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Executive Summary

This report's purpose is twofold. Firstly, a process is developed theoretically for screening, developing, and validating sustainable business model (SBM) blueprints that can ensure generation of sufficient public/private investments into solutions regarding the restoration of oceans and waters. Secondly, it identifies, defines, and analyses theoretical funding models for Mission roll-out, with a specific focus on new, innovative approaches.

Sustainable startups have great difficulties in attracting financial resources from traditional sources. One of the main issues is that funders and investors cannot see the business case, considering the risk too high compared to potential returns. One main derisking strategy for sustainable companies and startups, therefore, is to have sustainable business models (SBM) that can be communicated clearly to capital providers. It is extremely difficult to have specific business model blueprints since every company is unique, with a unique selling and value proposition. However, it is possible to develop a generic blueprint for a sustainable business model. This report developed a process for screening, developing, and validating SBM blueprints that can help generating sufficient public/private investments into solutions regarding the restoration of oceans and waters.

Our analysis resulted in the identification of five steps in this derisking strategy that should be taken to screen, develop, and validate SBM blueprints in general (see Figure 1) or for projects focusing on restoring oceans and waters specifically. Firstly, the project's activity focus should be mapped according to its ecological, social, and economic outcomes. Examples are provided in chapter 1 on issues such as maximizing material and energy efficiency, creating value from waste, substituting with renewables and natural processes, delivering functionality rather than ownership, adopting a stewardship role, encouraging sufficiency, re-purposing the business for society/environment and developing scale-up solutions. These affect choices around the business model's patterns around pricing and revenue, service and performance, access provision, cooperation, community, financing, social mission, eco-design, and the supply chain. Choices on these patterns will position the SBM in one of the SBM taxonomy fields in Figure 13.

In Step 2, choices according to the project's activity focus (step 1) will influence the selection of the for-profit, private-public-partnership, or not-for-profit business model category. The for-profit business model category comprises rather traditional business models that fit with SBMs that have an ecologic-economic, social-economic, or integrative activity focus. The public-private partnership business model category is founded on a collaboration between the public and the private sector and fits well with projects that generate an indirect economic outcome in combination with a direct or

indirect social and or ecological outcome. The not-for-profit business model category fits best with projects that do not generate an economic outcome but only ecological or social outcomes (see Figure 15). In Step 3, a specific business model canvas according to the business model category is chosen (see Table 7), which is then developed in Step 4 (see Table 8) and validated in Step 5. These steps were then validated and changed accordingly through exchanges with stakeholders. The model will support sustainable projects in selecting a viable business model based on a match between the characteristics of the project and the business model. This report also presents several case studies applying this process.

For the second purpose, the report furthermore identifies, defines, and analyses theoretical funding models for mission roll-out, with a specific focus on new, innovative approaches. Most models are located on a spectrum between equity financing (including FFF, angels, VC, SAFEs and IPOs) and debt financing (including senior debt, mezzanine capital, (GSSS) bonds, and debt-for-nature swaps) and donations and grants, including crowdfunding, cascade finance, concessional finance, blended finance, project finance, PCP and PPI.

Choosing an appropriate funding model that fits the chosen sustainable business model blueprint is the second major derisking strategy a sustainable company, startup, or project can apply. Our analysis of funding models included a discussion of their suitability for the key business model blueprints identified under the first purpose. The derived insights informed a heat mapping tool to identify relevant theoretical funding gaps for different business model blueprints, which was validated through stakeholder exchanges. The analysis shows that there is at least one funding model for each business model that seems very suitable, and there are multiple other funding models that seem at least sometimes suitable. That said, stakeholders identified several large obstacles and challenges in the design or implementation aspects of available business and funding models relevant to the roll-out of Mission Ocean & Waters. Stakeholders emphasised that out-scaling may be more effective in achieving the mission objectives than upscaling. Other problematic issues include a lack of expertise and understanding among investors and other stakeholders regarding the blue economy, a heavy reliance on public funding, gender discrimination, and too many and too costly bureaucratic demands, including long timelines. This is an area where regulators can improve conditions for sustainable startups and other companies. The outlined stakeholder input provides important starting points for additional derisking strategies.

Acronyms & Abbreviations

Table 1: Table of abbreviations and acronyms used in Prep4Blue and the document.

Acronym / Abbreviation	Signification
BMC	business model canvas
BOP	base of the pyramid
BV	bequest values
CBM	circular business model
CO2	carbon dioxide
DEV	development/exploitation of the ecosystem
DFI	development finance institutions
DUV	direct use value
e.g.	exempli gratia
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EIF	European Investment Fund
ESIF	European Structural and Investment Funds
EU	European Union
FFF	founders, friends, and family
FSSD	Framework for Strategic Sustainable Development
GHG	greenhouse gas
GSSS	green, social, sustainability and sustainability-linked
ha	hectare
IPO	initial public offering
IPR	intellectual property rights
IUV	indirect use value
Ltd.	limited
M	million
NGO	non-governmental organisation
NUV	non-use value
OECD	Organisation for Economic Co-operation and Development
OV	option values
P4B	PREP4BLUE
PCP	pre-commercial procurement
PDB	public development bank
PPI	public procurement of innovative solutions
R&D	research & development
SAFE	simple agreement for future equity
SBM	sustainable business model
SDGs	Sustainable Development Goals

SME	small and mid-sized enterprise
SPM	sustainable plastic management
SUE	sustainable use of the ecosystem
TBL	tripe bottom line
TEV	total economic value
TLBMC	triple layer business model canvas
UN	United Nations
US	United States
VC	venture capital
VR	virtual reality
WTA	willingness to accept
WTP	willingness to pay
XV	existence values

1 Benchmark overview of existing business models

1.1 Executive chapter summary

1.1.1 Purpose

The main purpose of this chapter can be summarized as developing a process for screening, developing, and validating business models that can ensure generation of sufficient public/private investments into solutions regarding the restoration of oceans and waters. The purpose is achieved by outlining different phases and steps that will support sustainable projects in selecting a viable business model based on a match between characteristics of the project and the business model. This chapter is based on the *Milestone 5.1 “Benchmark overview of existing business models”* of *Task 5.1 “Development of Business Models for Scale up/Roll out of Solutions”*. The milestone constituted an important element of the overall activities carried out by the work group.

1.1.2 Approach and high-level results

Based on a structured literature review, we identified a sample of 55 academic papers and other sources that were of relevance for screening, developing, and validating (sustainable) business models in line with the chapter’s purpose. The in-depth analysis of this sample of sources led to the identification of five steps that should be taken to screen, develop, and validate a sustainable business model (SBM) in general or for projects focusing on restoring oceans and waters specifically. The screening phase thereby comprises three steps: 1) Mapping of the project, 2) selection of a business model category, and 3) selection of the business model.

Step 1) involves mapping the project’s activity focus according to its ecological, social, and economic outcomes.

Step 2) refers to the selection of the for-profit, private-public-partnership, or not-for-profit business model category according to the project’s activity focus.

Step 3) finalizes the screening with the selection of a specific business model according to the business model category. The developing and validating phases are each reflected by their individual step.

Step 4) involves the development of the specific business model canvas according to the previously selected business model.

Step 5) finally involves the validation of the previously developed business model canvas through benchmarking. This can further lead to an iteration of previous steps, possibly resulting in a revision of decisions made in previous steps.

Figure 1 outlines the three phases and the respective steps. This chapter is structured along the identified phases and respective steps. Each step is thereby described in detail in a corresponding subchapter.

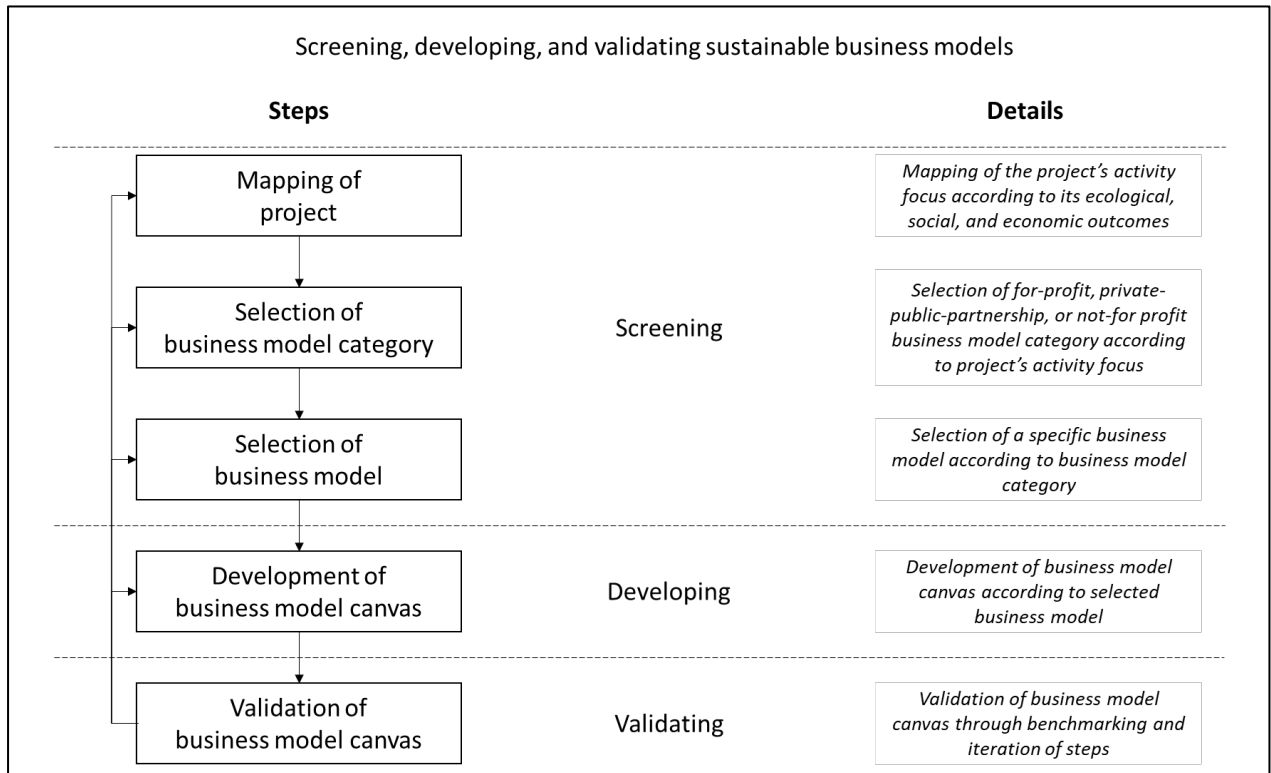


Figure 1: Screening, developing, and validating sustainable business models.

1.2 Introduction

A large proportion of the general business agenda today revolves around eco-innovations, eco-efficiency, corporate sustainability practices, and the restoration and cleaning up of oceans and waterways. To achieve economic, environmental, and social sustainability, companies globally need to deliver long-term changes in the way they operate (Bocken, Short, Rana, & Evans, 2014). Three main pillars can be identified for restoring our oceans and waterways: protecting and restoring marine and freshwater ecosystems and biodiversity, preventing and eliminating pollution of our oceans, seas and waters, and making the sustainable blue economy carbon-neutral and circular.

With respect to biodiversity, species are becoming extinct at an alarming rate (Lawton & May, 1995), and the loss of genetic and eco-systemic biodiversity can be called the most critical global environmental threat, along with climate change (EC, 2011). The UN declared 2011-2020 the decade for Biodiversity, and after four years of negotiations, on 19 December 2022, adopted the Post-2020 Global Biodiversity Framework, which should contribute to the objectives of the UN Convention on Biological Diversity and its Protocols. An important commitment was made to conserve at least 30%

of terrestrial, inland water and coastal and marine areas. In June 2021, the EU also set a new 2030-Biodiversity strategy, a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. This includes the protection of a minimum of 30% of the EU's sea area, integrating ecological corridors, restoring at least 25,000 kilometres of free-flowing rivers, and contributing to marine nature restoration targets, including degraded seabed habitats and coastal ecosystems.

With respect to pollution, millions of tons of plastic enter the oceans each year, and if no action is taken, this will have a growing negative impact on our environment, health, and economies (Ocean Cleanup, 2023). Currents and winds can carry floating plastics ashore or build up in areas known as convergence zones (Lebreton et al., 2017, p. 148). As floating plastics disintegrate into smaller and smaller pieces, they become more difficult to clean up and more likely to be mistaken for food by marine life. Due to this degradation, some of the recovered ocean plastics may be impossible to reuse (van Giezen & B. Wiegman, 2020). Globally, there are five large convergence zones, or gyres of plastic (Cózar et al., 2014), where it is predicted that at least 5.25 trillion plastic particles float, totalling more than 268,000 tons (Eriksen et al., 2014; van Giezen & Wiegman, 2020). Plastic will affect our ecosystems, health, and economies for decades or even centuries if it is allowed to float (Ocean Cleanup, 2023). The EU commits itself to reduce by at least 50% plastic litter at sea, reduce by at least 30% microplastics released into the environment, and reduce by at least 50% nutrient losses, as well as the use and risk of chemical pesticides.

With respect to carbon neutrality, scientific reports show unprecedented climate changes. Global warming is causing increased, sometimes irreversible, changes to rainfall patterns, oceans and winds globally. Global warming and intensified weather events result in huge costs for the EU's economy and impact countries' ability to produce food. Climate-related events have, for example, between 1980 and 2020, caused more than €487 billion in financial losses in the EU and killed over 138,000 people. The economic cost of river flooding in Europe exceeds €5 billion a year on average. The EU, therefore, has passed the EU Climate Law, which sets a legally binding target of net zero greenhouse gas emissions by 2050. With respect to the oceans, the EU commits to eliminating greenhouse gas emissions from maritime economic activities in the EU and sequestering unavoidable emissions. It also intends to develop zero-carbon and low-impact aquaculture and promote circular, low-carbon, multi-purpose use of marine and water space.

The history of understanding the significance of ecological systems and the natural resources necessary for human welfare is not new (Costanza et al., 1997), but as global development increases, so does the need for resources – and this is having a major impact on sustainability. It seems

increasingly apparent that environmental impacts are a concern and business as usual is not an option for a sustainable future. Changes like these require fundamental shifts in the purpose of business (Bocken et al., 2014). Understanding sustainable business models is crucial, including how to monetize the process.

The main purpose of this chapter can be summarized as developing a process for screening, developing, and validating business models that can ensure the generation of sufficient public/private investments into solutions regarding the restoration of oceans and waters. The literature review is conducted in the following subchapter 1.3 and will begin with a brief outline of the background (subchapter 1.3.1) and methodology (subchapter 1.3.2) before an overview of the studies reviewed is presented (subchapter 1.3.3). Subchapters 1.4, 1.5, and 1.6 will guide through the process of screening business models, developing the business model canvas, and its validation, respectively. The chapter ends with the presentation of a conclusion in subchapter 1.7.

1.3 Literature review

1.3.1 Background

1.3.1.1 Definition of a (sustainable) business model

A business model is a tool that can be used to understand how an organization conducts its operations and also for analysis, comparison, and performance assessment. It can help managers communicate with their employees and foster innovation (Bocken *et al.*, 2014; Osterwalder, Pigneur, & Tucci, 2005). Business models address how an organization defines its competitive strategy through the design of the good or service provided. Central to the concept of business models are series of events related to a *value proposition* (i.e., product/service, customer segments and relationships), *value creation and delivery* (i.e., key activities, resources, channels, partners, technology) and *value capture* (i.e., cost structure and revenue streams) (Richardson, 2008). These components are often summarized in a business model canvas, which we present in greater detail in subchapter 1.3.3, as well as in subchapter 1.5.

The business model is thus at the core of an organization, which is its system of transforming inputs through its business activities into outputs and outcomes. Traditional business models often focus mainly on financial and manufactured capital, but an organization also utilizes intellectual, human, social, relationship and natural capital as its inputs and produces positive and negative outputs and outcomes that impact these capitals (see Figure 2).

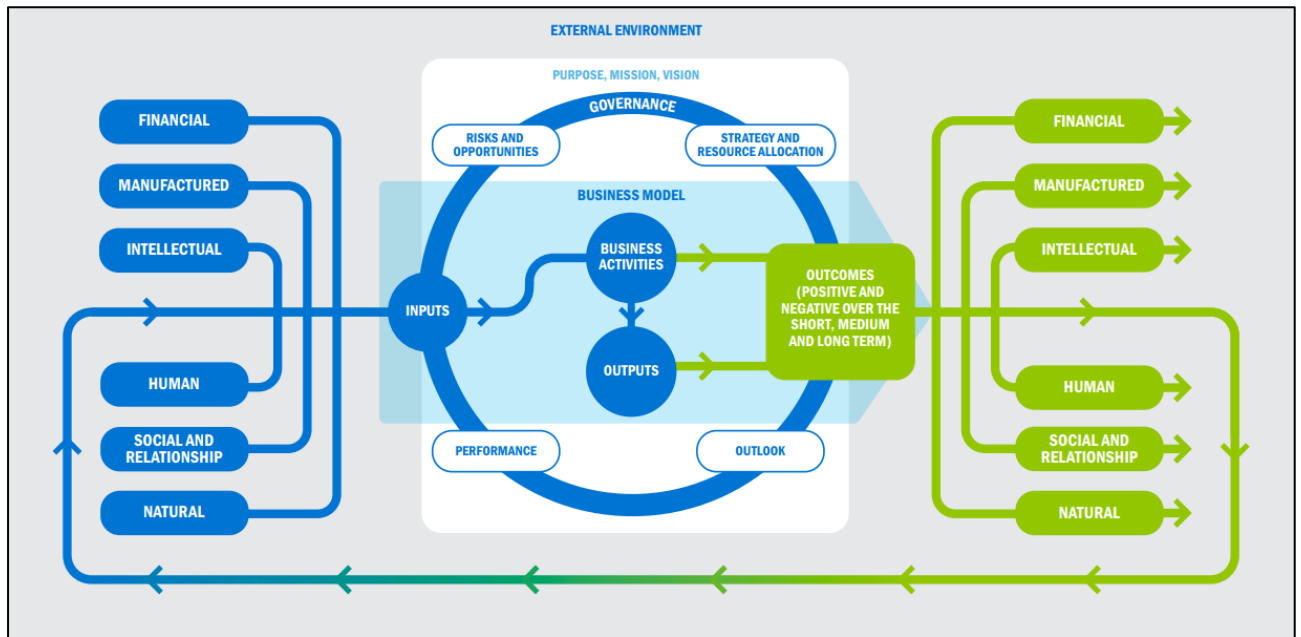


Figure 2: Process of value creation, preservation or erosion (Value Reporting Foundation, 2022).

An organization can thus create value for these capitals, preserve them or erode them. A sustainable business model (SBM) will focus on preventing eroding, while preserving and creating value on all capitals. An SBM requires *integrated thinking*, focusing the whole organization on the mutually reinforcing endeavour of value creation in the short, medium and long term. It is unique to each organization and should be continually assessed to be able to adapt to changes in the internal and external environment (Value Reporting Foundation, 2022).

The literature discusses a variety of sustainable business models. The acknowledgement that business models not only provide a novel method for studying the relationships between businesses and their environments but also alternative, possibly more sustainable methods for designing businesses within these environments is the foundation for SBM-research (Lüdeke-Freund, Carroux, Joyce, Massa, & Breuer, 2018; Marcus, Kurucz, & Colbert, 2010; Stubbs & Cocklin, 2008; Upward & Jones, 2016). Through changes in how an organization and its network create, deliver, capture, preserve or erode value, an SBM aims to significantly increase positive effects on all forms of capital in society and the natural environment or significantly reduce negative effects (Bocken *et al.*, 2014; Lüdeke-Freund *et al.*, 2018). Ideally, SBMs enable businesses to pursue sustainability by aligning their business with outcomes related to the sustainable development of society and the natural environment.

However, SBMs are criticized for not being adequately clarified, and SBM theory is still in its infancy. This calls for more empirical evidence to be collected, which in turn could improve the knowledge of both researchers and practitioners (Dentchev *et al.*, 2018). SBMs can help synchronize system-level

sustainability with technological and social advancements (Bocken *et al.*, 2014). Lüdeke-Freund (2010) defines an SBM as

“a business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society”

Related to this, SBM patterns are defined as *“an ecological, social, and/or economic problem that arises when an organisation aims to create value, and it describes the core of a solution to this problem that can be repeatedly applied in a multitude of ways, situations, contexts, and domains. A sustainable business model pattern also describes the design principles, value-creating activities, and their arrangements that are required to provide a useful problem–solution combination”* (Lüdeke-Freund *et al.*, 2018).

SBMs are important for organizations globally as they *“help describing, analyzing, managing, and communicating (i) an organization’s sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries”* (Schaltegger, Lüdeke-Freund, & Hansen, 2016, p. 268). They should be designed in a way that allows organizations to gain economic value while also producing social and environmental benefits for others (Schaltegger, Lüdeke-Freund, & Hansen, 2012). However, it might not be apparent how producing social and environmental benefits translates into profits and competitive advantages, which is why the design and development of SBMs should be thorough and thought through to bring value.

Designing business models where the organisation can deliver social and environmental benefits while also generating economic value is one of the main obstacles (Bocken *et al.*, 2014; Schaltegger *et al.*, 2012). Economic value must be generated for the economic viability of an organization or project, which makes it a crucial component of an SBM. Economic value and viability for for-profit organizations may imply the generation of a risk-adequate return on investment for the organization’s capital providers. To generate economic value for a not-for profit initiative in turn, simply covering the costs imposed by a sustainable project may be sufficient. As existing definitions of SBMs – also the previously presented definition – seem to not sufficiently clarify what the generation of economic value involves, we develop the following definition of an SBM for the purpose of this chapter:

“An SBM is a business model that produces positive social and/or environmental outcomes to its beneficiaries while maintaining economic viability.”

What economic viability implies, depends on the choice of business model category, as outlined later in this chapter.

1.3.1.2 *Types of value generation*

We have already outlined that the literature on SBMs often does not sufficiently clarify what the generation of economic value actually involves. Therefore, for the purpose of this chapter we in the following want to explicate different forms of value generation with a specific focus on the blue economy.

It is often challenging to convince politicians, funding organizations, investors, customers, and other stakeholders of the value of committing resources to preserve oceans and waters and their ecosystems. This is partly because many stakeholders think too narrowly in terms of value, limiting their view to (direct) economic value. This economic view excludes certain values from being incorporated into market mechanisms and only focuses on instrumental or utilitarian values (Van Liempd & Busch, 2013). But clean oceans and waters can also be said to have intrinsic value, irrespective of their instrumental or utilitarian value. Intrinsic value is usually defined as value that depends solely upon the intrinsic nature of the thing in question (derived from Moore, 1959). Following this definition, we can then say that sustainable marine systems or saving the whales have intrinsic value simply for existing to us. The deep ecology approach (Naess, 1973) even goes as far as stating that ecosystems are valuable in a universe with no human beings, which is an eco-centric as opposed to an anthropocentric view.

In policy and funding discussions, most however look to instrumental value, that is ecosystems are valuable because they are useful for something else (e.g., Chapin *et al.*, 2000). This instrumental value can, though, still be argued for in several different ways. Marine, fluvial and lacustrine ecosystems and biodiversity can, for example, have spiritual value (Hunter & Gibbs, 2007), aesthetic value (Chapin *et al.*, 2000), recreational and cultural or educational and scientific value (UN Convention on Biodiversity). Again, with respect to sustainable business models and funding opportunities for the preservation of clean oceans and waterways, we find it best to focus on considerations of economic value (Van Liempd & Busch, 2013).

Economic rationality predicts that the economic decision to develop/exploit or conserve a marine, river or lake system depends on the relative profitability or rate of return of developing or conserving it. Thus, ecosystems are conserved if the rate of return SUE > rate of return from DEV, where SUE is sustainable use of the ecosystem, and DEV is development/exploitation of the ecosystem. This can be rewritten as (Pearce and Moran, 1994):

$$B(SUE) - C(SUE) - [B(DEV) - C(DEV)] > 0$$

where $B(SUE)$ is the benefit from sustainable use of the ecosystem, $B(DEV)$ is the benefit from development, $C(SUE)$ is the cost of sustainable use, and $C(DEV)$ is the cost of development. One complication is people's time preference, where people value benefits accrued now higher than benefits accrued 10 years from now. This means we must discount the benefits and costs accordingly. The formula thus needs to be rewritten into the present value (PV) of the two options:

$$PV[B(SUE) - C(SUE)] - PV[B(DEV) - C(DEV)] > 0$$

One thing to remember is that benefits not only include willingness to pay (WTP) for a benefit and willingness to accept (WTA) compensation to forgo the benefit but also willingness to pay to avoid a loss or willingness to accept compensation to tolerate a loss (Pearce & Moran, 1994). Another thing to remember is that these individual preferences, benefits, and costs have to be aggregated into societal benefits and costs. This, again, can be divided into national values (befalling the host nation) and global values (befalling the global community of nations) (Pearce & Moran, 1994).

