Esau et al., 2025)	How can BMI mitigate climate threats and risks? How can BMI lead to more climate risk resilient models? (see Wang et al., 2025) How can the real climatic impact of BMI be better anticipated and measured in business operations and value chains?	How can BMI help mitigate Climate Change in different sectoral contexts? (see Esau et al., 2025) How can BMI help solve multiple intertwined and wicked climate change issues?
BMI Processes	How do companies incorporate climate adaptation and mitigation in their competitive BMI processes? How do companies develop	What BMI processes may support design against climate risks and threats? How do cognitive trajectories during BMI influence the development of sustainable business models? (see Esau	What processes support design for climate adaptive and mitigating BMI?

	processes for collaborative BMI to tackle climate change at a systemic level?	et al., 2025)	
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Tab.15 Research questions for BMI and climate change

Regarding these big questions, firms necessitate to stop relying on incremental improvements and start pursuing systemic, purpose driven transformation that aligns profitability with societal impact. Effective digital transformation requires strong collaboration and strategic agility, enabling organizations to adapt proactively rather than remain static amid rapidly evolving disruptive technologies. Strategic entrepreneurship, when applied through BMI, reframes global challenges as opportunities to improve the total value creation.

A.14 Sustainability-Oriented Business Model Evaluation—A Literature Review by Süß, A. et al. (2021)

This paper provides a comprehensive analysis of the different evaluation approaches that can be applied to sustainability-oriented business models. Four main categories of evaluation methods are identified: (1) single indicators, (2) indicator system/framework, (3) simulation-based evaluation and (4) multi criteria decision-making (MCDM).

The first evaluation method (1) utilizes single indicators which are most of the time derived from specific business model components such as total life cycle cost for building owners. While the use of such indicators facilitates comparisons of business models within the same context, it makes it harder to apply the method to another industry. For this matter, it's possible to use more general indicators using criteria for market, structure and value proposition [37]. Single indicators can also be directly associated with sustainability dimensions (e.g. for social performance the number of jobs generated, for economic performance the ROI and for ecological performance the GHC emissions).

The primary issue with this method, regardless of the indicators employed, is that it overlooks the interdependencies between business model elements and criteria.

(2) Indicators system or frameworks overcome this problem by applying a system approach to show relationships between different criteria/elements. Most common tools are the business model canvas and BSC (balance score card).

(3) Simulation-based evaluation refers to system dynamics to evaluate the sustainability of business models by simulating long term interactions between economic, environmental and social factors with a software testing different scenarios. It delivers a strong relational analysis but it may miss some evaluation aspects.

The last category (4) MCDM is a set of methods/approaches used to evaluate and choose among conflicting criteria to consider trade-offs across several factors. The most common method is the analytical hierarchy process (AHP). It requires a considerable amount of collected data and bears the risk of double counting the same effects if not applied correctly but it does offer a complete evaluation. In conclusion, all above-mentioned methods have some limitations that need to be considered when choosing the most suitable evaluation method for each case.

A.15 Business Model Innovation toward Sustainability and Circularity—A Systematic Review of Innovation Types by Brenner, B., Drdla, D. (2023)

This article focuses on innovation types that drive sustainable and circular business model innovation.

Business model	Innovation type	Definition	Value Creation, Delivery and Capture Strategy	Core Innovation Activities
	Digital technological Innovation	Innovations based on technological advancements and digitalization.	High impact on all value dimensions.	e.g. smart technologies such as an app-based smart sharing systems (expanded electric vehicle use, bike-sharing); increased efficiency; digital infrastructure

Sustainable business models	User-driven social Innovation	User-driven information offers solutions through an iterative process that involves engaging potential customers in designing the value proposition. The process of designing a sustainable business model entails creating tangible and intangible social value.	High impact on value creations.	e.g. social enterprises, focus on achieving social goals by fostering relationships and mutual interactions between market participants.
	Organizational Innovation	Organizational innovation focuses on reorganizing an organization's purpose, goals, processes, and value creation and delivery to achieve sustainability goals while maintaining profitability.	High impact on all value dimensions.	e.g., business modeling, risk assessment, financial management on CEO/Finance/HR level

Tab.16 Sustainable business model innovation (Brenner, B., Drdla, D. 2023)

Business model	Innovation type	Definition	Value Creation, Delivery and Capture Strategy	Core Innovation Activities
	Bioeconomic Innovation	Bioeconomic innovation is based on using renewable resources to create goods and services. It encompasses traditional sectors such as agriculture, fisheries, aquaculture, and forestry, as well as modern sectors such as biotechnology and bioenergy.	Not clear	e.g., Business model innovation as many bioeconomy products lack profitability, and therefore, companies must rethink their value creation, delivery, and capture strategies.
	Eco-Innovation	Eco-innovation refers to any technological or	High impact on all value dimensions	e.g., Product design, process optimization,