The total economic benefits and costs of an ecosystem can be measured in terms of Total Economic Value (TEV). TEV of marine, fluvial and lacustrine ecosystems can be divided into a Use Value (UV) and a Non-Use Value (NUV) (Pearce & Moran, 1994). Use Value can then again be divided into a Direct Use Value (DUV) and an Indirect Use Value (IUV). The DUV includes actual utilization of ecosystems and biodiversity, such as fishing, algae production, energy production, tourism and so on. The Indirect Use Value (IUV) includes the many services that eco-systems provide, such as filtering and purifying the water, providing renewal of nutrients, detoxification and decomposition of waste, carbon fixing, control of pests and partial stabilization of our climate for example storm control and flood control (Daly, 1977; Hunter & Gibbs 2007). It is important for sustainable projects to include not merely DUV but also accounts of IUV in their business models and accountability relations to stakeholders.

Importantly, sustainable business models and accountability to material stakeholders should also include accounts of non-use value. Non-use value can be further divided into Option Values (OV), Bequest Values (BV) and Existence Values (XV; also called passive use value). Option values (OV) include an individual's willingness to pay to safeguard an asset for the option of using it at a future date (like an insurance value). Politicians or users of marine, river and lake systems might, for example, be willing to pay for preserving the cleanliness of a river, so they can use it at a future date. Bequest Values (BV) include benefits accruing for any individual from the knowledge that others might benefit from a resource in the future. People are for example willing to pay to preserve marine life or marine systems so their children or grandchildren can use them. Lastly, Existence or Passive Use Values (XV) are derived simply from the existence of any particular species, ecosystem and the like. People might get value from the mere fact that a marine species like the blue whale exists.

Dividing these values with the applicable discount rate r gives the following formula for the present economic value of sustainable water ecosystems (Pearce & Moran, 1994):

$$TEV = \frac{UV + NUV}{r} = \frac{DUV + IUV + OV + BV + XV}{r}$$

Isolating the value of OV, BV, and XV is, of course, rather problematic, but science-based numbers and techniques can provide reasonable estimates or approximations. Direct use values are easiest to calculate by accounting for industry numbers, for example, for the fishing industry, the algae industry, the tourism industry, *etc.* Indirect use values require more subjective estimates. Costanza *et al.* (1997, pp. 253ff) state that the current economic value of Biodiversity and Ecosystem Services (BES) for the entire biosphere is estimated to be, on average, 33 trillion USD per year at a minimum, the majority of which is currently outside the market system. Examples include gas regulation (1.3 trillion), disturbance regulation (1.8 trillion), waste treatment (2.3 trillion) and nutrient cycling (17 trillion). About 63% of the estimated value is contributed by marine systems (20.9 trillion) and most of this comes from coastal systems (10.6 trillion). About 38% comes from terrestrial systems, mainly from forests (4.7 trillion) and wetlands (4.9 trillion). The sheer size of these indirect use values alone might convince anyone of the instrumental economic value of preserving these systems. The following examples presented in Table 2 show proxies for how these values can be calculated.

Business models that focus on direct use value with everything else being equal have an easier time being based on profit models with private investors. Business models that also include indirect values may be more suitable for public-private partnerships, while business models that mostly focus on non-use values may be best suited for not-for-profit models with public funding and charitable donations.

Table 2: Example of economic value from a coastal marine ecosystem (based on Pearce & Moran, 1994).

Direct use value	Indirect use value	Non-use values
Direct \$\$ value of tourism, e.g., calculated by the total travel cost of tourists to experience the ecosystem, or eco-tax \$\$ for visiting, or \$\$ spent on diving, snorkelling, boating, etc.	Indirect \$\$ value of tourism, e.g., airlines, hotels, restaurants, local community	\$\$ value for option value for using the ecosystem, e.g., through a WTP/WTA survey of possibility to dive in the ecosystem
\$\$ value of direct and indirect provision of employment by tourist jobs in the ecosystem	\$\$ value of being a nursery ground for fish breeding per ha.	\$\$ value for existence value of ecosystem, e.g., through a WTP/WTA survey
\$\$/ha. for sustainable fishing/food production; \$\$/ha. of sustainable waterfowl hunting	\$\$ value of watershed and erosion prevention per ha.	\$\$ value of passive use value, e.g., through median household WTP to prevent oil pollution in the ecosystem
\$\$ value of rise in land value close to the marine system	\$\$ value of water purification by the system per ha.	\$\$ value of charitable donations
\$\$ value of WTP to avoid unsustainable fishing	\$\$ value of carbon fixing by water plants in the system per ha.	\$\$ value of memberships of NGO
\$\$ value of genetic and information value of the ecosystem	\$\$ value of waste/nutrient recycling in the system per ha.	\$\$ value of books, films and tv programs about the system
\$\$ value of flood and storm protection by the system	\$\$ value of investments in local infrastructure around the system	

While the outlined separation of economic value into direct, indirect and non-use value and, the presented detailed calculations, are highly relevant for understanding what the generation of value may involve, we translate the general implications into a framework that is less complex and therefore easier to convey. Specifically, for the purpose of mapping a project (first step of the process for screening, developing, and validating business models, see Figure 1), we will in subchapter 1.4.2 refer to economic (as well as social and ecological) *outcomes*. Furthermore, we will differentiate between *direct* and *indirect* outcomes. Direct outcomes are immediate results of the project’s activity and being controlled by the project. The concept of a direct economic outcome thereby widely overlaps with the concept of direct use value. Indirect outcomes, in turn, are intermediate results of the project’s activity and may not be controlled by the project. The concept of indirect economic outcomes largely includes both the concept of indirect-use values and the concept of non-use values.

1.3.2 Methodology

We conducted a three-step systematic literature review (Tranfield, Denyer, & Smart, 2003). We planned the review during Stage 1 by following a non-structured snowball approach (*i.e.*, referring to

references) to better understand the topic keywords in relevant databases (Morioka & de Carvalho, 2016). The non-structured snowball approach showed that the terms “sustainable business model” and “green business model” were the most used terms for the business models of interest. Hence, these terms were included in the search string.

In Stage 2, we conducted a systematic literature review based on a 7-step approach (Tranfield *et al.*, 2003). We searched the following string in either title or keywords in the EBSCO Business Source Complete database: (“sustainab* business model*” OR “green business model*”). This initial search resulted in a total of 381 papers. In the second step of Stage 2, we set research boundaries, which included only English-speaking peer-reviewed academic papers identifying business models as one of their subjects. This was done to specify the search further and identify papers with a stronger fit. This reduced the sample to 190 papers.

In the third step of Stage 2, we performed a cursory analysis of the titles of the 190 papers. We excluded papers not focusing on sustainable business models as well as papers with a too narrow focus on separate dimensions of an SBM. Research studying narrow parts of sustainable business models might overlook internal relationships and trade-offs of importance. During this step, the sample was reduced to 55 papers.

In step 4, we read the abstracts of the 55 papers to include papers that met the inclusion criteria mentioned. These criteria include having an SBM focus at a relatively general level. We excluded papers that did not have a strong SBM focus but rather focused on other aspects including the process of innovation, small industries, etc., bringing SBM to the discussion more vaguely, as the goal is a broader mapping of SBM. This reduced the sample of papers to 29 papers. Next, we took an iterative snowball approach by looking through references in the sample. We identified two relevant papers; hence the final sample consists of 31 papers. In Stage 3, the final stage, we discuss some of the papers in greater detail (see also Figure 3 for a summary of paper identification).

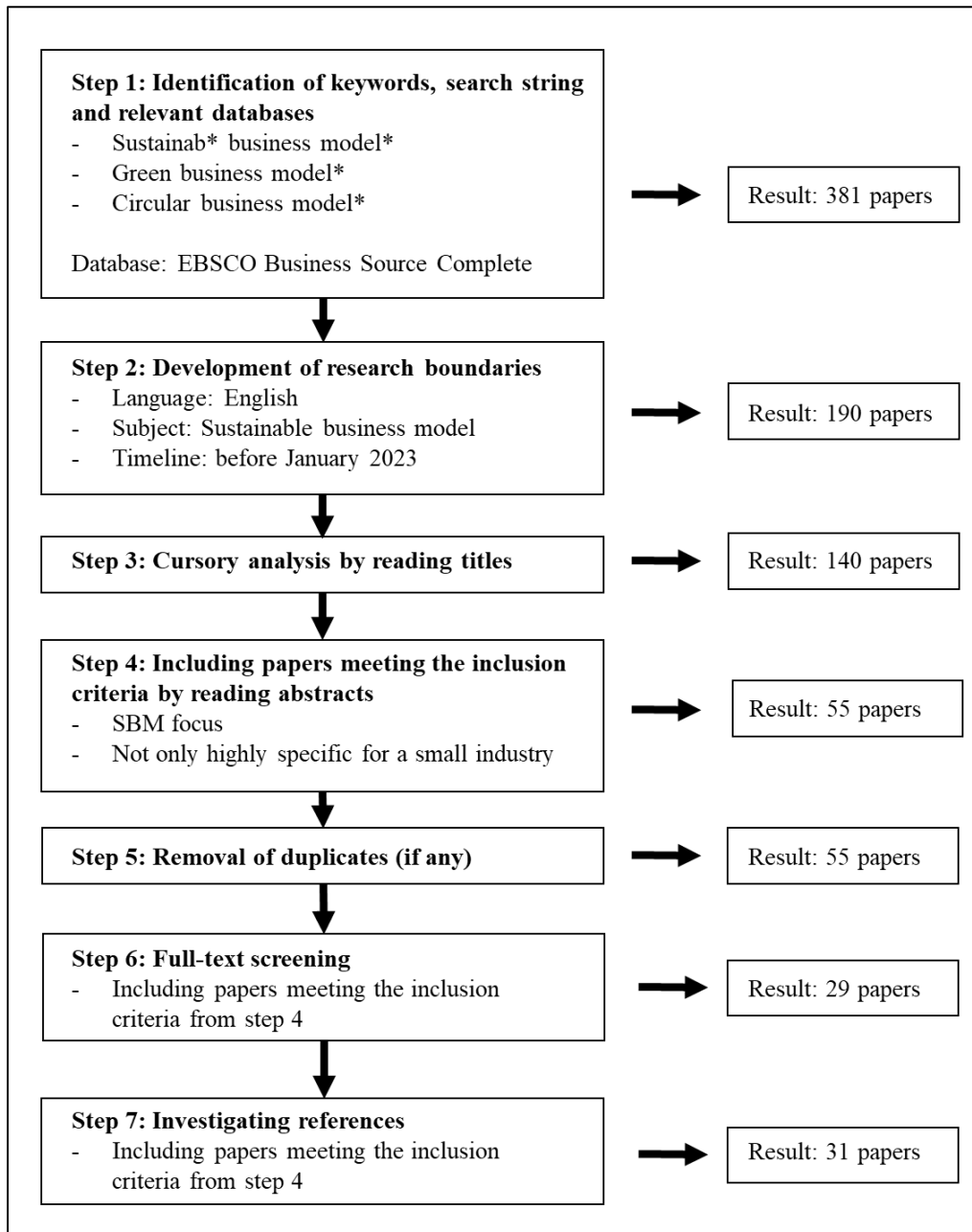


Figure 3: Summary of paper identification during systematic literature review.

1.3.3 Study overview

The literature review revealed a research area that is relatively fragmented, with several proposals for both generic SBMs as well as industry-specific SBMs. As mentioned in the methodology section, we identified a total of 31 papers related to SBMs. We provide a full overview of the sample as well as short abstracts and related information in Appendix 1. In the following section, we provide further insight into a selection of the most relevant articles from the total sample. This then provides the basis for further refinement of the presented approaches in the following subchapters.

Based on two case studies, Stubbs and Cocklin (2008) develop salient features of an ideal type of sustainability business model. They distinguish between “structural” and “cultural” characteristics, where structural characteristics relate to processes, organizational forms and structures, and business practices, while cultural characteristics refer to norms, values, behaviours, and attitudes. They conclude with the following six salient features that are essential to an SBM (Stubbs and Cocklin, 2008):

1. An SBM draws on economic, environmental and social aspects of sustainability in defining an organization’s purpose. That is, sustainability is a central strategic focus rather than an add-on.
2. An SBM uses a Triple Bottom Line (TBL) approach to measure performance. This TBL of People (social bottom line), Planet (environmental bottom line) and Profit (economic bottom line) should be used internally for performance measurement and reported externally.
3. An SBM considers the needs of all stakeholders rather than giving priority to shareholders’ expectations. Sustainability requires a stakeholder view and, thus, stakeholder engagement and collaboration.
4. An SBM treats nature as a stakeholder and promotes environmental stewardship. Natural capital is preserved through technological innovation, reduced consumption and the use of renewable or human-made resources. Organizations apply a policy of “do no harm”.
5. Sustainability leaders, or champions, drive the cultural and structural changes necessary to implement sustainability. These leaders make sure sustainability is institutionalized and embedded in organizations and their employees’ mindsets.
6. An SBM encompasses the systems perspective as well as the firm-level perspective. Structural and cultural changes to the socioeconomic system are required to facilitate firm-level and system-level sustainability.

To have an SBM thus requires that organizations develop internal structural and cultural capabilities to achieve firm-level sustainability and collaborate with key stakeholders to achieve system-level sustainability.

The original Business Model Canvas (BMC) by Osterwalder & Pigneur (2010) defines business models of organizations into nine consistent sections: customer value proposition, customer segments, customer relationships, distribution channels, key resources, key activities, key partners, costs, and revenues. This is not sufficient to cover more sustainability-oriented business models. Joyce & Paquin (2016) therefore extend the BMC tool to sustainability situations by including an environmental and a social layer. The environmental layer is based on a lifecycle perspective, while the social layer is based

on a stakeholder perspective. The new framework called the Triple Layer Business Model Canvas (TLBMC), consisting of three separate layers, more explicitly shows how organizations can generate multiple types of values. These values include not only economic value but also social and environmental value. To showcase how this framework is applied, they re-analyse the business model of Nestlé Nespresso.

The economic aspects (see Figure 4) start with the demand for good quality coffee at home and at restaurants. At this time, Nespresso sold high-margin coffee pods and lower-margin machines developed by third parties. Costs include marketing, manufacturing and distribution, and resources include distribution channels, patents on systems, brands, and production plants. Office market and membership clubs were targeted as long-term relationships. They applied several different channels for distribution, including mail order, call centres and retail (Joyce & Paquin, 2016).

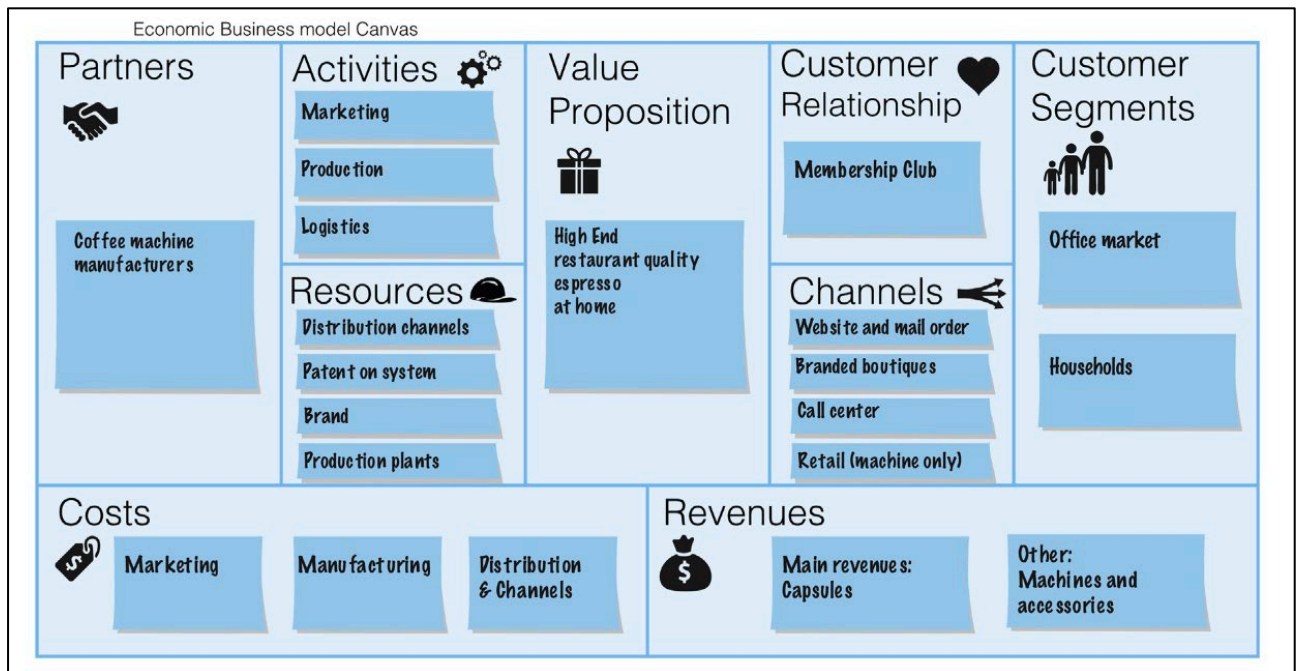


Figure 4: Nespresso's economic layer of the Triple Layer Business Model Canvas (Joyce & Paquin, 2016, p. 1476).

The environmental layer (see Figure 5) focusses on assessing how the organization produces more environmental benefits than impacts. In the case of Nespresso, environmental impacts include CO2 emissions and carbon footprints as examples. There are several different elements of the environmental layer (see Table 3).

Table 3: Elements of the environmental life cycle business model canvas (based on Joyce & Paquin, 2016).

Value	Description
Functional value	Defines the principal outputs of a service/product.
Materials	Are the bio-physical components that are employed to create functional value.
Production	Encapsulates the steps taken by the organization to produce value.
Supplies and outsourcing	All the other different material and manufacturing operations that are required for the functional value but not regarded as "central" to the business are represented by supplies and outsourcing.
Distribution	Involves the transportation of products.
Use phase	The impact of the client using the organization's functional value/ core service or product. When applicable, this would also cover product upkeep and repair.
End-of-Life	When customers stop the consumption of the functional value. It includes remanufacturing, repurposing, recycling, disassembly, incineration, or disposal of a product.
Environmental impact	Tackles the environmental costs of the actions made by the organization.
Environmental benefits	Tackles the concept of value creation beyond simple economic value. Includes environmental impact reductions and regenerative positive ecological value.

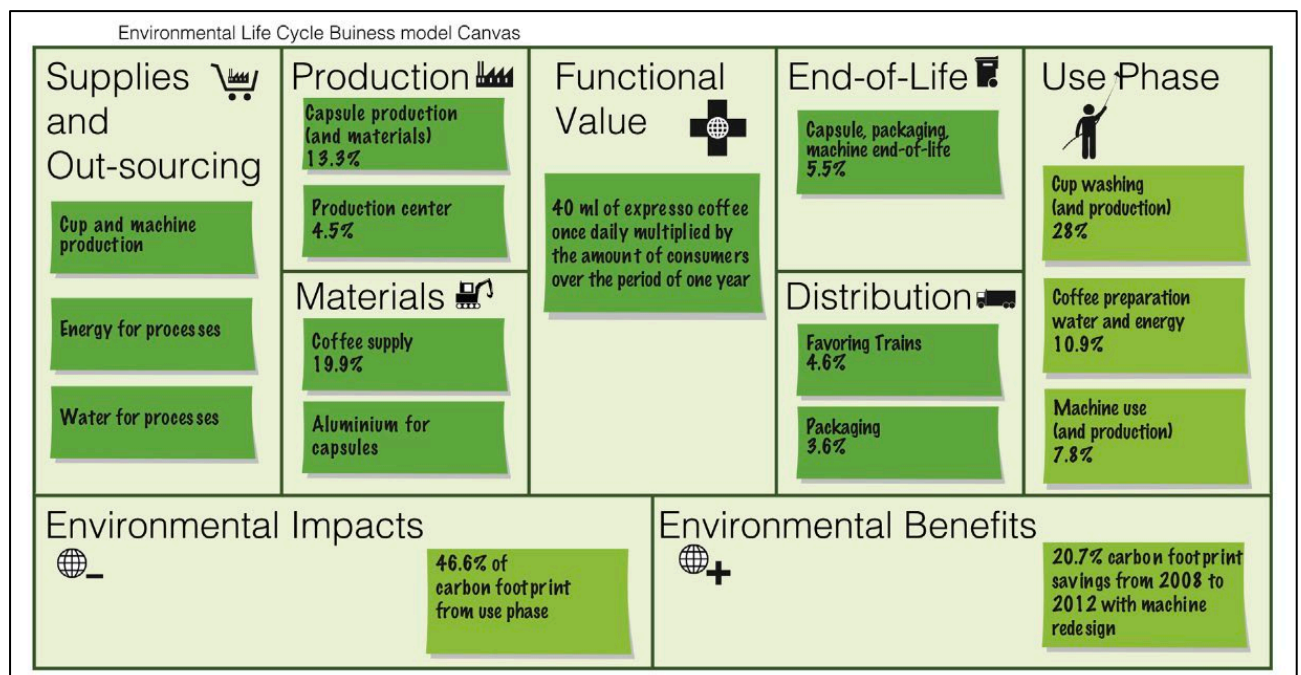


Figure 5: Nespresso's environmental layer of the Triple Layer Business Model Canvas (Joyce & Paquin, 2016, p. 1479).

The social layer integrates a stakeholder view to capture joint effects between stakeholders and the organization as well as the key social impacts. This layer includes the elements outlined in Figure 6 and Table 4.

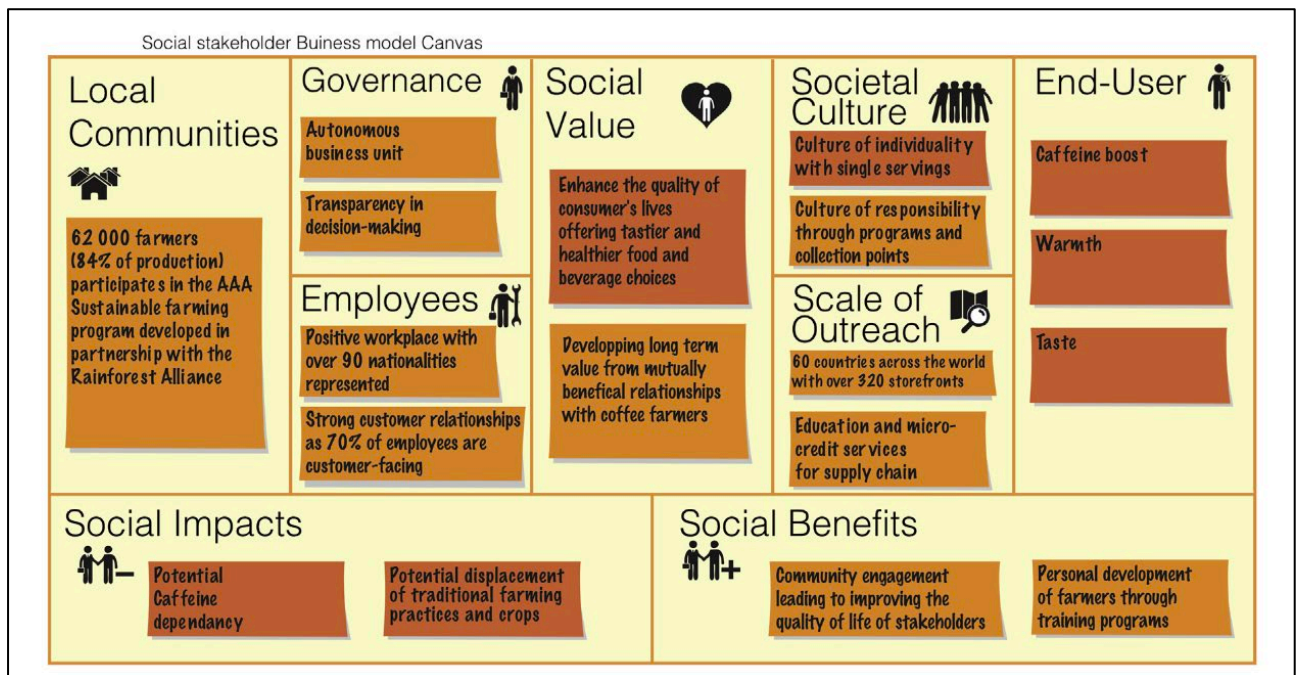


Figure 6: Nespresso’s social layer of the Triple Layer Business Model Canvas (Joyce & Paquin, 2016, p. 1480).

Table 4: Elements of the social stakeholder business model canvas (based on Joyce & Paquin, 2016).

Value	Description
Social value	Relates to the mission of an organization and focuses on developing benefits for stakeholders and the society in general.
Employee	Information can include types and numbers of employees, demographics including variations in payment, gender, ethnicity, and education.
Governance	Focuses on the structure and decision-making policies of the organization.
Communities	Mutually beneficial social relationships between supplies, local communities and the organization can significantly influence success.
Societal culture	This component acknowledges the potential impact on the society.
Scale of outreach	The range of the relationships an organization creates with its stakeholders over time.
End-users	The ‘consumers’ of the value proposition and the relation with how the value proposition tackles the requirements of end-users, contributing to quality of life.
Social impacts	Focuses on the social costs of an organization and extends the financial costs in the economic layer and bio-physical impacts of the environmental layer.
Social benefits	Is the positive social value created by the actions of the organization.

The authors argue that the TLBMC is useful for several reasons. First, it creates a visual representation of the business model, providing a better understanding. Second, it acts as a creation tool, as it can simplify the understanding and creation of new ideas by emphasizing the interconnections of

elements within the model. Third, it acts as a validation tool. In addition, it enables and supports horizontal and vertical coherence. The horizontal coherence allows some depth in identifying different types of value creation, which may simplify a more holistic view of the SBM. The vertical coherence is the alignment of each layer constituent across the canvas layers. This allows for the discovery of alignment of activities and interconnectedness across different types of value (Joyce & Paquin, 2016). Overall, the TLBMC provides an innovative method for analysing and theorising sustainability-oriented innovation and SBMs.

Bocken *et al.* (2014) conducted a literature and practice review of SBMs and identified several illustrations of procedures and solutions that can support the development of SBMs. The examples were compiled and examined to identify traits and trends that would make categorization easier. They introduce the following SBM archetypes to create a common vocabulary that can be utilized to accelerate the application of SBMs (see also Figure 8):

1. maximize material and energy efficiency
2. create value from waste
3. substitute with renewables and natural processes
4. deliver functionality rather than ownership
5. adopt a stewardship role
6. encourage sufficiency
7. re-purpose the business for society/environment
8. and develop scale-up solutions.

These will be explained further below. As organizations and individuals try to become more sustainable, SBMs must also undergo an innovative process to meet these changes. Characteristics of a path to a sustainable economy could be (Bocken *et al.*, 2014; Jackson, 2009):

- A system that promotes consumption reduction or imposes individual and institutional limitations or quotas on energy, products, water, etc.
- A system that prioritizes societal and environmental benefits over economic growth.
- A closed-loop system that prioritizes reuse, repair, and remake over recycling and prevents anything from being wasted or dumped into the environment.
- A system that prioritizes experience and functionality delivery over product ownership; a system created to give everyone satisfying, meaningful jobs that foster creativity and other abilities.

To meet these changes, it is necessary to fundamentally alter the purpose of business and nearly every aspect of its operation (Bocken *et al.*, 2014). For this research, three main components define a business model: the value proposition, the creation and delivery of value, and the acquisition of value (Bocken *et al.*, 2014) (see Figure 7).

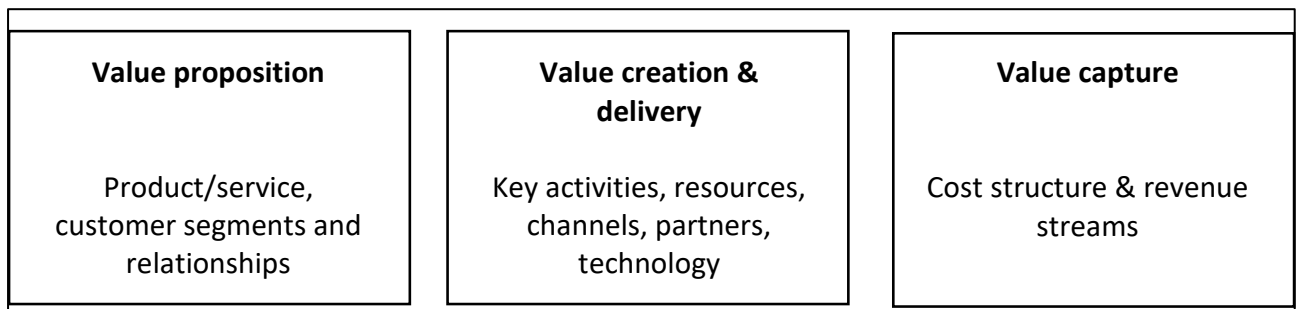


Figure 7: Conceptual business model framework (Bocken *et al.*, 2014, p. 43).

Sustainable business models can be used to combine system-level sustainability with technological and social advancements (Bocken *et al.*, 2014). Past improvements in efficiency and quality translated easier into profits, whereas it is not always clear how delivering social and environmental value might translate into profit and competitive advantage for the organization. Van Giezen & Wiegman (2020) for example evaluate alternative logistic chains to adapt ocean plastic waste recycling, by linking transportation to collecting and analysing data. They analyse direct economic value by incorporating sea transportation costs, port handling costs, storage costs, hinterland transportation costs, recycling and production costs, and revenues. An important point here is that from the direct economic value perspective the best solution often is to do nothing, as this is the safest choice in regards of investment as well as the cheapest. However, this solution is not feasible for marine life nor the environment, thus eroding indirect economic use and non-use values.

Bocken *et al.* (2014) further identified and categorized higher order groupings to classify archetypes and describe the primary type of innovation in business models based on innovations with a focus on technology, society, and organizations (Figure 8). Archetypes with a strong technical innovation component (such as product redesign and manufacturing process) are included in the technological grouping. While archetypes in the organizational grouping have a predominant organizational innovation change component (such as changing the firm's fiduciary responsibility), archetypes in the social grouping have a predominant social innovation component (such as innovations in consumer offering, changing consumer behaviour) (Bocken *et al.*, 2014; Boons & Lüdeke-Freund, 2013).

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

Figure 8: The sustainable business model archetypes (Bocken et al., 2014, p. 48).

In the following, examples of the most relevant archetypes are elaborated.

Archetype 1: Maximizing material and energy efficiency

Maximizing material and energy efficiency focuses on doing more with fewer resources, producing less waste, reducing emissions, and reducing pollution. Maximizing material and energy efficiency ought to run through the entire organization and, as a result, improve the value proposition (for example, by significantly lowering prices). It seizes conceptions such as lean, eco-efficiency, and cleaner production methods, which, through process and product redesign, seek to improve resource efficiency and cut down on waste and emissions. By this, the archetype contributes to system-wide resource consumption decreases (Bocken et al., 2014). Figure 9 outlines the three components value proposition, value creation & delivery, and value capture, of the maximize material and energy efficiency archetype.

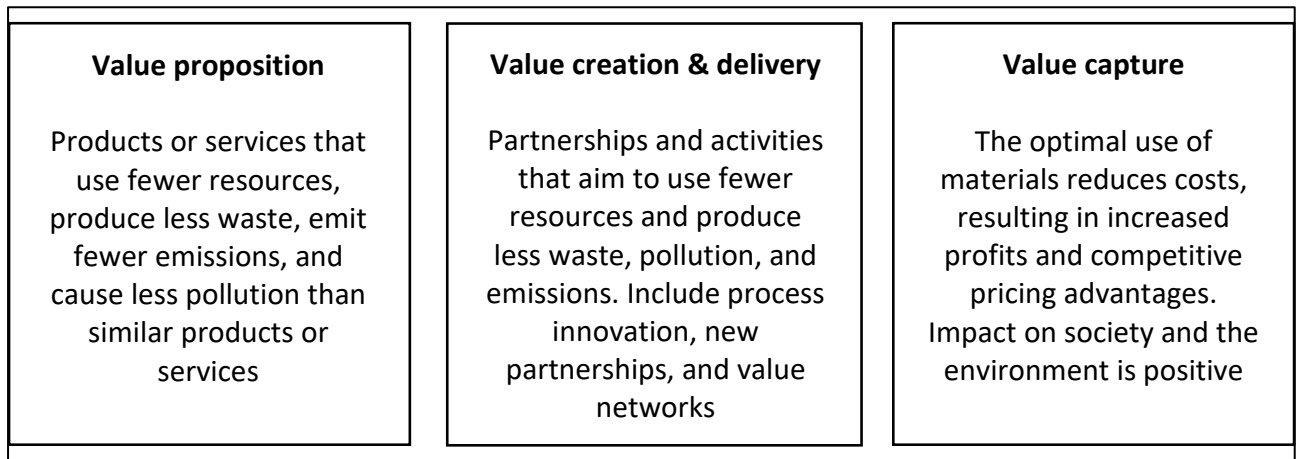


Figure 9: Maximize material and energy efficiency archetype (Bocken et al., 2014, p. 48).

As can be seen in Figure 9, this archetype strongly focuses on the use of resources and waste created.

Archetype 2: Creating value from waste

Creating value from waste is related to eliminating “waste” as a concept by developing materials and other valued inputs from it. In other words, this archetype aims to find and develop new uses for what is currently regarded as waste (Bocken et al., 2014). The focus is on reducing industries' environmental footprint. By utilizing waste as new input, a material loop is closed, and the demand for materials is reduced, leading to reduced demand for resource extraction and, therefore, less resource depletion and emissions omitted. One example is industrial symbiosis, which is a solution that is focused on processes, converting waste from one process into feedstock for another process (Ayres, 1994). Other examples are closed-loop business models, which focus on processes designed to enable waste to be used in other processes after the initial process ended (Winkler, 2011) and cradle-to-cradle, which combines the idea of a biological open-loop cycle with a closed-loop technical nutrient cycle. The biological open-loop cycle recognizes that lost materials cannot always be captured, but in these situations, the lost materials and emissions should be designed to be environmentally friendly and, ideally, to add beneficial nutrients to the natural environment, thereby generating positive outcomes (Bocken et al., 2014; McDonough & Braungart, 2010). Figure 10 outlines these three components: value proposition, value creation & delivery, and value capture of the created value from the waste archetype.

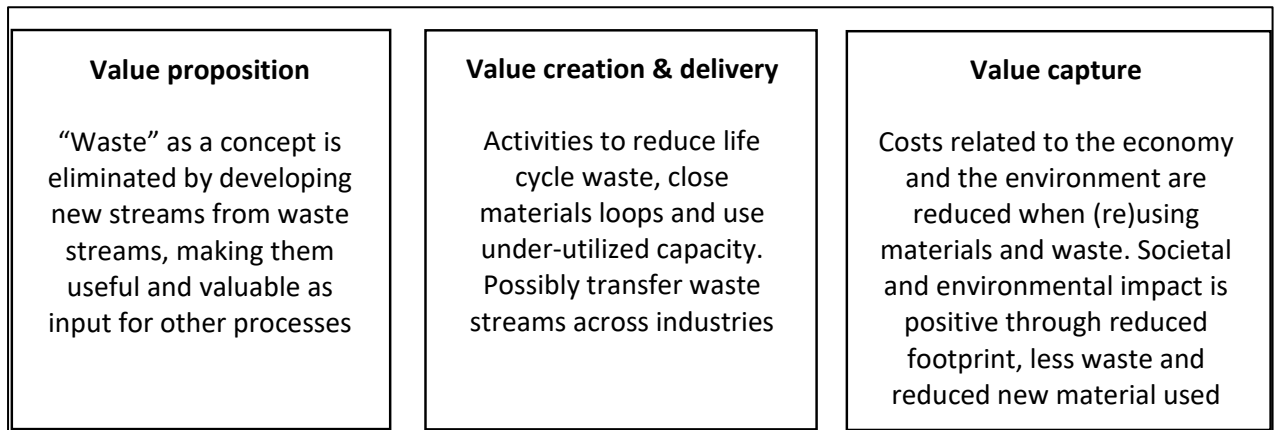


Figure 10: Create value from waste archetype (Bocken et al., 2014, p. 52).

The main focus of this archetype is on waste and the reuse of what is previously viewed as “waste” to create new value.

Archetype 3: Encouraging sufficiency

Encouraging sufficiency is rooted in solutions that try to cut down on production and consumption. It is argued that solutions focusing solely on the production side are insufficient to offset the unsustainable Western lifestyle (Bocken et al., 2014; Jackson, 2009). Organizations should address a broader range of stakeholders and enlighten the proper application of sales, growth, and advertising goals. System-level-wise, this should reduce over-consumption and positively affect the level of materials and energy used (Bocken et al., 2014). Examples include energy saving organizations that optimize organizations’ energy consumption and, in return, are compensated with a portion of the savings made. Other examples are designing products that have a long durability and, therefore, a longer replacement cycle (Bocken et al., 2014). Figure 11 outlines the three components value proposition, value creation & delivery, and value capture of the encourage sufficiency archetype.



Figure 11: Encourage sufficiency archetype (Bocken et al., 2014, p. 52).

Archetype 4: Develop up-scale solutions

Developing up-scale solutions is about implementing large-scale sustainable solutions with the goal of maximizing the benefits to society and the environment (Bocken *et al.*, 2014; see also Figure 12). Many organizations are built on solid sustainability principles but often remain on a relatively small scale. A strong emphasis on sustainability may hinder strong growth strategies and reduce conventional investor appeal. Reaching a scale at which businesses can make a significant contribution to environmental and social sustainability globally is a challenge. Examples of sustainable up-scale solutions are franchising and licensing to precipitous replication without requiring the founders to directly finance and manage all operations (Bocken *et al.*, 2014; Dant, Grünhagen, & Windsperger, 2011). Other examples include peer-to-peer models, crowd-sourcing and open innovation (Bocken & Allwood, 2012; Brabham, 2008; Chesbrough & Crowther, 2006).

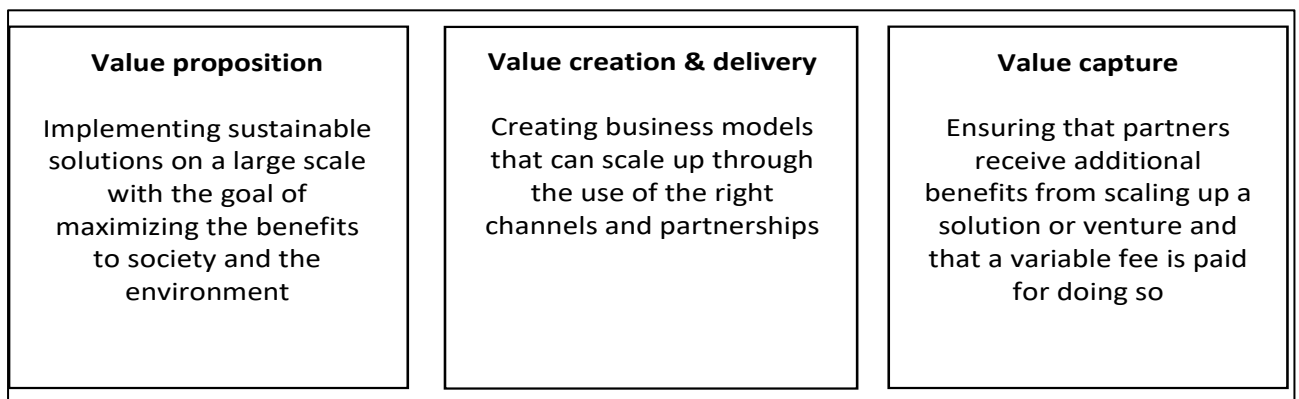


Figure 12: Develop up-scale solutions archetype (Bocken *et al.*, 2014, p. 54).

Organizations can apply one or more of these archetypes to develop their own approach and transformation for a more sustainable future and for generating sustainable value through business model innovations (Bocken *et al.*, 2014). The authors also argue for applying the framework in workshops and as inspiration when organizations brainstorm developing new SBMs. However, these archetypes cannot predict future trends and might need to be updated. Additionally, the emphasis is strongly on the environmental aspect and might overlook social aspects to some degree (Bocken *et al.*, 2014).

Lüdeke-Freund *et al.* (2018) argue that current classifications of SBMs are developed ad-hoc and on deviating perspectives, making them only partially overlapping and challenging to reunite, impeding progress. They develop a taxonomy of 45 SBM patterns, serving a more unified basis. Classifying SBM patterns is imperative as it fosters information about value creation, value delivery and value capture in organizations (Lambert, 2015; Lüdeke-Freund *et al.*, 2018). In addition, it supports researchers and practitioners in understanding the phenomenon. Second, classifications can help actors effectively

communicate and simplify cognition. Well-ordered knowledge makes cognitive processes simpler and makes it possible to concisely capture and convey the reasons behind various business operations within and across organizations (Lüdeke-Freund *et al.*, 2018). To overcome these issues, they present a new method-mix resulting in a new, comprehensive taxonomy containing 45 SBM patterns and 11 pattern groups.

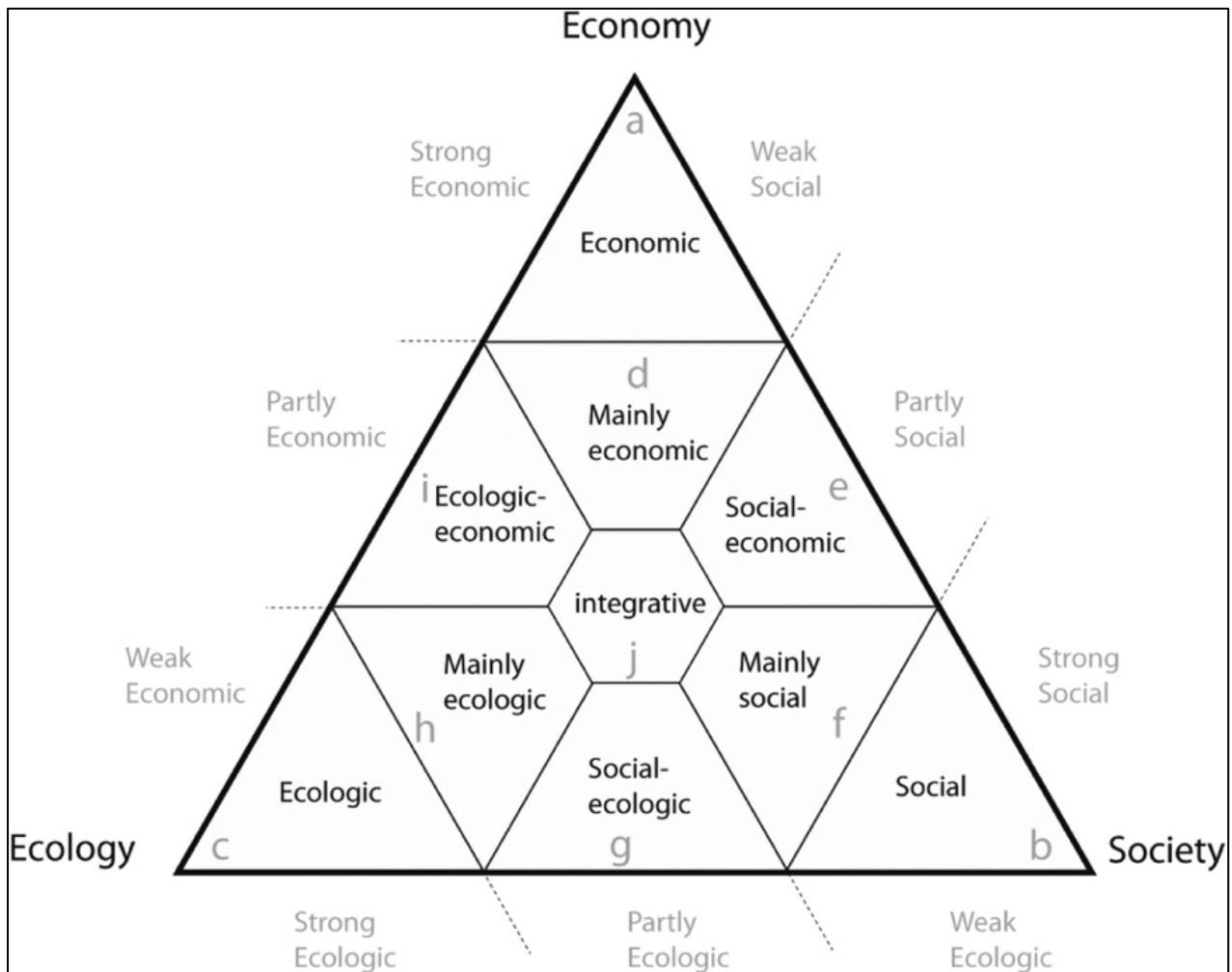


Figure 13: Sustainability triangle (Lüdeke-Freund *et al.*, 2018, p. 150).

They employed a five-step approach to develop an SBMs pattern taxonomy based on a sustainability triangle. Angles of the triangle symbolize each dimension of sustainability, specifically strong contributions to environmental, social, and economic development, whereas the edges between the angles symbolize combined contributions, i.e., ecologic–economic, social–economic, and social–ecologic (Kleine & Hauff, 2009; Lüdeke-Freund *et al.*, 2018). Synonyms for these terms include eco-efficiency, socio-efficiency, and eco-justice. This theoretical framework is especially appealing as it makes it possible to differentiate between various sustainability problems and their solutions. The centre of the triangle symbolizes contributions that integrate all three dimensions (see Figure 13).

Next, they identified 11 sustainability pattern groups with sub-patterns included, as shown in Table 5. All 11 groups are evaluated according to their relations to weak, partial, and strong practices of ecological, social, and economic value creation, leading to the final SBM taxonomy. A total of 45 SBM patterns are included for a more refined view of the taxonomy (Lüdeke-Freund et al., 2018).

Table 5: Sustainability pattern groups (Lüdeke-Freund et al., 2018, pp. 151 - 153).

Group number	Pattern groups	Included patterns
G1	Pricing & Revenue Patterns Patterns that primarily address the revenue model of a business model, i.e., how offerings are priced, and revenues generated.	<ul style="list-style-type: none"> • Differential pricing • Freemium • Innovative product financing • Subscription model
G2	Financing Patterns Patterns that address the financing model within a business model, i.e., how equity, debt and operating capital are acquired.	<ul style="list-style-type: none"> • Crowdfunding • Microfinance • Social business model: no dividends
G3	Eco-design Patterns Patterns that 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.	<ul style="list-style-type: none"> • Hybrid model / Gap-exploiter model • Maximize material productivity and energy efficiency • Product design • Substitute with renewables and natural processes
G4	Closing-the-Loop Patterns Patterns that help integrate the idea of circular material and energy flows into partnerships, key activities, and customer channels, i.e., how materials and energy flow into, out of, and return to an organization.	<ul style="list-style-type: none"> • 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 Patterns that modify the upstream (partners, resources, capabilities) and/or downstream (customers, relationships, channels) components of a business model, i.e., how inputs are sourced, and target groups are reached.	<ul style="list-style-type: none"> • Green supply chain management • Inclusive sourcing • Micro distribution and retail • Physical to virtual • Produce on demand • Shorter supply chains
G6	Giving Patterns Patterns that help donate products or services to target groups in need, i.e., how costs are covered, and social target groups are reached.	<ul style="list-style-type: none"> • Buy one, give one • Commercially utilized social mission

G7	Access Provision Patterns Patterns that create markets for otherwise neglected target groups, involving modified value propositions, channels, revenue, pricing and cost models, i.e., how value propositions are designed, delivered, and to whom.	<ul style="list-style-type: none"> • 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 Patterns that integrate social target groups in need, including otherwise neglected groups, either as customers or productive partners, i.e., how customers, partners, and employees are defined and integrated.	<ul style="list-style-type: none"> • Expertise broker • Market-oriented social mission • One-sided social mission • Social business model: empowerment • Two-sided social mission
G9	Service & Performance Patterns Patterns that emphasize the functional and service value of products and that offer performance management, i.e., how value propositions are defined and delivered.	<ul style="list-style-type: none"> • Pay for success • Product-oriented services • Result-oriented services • Use-oriented services
G10	Cooperative Patterns Patterns that integrate a broad range of stakeholders as co-owners and co-managers, how partners are defined and how the organization is governed.	<ul style="list-style-type: none"> • Cooperative ownership
G11	Community Platform Patterns Patterns that substitute resource or product ownership with community-based access to resources and products, how value propositions are defined and delivered.	<ul style="list-style-type: none"> • Sharing business

The placement of the 11 groups on the triangle can be seen in Figure 14. A closer look at this figure reveals that quite some groups are located close to the edges between different dimensions and forms of value creation. In addition, three parts stay unattached to any pattern: strong economic, strong ecological, and social-ecological value creation (Lüdeke-Freund *et al.*, 2018). Some pattern groups are seen in more than one value--creation category. These include G1 (Pricing & Revenue), G2 (Financing) and G10 (Cooperative), which are related to mainly economic and socio-economic value creation. The underlying contributions of “differential pricing” and “freemium” are expected to solve economic problems, for example, by introducing eco-friendly products requiring new pricing models or cross-subsidization of certain social groups (Clinton & Whisnant, 2014; Lüdeke-Freund *et al.*, 2018).