Circular business models		non-technological innovation that promotes sustainable development by using natural resources more efficiently and reducing the environmental impact of production methods.		improving energy efficiency, organizational, marketing, social eco-innovation, system eco innovation, green innovation
	Circular-oriented collaborative Innovation	Circular-oriented collaborative innovation is the process whereby new ideas, products, services, or business models are generated through the joint contributions of various stakeholders. It includes the combination of product design, business models, and value network configurations to implement circular economy strategies.	High impact on all value dimensions.	e.g., Product design, modifications to the business model, and various arrangements of the value network
	Open/close Innovation	Innovation strategy can be categorized as “closed” or “open” based on the level of collaboration. An open strategy involves collaborating with external partners, customers, and user communities to increase circularity in the CBM.	High impact on all Value dimensions	e.g., Open/close-narrowing, open/close-slowness, and open/close-closing
	Circular business model	A product, a service, or a product-service system (PSS) BM prioritizes sustainability by reducing	High impact on all value dimensions	e.g., sales of products with additional service components such as lifetime

		the negative environmental impacts of consumption and incorporating circularity benefits.		warranties and maintenance services, recycled products, do-it-yourself and do-it-together products, green products and services, and sustainable service innovation.
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Tab.17 Circular business model innovation (Brenner, B., Drdla, D. 2023)

This framework offers a clear view of innovation types used for BMI to transition towards SBMs or CBMs. First, it differentiates between two kinds of BMIs; sustainability-oriented and circularity-oriented BMIs. Second, it specifies that both are based on specific innovation type.

It identifies three types of sustainable innovation relevant to SBMI:

- (1) Digital technological innovation involves using technology to promote sustainability and get competitive advantage. It helps developing technical support systems and digital infrastructure to create value, enhance efficiency and resource utilization.
- (2) User-driven social aims to offer a value proposition that enables both societal and business benefits focusing on user needs, ideas and opinions.
- (3) Organizational innovation focuses on reorganizing goals, processes and purpose of an organization in relation to social and environmental issues.

CBMI is based on five innovation types:

- (1) Bioeconomic innovation applies renewable resources to create goods and sustainable services.
- (2) Eco-innovation focuses on reducing environmental impacts while improving resource efficiency and creating economic value.
- (3) Circular-oriented collaborative innovation refers to collaboration among stakeholders to co-create products, services or business models that promote circularity.

- (4) Open innovation increases circularity within the business ecosystem with the help of external partners while close innovation implements circular principles focusing on the single company.
- (5) Product or service or product-service systems adopt personalized approaches to reduce environmental impacts and generate new revenue streams.

This classification identifies innovation types that support CBM and SBM highlighting how each contributes to environmental, social and economic goals but it lacks empirical validation as much of the literature reviewed is conceptual. There is also limited exploration of potential synergies between different types of innovations. Many innovations contribute to both circularity and sustainability making the boundary between CBM and SBM often unclear.

A.16 Design Options for Sustainable and Open Business Models: A Taxonomy-Based Analysis by Mais, F., Bauernhansl, T. (2024)

This paper proposes a taxonomy to classify design options across nine dimensions for sustainability. The developed taxonomy is structured to improve conceptual clarity on different design options and integrates the strengths and similarities of Sustainable Business models and Open Business Models. It highlights the role of partnerships, knowledge sharing and external stakeholders, including customers that actively co-create innovation and value creation.

Even though it is mainly theoretical, the practical applicability of this taxonomy was demonstrated through a use-case classification of EIMI (Energy-Intensive Manufacturing Industries). A practice-oriented validation was carried out with three experts from EIMI who unanimously confirmed 55 out of 64 characteristics as relevant. The remaining characteristics were only considered relevant by some of the experts, indicating different perspectives and possibly company-specific contexts. The relevance of certain design options may vary depending on industry, market conditions, and institutional environments.