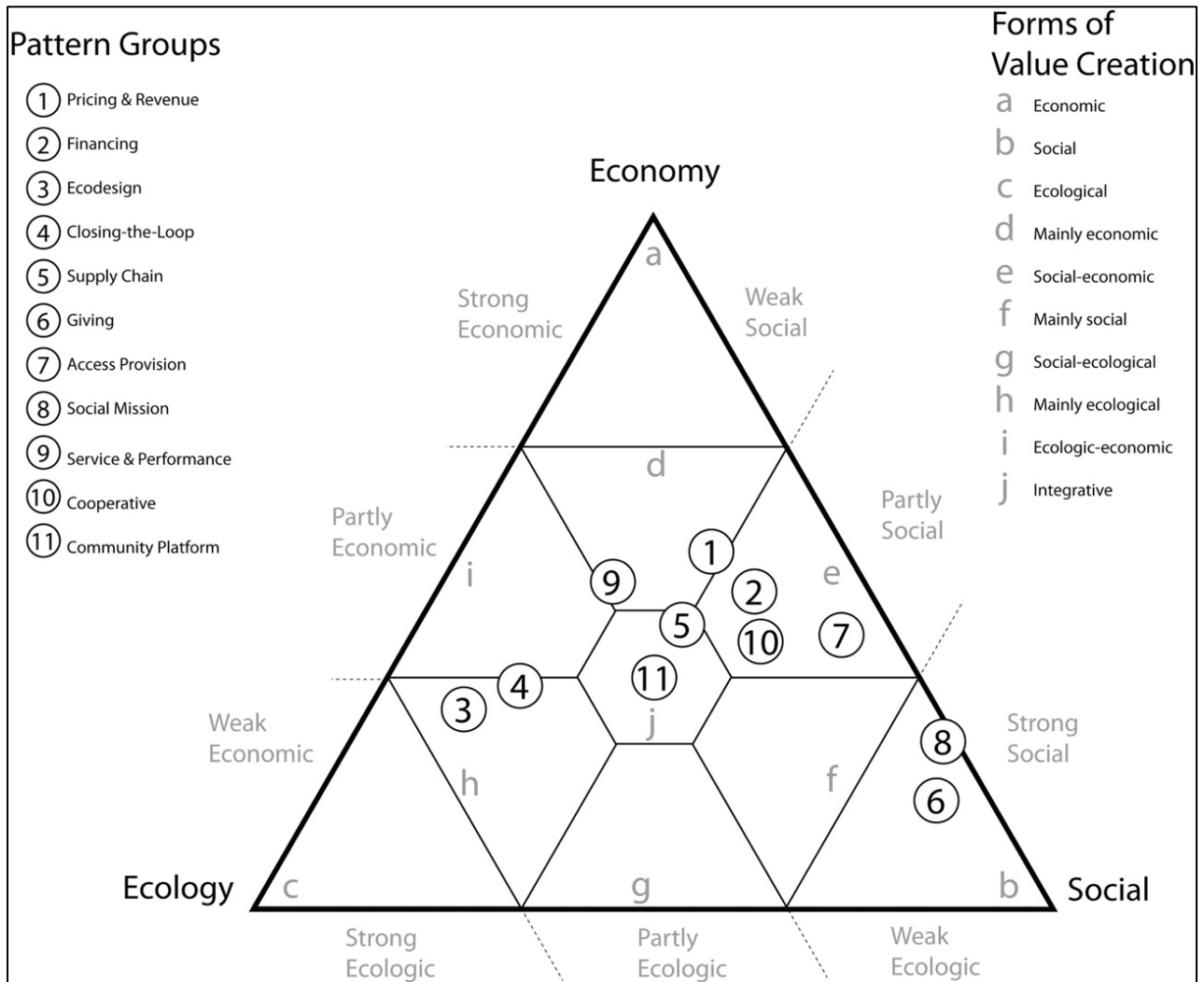


Figure 14: The sustainable business model pattern taxonomy (Lüdeke-Freund et al., 2018, p. 150).

Table 6: Overview of all patterns and their primary and secondary value creation (based on Lüdeke-Freund et al., 2018, p. 157).

Primary associated value creation	SBM pattern groups	Secondary associated value creation
Mainly economic	G1 - Pricing & Revenue Patterns <ul style="list-style-type: none"> Differential pricing Freemium Innovative product financing Subscription model 	Social-economic <ul style="list-style-type: none"> Social-economic Social-economic Mainly economic Mainly economic
	G9 - Service & Performance Patterns <ul style="list-style-type: none"> Pay for success Product-oriented services Result-oriented services Use-oriented services	Ecologic-economic <ul style="list-style-type: none"> Mainly economic Mainly economic Ecologic-economic Ecologic-economic

Social–economic	G7 - Access Provision Patterns <ul style="list-style-type: none"> • Building a marketplace • E -transaction platforms • Experience-based customer credit • Last-mile grid utilities • Value-for-money degrees Value-for money housing	Multiple <ul style="list-style-type: none"> • Social–economic • Social–economic • Social–economic • Social–economic • Social Mainly social
	G10 - Cooperative Patterns Cooperative ownership	None Social–economic
	G2 - Financing patterns <ul style="list-style-type: none"> • Crowdfunding • Microfinance Social business model: no dividends	Mainly economic <ul style="list-style-type: none"> • Mainly economic • Social–economic Social–economic
Social	G6 - Giving Patterns <ul style="list-style-type: none"> • Buy one, give one Commercially utilized social mission	None <ul style="list-style-type: none"> • Social Social
	G8 - Social Mission Patterns <ul style="list-style-type: none"> • Expertise broker • Market-oriented social mission • One-sided social mission • Social business model: empowerment Two-sided social mission	Social–economic <ul style="list-style-type: none"> • Social • Social • Social • Social–economic Social
Mainly ecological	G3 - Ecodesign Patterns <ul style="list-style-type: none"> • Hybrid model / Gap-exploiter model • Maximize material productivity and energy efficiency • Product design Substitute with renewables and natural processes	Ecologic–economic <ul style="list-style-type: none"> • Ecologic–economic • Mainly ecological <ul style="list-style-type: none"> • Mainly ecological Mainly ecological
	G4 - Closing-the-Loop Patterns <ul style="list-style-type: none"> • Co-product generation • Industrial symbiosis • Online waste exchange platform • Product recycling • Remanufacturing/next life sales • Repair • Reuse • Take back management Upgrading	Ecologic–economic <ul style="list-style-type: none"> • Ecologic–economic • Ecologic–economic • Ecologic–economic • Ecologic–economic • Mainly ecological • Mainly ecological • Mainly ecological • Mainly ecological Mainly ecological
Integrative	G11 - Community Platform Patterns Sharing business	None Integrative

	<p>G5 - Supply Chain Patterns</p> <ul style="list-style-type: none"> • Green supply chain management • Inclusive sourcing • Micro distribution and retail • Physical to virtual • Produce on demand <p>Shorter supply chains</p>	<p>Multiple</p> <ul style="list-style-type: none"> • Mainly ecological • Mainly social • Social–economic • Mainly economic • Mainly economic <p>Integrative</p>
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Other patterns associated with social-economic value creation but also with a stronger social value are G7 (Access Provision), G6 (Giving) and G8 (Social Mission). Next, G3 (Ecodesign) and G4 (Closing-the-Loop) are mostly associated with mainly ecological contributions, including business models focused on improvements in ecological terms, while G9 (Service & Performance) is placed more towards the economic value creation. Lastly, G5 (Supply Chain) and G11 (Community Platform) are associated with all dimensions and placed towards the middle of the triangle. A clear overview of all patterns including their primary and secondary value creation can be seen in Table 6.

1.4 Screening of business models

1.4.1 *Recollection*

We have defined an SBM as a business model that strives to produce positive social and/or environmental outcomes to its beneficiaries while maintaining economic viability. Achieving economic viability may thereby be more challenging for SBMs as compared to traditional business models. That is because seeking economic outcomes that suffice for the demanded return on investment of capital providers is normally an inherent element of a traditional business model, while SBMs often prioritize the generation of positive social and/or environmental outcomes. To ensure that a project or organization relying on an SBM can actually be sustained or even upscaled, it is therefore essential to select a business model that ensures economic viability (for details regarding the definition of SBM go back to subchapter 1.3.1).

What economic viability implies depends on the business model category. In the case of an SBM proposed by a for-profit organization, economic value – and viability – may imply the generation of a risk-adequate return on investment for the organization’s capital providers. For a not-for-profit initiative, the generation of an economic value simply covering the costs imposed by a sustainable project may be sufficient for economic value.

To support projects in selecting a viable business model and allowing upscaling, we are proposing a five-step process to screen, develop, and validate a sustainable business model (SBM) in general and for projects focusing on restoring oceans and waters specifically (see also Figure 1). The selection of a

viable business model is thereby based on a match between the characteristics of the project and the business model.

The screening phase thereby comprises three steps:

- 1) Mapping of the project
- 2) Selection of a business model category
- 3) Selection of the business model

Step 1) involves mapping the project's activity focus according to its ecological, social, and economic outcomes. Step 2) refers to the selection of for-profit, private-public-partnership, or not-for-profit business model categories according to the project's activity focus. Step 3) finalizes the screening by selecting a specific business model according to the business model category.

The developing and validating phases are each reflected by an individual step. Step 4) involves the development of the specific business model canvas according to the previously selected business model. Step 5) finally involves the validation of the previously developed business model canvas through benchmarking. This can further lead to an iteration of previous steps, possibly resulting in a revision of decisions made in previous steps.

1.4.2 Mapping of the project

The first step of the screening phase constitutes the mapping of the project's activity focus according to its ecological, social, and economic outcomes. For this first step, we are modifying the sustainability triangle of Lüdeke-Freund *et al.* (2018) to enable the identification of a suitable business model category for the project (for details regarding the sustainability triangle, please go back to subchapter 1.3.3). The mapping of the project's activity focus initially leads to the identification of one of 11 forms of outcome creation that reflects the project's ecological, social, and economic outcomes (see Figure 15). Creating an outcome thereby should be understood as having a positive impact in terms of ecology, society, or economy. A project, that for example focuses on ecological and social outcomes, but generates no economic outcome, falls under the social-ecological form of outcome creation. It is furthermore important to differentiate between direct and indirect outcomes. Direct outcomes are immediate results of the project's activity and controlled by the project. Indirect outcomes instead are mediate results of the project's activity and may not be controlled by the project. For the purpose of identifying a suitable business model category, the differentiation between direct and indirect outcomes is only relevant in terms of the economic dimension. The concept of a direct economic outcome is thereby widely overlapping with the concept of direct use value. The concept of indirect

economic outcomes in turn largely includes both the concept of indirect use values and the concept of non-use values (see also subchapter 1.3.1.2 for the different types of outcomes).

As can be seen in Figure 15, projects that do not generate an economic outcome, will likely have to select a business model from the not-for profit category. These projects do not generate direct or indirect economic outcomes that would satisfy return requirements of capital providers. For these projects, it is often not possible to identify specific third parties that could be charged or would be willing to pay for benefiting from the value proposition. Hence, in the longer run, these projects are not economically viable relying on a for-profit business model, and an upscaling is unlikely. A project aiming at ocean clean-up that is collecting plastic waste from remote areas outside territorial waters can serve as an example. In light of lacking sovereign authority and long transportation distances, it seems implausible that such a project could be financed through monetizing recyclable material or charging potential beneficiaries (Van Giezen & Wiegmans, 2020).

For projects that generate a direct economic outcome in combination with a direct or indirect social and or ecological outcome, a business model from the traditional for-profit category may be feasible. These projects are based on a value proposition that ensures a sufficient return on investment for their capital providers based on a direct economic outcome that is controlled by the project. This implies that third parties are willing to pay voluntarily for benefiting from the value proposition of the project. A project aiming at supporting carbon neutrality by using wave power to generate renewable energy can serve as an example. Assuming that such a project would be able to develop a reliable and efficient technology to convert wave energy into electricity, it seems plausible that the project could generate a profit from providing coastal communities with clean energy.

For projects that generate an indirect economic outcome in combination with a direct or indirect social and or ecological outcome, the business model will likely have to pertain to the private-public partnership category. This is because these projects have a value proposition that requires governmental backing for ensuring a sufficient return on investment for their capital providers, as economic outcomes are mediate outcomes and may not be controlled. This implies that the value proposition goes beyond the possibilities of a private organization, and/or that third parties are not willing to pay voluntarily although benefiting from the project. Large infrastructure projects, such as offshore windfarms, are often carried out by private-public partnership, and can serve as an example. Another example may be a project where a private organization restores a marine ecosystem and in return charges cultural, educational, or recreational beneficiaries with governmental backing.

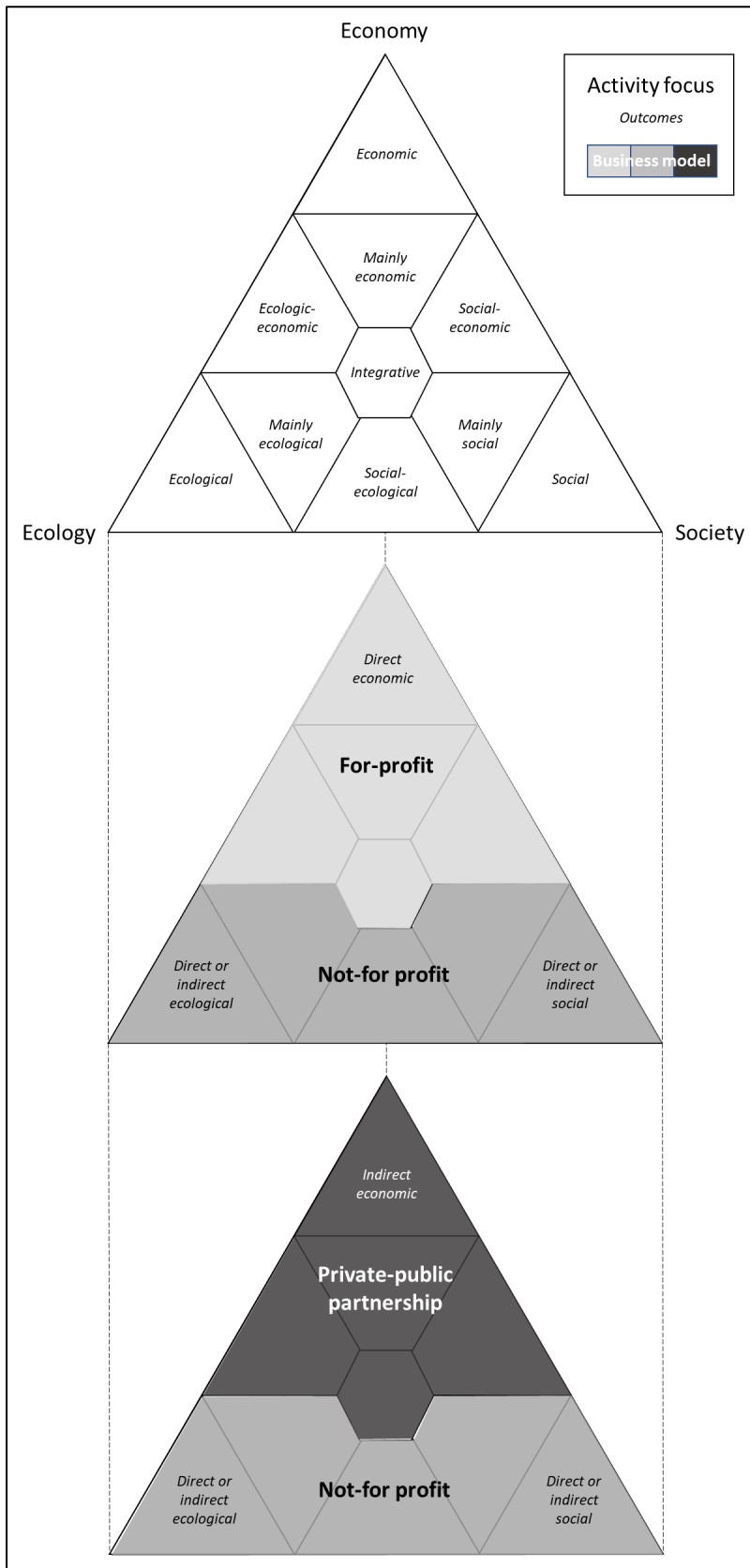


Figure 15: Mapping of activity (based on Lüdeke-Freund et al., 2018, p. 150).

1.4.3 Selection of a business model category and business model

The screening phase further comprises the second step, referring to the selection of the for-profit, private-public-partnership, or not-for-profit business model category according to the mapping of the project's activity focus in the first step. This goes hand in hand with the third step that finalizes the screening phase: the selection of a specific business model according to the business model category.

Within the for-profit business model category, rather traditional business models of providing a product or service, relying on shared assets, subscription or lease/rental, etc. may be suitable also for projects that have an ecologic-economic, social-economic, or integrative activity focus. That said, it may be more appropriate to directly select a truly sustainable business model from the variety outlined in greater detail in subchapter 1.3.3, if the social/ecological focus prevails. Examples are remanufacturing/next-life sales, physical to virtual or buy one, give one, etc. (see also Table 7). Working with a business model explicitly positioned as sustainable may guide the development of a business model canvas optimally and increase the likelihood of success and upscaling.

Within the public-private partnership business model category, the business model is founded on a collaboration between the public and the private sector. The concept of a private-public partnership implies that a public organization and a private organization collaborate to achieve a specific economic, ecological, and/or social outcome. The details of the partnership are generally specified in a contract between the involved parties. Normally, the public organization exercises control by defining the outcomes to be achieved by the partnership and delegates the details of the execution of the project to the private organization. This is mostly done if the public organization lacks capacity or skills to achieve the desired outcomes or strives for a cost reduction and/or quality increase in generating the desired outcome achieved by, e.g., constructing or operating a project or providing a service.

Table 7: Business model categories.

Category of business model			
	For-profit	Public-private partnership	Not-for-profit
Business model	<p><i>Traditional</i></p> <ul style="list-style-type: none"> • Product • Service • Shared assets • Subscription • Lease/Rental • Insurance • Reselling • Agency/Promotion • ... <p><i>SBMs</i></p> <ul style="list-style-type: none"> • Remanufacturing/next life sales • Repair • Upgrading • Crowdfunding • Physical to virtual • Produce on demand • Buy one, give one • Functional economy • ... 	<ul style="list-style-type: none"> • collaboration between the public and the private sector 	<ul style="list-style-type: none"> • Donation (private funding) • Public funding

The advantage of the private-public partnership from the perspective of the private sector mainly lies in the fact that the outcomes of the project could generally not be created without the involvement of the public sector and legal grounds. Hence, the ultimate goal of the public-private partnership business model category is the exploitation of synergies between the public and the private sector to optimize the achievement of the desired outcome of the project (see also Figure 16).

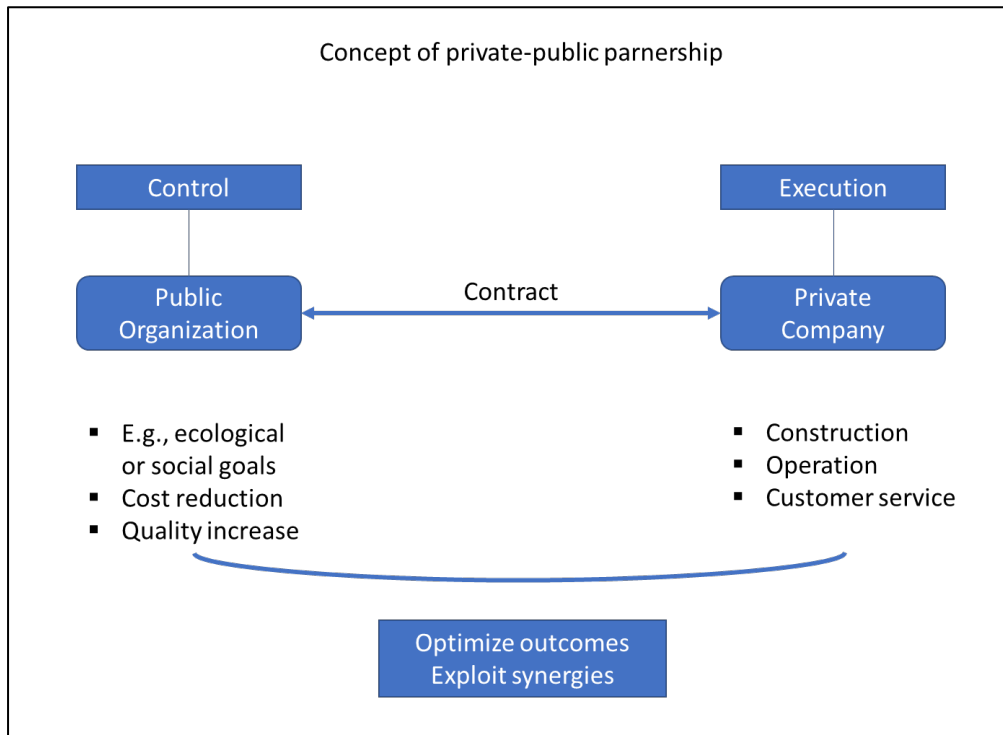


Figure 16: Concept of private-public partnership (van Drimmelen, 2013, p. 877).

The not-for-profit business model category pertains to projects that do not aim at earning profits for their owners/founders. All money donated to or earned by the organization is instead used to achieve the project's objectives and cover its running costs. Please note that we do not differentiate between not-for-profit and non-profit organizations, which may be relevant in some jurisdictions due to associated tax implications, and rather refer to a broad understanding covering both types. The main source of funding for a not-for-profit business model will be private individual or corporate donations. It is furthermore possible that a not-for-profit organization receives public funding, either through donations or other forms of financing. Implementing a not-for-profit business model does, however, not imply that the project does not utilize opportunities of cutting running costs, e.g., by monetizing recyclable material taken from the ocean.

1.5 Development of a business model canvas

The developing phase is reflected by a separate individual step 4), which involves the development of the specific business model canvas according to the previously selected business model. Our approach to developing a business model canvas builds on a slightly modified version of the original proposition by Osterwalder & Pigneur (2010) but incorporates ideas of the Triple Layer Business Model Canvas (TLBMC) approach of Joyce & Paquin (2016). Traditionally, the business model canvas refines business models of projects into nine consistent elements: customer value proposition, segments, customer relationships, channels, key resources, key activities, partners, costs, and revenues. Our suggestion for

a (sustainable) business model canvas outlined in Table 8 comprises variants of these nine elements which better reflect the breadth of possible sustainable projects (e.g., having beneficiaries instead of customers) and further contains a tenth element inspired by the TLBMC (i.e., social, environmental, and/or economic outcome). While we believe that reducing the fairly complex approach of the TLBMC to a single element is adequate and sufficient for gaining a good first overview of most sustainable business models, a detailed analysis of the business model in line with the full TLBMC approach may be beneficial at times (please see subchapter 1.3.3 for further details).

Table 8: The business model canvas (based on Sparviero, 2019, p. 237).

Key Partners	Key Activities	Value Proposition/ Mission	Customer Relationships	Customer Segments/ Beneficiaries
	Key Resources		Distribution Channels	
Costs Structure		Revenue Model		
Social, Environmental, and/or Economic Outcome (other than Value Proposition/Mission)				

Specifically, our proposed business model canvas comprises the following 10 elements. The *Value Proposition/Mission* gives a complete overview of all products and services provided by the project and of the value that the project offers to its customers/beneficiaries. *Customer Segments/Beneficiaries* depicts the segments of customers/beneficiaries a project wants to offer value to. *Distribution Channels* describes the ways in which the project gets in touch with its customers/beneficiaries. *Customer/Beneficiary Relationships* explains the connection between the project and its customer segments/beneficiaries. *Key Activities* explains the way in which resources and activities of the project are connected. *Key Resources* defines the resources necessary to execute the project’s business model. *Key Partners* portrays the network of cooperative agreements with other

projects or organizations necessary to efficiently offer (and, possibly: commercialize) value. *Costs Structure* sums up the monetary consequences of the means employed in the business model of the project. *Revenue Model* describes the way a project makes money through a variety of revenue streams. *Social, Environmental, and/or Economic Outcome (other than Value Proposition/Mission)* gives an overview of the most important social, environmental, and/or economic outcomes provided by the project, other than those outlined as the value proposition/mission (see also Table 9 for a summarizing overview).

Table 9: Business model canvas elements (based on Perić et al., 2020, p. 185).

Business Model Canvas Element	Description
Value Proposition/Mission	Gives a complete overview of all products and services provided by the project and of the value that the project offers to its customers/beneficiaries
Customer Segments/Beneficiaries	Depicts the segments of customers/beneficiaries a project wants to offer value to
Distribution Channels	Describes the ways in which the project gets in touch with its customers/beneficiaries
Customer/Beneficiary Relationships	Explains the connection between the project and its customer segments/Beneficiaries
Key Activities	Explains the way in which resources and activities of the project are connected
Key Resources	Defines the resources necessary to execute the project's business model
Key Partners	Portrays the network of cooperative agreements with other projects or organizations necessary to efficiently offer (and, possibly: commercialize) value
Costs Structure	Sums up the monetary consequences of the means employed in the business model of the project
Revenue Model	Describes the way a project makes money through a variety of revenue streams
Social, Environmental, and/or Economic Outcome (other than Value Proposition/Mission)	Gives an overview of the most important social, environmental, and/or economic outcomes provided by the project, other than those outlined as the value proposition/mission

1.6 Validation of the business model canvas

1.6.1 In-depth case studies of exemplary projects

The validating phase is reflected by the final single step 5), which involves the validation of the previously developed business model canvas through benchmarking. This can further lead to an iteration of previous steps possibly resulting in a revision of decisions made in previous steps.

Generally, business models are highly specific, which makes general conclusions on a more aggregate level difficult, if not impossible. Step 5) therefore normally requires not only a thorough and detailed run through the previous four steps of screening and developing a business model for a project (see also Figure 1), but also in-depth case studies of peer projects and their business models for benchmarking purposes.

For this chapter, we will keep the benchmarking at an aggregate level by briefly and exemplarily running through the first steps of the proposed model of screening sustainable business models for a number of projects. Specifically, we will look at the following cases:

- Case Study 1: Ecocean – Raised to be wild
- Case Study 2: Airseas
- Case Study 3: The Ocean Cleanup
- Case Study 4: Redrose Developments
- Case Study 5: Vyld
- Case Study 6: Mounid
- Case Study 7: 4DimBlick

1.6.1.1 Case Study 1: Ecocean – Raised to be wild

As an effective response to the collapse of fish stocks, Ecocean proposes two complementary solutions which both have the same goal: to boost the recruitment and survival of fish: BioRestore to increase fish population by restocking and Biohut to bring back fish nursery function in places where it has been damaged by built infrastructures (ports, pipelines, seawalls, etc.). More specifically, BioRestore is a comprehensive process of post-larval capture, culture, rearing and restocking on temporary habitats. Biohut in turn is an artificial habitat which offers food and shelter in order to increase the survival rate of fish larvae naturally entering harbours and other marine facilities (see Figure 17 for a summary of the Ecocean's value proposition). With these solutions, harbours, organizations, and others can reduce their marine structures' ecological footprint (Ecocean, 2023). Further details on the project can be found at <https://www.ecocean.fr/home>.

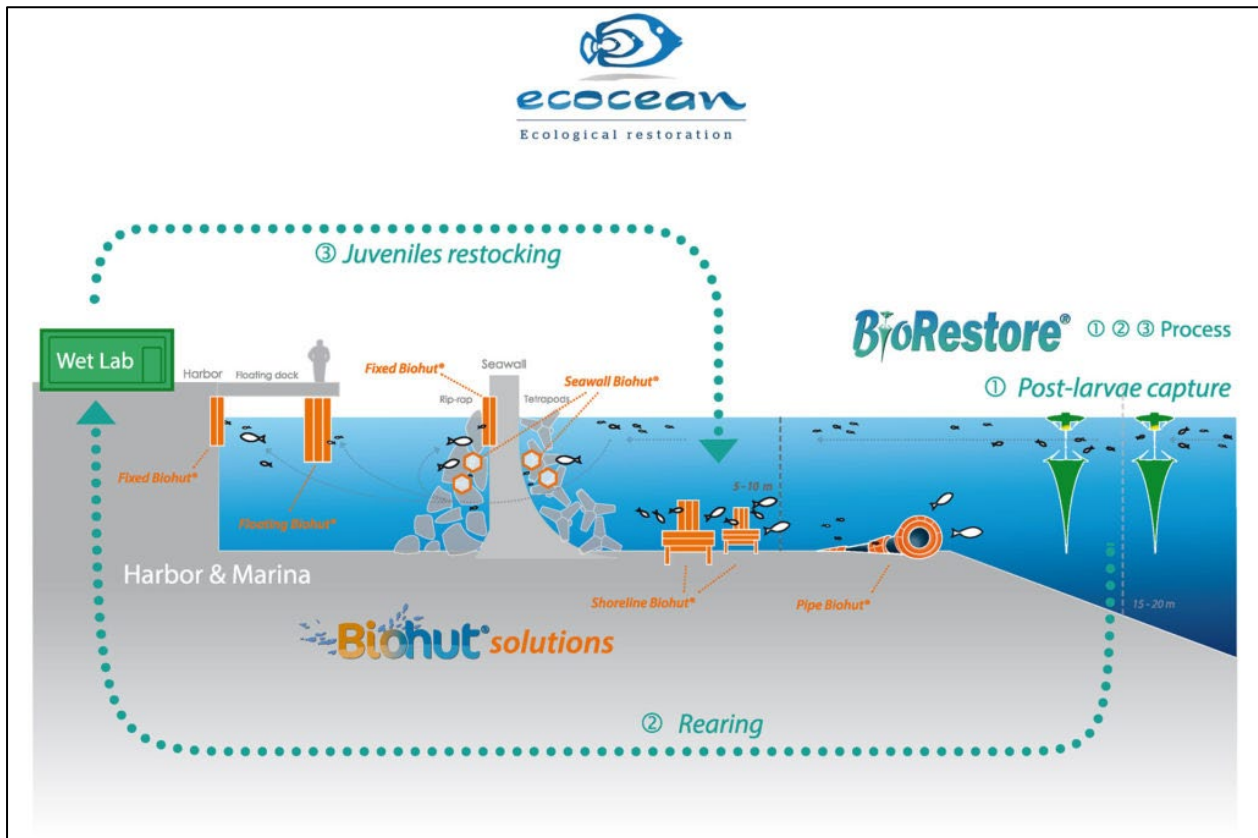


Figure 17: Value proposition of ecocean in brief (Ecocean, 2023).

1.6.1.2 Case Study 2: Airseas

Every year, 940 million tons of CO₂ – about 13% of EU Green House Gas (GHG) emissions and nearly 3% of the global worldwide emissions – are emitted from the shipping industry. In order to contribute to the decarbonization of shipping, Airseas has introduced Seawing, an integrated solution that combines kite-technology with an automated flight control system developed by the aerospace industry to harness the power of the wind. Safe, clean, reliable, and compact, the system can be used easily by virtually any commercial ship to reduce emissions and fuel consumption by an average of 20%. With this solution, the shipping industry can reduce its carbon footprint as well as save fuel costs (Airseas, 2023). Further details on the project can be found at <https://www.airseas.com>.

1.6.1.3 Case Study 3: The Ocean Cleanup

The Ocean Cleanup is a not-for-profit organization developing and scaling technologies to rid the oceans of plastic. To achieve this objective, they work on a combination of closing sources of plastic pollution and cleaning up what has already accumulated in the ocean and does not disappear by itself. More specifically, the Ocean Cleanup is currently conducting cleanup operations in the Great Pacific Garbage Patch and in some of the world's most polluted rivers, using the interceptor solution. The composition of trash extracted from the ocean differs from what they catch in rivers, as does the ownership of the catch. Due to these factors, the project's role in creating value for these two streams

also differs (see Table 10). The Ocean Cleanup intends to do something valuable with the plastic they clean up, either by creating durable new products or processing it otherwise. They have already launched a first product made with plastic caught in the Great Pacific Garbage Patch, the Ocean Cleanup Sunglasses. In the future, they no longer intend to create their own products, but will instead work with partners to develop products using plastic collected by the Ocean Cleanup (Ocean Cleanup, 2023). Further details on the project can be found at <https://theoceancleanup.com>.

Table 10: Value proposition of the Ocean Cleanup in brief (Ocean Cleanup, 2023).

	Oceans	Rivers
Composition	Only certain types of plastic make their way out to the middle of the ocean. Compared to plastic retrieved from rivers, ocean plastic is also much more degraded due to decades of exposure to seawater and UV radiation from the sun.	The diversity of trash in rivers is much more significant than for oceans. Here, the Ocean Cleanup not only catches different types of plastic but also other types of waste.
Ownership	The plastic the Ocean Cleanup catches in oceans is located in international waters, making them the legal owners.	Trash caught in rivers is mainly owned by the operators of the interceptor solution.
Waste management	As legal owners, the Ocean Cleanup ensures the ocean catch is processed in accordance with their waste management policy, overseeing the entire value chain.	Working closely with the local operators, the Ocean Cleanup reviews waste management plans, helping to identify and mitigate potential risks. The aim is to ensure a positive environmental impact.
Funding & business model	The Ocean Cleanup recycles the majority of plastic, after which their partners process it to make durable new products – while constantly looking for the best way to process any remaining waste.	The Ocean Cleanup supports operators of the interceptor solution in developing business models for the extracted waste – by sharing their knowledge, experience, and access to their network.

1.6.1.4 Case Study 4: Redrose Developments

Redrose Developments, together with Alga Seaweed Ltd, focusses on seaweed. The idea is to deliver valorised seaweed extracts to industries that need them. Over 10,000 known species of macroalgae, classified as either reds, greens or browns, can be found growing and thriving in oceans. Various new exciting applications are frequently found for the nutrient rich product, from raw ingredients in the kitchen to animal feed, crop fertilisers, biopolymers, biofuels and cosmetics. Hence, seaweed is a multifunctional resource which Redrose Developments intends to manage responsibly and sustainably

as the demand for the product increases. Redrose Developments offers a franchise solution to allow seaweed harvesters and farmers to maximise the value of their wild and cultivated stock by processing the seaweed within minutes of harvesting, preserving nutritional biomass and important minerals and proteins which might otherwise be lost. Harvesters can become owner operators of the franchise units, processing a wide range of wild and cultivated seaweed daily, increasing stock value and volume. Processing units are provided with full training and management support and the units are remotely monitored for safety and maintenance. Redrose Developments are part of a consortium seeking blended finance to develop a novel approach to cultivating macroalgae, directly at sea in open waters. The aims are to remove pressure on the crowded marine space, to record biomarkers to ensure healthy and sustainable growth of microalgae, and to address risks to personnel working in the sector (Redrose Developments, 2024). Further details on the project can be found at <https://www.redrosedevelopments.com>.

1.6.1.5 Case Study 5: Vyld

Vyld was founded in 2021 in Berlin and aims at developing and producing tampons (and in the future possibly other types of absorbent products) made from seaweed. Algae and seaweed fibres are traditionally used in medical applications because of their absorbent, anti-inflammatory and hypoallergenic properties. For Vyld's products, seaweed is harvested from the ocean, then dried and ground. An extract is obtained from the powder in an environmentally friendly process. The naturally white extract can then be spun out into a fibre – much like viscose, only without all the chemicals. The remaining components of the seaweed can be used for other products, e.g., vegan seaweed burger patties or as fertilizers. In September 2022, Vyld successfully completed a crowdfunding campaign, allowing the project to enter the beta phase of tampon development, i.e., the first product tests. As the company puts it, they “want to grow as sustainably as [their] seaweed” and it was therefore founded as a steward-ownership profit-for-purpose company. Most startups want to grow as fast as possible to then be able to sell the company for as much as possible. Instead, Vyld focuses on the long-term in their business model, which is also a legally binding commitment in their articles of association. Vyld as a company owns itself and is not an object of speculation. Steward ownership of Vyld thereby has two core principles: 1) self-governance, i.e., the control of the company (the voting rights), always lie with the people who actively work in the company, not with (external) investors; 2) profits serve purpose, i.e., profits generated by Vyld cannot be privatized, because they are means to pursue the mission and not an end in itself to increase investors' (or founders') wealth. They are therefore not distributed to shareholders but reinvested in the mission. Finally, a charitable foundation has a veto vote that would prevent any change in the bylaws that could undermine these principles (Vyld, 2024). Further details on the project can be found at <https://www.vyldness.de/>.

1.6.1.6 Case Study 6: Mounid

Mounid aims at creating an algae ink colour for textiles, in collaboration with stakeholders in the Swedish textile value chain to push the transition towards a more sustainable, circular textile industry with reduced climate footprint. Using algae and microalgae to create textile colours makes it possible to design them non-toxic from the start and to achieve circular end-products. Mounid has received initial funding from various sources, such as Smart Textiles (Business Innovation) and Vinnova, Sweden's Innovation Agency (Mounid, 2024). Further details on the project can be found at <https://www.mounid.se>.

1.6.1.7 Case Study 7: 4DimBlick

4DimBlick focuses on the development of virtual-reality-supported immersive learning modules for schools and specialist training. They enable individuals or groups of learners to be completely immersed and interact with a realistic learning environment at any time and in any place. Their current customers come from the fishing industry and agriculture, as they have in-depth expertise and a large network in these areas. However, the possible applications for virtual reality (VR) and professional 360° film recordings with interactive content are diverse and can be used in a wide variety of areas. 4DimBlick's range of services extends from individual 360° panorama tours or product presentations to thematically clearly defined and self-contained VR productions and complex, long-term and scalable VR projects with a modular structure. They integrate text and image content provided by the customer or develop completely new content and make the corresponding recordings (4DimBlick, 2024). Further details on the project can be found at <https://www.4dimblick.de>.

1.6.2 Screening of exemplary projects

1.6.2.1 Case Study 1: Ecocean – Raised to be wild

Specifically, step 1) involves the mapping of the project's activity focus according to its ecological, social, and economic outcomes. The activities of both elements of *Ecocean's* value proposition, BioHut and BioRestore, generate an obvious direct ecological outcome in terms of boosting the recruitment and survival of fish. Increasing the fish population may in turn also be associated with (indirect) social outcomes, e.g., improved living conditions for local communities through larger food supply. Indirect economic outcomes in the form of increased income for local fishermen, or an increase of tourism because of improved snorkelling conditions may also occur. These are, however, side effects and are not the primary focus of *Ecocean's* activities. Regarding the economic dimension, *Ecocean* clearly targets direct outcomes utilizing organizations' as well as regulators' increased focus on sustainable corporate behaviour. *Ecocean* thereby can help harbours, organizations, and others reduce their ecological footprint, which may, under increasing scrutiny of the public, investors, customers, etc.,

become a prerequisite for operating existing and installing new marine structures. This creates demand for *Ecocean's* value proposition and ensures third parties' willingness to pay voluntarily for benefiting from the project. In summary, a mapping of *Ecocean* as ecologic-(direct)economic seems plausible.

Step 2) then refers to the selection of for-profit, private-public-partnership, or not-for profit business model category according to the project's activity focus. Mapping *Ecocean's* activity focus as ecologic-(direct)economic indicates that a for-profit business model may ensure economic viability over time.

Step 3) then finalizes the screening with the selection of a specific business model according to the business model category. There is a variety of business models that seem to be suitable for *Ecocean*, both from the selection of traditional business models as well as SBMs. Specifically, BioHut can be seen as product, and the installation of it as a service. BioRestore classifies rather as a service offered to *Ecocean's* customers. Hence, a possible upscaling of *Ecocean's* business model is dependent on the same factors as the business model of any for-profit organization offering products and/or services, e.g., offering a demanded product/service at a competitive price. A suitable alternative for *Ecocean* from the variety of SBMs could be the business model of functional economy. Functional economy refers to the idea of using a good instead of owning it. Under this business model, organizations rather sell a function which can be used, instead of a product. This increases incentives to design and produce high-quality, repairable goods with a long lifetime. Offering BioHut under the SBM of functional economy would not only nicely complement *Ecocean's* focus on ecological outcomes, but also the potential customers' interest in reducing their ecological footprint. However, with a focus on durability, BioHut likely has to be offered at a higher price under the SBM of functional economy as compared to traditional business models. Ultimately, the potential success of *Ecocean* under the different business models will therefore depend on customers' preferences.

1.6.2.2 Case Study 2: Airseas

Although *Airseas* offers a totally different value proposition than *Ecocean*, the screening phase for *Airseas* leads to similar conclusions. Specifically, the central element of *Airseas's* value proposition, Seawing, generate an obvious direct ecological outcome in terms of reducing GHG emissions of the shipping industry. While curbing global warming will generally have a variety of positive social outcomes, *Airseas's* contribution seems neither large nor specific enough to argue in favour of an intended (indirect) social outcome. Regarding the economic dimension, *Airseas* clearly targets direct outcomes utilizing organizations' as well as regulators' increased focus on sustainable corporate behaviour. *Airseas* can help the shipping industry to reduce its carbon footprint. Additionally, Seawing reduces fuel consumption and thereby fuel costs. Shipping organizations may therefore also have a direct economic incentive to utilize Seawing. Both creates demand for *Airseas's* value proposition and

ensures third parties' willingness to pay voluntarily for benefiting from the project. In summary, a mapping of *Airseas* as ecologic-(direct)economic seems plausible. Mapping *Airseas*' activity focus as ecologic-(direct)economic indicates that a for-profit business model may ensure economic viability over time. There is a variety of business models that seem to be suitable for *Airseas*, both from the selection of traditional business models as well as SBMs. E.g., *Seawing* could be offered under a traditional product, service, or lease/rental business model. A suitable alternative for *Seawing* from the variety of SBMs could again be the business model of functional economy.

1.6.2.3 Case Study 3: *The Ocean Cleanup*

The activities of the two elements of *The Ocean Cleanup*'s value proposition, oceans, and rivers, clearly generate obvious direct ecological outcomes in terms of removing plastic from/preventing plastic from ending up in the ocean. Clean oceans may in turn also be associated with (indirect) social outcomes, e.g., improved living conditions for local communities through better health or larger food supply. Indirect economic outcomes in the form of increased income for local fishermen, or an increase of tourism because of clean beaches and improved snorkelling conditions may also occur. These are, however, side effects and are not the primary focus of *The Ocean Cleanup*'s activities. Regarding the economic dimension, *The Ocean Cleanup*'s two main activities should be viewed separately. The plastic *the Ocean Cleanup* catches in oceans is located in international waters far away from harbours. On the one hand, this makes *the Ocean Cleanup* the legal owners of the trash and gives them the opportunity to directly benefit financially from processing/recycling the plastic. On the other hand, this makes it difficult to charge identifiable third parties for the service offered and leads to high operating cost that are unlikely to be compensated by inflows from the recycling process. Consequently, the *The Ocean Cleanup*'s activity focus regarding oceans cannot be viewed as economically oriented. Regarding oceans, *The Ocean Cleanup*'s activity focus seems to be best mapped as (mainly) ecological.

The trash *the Ocean Cleanup* Trash catches in rivers, however, is mainly owned by the operators of the interceptor solution. *The Ocean Cleanup* thereby supports operators of the interceptor solution in developing business models for the extracted waste – by sharing their knowledge, experience, and access to their network. It seems possible that *The Ocean Cleanup* could monetize this as it would not only help operators of the interceptor solution (e.g., harbours, organizations, local municipalities, and others) to reduce their ecological footprint, but also provides them with a direct inflow from processing/recycling waste. Consequently, one could classify the *The Ocean Cleanup*'s activity focus in terms of rivers as ecologic-(direct)economic. This would, however, presuppose *The Ocean Cleanup*'s

intention of generating economic outcomes, which is not the case in reality. Consequently, also regarding rivers, *The Ocean Cleanup's* activity focus seems to be best mapped as (mainly) ecological.

In the second and third step of the screening phase, the mapping of *The Ocean Cleanup's* activity focus as (mainly) ecological leads to the conclusion that the business model has to belong to the not-for-profit category. Consequently, *The Ocean Cleanup's* economic viability is dependent on donation (private funding) and/or public funding. This, however, does not exclude that *The Ocean Cleanup* utilizes opportunities of cutting running costs. In fact, *The Ocean Cleanup* monetizes recyclable material taken from the ocean, e.g., with the Ocean Cleanup Sunglasses or through partners. Ultimately, the potential success of *The Ocean Cleanup* will depend on individuals', organizations', and public bodies' willingness to contribute financially to the cause.

1.6.2.4 Case Study 4: Redrose Developments

Specifically, step 1) involves the mapping of the project's activity focus according to its ecological, social, and economic outcomes. Clearly, *Redrose Developments* as the franchiser aims at generating a direct economic outcome for itself by providing the franchise seaweed processing units, but also for the franchisees, who can maximize the value of their wild and cultivated seaweed stock by using the processing units. As growing seaweed helps stabilize existing ecosystems and reduce greenhouse gasses by capturing large amounts of CO₂, controlled cultivation of seaweed therefore has direct as well as indirect ecological outcomes. These can then also translate into an improvement of living conditions of coastal communities, which constitutes an indirect social outcome of the project. While the described ecological outcomes may be seen as a central part of the value proposition of *Redrose Developments*, social outcomes do not seem to be the primary focus of *Redrose Developments*, but rather side effects. Consequently, *Redrose Developments's* franchise model can be mapped as ecologic-(direct)economic.

The respective mapping of the project's activity focus suggests that the selection of the for-profit business model category under step 2) is adequate for *Redrose Developments*. Thereby, several specific business models seem to be suitable in step 3) of the screening phase, both from the selection of traditional business models as well as SBMs. Specifically, *Redrose Developments's* franchise model constitutes a particular form of a traditional business model focussed on a product (in this case, valorised seaweed extracts). Hence, a possible upscaling of *Redrose Developments's* business model is dependent on the same factors as the business model of any for-profit organization offering products and/or services under a franchise model, e.g., offering a demanded product/service at a competitive price. A suitable alternative for *Redrose Developments* from the variety of SBMs could be the business model of functional economy. Functional economy refers to the idea of using a good instead of owning

it. Under this business model, organizations rather sell a function which can be used, instead of a product. This increases incentives to design and produce high-quality, repairable goods with a long lifetime. The practical implementation of a functional economy business model may in fact be quite similar to that of a franchise model, although the underlying motivations and aims most likely fundamentally differ.

1.6.2.5 Case Study 5: *Vyld*

Vyld was founded as a steward-ownership profit-for-purpose company. Thereby, the company clearly aims at generating a direct economic outcome by selling tampons made from seaweed. However, profits are not mainly supposed to be distributed to shareholders, but rather to be reinvested in the company's mission. As growing seaweed helps stabilize existing ecosystems and reduce greenhouse gasses by capturing large amounts of CO₂, controlled cultivation of seaweed therefore has direct as well as indirect ecological outcomes. These can then also translate into an improvement of living conditions of coastal communities, which constitutes an indirect social outcome of the project. Furthermore, *Vyld* arguably also generates direct social outcomes by extending the range of menstrual products and by supporting initiatives fighting period poverty. In summary, a mapping of the project as being integrative in the first step seems reasonable.

In the second and third step of the screening phase, the mapping of *Vyld*'s activity focus as integrative leads to the conclusion that the business model can belong to the for-profit category. Thereby, *Vyld*'s claim of being a profit-for-purpose company does not contradict this categorization. It rather implies that investors as well as owners must accept a defined fair compensation (i.e., risk-adequate return, salary) instead of receiving the entirety of surpluses. The traditional business model of providing a product seems most suitable for *Vyld*. Regarding SBMs, it is noteworthy that *Vyld* has successfully raised funds through crowdfunding. However, with a tampon being a low-price hygiene product, which is normally frequently purchased in small batches, crowdfunding does not seem to constitute a viable business model in the long run.

1.6.2.6 Case Study 6: *Mounid*

Aiming at the creation of a non-toxic algae ink colour for textiles, *Mounid* clearly intends to generate direct as well as indirect ecologic outcomes. These do not only come from growing seaweed (see previous case studies), but also from reducing toxic wastewater from dyeworks. This will also benefit local communities by improving their living conditions and hence has indirect social outcomes. This, however, does not seem to be central to the value proposition of *Mounid* and is for this mapping exercise rather seen as a side effect. Finally, *Mounid*'s ink colour for textiles will compete with

traditional products and in case of success generate a direct economic outcome. Consequently, a mapping of *Mounid* as ecologic-(direct)economic in step 1) seems plausible.

The respective mapping of the project's activity focus suggests that the selection of the for-profit business model category under step 2) is possible for *Mounid*. Thereby, it seems most reasonable for *Mounid* to focus on the traditional business model of providing a product under step 3) of the screening phase. This applies to both a situation where *Mounid* targets the business-to-consumer market (i.e., for individuals who want to dye their clothes), as well as a situation where *Mounid* targets the business-to-business market (i.e., for clothes manufacturers using it during the production process).

1.6.2.7 Case Study 7: 4DimBlick

To begin with, social or ecological outcomes of *4DimBlick's* provision of virtual-reality-supported immersive learning modules for schools and specialist training may not be as obvious as in the other cases but are clearly there. First, providing, e.g., specialist training virtually instead of physically (in possibly hazardous environments) may increase work safety and can be beneficial for achieving learning objectives (e.g., by allowing for many repetitions). Second, while online solutions are not per se climate friendly due to high energy needs, relying on renewable energy sources can mitigate respective impacts. Furthermore, virtual training will likely reduce travel and the utilization of physical facilities like hotels, offices, or schools, which further contributes to emissions reduction. Summarizing, the project produces direct social as well as environmental outcomes. These outcomes, together with a cost-saving potential for the customers, constitute key elements of the project's value proposition, which in turn makes it plausible that *4DimBlick* can generate direct economic outcomes. Consequently, the project can be mapped as integrative in step 1) and the selection of the for-profit business model category in step 2) seems possible.

For the selection of the business model itself in step 3), *4DimBlick* once more has various choices from both the traditional as well as the sustainable business model category. Regarding the former, the provision of virtual-reality-supported immersive learning modules could for example be seen as a service, possibly combined with a subscription or lease/rental model (particularly for the necessary equipment, e.g., VR glasses). Regarding the latter, *4DimBlick's* value propositions seem to be a particularly suitable example of the physical-to-virtual-SBM.

1.7 Chapter conclusion

This chapter is based on *Milestone M5.1, "Benchmark overview of existing business models"* of *Work Package 5.1, "Development of Business Models for Scale up/Roll out of Solutions"*. The milestone

constituted an important element of the overall activities carried out by the workgroup. Specifically, the main activities of the work group can be summarized as proposing a process of screening, developing, and validating business models that can ensure the generation of sufficient public/private investments into solutions regarding the restoration of oceans and waters. This is achieved by outlining different phases and steps that will support sustainable projects in selecting a viable business model based on a match between the characteristics of the project and the business model.