(Meta) Dimens ions	Sustainable Open Business Model Characteristics													
Value creatio n (MD1)	Strategic Collaboration (D1)	Inbound-Exchange (C1,1)		Coupled-Exchange (C1,2)				Outbound Exchange (C1,3)						
	Key Partners (D2)	Political Decision Makers (C2,1)	Competitor s (C2,2)	Customers (C2,3)	Research Institution (C2,4)	Stakeholder Ecosystem (C2,5)		Suppliers (C2,6)		Industrial Symbiosis (C2,7)		Organization (C2,8)		
	Key Activities (D3)	Crowdsourcing (C3,1)	Customer Integration (C3,2)	Social Networking (C3,3)	Sharing Economy (C3,4)	Material Substitution (C3,5)	Reduction (C3,6)	Recycling (C3,7)	Collabo ration (C3,8)	Open Innov ation (C3,9)	Standardi zation (C3,10)	Reuse (C3,11)	Awareness for Sustainabili ty (C3,12)	
	Key Resources (D4)	Open Data (C4,1)	Renewable Energies (C4,2)	Waste and Byproducts (C4,3)	Value-Enhancing Exchange Resource (C4,4)		Knowledge (C4,5)	New Skills (C4,6)	Biogenic Raw Materials (C4,7)	New open and/or sustainable Technologies (C4,8)		Financial Resource (C4,9)		
Value Proposi tion (MD2)	Value Proposition (D5)	Technological Process (C5,1)	Maximizing Customer Benefit (C5,2)	Personaliza tion (C5,3)	Positive Social Value (C5,4)		Maximizing Material and Energy Efficiency (C5,5)		Reducing Negative Environmental Impacts (C5,6)		Mass Customiz ation (C5,7)	Product Responsibility across all Stakeholder (C5,8)		
Value Delivery (MD3)	Customer Relationship (D6)	Customer Centric (C6,1)		Actively Communicate and Network (C6,2)		Inclusive (C6,3)	Awareness Raising (C6,4)		Transparent (C6,5)			Trustworthy (C6,6)		
	Customer Segment (D7)	Community (C7,1)		Conventional (C7,2)		Health Conscious (C7,3)		Ecologically Conscious (C7,4)		Financially Conscious (C7,5)		Innovation- Oriented(C7,6)		
Value Captur e (MD4)	Cost Structure (D8)	Investment Costs (C8,1)	Operating Costs (C8,2)	Personnel Costs (C8,3)		Development Costs (C8,4)		Production Costs (C8,5)		Maintenance Cost (C8,6)		Cost of Environmental Pollution or Protection (C8,7)		
	Revenue Stream (D9)	Customer Service Fees (C9,1)		Licensing Fees (C9,2)		Product Sale (C9,3)			Leasing (C9,4)			Sharing Model (C9,5)		

Tab.18 Design options for sustainable and open business models (Mais, F., Bauernhansl, T., 2024)

A.17 Aligning Values for Impact: A Value Mapping Tool Applied to Social Innovation for Sustainable Business Modelling by Vivas, C. et al. (2025)

This article introduces the VMT (Value Mapping Tool) as a framework to support the design of sustainable business models. It analyzes and explores the role of a wide range of stakeholders (top managers, technical directors, academic researchers, seniors, external advisors and community members) taking into consideration value creation and value capture processes.

Stakeholder	Value Created	Value Destroyed	Value Missed	New Value Opportunities
Seniors	Well-being; Diversification of activities; Contact with outsiders; New experiences; Empowerment.	Geographical Environment (rurality): many of the elderly are not used to having holidays and “leaving their comfort zone” is not part of their mindset; Health-status sometimes makes it impossible to participate in this kind of activity.	Little diversification of social activities; Poor ICT skills; Little bargaining power.	Experience touristic and Cultural activities; Knowledge sharing for seniors (between/within groups); Prospects for the future, personal fulfilment; Opportunity to expand their network of relationships; Use of Facebook and Skype to communicate with the new friends; Emotional well-being.
SEO (managers)	Value added activities (low-cost) for their seniors; Increasing their network; Social visibility.	Various barriers to innovative initiatives; Lack of resources (e.g., human, financial and Organizational resources).	Low offer of senior activities; Lack of resources; Few interchange opportunities.	Knowledge sharing; Reputational capital; Diversification of activities; Reinforce bonds with academia; Participation in R&D projects; Enhance corporate image (Relationship between seniors and employees was described as compatible, friendly and familiar).
Society	Well-being of seniors; Active ageing; Promotion of local culture.	Social asymmetries.	Insufficient engagement.	Combat asymmetries (inclusive project); Community development; Increasing bonds between different generations.
Environment	Efficiency in the use of resources; Permit access to services with fewer		Explore green tourism.	Assets sharing between SEO (low impact); Increase in seniors' stock of health.

	resources; Improve seniors' quality of life because these activities foster positive feelings such as satisfaction with one's life, encouragement, enthusiasm and happiness.			
City Council	Visibility of cultural equipment; Complies with their mission; Proximity with the local actors.		Under-use of cultural equipment; Architectonic barriers; Insufficient resources.	Reputational capital; Social cohesion; Capture potential synergies in the medium and long term.

Tab.19 Value Mapping Tool for sustainable business models (Vivas, C. et al., 2025)

Different forms of value (created, destroyed, missed, and new opportunities of value) are evaluated with the goal of reaching greater sustainability and validate the applicability of the value proposition. The study demonstrates that the application of VMT supports managers in the development of SBM, improves resource efficiency and promotes the delivery of socially impactful services. In particular, value creation for managers is linked to strengthening relationships through a continuous and iterative process generating spillover effects throughout the stakeholder network.