Based on a structured literature review, we identified a sample of 55 academic papers and other sources that were of relevance for screening, developing, and validating (sustainable) business models in line with the chapter's purpose. The in-depth analysis of this sample of sources led to the identification of five steps that should be taken in order to screen, develop, and validate a sustainable business model (SBM) in general, or for projects focusing on restoring oceans and waters specifically: 1) Mapping of the project, 2) selection of a business model category, 3) selection of the business model, 4) development of the specific business model canvas, 5) validation of the business model canvas through benchmarking (see also Figure 1).

Normally, business models are highly specific, which makes general conclusions on a more aggregate level difficult, if not impossible. Specifically, the last step outlined above normally requires not only a thorough and detailed run through the previous four steps of screening and developing a business model for a project, but also in-depth case studies of peer projects and their business models for benchmarking purposes. For this chapter, we kept the benchmarking at an aggregate level by just briefly and as exemplars running through the first steps of the proposed model of screening sustainable business models for a number of projects. Specifically, we looked at the cases of Ecocean, Airseas, The Ocean Cleanup, Redrose Developments, Vyld, Mounid, and 4DimBlick.

2 Theoretical analysis of most pertinent funding gaps

2.1 Introduction

2.1.1 *Purpose and approach*

This chapter seeks to identify, define, and analyse funding models for mission roll-out, with a specific focus on new, innovative approaches. The analysis of funding models such as donations, equity and debt financing, blended financing, cascade finance, pre-commercial procurement, and crowdfunding will thereby include a discussion of their suitability for key business models identified in chapter 1. The derived insights will finally inform the presentation of a tool to identify relevant theoretical funding gaps for different business model categories. As a basis for our analyses, we conducted a convenient

literature review relying on a non-structured snowball approach (i.e., referring to references) to better understand the topics at hand and applied an analytic approach to arrive at our conclusions. This chapter is based on the *Milestone M5.3 “Analysis of most pertinent funding gaps completed” of Work Package 5 “Supporting an Enabling Environment: Business Models, Regulation and Financial Ecosystem”*. The milestone constituted an important element of the overall activities carried out by the work group.

2.1.2 High-level results

Our literature review revealed many funding models that can be considered for sustainable projects in general and for mission roll-out specifically. Applying the proposed tool to identify relevant funding gaps for different business model categories shows that there is at least one funding model for each business model that seems very suitable, and mostly multiple other funding models that seem at least sometimes suitable. That said, the analyses also reveal that there are systematic differences between business model categories. We further conclude that the suitability of a funding model depends on the activity focus of the project. Therefore, a practical funding gap analysis, applying the proposed tool, should also be done considering the specific project.

2.2 Identification, definition, and analysis of funding models

2.2.1 Background

Sustainable startups have great difficulties in attracting financial resources from traditional sources, especially after the global crises. Supranational organizations like the EU and OECD, international NGOs, and public opinion agree that the transition to a more sustainable economy is not possible without the contribution of the private sector (Benn *et al.*, 2017; Pizzi *et al.*, 2020). Alternative forms of funding are therefore needed to reduce the existing funding gap.

The two ends of the funding spectrum consist of traditional altruistic models of donations and grants on the one end and traditional profit-oriented forms of funding, specifically equity and debt financing, on the other end (see Figure 18 below). Many other forms of funding are specific types or combinations of these main forms. We will in the following present and discuss in greater detail several important funding models across the entire spectrum.

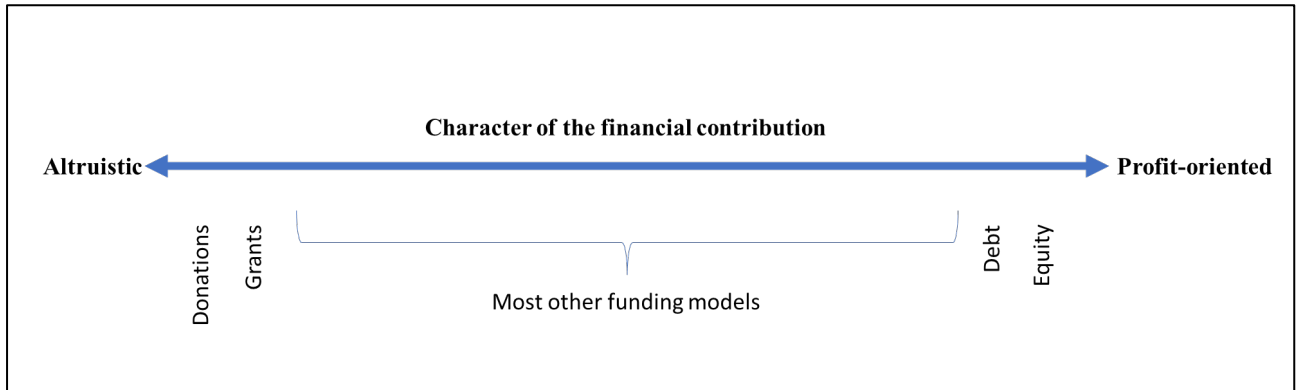


Figure 18: Funding spectrum based on character of financial contribution.

2.2.2 Discussion of different funding models

2.2.2.1 Donations or grants

A donation or grant is a voluntary gift with no expectation for repayment (Yasar, 2021). Donations and grants can come from a multitude of sources: from individual donors, from the community-at-large, from institutional donors (such as international NGOs and foundations), from government agencies, or from for-profit businesses. Donations can of course also be sourced from crowdfunding, without any expectation of repayment or returns. Donations and grants are meant for charity, humanitarian aid, or to benefit a cause, like the environment. A donation may take various forms, including monetary donations, gifts in kind, or donation of services, while grants most often consist of money. Grants and donations sizes can range from one time amounts to larger multiyear commitments.

In return, different donors might expect different services. Corporate donors will often expect the donation recipient to report back on how the funds were used and potentially collaborate on marketing materials related to the project. Sometimes, charity status will be required so companies are able to claim a tax deduction. Not-for-profit NGOs or foundations often also expect a report back on how the funds were used and that data is shared on the outcomes achieved. Grants and donations can thus, sometimes, have significant reporting and other administrative requirements, which cost money in the form of added staff time and transaction costs.

Identifying and implementing a donation funding model can be challenging because of donor restrictions, legal challenges in different countries, and other barriers, such as lack of skills and understanding of the funding landscape. Being dependent on donations can also be insecure in that donors' funding priorities might shift. Securing a diversity of funding can reduce this risk. While donations and grants do not expect repayment of funds, traditional market-based forms of financing, like equity and debt, do involve demands for financial returns.

2.2.2.2 *Equity financing*

Equity financing is when an investor, in exchange for investing funds, receives an ownership interest or share in an investment, like a company, an asset or a project. The return on investment for equity holders or shareholders can consist of capital gains, which are increases in the value of their shares, and paid dividends, which are a distribution to the shareholders of periodic profits of the company, asset, or project. Equity financing can be divided into different classes, such as business angels, venture capital, IPOs/public shares, which typically are used at different stages of maturity and development of the company (see also Figure 19).

The ease of equity financing will depend on the maturity phase of the company. It is difficult to raise seed funds for startups, especially from venture capitalists, because startups usually have no track records, reputation, cash flows or collateral. Often startups therefore depend on non-professional **FFF-finance**, which from a more positive perspective stands for Founder, Friends & Family finance (Zaccaria, 2023). Taking a rather negative perspective, FFF is sometimes also translated into Friends, Family & Fools, who have no experience in funding investments. Up to 40% of startups rely on FFF-funding, but what family and friends can contribute does often not exceed more than a few hundred thousand Euros. Usually, FFF-funding is not based on achievements or growth potential, but on emotions.

The funding gap between family and friends and venture capital can be filled by so-called **angel investors** or business angels, who most often are wealthy individuals contributing their own funds, typically a maximum of up to 1-2 million Euros (Cumming and Zhang, 2019). Business angels do not necessarily participate in the running of the company and often have both financial and nonfinancial goals, such as becoming part of the startup ecosystem or giving back to the entrepreneurial community (Shane, 2005). Due to the extremely high failure risk, business angels will typically require a factor 10 to factor 30 return over 3-7 years. Angel investors often do not have a clear exit strategy, which would typically come in the form of an Initial Public Offering (IPO), acquisitions by third party investors or a management share buy-back (Botelho *et al.*, 2021).

Early-stage equity funding can also come in the form of **equity warrants**, so-called **Simple Agreement for Future Equity (SAFE)**. With a SAFE, an investor funds a startup without immediate shares, but with a right to future equity, triggered by some event such as reaching a certain amount of funding, an acquisition or an IPO. When triggered, equity is then converted at a discount or valuation cap, to stimulate early investment. SAFEs usually have shorter maturity and are less complex and more flexible than normal equity. If equity is not triggered before maturity, the investor can either get the

investment back or convert it into equity at the company’s discretion. One of the main benefits of SAFEs is that it doesn’t require an accurate valuation, which can often be difficult for startups to get.

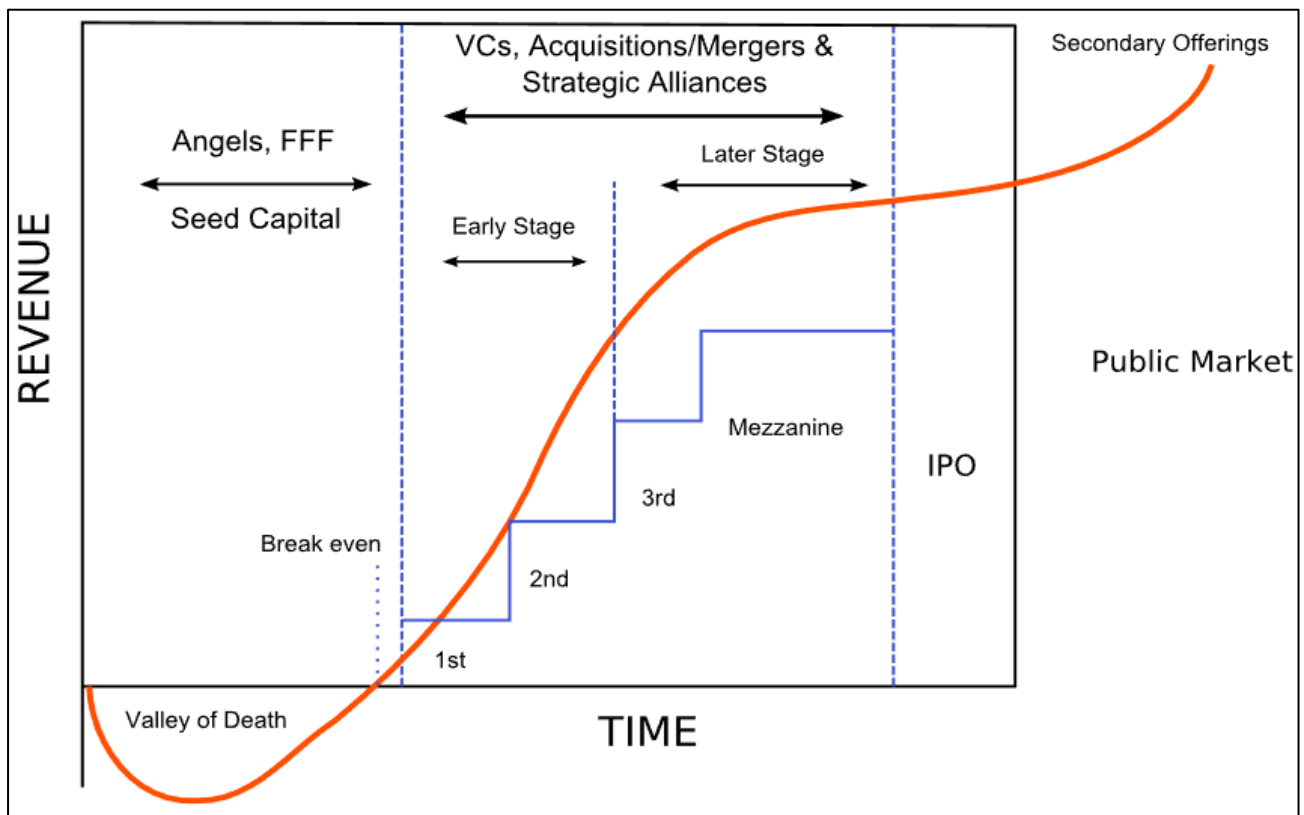


Figure 19: Typical equity financing cycle (Wikipedia.org).

Venture capital (VC) is a form of private equity funding, which usually occurs after the seed phase, that is in early-stage and emerging companies with high growth (potential) (Gompers, 1995). VCs act as financial intermediaries for professional investors and use pooled money from the fund to invest in handpicked businesses with high potential. Using industry benchmarks, venture capitalists are very selective and pick well-managed firms with a strong competitive advantage. Where business angels usually do not get actively involved in managing the company, VC funds will participate in the day-to-day running of the company to secure their investment. Besides money, venture capitalists therefore often will bring managerial and technical expertise and network contacts to the company (Lerner and Nanda, 2020). Venture capitalists typically invest over 1 million Euros and often have as their exit strategy either an acquisition or an Initial Public Offering (IPO), where the company goes public.

When a company becomes more mature, it can go public through an **Initial Public Offering**, where shares are offered to the public through securities exchanges. At most IPOs, larger institutional investors will guarantee funds before the IPO. IPOs are an expensive and time-consuming source of funding.

The advantage of equity financing for the company is that funds, unlike debt financing, do not have to be repaid to the investor. The investor thus runs the risk of failure. A potential disadvantage is that shares often include voting rights, which gives the shareholder a say in the company, relative to the size of the ownership interest. Startups or risky businesses often have trouble attracting equity financing, which can cause them to have to lower their share prices, increase the dividend payments and/or offer a greater percentage of ownership for each share held.

2.2.2.3 Debt financing

Debt financing is essentially the act of a debtor raising capital by borrowing money from a lender or a financial institution (creditor), to be repaid in one payment or a series of payments at a future date. These payments usually contain repayment of the principal supplemented by interest payments, where the principal is the amount of money originally loaned and on which basis interest and returns are calculated. A debt obligation is often secured by creditors having recourse to specific collateral, which means that if a debtor defaults on a loan (due to insolvency or another event), the debtor loses the property pledged as collateral, with the creditor then becoming the owner of the property. These loans are called secured debt.

Specific forms of debt are **senior debt**, which can be secured or unsecured. Senior debt takes priority over other (unsecured) debt owed by the issuer. If the issuer goes bankrupt, senior debt theoretically must be repaid before other creditors receive any payment. Further, we can identify **subordinated debt** (also known as junior debt), which, in case of liquidation or bankruptcy, ranks at a lower priority than other debt or bonds of the issuer. A specific example is **mezzanine capital**, which is any subordinated debt (or preferred equity instrument) that represents a claim on a company's assets which is senior only to that of the company's common shares. Because in a company's capital structure, both mezzanine capital and subordinated or junior debt are riskier, the cost of this capital is higher; that is, a higher return is required than for secured or senior debt.

Another specific form of debt financing is **bonds**, which are debt securities that are tradeable on a bond market. There are many kinds of bonds. Some of the most common ones are government bonds (or treasury bonds), which are issued by a sovereign national government; supranational bonds, which are issued by a supranational organization like the World Bank; municipal bonds, which are issued by a local authority or subdivision within a country, and corporate bonds, which are issued by corporations.

With respect to sustainability, there are **Green, Social, Sustainability and Sustainability-linked (GSSS) Bonds**, which can be issued by both government agencies (including municipalities), public development banks (PDBs) or corporations, including financial institutions (Dembele *et al.*, 2021).

GSSS bonds raise finance for climate change mitigation or adaptation projects or other sustainability projects.

GSSS bonds can be divided into two main categories (Dembele *et al.*, 2021):

- 1) **Use of proceeds bonds**, which focus on how issuers employ the funds raised. GSSS proceed bonds should be used for green (or blue) purposes, independent of the main business activity. That is, as long as the proceeds finance eligible green/blue projects and ultimately use the proceeds to finance the transition to an environmentally sustainable business model, they are considered GSSS (EU TEG on Sustainable Finance, 2020).
- 2) **Sustainability-linked bonds (SLB)** are any type of bond instrument for which the financial and/or structural characteristics can vary depending on whether the issuer achieves predefined sustainability or ESG objectives (ICMA, 2020). Issuers are thus explicitly committing to future improvements in sustainability outcomes within a predefined timeline (Dembele *et al.*, 2021).

Examples of GSSS bonds are:

- **Green bonds**, funding projects intended to deliver a positive environmental impact, like renewable energy, energy efficiency, clean transportation, green buildings, wastewater management and climate change adaptation (pimco.com, 2022).
- **Social bonds**, funding projects intended to address unforeseen economic and social disruptions, like bonds for food security and sustainable food systems, socioeconomic advancement, affordable housing and access to essential services such as healthcare (pimco.com, 2022). Another example is COVID-19 bonds with the purpose of mitigating the adverse impacts of the global pandemic. There are also social impact bonds, which are agreements for public sector entities to pay back private investors after meeting verified improved social outcome goals that result in public sector savings from innovative social program pilot projects.
- **Gender bonds** are a specific form of social bonds, funding projects that support women's empowerment and gender equality (AMMC, 2021).
- **Sustainability bonds**, funding projects that combine both green and social purposes. A specific example of sustainability bonds is ESG bonds that contribute to the UN's Sustainable Development Goals.
- **Blue bonds**, funding projects where proceeds go to marine projects, such as promoting biodiversity and supporting economies reliant upon healthy and sustainable fisheries (Morgan Stanley, 2019).

- **Transition bonds**, funding projects where proceeds are used to finance projects within pre-defined climate transition-related activities.

Another special form of debt funding is through so-called **debt-for-nature swaps**. Here, a creditor of a government, usually in a country with a high risk on default, agrees to cancel the debt by accepting a payment from a funder or donor, often well below the debt's face value. The funder or donor then receives an agreement from the national government to enact certain environmental policies or that certain environmental NGOs or programs are being funded for a certain amount.

2.2.2.4 Crowdfunding

A special form of financing is crowdfunding. Crowdfunding can be defined as “the efforts by entrepreneurial individuals and groups – cultural, social, and for-profit – to fund their ventures by drawing on relatively small contributions from a relatively large number of individuals using the internet, without standard financial intermediaries” (Mollick, 2014, p. 1). Crowdfunding is thus (mostly internet-enabled) funding in the form of either donations, loans or equity investments from multiple individuals (Worldbank, 2013). Crowdfunding pools small contributions (often less than 1,000 Euros) from many individuals and match funds to projects, ventures, or other financial needs (Luo *et al.*, 2022). Crowdfunding provides a good opportunity for individuals who want to make impact investments (Agrawal and Hockerts, 2021). Crowdfunding is thus a valid financing alternative for sustainability-oriented startups to conventional sources of funding to support their establishment and growth (Caputo *et al.*, 2022).

Crowdfunding investments usually are used early in a company's life, where more traditional forms of funding take over at more mature stages (see Figure 20). There are different crowdfunding models, such as donation-based models, reward-based models, equity-based, lending-based and royalty-based models (World Bank, 2013). Donation-based models are based on philanthropic donations without the expectation of monetary repayment or compensation (see section on donations and grants). Reward-based crowdfunding is when funders receive a token gift of appreciation or the possibility of pre-purchase of a service or product. Equity-based crowdfunding is similar to equity funding, in that funders receive equity, that is share in the profit, but divided over many individuals in small amounts (Yasar, 2021). Lending-based models are like receiving debt instruments with a fixed interest rate and repayment of the principal, but again divided over a large amount of (smaller) lenders through either microfinance institutions or (peer-to-peer) crowdlending platforms such as Kiva (see section on debt financing). Royalty-based crowdfunding is less common than the others and consists of funders receiving a share in the royalty interest of an intellectual property. Payouts depend here on the periodic revenue received (Worldbank, 2013).

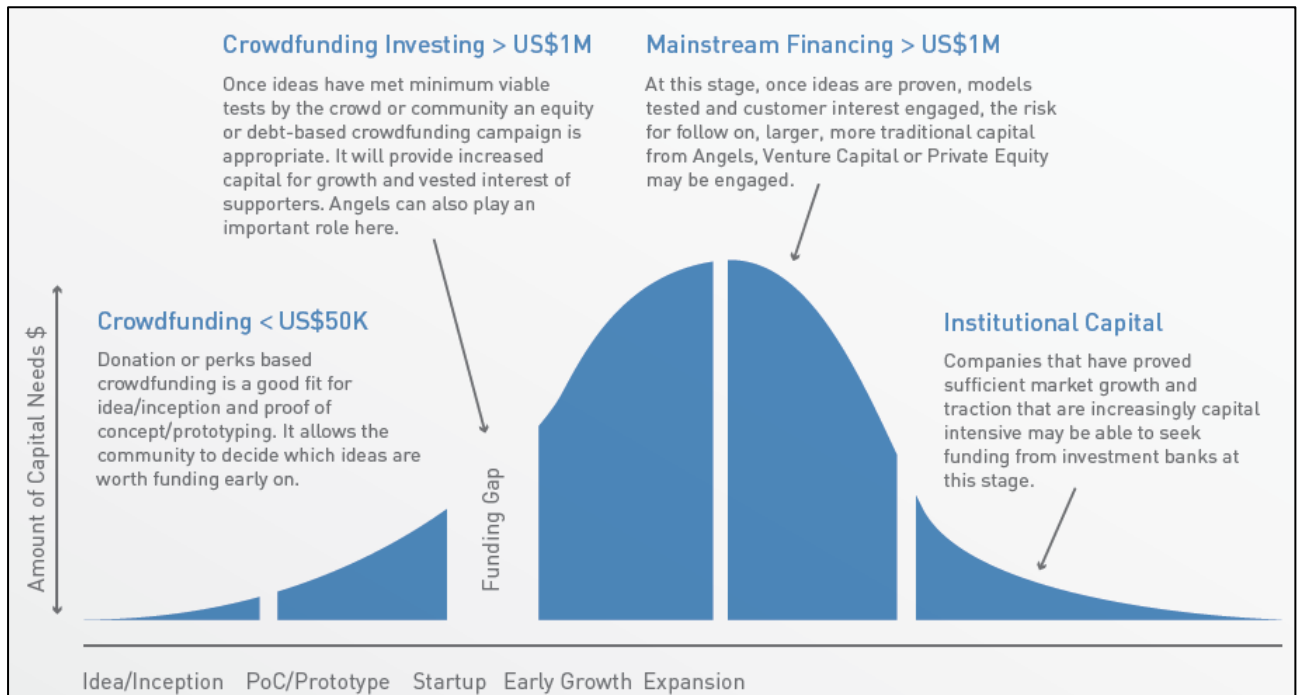


Figure 20: Crowdfunding adoption curve (Worldbank, 2013, p. 16).

2.2.2.5 Cascade finance

Cascade funding is a specific funding mechanism that facilitates the delivery of public funds to smaller organizations, which are innovating in fields that are of high strategic importance by, for example, the EU (Volpe *et al.*, 2022). Like microfinancing for individuals, cascade funding provides small grants issued by the beneficiaries of projects funded by the EC, for example, under the Horizon 2020 framework. The EU delegates the selection and monitoring of innovative projects to consortiums, which provide funding via open calls for proposals. These can provide startups and SMEs with grants for an experiment, typically between 50,000 and 150,000 EUR. The financial support is usually equity-free.

The advantage of cascade finance is that startups and SMEs have much less bureaucracy because a consortium handles the high overhead of the administrative workload of the publicly funded project. Consortia also help with the submission process, thereby training candidates in proposal preparation. This also leads to greater efficiency. Furthermore, it enhances collaboration and mutual learning between highly innovative companies and research centres because funding consortia often offer exclusive technical and/or business support to aid development and to speed up the industrialization process, for example, in the form of business development training and practical innovation management (Volpe *et al.*, 2022). The disadvantage is that the process is very competitive.

2.2.2.6 Concessional finance

Concessional finance does not represent a single mechanism or type of financial support but refers to all financial and tax instruments with more generous terms than market loans or equity, made available to businesses by lawmakers to encourage new sustainable development and investment projects (Worldbank, 2021). Similar funding is also called soft financing or subsidized funding. Concessional finance typically provides funds below market rates to developing countries to accelerate development objectives. Examples are loans with below-market interest rates, debt repayment grace periods, longer-than-usual repayment periods or a combination of these (World, 2021). Concessional finance can also come in the form of a first-loss guarantee whereby a third party compensates lenders if the borrower defaults. It is mostly provided by major financial institutions, such as development banks (e.g., the European Bank for Reconstruction and Development (EBRD)) and/or multilateral funds (DFI WG, 2018). Concessional finance can also consist of equity, although this is rarer. An equity investment into sustainable energy reforms could for example ask for less value in shares than the investment is worth.

The aim of concessional finance is, amongst others, to promote national economic development by supporting private spending in research, development, and innovation activities, encouraging investments in capital and skills, facilitating export and internationalization processes, and supporting the drivers of business growth in general (World Bank, 2021). This form of financing can of course also be used to promote sustainability goals, including globally significant development challenges, like climate change mitigation and adaptation, water sanitation or eco-system protection. Concessional finance is an efficient and highly targeted financial tool explicitly designed to bridge the gap between grants, government funding and private-sector capital. Concessional finance works best when it is used alongside long-term strategic engagement and technical assistance with a country or region (World Bank, 2021).

2.2.2.7 Blended finance

The OECD defines blended finance as “the strategic use of development finance for the mobilization of additional finance towards sustainable development in developing countries” (OECD, 2020). Blended finance’s key objective is to deploy concessional development capital from both public funders, such as development agencies and/or philanthropic institutions, such as foundations, with the goal of creating investment opportunities in developing countries that have an acceptable risk-adjusted return for institutional investors (Convergence, 2018). Private investors can, for example, be pension funds, insurance companies, banks, private equity firms, and asset/wealth managers. Blended

finance, thus, should create assets that fit within the mandates, constraints, and risk-adjusted return preferences of each of these institutional investor classes.

Even though Development Finance Institutions (DFIs) are public, they will often invest with a commercial mandate. DFIs may also deploy concessional funding on behalf of development agencies, provide credit enhancement or other risk participation, or play an important asset origination and arranging role (OECD, 2020). Through blended finance, public and philanthropic parties can achieve their (sustainable) development objectives, while institutional investors can achieve their risk-adjusted return requirements. Blended finance thus also can attract commercial capital towards projects that contribute to sustainable development, while providing financial returns to investors (see Figure 21).

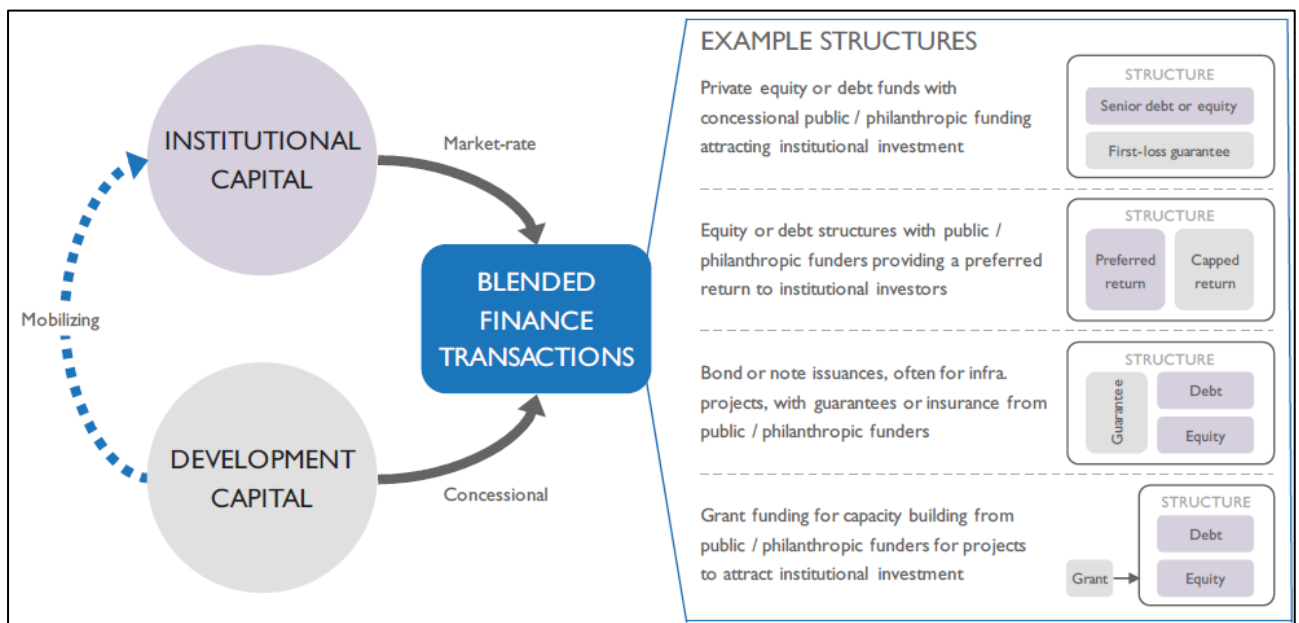


Figure 21: Structure of blended finance (Convergence, 2018, p. 10).

This funding form can help complement Official Development Assistance (ODA) to fill sustainability financing gaps. Blended finance solutions can be structured as debt, equity, risk-sharing, or guarantee products with different rates, tenor, security, or rank. The OECD (2018) has established five principles for blended finance: 1) anchor blended finance use to a development rationale; 2) design blended finance to increase the mobilization of commercial finance; 3) tailor blended finance to local context; 4) focus on effective partnering for blended finance, and 5) monitor blended finance for transparency and results.

It is important to note though that blended finance can only be used for projects that can produce enough cash flows over time to provide investors with an acceptable rate of return. Blended finance has great potential to increase institutional investment into sustainable development, but to achieve

this, blended finance should fit within the mandates, constraints, and risk-adjusted expected rates of return of the different investor classes (Convergence, 2018).

2.2.2.8 Project finance

Project finance is the funding (financing) of long-term infrastructure, industrial projects, and public services using a non-recourse or limited recourse financial structure. What this means is that a legally and commercially self-contained special entity is constructed with its own balance sheet that only incorporates the project (Steffen, 2018). The project can either be debt-based and/or equity-based, where both are repaid using only cash flows generated from the project itself (thereby protecting the firm's other assets). Project financing is mostly used as a loan structure that relies primarily on the project's cash flow for repayment, while the project's assets, rights, and interests are held as secondary collateral.

Project finance is especially attractive to the private sector because companies in this way can fund major projects off-balance sheet. This is, as said, done through the establishment of special purpose vehicles (SPV), where the company's sole activity is carrying out the project by subcontracting most aspects through construction and operations contracts (Steffen, 2018). Because there is no revenue stream during the construction phase of new-build projects, debt service only occurs during the operations phase. Traditionally, project finance has thus mainly been used for large, high-risk projects where sponsors need to protect their core firm from a potential project failure. But nowadays, project finance is also utilized for less complex, relatively small and low-risk projects in technologies such as onshore wind and solar (Steffen, 2018).

2.2.2.9 Pre-commercial procurement

Pre-commercial procurement (PCP) is a special form of public procurement. Public procurement is the process whereby public authorities purchase equipment and services from the commercial sector. PCP is specifically adapted to research and innovation, where public authorities, in a step-by-step process, select organizations which offer to carry out research and innovation activities. PCP therefore takes place in the R&D phase of product innovation before the commercialization phase (see Figure 22).

Pre-commercial procurement steps can be divided into:

- 1) Solution exploration and design
- 2) Prototyping
- 3) Original development
- 4) Validation/testing of a limited set of first products

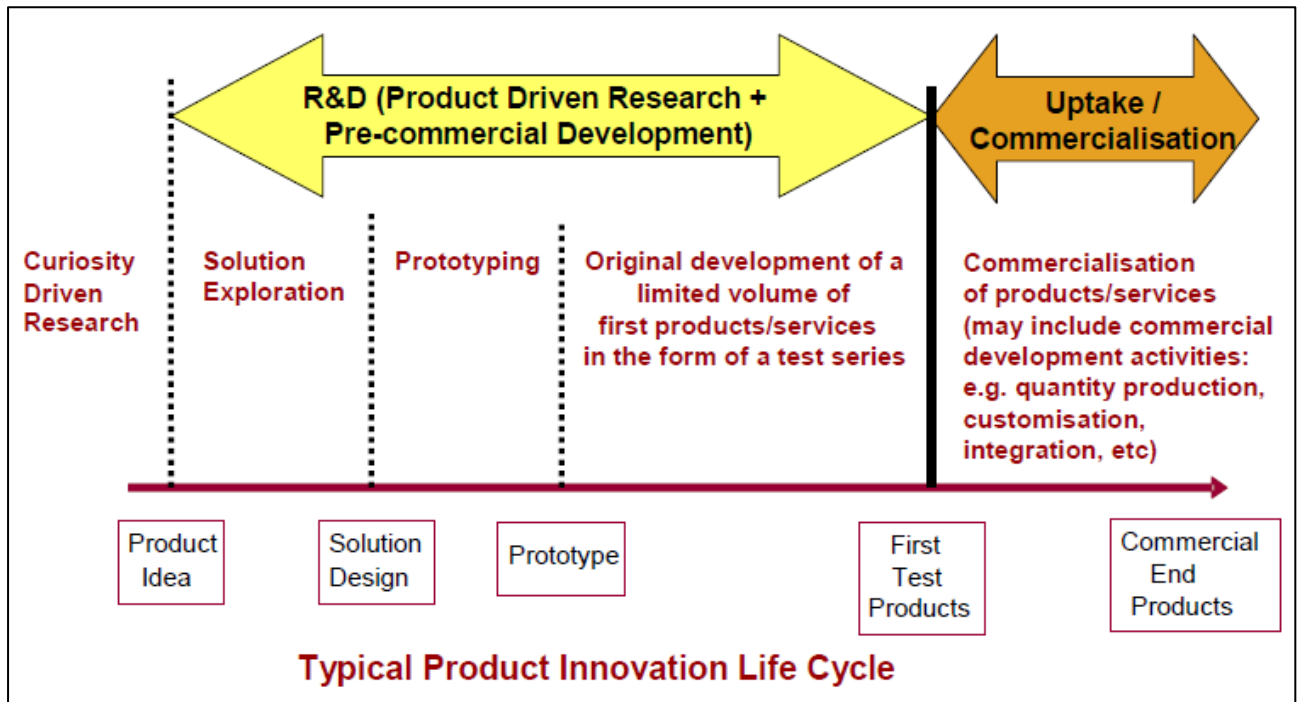


Figure 22: R&D and commercialization phases (EC, 2007).

PCP allows public procurers to compare alternative solutions: after the solution design and early prototyping stage, a reduced group of the best value-for-money solutions is filtered out to deliver the final prototypes that the market can deliver to address the sustainability need. Based on the outcome, the commercial procurement phase starts. PCP thus provides a first customer reference that enables companies to create a competitive advantage in the market (EC, 2007).

Public procurers share the benefits and risks related to the intellectual property rights (IPRs) resulting from the R&D with suppliers at market price. Suppliers retain IPRs ownership, while procurers keep some usage and licensing rights. It is an important tool to stimulate innovation as it enables the public sector to steer the development of new solutions directly towards its needs. The European Structural and Investment Funds (ESIF) are financially supporting individual procurers in preparing and undertaking PCPs. The Horizon 2020 Access to Risk Finance work program also provides, in cooperation with EIB and EIF, loans for individual or groups of public procurers to start PCPs and helps companies that are involved in PCPs to gain easier access to loans, guarantees, counter-guarantees, hybrid, mezzanine and equity finance to grow their business in view of wider commercialization of solutions (EC, 2007).

As R&D cannot include large-scale production at quantity to produce commercial volumes of end-products, PCP does not cover large-scale commercialization. The deployment of commercial volumes of end-products is the remit of public procurement of innovative solutions (PPI).

2.2.2.10 Public procurement of innovative solutions

Public procurement of innovative solutions (PPI) happens when the public sector uses its purchasing power to act as early adopters of innovative solutions which are not yet available on a large-scale commercial basis (EC, 2022). The first step is to find a large enough buyer or several smaller ones in a buyer group so one has a critical mass of purchasing power on the demand side. This buyer group will incentivize the industry to scale production to bring solutions to the market with the price and quality requirements for large scale deployment. Secondly, the procurers make an early announcement of the innovation need, including the required functionality/performance and price requirements, and promise to buy a critical mass of the new product. The third step is the actual public procurement of the innovative solutions through one of the existing public procurement procedures (e.g., open/negotiated procedure, competitive dialogue, etc.; EU, 2022).

PPI helps boost a particular new market for innovative solutions, supporting innovative companies to reach economies of scale to grow their business. PPI is complementary to pre-commercial procurement (PCP), as PPI can enable larger-scale deployment of solutions that were developed in small quantities in a preceding PCP. PPI can also be used independently to bring innovative solutions to the market that do not result from R&D but, for example, from organizational or process innovation. The European Assistance for Innovation Procurement Initiative provides free of charge technical and legal assistance to individual procurers to implement PCPs and PPIs (EU, 2022).

2.3 Relevant funding gaps

In this subchapter, we will present a theoretical tool to identify relevant funding gaps for different business model categories. While we have identified, defined, and analysed funding models for mission roll-out, with a specific focus on new, innovative approaches in the previous subchapter, we will in the following use relevant business model categories as presented in chapter 1.

For the identification of relevant funding gaps, we are first proposing a tool that graphically presents the suitability of the funding models discussed in chapter 2.2.2 for key business models outlined in chapter 1 in the form of a heat map. Generating the heat map requires that the suitability of each funding model is rated on the following scale for each business model: 0 = “Not at all suitable”, 1 = “Rather unsuitable”, 2 = “Sometimes suitable”, 3 = “Rather suitable”, 4 = “Very suitable”. The rating could thereby rely on insights from literature, stakeholder dialogue, expert interviews, or own professional judgment. Questions that could be assessed for the rating are, inter alia: *Does the funding model generally seem well suitable for the business model? Is the funding model often in fact used for the business model? Is the funding model readily available to projects using the business model?*

For this chapter, we conducted an exemplary rating for key business models and relevant funding models based on the insights derived from the convenient literature review presented above and from the stakeholder exchange as described in chapter 3. Thereby, each author first conducted the rating independently. In a second step, involving intense discussions, we merged our individual ratings into the one presented in Table 11. It is important to acknowledge that the current rating is subjective in nature and relies on assumptions and interpretations of the authors, e.g., regarding the stakeholder input and literature review. Future validation of the rating could rely on a systematic survey-based outreach to stakeholders.

The rating results are then transformed into a heat map that graphically expresses the suitability of relevant funding models for key business models (see Figure 23). Thereby, we colour-coded ratings of 0 and 1 in red, of 2 and 3 yellow, and of 4 green. Consequently, the greener a column, the more funding opportunities are suitable for a business model. In turn, many red areas in a column indicate the risk of a funding gap for a specific business model.

Table 11: Exemplary rating of suitability of relevant funding models for key business models.

Business model	Donation	Public Funding	Public-Private	Product	Service	Subscription	Remanufacturing	Repair	Upgrading	Functional
Donations	4	2	1	0	0	0	1	1	1	2
Grants	3	4	4	3	3	2	4	4	4	4
FFF-finance	2	1	1	4	4	4	3	3	3	3
Angel investors	0	1	2	4	4	4	3	3	3	3
Venture capital	0	1	3	4	4	4	3	3	3	3
IPO	0	1	2	4	4	4	3	3	3	3
Senior/junior debt	0	1	4	4	4	4	4	4	4	4
GSSS bonds	0	1	4	3	3	3	4	4	4	4
Crowdfunding	4	2	2	2	2	2	3	3	3	3
Cascade finance	3	4	3	3	3	3	3	3	3	3
Concessional finance	1	1	3	2	2	1	3	3	3	3
Blended finance	2	2	4	4	4	3	4	4	4	4
Project finance	0	3	4	4	4	2	4	4	4	4
Pre-commercial procurement	0	4	4	4	4	4	4	4	4	3
Public procurement	0	4	3	4	4	2	2	2	2	3

Business model	Donation	Public Funding	Public-private partnership	Product	Service	Subscription	Remanufacturing	Repair	Upgrading	Functional economy
Funding model										
Donations	Green	Yellow	Red	Red	Red	Red	Red	Red	Red	Yellow
Grants	Yellow	Green	Green	Yellow	Yellow	Yellow	Green	Green	Green	Green
FFF-finance	Yellow	Red	Red	Green	Green	Green	Yellow	Yellow	Yellow	Yellow
Angel investors	Red	Red	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Yellow
Venture capital	Red	Red	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Yellow
IPO	Red	Red	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Yellow
Senior/junior debt	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green
GSSS bonds	Red	Red	Green	Yellow	Yellow	Yellow	Green	Green	Green	Green
Crowdfunding	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Cascade finance	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Concessional finance	Red	Red	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Yellow	Yellow
Blended finance	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green
Project finance	Red	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green
Pre-commercial procurement	Red	Green	Green	Green	Green	Green	Green	Green	Green	Yellow
Public procurement	Red	Green	Yellow	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow

Figure 23: Suitability of relevant funding models for key business models.

Heat map that graphically expresses the suitability of relevant funding models for key business models. Colour-coded ratings of 0 and 1 in red, of 2 and 3 yellow, and of 4 green. The greener the column, the more funding opportunities are suitable for a business model. The red areas in a column indicate the risk of a funding gap for a specific business model.

However, in the interpretation of the rating, it is important to acknowledge that it does not indicate the extent of funding available to a project through a specific funding model. In that sense, the existence of a single suitable funding model may be sufficient for implementing and upscaling a viable business model.

2.4 Chapter conclusion

This chapter is based on *Milestone M5.3, "Analysis of most pertinent funding gaps completed"* of *Work Package 5, "Supporting an Enabling Environment: Business Models, Regulation and Financial Ecosystem"*. The milestone constituted an important element of the overall activities carried out by the workgroup. Specifically, our convenient literature review relying on a non-structured snowball approach has revealed a large number of funding models that can be considered for sustainable projects in general and for mission roll-out specifically (see subchapter 2.2.2 for their detailed

presentation). Exemplarily applying the proposed tool to identify relevant funding gaps for different business model categories shows that there is at least one funding model for each business model that seems very suitable, and mostly multiple other funding models that seem at least sometimes suitable (see also Figure 23). That said, the analyses also reveal that there are systematic differences between business model categories.

Specifically, we conclude that relatively few funding models seem to match well with business models within the not-for-profit business model category, i.e., donation and public funding. Suitable funding models in these cases are mostly located close to the altruistic end of the funding spectrum. In turn, funding models located towards the profit-oriented end of the spectrum mostly seem unsuitable. This is because it will often be difficult (if not impossible) for not-for-profit projects to satisfy the return demands of a profit-oriented funder. However, as there are funding models like donations and public funding that explicitly aim at not-for-profit business models, the extent of available funding may very well be sufficient for implementing and upscaling a viable business model within this category.

For business models within the public-private partnership category, a larger number of funding models seem to fit well. Whether funding models from the altruistic end of the funding spectrum or funding models from the profit-oriented end of the funding spectrum are better suited depends on the characteristics of the specific project. If an ecological/social activity focus prevails, it may be the former, and if an economic activity focus prevails, it may be the latter.

Business models within the for-profit business model category generally have the largest selection of funding models available. While donations and public funding as rather altruistic funding models will likely only be suitable in some cases, aiming at a profit potentially allows to satisfy the return demands of a profit-oriented funder and, therefore, gives access to funding models from the profit-oriented end of the funding spectrum. This is also why, in our exemplary rating, traditional business models (e.g., product or service) achieved the highest score sums, as sustainable business models that may sacrifice profit to a larger degree in favour of an ecological or social outcome may not be able to attract funders being highly focused on returns. However, it might as well be that sustainable business models can utilize funding models that are neither extremely altruistic nor extremely profit-oriented more easily than traditional business models.

Also, based on the previous deliberations, we conclude that the suitability of a funding model depends on the specific characteristics of a project. In other words, whether or not a funding model from the funding spectrum will be available to the project depends on the activity focus of the project. Therefore, a funding gap analysis, applying the outlined tools, should be done in light of a specific project to understand whether or not there may be funding gaps for the specific project, given its

business model and activity focus. Furthermore, the rating should involve insights from dialogue with stakeholders and experts in the specific domain of the project.

3 Stakeholder exchange on business models and enabling environment

3.1 Purpose and approach

The purpose of this chapter is twofold:

- First, the approach taken for the stakeholder exchange on business models and enabling environment, both with the business and the regulatory community, is described.
- Second, a summary of gained insights, as well as their implications for the entire report, are briefly presented.

This chapter is based on *Milestone M5.2, “Stakeholder exchange on business models and enabling environment (business and regulatory community)”* of *Task 5.1, “Development of Business Models for Scale up/Roll out of Solutions”*. The milestone constituted an important element of the overall activities carried out by the workgroup.

The stakeholder exchange took place in three different forms:

- Regular informal exchange on (preliminary) work results during various online meetings with collaborators of Task 5.1.
- Workshop on “Funding models for Mission Ocean – First Results and Feedback from Partners” during PREP4BLUE’s 2nd Project Meeting held 27-28 September 2023 in Venice, Italy.
- Workshop on “Business models and approaches to support the sustainable blue economy” during the 1st Mission Arena by Blue Mission BANOS held 14-16 November 2023 in Gothenburg, Sweden.

During the two workshops, work results were discussed with workshop participants, constituting stakeholders from the business and the regulatory community. As part of these outreach activities, specific questions were presented to stakeholders, and their responses were systematically captured using a virtual visual collaboration tool. The insights gained from the stakeholder exchange activities relevantly influenced this report and led to important revisions as well as recommendations and conclusions, as detailed in the following.

In detail, the following questions were discussed during the workshop in Venice [*Editor’s note: edited by the authors of this report for clarity, as they are here presented out of the workshop context*]:

- Are any of the funding models presented in this workshop irrelevant for the roll-out of the Mission Ocean & Waters?
- Are there other funding models that should be considered for the roll-out of the Mission Ocean & Waters?
- Are there other funding sources that should be considered for the roll-out of the Mission Ocean & Waters?
- What are in your opinion the biggest obstacles in the design or implementation aspects of available funding models relevant for the roll-out of the Mission Ocean & Waters?
- Please indicate any best practice examples/case studies on funding models you are aware of and that are relevant for the roll-out of the Mission Ocean & Waters!
- Are there any notable thematic, territorial, or other type of funding gaps or needs to be closer examined in this context?

A document in which one of the collaborators of Task 5.1 summarized the insights gained in Venice and that was shared with the authors of this report constitutes a central source for this chapter. Furthermore, the following questions were discussed during the workshop in Gothenburg [*Editor's note: edited by the authors of this report for clarity, as they are here presented out of the workshop context*]:

- What are the main obstacles or gaps in making existing funding and business models relevant to the Mission Ocean & Waters more effective? [*E.g., design or implementation obstacle, wrong thematic or territorial scope, etc.*].
- In your experience, which funding and business models will be most effective in achieving the objectives of the Mission Ocean & Waters and why?
- Do you have any examples of successful business or funding models, and which models are supporting the blue economy would you like to see more of? [*E.g., innovative business/funding models*].
- Can you think of any policies that would support the operational deployment of useful innovations to support the sustainable blue economy?

The notes taken during the outreach activity in Gothenburg (by the authors of this report and other collaborators of Task 5.1) were summarized by the authors of this report using a generative artificial intelligence tool (comprehensively redacted for accuracy). The generated raw data constitutes a central source for this chapter and is presented in Appendix 2 (see chapter 6.2; the original version of the questions is also presented there). Please note that not all the previously presented questions were of relevance to this chapter, as they were included by other collaborators of Work Package 5 to

inform their own milestones or deliveries. Consequently, not all of the input generated during the stakeholder exchange is presented in this report but may be parts of other milestones or deliveries of Work Package 5.

3.2 Summary of gained insights and implications for the report

The stakeholder exchange conducted as outlined in the previous chapter has first of all in all material respects confirmed the validity and relevance of the contents conveyed with Milestones *M5.1 “Benchmark overview of existing business models”* and *M5.3 “Analysis of most pertinent funding gaps completed”*. More specifically, the stakeholder exchange affirmed the proposed process of screening, developing, and validating business models that can ensure the generation of sufficient public/private investments into solutions regarding the restoration of oceans and waters (see chapter 1). Furthermore, it allowed us to conclude that the identified, defined, and analysed funding models for Mission roll-out and the provided analysis of the most pertinent funding gaps are relevant and comprehensive (see chapter 2).

That said, the stakeholder exchange has led to various adaptations and extensions of the contents initially provided by the milestones, which are presented in this final report constituting deliverable D5.2. The most important modifications are presented in the following:

- The lists of SBMs as well as funding models presented in chapter 1.4.3 and chapter 2.2.2, respectively, were suggested by stakeholders to be extended by the steward ownership model. Even though we consider this model relevant, it is more of a legal ownership model than a business or funding model. It is briefly described below.
- The screening of example projects as part of the validation of the business model canvas in chapter 1.6, aiming at the identification of relevant business model blueprints, was extended by case studies identified during the stakeholder exchange.
- The tool to identify relevant funding gaps for different business model categories, as presented in chapter 2.3, was modified. First, the rating of the suitability of each funding model for each business model was updated based on stakeholder input. Second, the graphical presentation of rating results and funding gaps using radar and bar charts, as proposed in the milestone, turned out to be detrimental to stakeholder’s understanding. Consequently, we chose to switch to a heat map representation of funding gaps for this final report.

We furthermore gained insights through the stakeholder exchange that are unrelated to the previous milestones but are highly relevant to the purpose of this final report and the mission objectives. These insights are presented in the following:

- **Out-scaling instead of upscaling:** Stakeholders emphasized that out-scaling may be more effective in achieving the Mission objectives than upscaling. Out-scaling refers to the provision of multiple products at a smaller scale that serve different purposes, providing resilience during economic downturns. Other stakeholders expressed this differently and recommended diversification of business models under the umbrella of one project instead of trying to scale up under a single business model.
- **Steward ownership:** Stakeholders discussed stakeholder ownership as a possibility to ensure long-term commitment and responsible management. Steward ownership is a set of legal ownership structures that contain two key principles: self-governance and profits serve purpose. Voting rights and, thus, control over the business are held by the organization itself or organizations closely connected to the mission. This could, for example, be through foundations, trusts or golden shares (i.e., 1% of voting rights is classified as the “Golden Share”, which has a veto right to major decisions such as selling the company or changing the structure). Under a steward ownership governance structure, a company aims to generate a direct economic outcome, but profits are not mainly supposed to be distributed to company owners. Rather, they are to be reinvested in the company’s mission. It is important to acknowledge that steward ownership does not imply that stakeholders come away empty-handed. It rather implies that, e.g., investors as well as owners must accept a defined fair compensation (i.e., risk-adequate return, salary) instead of receiving the entirety of surpluses.
- **Lack of experience and understanding:** Stakeholders expressed that there is a shortage of experience and knowledge regarding the blue economy among investors and other stakeholders within the business community. This makes it difficult to acquire, e.g., funding from profit-oriented investors. However, stakeholders also recognized a growing understanding among angel investors regarding sustainable business models despite the existing challenges.
- **Intellectual property:** Stakeholders emphasized the importance of protecting intellectual property for new business models and sustainable products. Existing definitions of intellectual property and its protection, possibly being biased towards traditional business models and involving lengthy or costly processes, may disadvantage startups focussing on SBMs.

- **Reliance on public funding:** Stakeholders acknowledge the dependence of many projects on public funding and suggest focussing on how public funding can facilitate private investments for the takeover of blue economy projects. More specifically, stakeholders suggested blended financing models as a possible solution to address the high-risk nature of certain blue economy projects.
- **Gender discrimination:** Stakeholders discussed struggles that specifically female founders face in securing funding, with the funding landscape often being dominated by men.
- **Bureaucracy:** Stakeholders agreed on the large set of bureaucratic issues connected to establishing business models and obtaining funding. There are large demands in time and resources for reporting and other administrative requirements, including licensing and environmental regulations (e.g., laboratory costs), which present challenges that could be addressed to support businesses. There are also a confusing number of different actors and authorities involved with different timelines and timelines that are too long. Additional hurdles are created by variances in administrative processes and timelines across different countries, as well as cultural disparities. There is not enough congruence and coordination between supranational, national, regional and local authorities, and sometimes contradictory demands are placed on entrepreneurs and founders, which can cause frustration. Other systems, such as tax systems, also favour large producers, which can be burdensome for small producers with innovative business models.

3.3 Chapter Conclusion

This chapter is based on *Milestone M5.2 “Stakeholder exchange on business models and enabling environment (business and regulatory community)”* of *Task 5.1 “Development of Business Models for Scale up/Roll out of Solutions”*. The milestone constituted an important element of the overall activities carried out by the workgroup. Based on workshops in Venice and in Gothenburg, results were discussed with workshop participants constituting stakeholders from the business and the regulatory community. Questions discussed incorporated the completeness and appropriateness of the theoretically found business models and funding models for the Mission Ocean & Waters roll-out. The lists of SBMs as well as funding models presented in chapter 1.4.3 and chapter 2.2.2, respectively, were validated with only minor changes and suggestions by stakeholders. The tool to identify relevant funding gaps for different business models was validated and updated based on stakeholder input, resulting in a heat map representation of funding gaps for this final report.

Also, the biggest obstacles and challenges in the design or implementation aspects of available business and funding models relevant to the roll-out of the Mission Ocean & Waters were discussed.

Main issues, as described above, revolved around upscaling issues, lack of expertise and understanding, too heavy reliance on public funding, gender discrimination and too many and too costly bureaucratic demands, including long timelines. Lastly, the most effective funding and business models in achieving the objectives of the Mission Ocean & Waters (including best practice examples/case studies) were presented.

4 Conclusions

Sustainable startups have great difficulties in attracting financial resources from traditional sources. One of the main issues is that funders and investors cannot see the business case, considering the risk too high compared to potential returns. Therefore, one main derisking strategy for sustainable companies and startups is to have sustainable business models (SBM) that can be communicated clearly to capital providers. It is extremely difficult to have specific business model blueprints since every company is unique, with a unique selling and value proposition. However, it is possible to develop a generic blueprint for a sustainable business model. This report developed a process for screening, developing, and validating SBM blueprints that can help generating sufficient public/private investments into solutions regarding the restoration of oceans and waters.

Our analysis resulted in the identification of five steps in this derisking strategy that should be taken to screen, develop, and validate SBM blueprints in general (see Figure 1), or for projects focusing on restoring oceans and waters specifically. Firstly, the project's activity focus should be mapped according to its ecological, social, and economic outcomes. Examples are provided in chapter 1 on issues such as maximizing material and energy efficiency, creating value from waste, substituting with renewables and natural processes, delivering functionality rather than ownership, adopting a stewardship role, encouraging sufficiency, re-purposing the business for society/environment and developing scale-up solutions. These affect choices around the business model's patterns around pricing and revenue, service and performance, access provision, cooperation, community, financing, social mission, eco-design, and the supply chain. Choices on these patterns will position the SBM in one of the SBM taxonomy fields in Figure 13.

In Step 2, choices according to the project's activity focus (step 1) will influence the selection of the for-profit, private-public-partnership, or not-for profit business model category. The for-profit business model category comprises rather traditional business models that fit with SBMs that have an ecologic-economic, social-economic, or integrative activity focus. The public-private partnership business model category is founded on a collaboration between the public and the private sector and fits well with projects that generate an indirect economic outcome in combination with a direct or

indirect social and or ecological outcome. The not-for-profit business model category fits best with projects that do not generate an economic outcome, but only ecological or social outcomes (see Figure 15). In Step 3, a specific business model canvas according to the business model category is chosen (see Table 7), which is then developed in Step 4 (see Table 8) and validated in Step 5. This report also presents several case studies applying this process.

The report furthermore identifies, defines, and analyses theoretical funding models for mission roll-out, with a specific focus on new, innovative approaches. Most models are located on a spectrum between equity financing (including FFF, angels, VC, SAFEs and IPOs) and debt financing (including senior debt, mezzanine capital, (GSSS) bonds, and debt-for-nature swaps) and donations and grants, including crowdfunding, cascade finance, concessional finance, blended finance, project finance, PCP and PPI.

Choosing an appropriate funding model that fits the chosen sustainable business model blueprint is the second major derisking strategy a sustainable company, startup, or project can apply. Our analysis of funding models included a discussion of their suitability for the key business model blueprints identified under the first purpose. The derived insights informed a heat mapping tool to identify relevant theoretical funding gaps for different business model blueprints, which was validated through stakeholder exchanges. The analysis shows that there is at least one funding model for each business model that seems very suitable and mostly multiple other funding models that seem at least sometimes suitable. That said, stakeholders identified several large obstacles and challenges in the design or implementation aspects of available business and funding models relevant to the Mission Ocean & Waters roll-out. Stakeholders emphasized that out-scaling may be more effective in achieving the Mission objectives than upscaling. Other problematic issues include a lack of expertise and understanding among investors and other stakeholders regarding the blue economy, too heavy reliance on public funding, gender discrimination and too many and too costly bureaucratic demands, including long timelines. This is an area where regulators can improve conditions for sustainable startups and other companies. The outlined stakeholder input provides important starting points for additional derisking strategies.

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6 ANNEXES

6.1 Appendix 1

Author	Title	Journal	Short abstract
Agwu & Bessant, 2021	Sustainable Business Models: A Systematic Review of Approaches and Challenges in Manufacturing	Journal of Contemporary Administration	Manufacturing as a sector has advanced drastically and the literature on sustainable business models in this sector has emerged. The purpose of this paper is to analyze sustainable business models in manufacturing and the approaches and challenges faced in creating and implementing them. We identify sustainable business models and classify them within different industry areas while strategies and challenges emerge from the literature.
Alonso-Martinez, De Marchi, & Di Maria, 2021	The sustainability performances of sustainable business models	Journal of Cleaner Production	This paper addresses this gap by exploring how SBMs relate to sustainability performance, considering both overall sustainable performance and the balance across the three dimensions – environmental, social, and economic (integrated performance). Based on original survey data on B Corps located in Italy, Spain and the United Kingdom, our findings suggest that the implementation of most SBMs results in the prioritization of one sustainability dimension over the others, especially when it comes to economically oriented SBMs. Furthermore, our study suggests that none of the SBM archetypes considered is associated with a balanced sustainable performance, that is, none of them are inherently better able to overcome tensions across the Triple Bottom Line.
Baldassarre, Calabretta, Bocken, & Jaskiewicz, 2017	Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design	Journal of Cleaner Production	This research aims at combining principles from both sustainable business model innovation and user-driven innovation to develop more successful, radical, and user-centered sustainable value propositions. To this end, a design project in the framework of the Climate-KIC (the largest European partnership addressing the challenge of climate change) was investigated. As a result, this paper proposes a process for sustainable value proposition design which adopts a thorough, dynamic, and iterative perspective (talking to stakeholders, thinking about the problem, testing the product/service) that leads to an actual sustainable value proposition and to a superior problem-solution fit.

Barbieri & Santos, 2020	Sustainable business models and eco-innovation: A life cycle assessment	Journal of Cleaner Production	<p>Eco-innovative business models are prominent elements of the development of sustainable production and consumption systems in organizations of all sizes, especially for small and medium enterprises, where a key challenge is to direct eco-innovation strategies toward the goals of their business model. Therefore, using product life cycle assessment, this research analyzed the alignment between the sustainable business model and the eco-innovative strategies of a Brazilian company in the veterinary homeopathy pharmaceutical industry. The management model was framed in the “adopt a management role” archetype, in accordance with the literature. It was found that eco-innovation strategies are important for the development of the company’s business model and that this alignment is possible only when there is a management system and investments in the company’s ability to eco-innovate in product, process and organizational structure.</p>
Barth, Ulvenblad, Ulvenblad, & Hoveskog, 2021	Unpacking sustainable business models in the Swedish agricultural sector– the challenges of technological, social and organisational innovation	Journal of Cleaner Production	<p>Several sustainable business model frameworks have been presented in recent years to address these challenges, but our knowledge is limited about the change processes of the agricultural sector. This paper aims to increase our understanding of how sustainable business models have developed in the agricultural sector in Sweden. It maps eight archetypes of sustainable business models, clustered in three groups, with a focus on the technological, social, and organizational innovation components at agri-food companies. No major differences were found with respect to technical or social innovation components in the three regions: East, south, and north Sweden. However, significant differences were found between the regions with respect to the organizational innovation component. The organizational innovation component is based on two sustainable business model archetypes, namely, repurpose for society/environment and develop scale up solutions.</p>
Bhatnagar, Keskin, Kirkels, Romme, & Huijben, 2022	Design principles for sustainability assessments in the business model innovation process	Journal of Cleaner Production	<p>This paper seeks to develop a deeper understanding of this organizational process by analyzing the extant sustainability assessment frameworks and tools for business models and synthesizing the findings into a set of design principles (as meta-artifacts). The proposed design principles can serve as guidelines in helping an organization integrate sustainability assessment into its business model innovation process. The paper concludes by presenting a research agenda for future work in this area.</p>
Biloslavo, Bagnoli, & Edgar, 2018	An eco-critical perspective on business models: The value triangle as an approach to closing the sustainability gap	Journal of Cleaner Production	<p>The purpose of our paper is to add a new lens and richness to sustainable business model research by building on the need for more interdisciplinary approaches. This paper applies an eco-critical approach to analyze the 20 most often cited business model frameworks. We explore the conventional understanding of the business models based on the language applied and reflect on gaps in the current perspectives of sustainability. The analysis shows that existing business model frameworks exclude natural and social aspects of organizational environment from the discussion and tend to neglect the interrelationships between economic and not-economic actors as well as the intertemporal trade-offs. Based on the results of the analysis we propose a new sustainable business model framework named “Value Triangle”, which explicitly includes as core elements society incorporating the natural environment and future generations and three types of co-created and co-delivered value: public, partner and customer. The Value Triangle together with the corresponding canvas is presented through a business case for sustainability represented by Italian company Loccioni.</p>

Bocken, Boons, & Baldassarre, 2019	Sustainable business model experimentation by understanding ecologies of business models	Journal of Cleaner Production	Scant research has been done on ‘ecologies’ of different business models to understand and improve these and create positive impact on the environment, society, economy and other key stakeholders. Hence, in this paper a novel framework is presented to enable a systemic form of sustainable business model experimentation. The framework is based on the recognition of three key issues which have not yet been sufficiently incorporated in the literature on sustainable business models: construct clarity, boundary setting and uncertainty about outcomes. Building on earlier work, the resulting framework incorporates potential side-effects and boundary setting based on the concept of an ‘ecology’ of business models. Second, an approach is proposed that could stimulate more profound forms of sustainable business model innovation: The Ecology of Business Models Experimentation map.
Bocken, Rana, & Short, 2015	Value mapping for sustainable business thinking	Journal of Industrial and Production Engineering	Pressures on business to operate sustainably are increasing. This requires companies to adopt a systemic approach that seeks to integrate consideration of the three dimensions of sustainability – social, environmental, and economic – in a manner that generates shared value creation for all stakeholders including the environment and society. This is referred to as sustainable business thinking. The business model concept offers a framework for system-level innovation for sustainability and provides the conceptual linkage with the activities of the firm such as design, production, supply chains, partnerships, and distribution channels. A value mapping tool has been presented in the literature to assist in sustainable business model innovation. This study explores the use of value mapping for broader sustainable business thinking, by reflection on its use in workshop settings. A range of new applications is identified which is expected to be of interest to business practitioners, policy makers, and academic researchers.
Bocken, Short Rana, & Evans, 2014	A literature and practice review to develop sustainable business model archetypes	Journal of Cleaner Production	Sustainable business model archetypes are introduced to describe groupings of mechanisms and solutions that may contribute to building up the business model for sustainability. The aim of these archetypes is to develop a common language that can be used to accelerate the development of sustainable business models in research and practice. The archetypes are: Maximize 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; Re-purpose the business for society/environment; and Develop scale-up solutions.
Del Giudice, Di Vaio, Hassan, & Palladino, 2022	Digitalization and new technologies for sustainable business models at the ship–port interface: a bibliometric analysis	Maritime Policy & Management	The paper identifies the shipping and seaport business models that can meet environmental, economic, and social goals through the digitalization of operational processes in the ship–port interface. This paper aims to investigate whether digitalization and new technologies can help in the creation of sustainable business models as set out in the United Nations (UN) 2030 Agenda for Sustainable Development Goals (SDGs) adopted by all UN member states in 2015.

Dembek, York, & Singh, 2018	Creating value for multiple stakeholders: Sustainable business models at the Base of the Pyramid	Journal of Cleaner Production	Approaches has proven very challenging. Studies built around traditional profit and customer focused business models adapted to the BOP context have yielded limited insight into how business models that address poverty work to create value for their various stakeholders. The lens of sustainable business models has been recently turned on the BOP with promising results. This study continues this approach and extends our understanding of how business models work in the BOP context. We find that one group of models, which aims to reorganize how BOP communities and the systems around them operate, has especially large value creation potential because it combines three distinct value creation logics to provide comprehensive solutions to complex problems.
Dentchev et al., 2018	Embracing the variety of sustainable business models: A prolific field of research and a future research agenda	Journal of Cleaner Production	Investigating the benefits of sustainable business models for our societies is an important and timely topic. This Special Volume contributes to current research by exploring a variety of sustainable models in use around the world. The accepted articles provide an overview of the various organizational forms, management mechanisms, sustainability solutions, challenges, theoretical lenses and empirical evidence, i.e., fundamental elements in the study of sustainable business models.
Dijkstra, van Beukering, & Brouwer, 2020	Business models and sustainable plastic management: A systematic review of the literature	Journal of Cleaner Production	This study reviews the scientific literature for business models contributing to sustainable plastic management and suggests avenues for future research. We define sustainable plastic management (SPM) as any technique along the waste hierarchy seeking to minimize the environmental damage of plastic material. Limited cases were found during the literature review, whereas many more SPM business models exist in practice, signaling a research gap. Forty-four scientifically documented business models were identified and analyzed on the basis of business model component, sustainability, level of waste hierarchy and sustainable business model archetype. Our results suggest that business models focus on recycling and creating value from waste, as well as the development of bioplastic.
França, Broman, Robèrt, Basile, & Trygg, 2017	An approach to business model innovation and design for strategic sustainable development	Journal of Cleaner Production	A unifying framework for sustainability analyses, planning, cross-disciplinary and cross-sector cooperation, and cohesive use of the myriad sustainability tools, methods and concepts has been developed: the Framework for Strategic Sustainable Development (FSSD). Similarly, a generic approach to business model design has been put forward: the Business Model Canvas (BMC). In this paper we explore how the FSSD could inform business model innovation and design by combining it with the BMC and supplementary tools, methods, and concepts such as creativity techniques, value network mapping, life-cycle assessment, and product-service systems. The results show that the FSSD-BMC combination can support business model innovation and design for strategic sustainable development, as well as strengthen each supplementary tool, method and concept in its own primary purpose.

Geissdoerfer, Bocken, & Hultink, 2017	Design Thinking to Enhance the Sustainable Business Modelling Process	Journal of Cleaner Production	This paper works towards closing this gap by bringing together ‘design thinking’ and ‘sustainable business model innovation’ to refine the creative process of developing sustainable value propositions and improve the overall business modelling process. This paper proposes a new workshop framework based on a value mapping process, which was developed by literature synthesis, expert interviews, and multiple workshops. The framework was transferred into a workshop routine and subsequently tested with companies and students. The resulting ‘Value Ideation’ process comprises value ideation, value opportunity selection, and value proposition prototyping. The integration of design thinking into the innovation process helps to create additional forms of value and include formerly underserved stakeholders in the value proposition. Thus, the Value Ideation process helps companies to improve their performance while becoming more sustainable.
Hofmann, 2019	Circular business models: Business approach as driver or obstructer of sustainability transitions?	Journal of Cleaner Production	In times of climate change, biodiversity loss, or growing natural resource scarcity, the circular business model (CBM) concept is increasingly attractive, promoting the reorganization of current value creation architectures and supply chains toward a sustainable system of production and consumption. However, how “holistic” and “radical” are CBMs theoretically constituted in academia if we consider the deep structural and paradigmatic shifts in societies necessary to deal with the challenges associated with the Anthropocene? To reconstruct the theoretical foundations of CBMs critically, the recent CBM body of academic literature is systematically reviewed according to (1) the legitimacy of CBMs (why should it be done) (2) the modes of value creation and offerings (what should be done), and (3) the core principles of CBM integration into daily business (how should it be done).
Joyce & Paquin, 2016	The triple layered business model canvas: A tool to design more sustainable business models	Journal of Cleaner Production	The Triple Layered Business Model Canvas is a tool for exploring sustainability-oriented business model innovation. It extends the original business model canvas by adding two layers: an environmental layer based on a lifecycle perspective and a social layer based on a stakeholder perspective. When taken together, the three layers of the business model make more explicit how an organization generates multiple types of value – economic, environmental, and social. Visually representing a business model through this canvas tool supports developing and communicating a more holistic and integrated view of a business model, which also supports creatively innovating towards more sustainable business models. This paper presents the triple layer business model canvas tool and describes its key features through a re-analysis of the Nestlé Nespresso business model.
Leisen, Steffen, & Weber, 2019)	Regulatory risk and the resilience of new sustainable business models in the energy sector	Journal of Cleaner Production	Recently, three key developments have affected the energy sector in many countries, namely the clean energy transition, market liberalization, and digitization. These developments enabled new business models in a coevolving regulatory landscape. While previous research showed that support policies played an important role in enabling sustainable new business models, little attention has been paid on the question how dependent these business models are on specific regulations, and hence to which extent are they at risk of becoming obsolete after a regulation changes. Here we address this gap by studying how new sustainable business models in the energy sector work, and by investigating their risk profile, especially concerning the risk of regulatory changes.

Lüdeke-Freund et al., 2018	The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation	Sustainable Production and Consumption	They developed, tested, and applied a new multi-method and multi-step approach centred on an expert review process that combines literature review, Delphi survey, and physical card sorting to identify and validate the currently existing SBM patterns. Ten international experts participated in this process. They classified 45 SBM patterns, assigned these patterns to 11 groups along ecological, social, and economic dimensions of sustainability and evaluated their potential to contribute to value creation. The resulting taxonomy can serve as a basis for more unified and comparable studies of SBMs and for new business model tools that can be used in various disciplines and industries to analyse and develop sustainability-oriented business models in a consistent manner.
Morioka, Bolis, & Carvalho, 2018	From an ideal dream towards reality analysis: Proposing Sustainable Value Exchange Matrix (SVEM) from systematic literature review on sustainable business models and face validation	Journal of Cleaner Production	This paper addresses sustainable business models (SBMs), as an attempt to systematically integrate corporate sustainability principles (including economic, environmental, and social goals; multi-stakeholder perspective and long-term outlook) into core business. This paper proposes the Sustainable Value Exchange Matrix, a visual framework to help academics and practitioners discuss sustainable business models, based on solid theory analysis and practice-oriented application. The tool proposed provokes reflections about organization’s reason of existence and deployment of this purpose into the business model dimensions from a multi-stakeholder and from a value exchange perspective.
Pal & Gander, 2018	Modelling environmental value: An examination of sustainable business models within the fashion industry	Journal of Cleaner Production	The business models of enterprises in the global fashion industry produce highly negative outcomes for the environment. High water usage, pollution from chemical treatments used in dyeing and preparation and the disposal of large amounts of unsold stock through incineration or landfill deposits combine to make clothing one of the highest impact industries on the planet. This paper uses the sustainable logics of narrowing, slowing, and closing the loop of resources used during the production, design, manufacture, and distribution of fashion garments to analyze emerging business models that seek to reduce the environmental impact of the fashion system. Taking the business model conceptualization of an enterprise as a system designed to create value for the customer and capture value for the firm, we add a consideration of environmental value and derive propositions that test the possibility that emerging sustainable business models in fashion will replace the dominant, unsustainable model. The paper argues that lack of scalability, incompatibility with fashion customers value propositions plus obstacles to supply chain changes militate against the prospect of the currently designed sustainable business models becoming the standard model of the fashion industry.

Palomares-Aguirre, Barnett, Layrisse, & Husted, 2018	Built to scale? How sustainable business models can better serve the base of the pyramid	Journal of Cleaner Production	One of the greatest challenges for sustainable business models is achieving a scale of operations that is adequate to meet the quantity and depth of needs in their markets. In this paper, we examine scaling of sustainable business models at the base of the pyramid (BOP). Using within- and cross-case analyses, we study the sustainable business models of three firms that provide affordable housing for people with very low incomes in Mexico. Our analyses reveal the importance of community engagement as well as constraints on the ability to stimulate market forces when serving the very poor. These findings suggest that the literature on sustainable business models should be modified to account for the essential roles of community engagement and government collaboration in lieu of reliance on market forces in enabling social enterprises to scale in order to better serve the very poor.
Ritala, Albareda, & Bocken, 2021	Value creation and appropriation in economic, social, and environmental domains: Recognizing and resolving the institutionalized asymmetries	Journal of Cleaner Production	Value creation and appropriation are much-studied processes in business and management fields. However, both academia and business practice have traditionally focused on how value is created and appropriated in the economic context and by economic actors. This overemphasis on economic logic has created institutionalized asymmetries in managing the relationship between business, society, and ecological environment. In this paper, we broaden the value creation and appropriation analysis along two dimensions: (1) the type of economic goods used to create value (private and club goods, public goods, and common goods) and (2) value creation and appropriation domains (economic, social, and environmental). Building on this framework, we argue that there are several institutionalized asymmetries in the relationship between the goods used to create value and the domains in which the value is eventually appropriated.
Ritala, Huotari, Bocken, Albareda, & Puumalainen, 2018	Sustainable business model adoption among S&P 500 firms: A longitudinal content analysis study	Journal of Cleaner Production	In this study, we examine the diversity of sustainable business models adopted by the largest global corporations — those listed in the S&P 500 index — over the period 2005–2014. We examine press release communications during this period, which represent public data about business-relevant events. We expect that examining this communication can reveal longitudinal patterns in the adoption of sustainable business activities and models. Empirically, we utilize academic and practitioner expert panels to build a set of keywords across nine sustainable business model archetypes and utilize automated content analysis to examine the breadth and nature of a firm's sustainable business activities and practices. We find evidence of the increasing prominence of different types of sustainable business models over time. In particular, the results show that large, capitalized firms have mostly adopted the environmentally oriented archetypes, and to much lesser extent the societal and organizational ones.
Trapp & Kanbach, 2021	Green entrepreneurship and business models: Deriving green technology business model archetypes	Journal of Cleaner Production	This study proposes a novel typology of green technology business models by outlining twelve distinctive business model archetypes based on two relevant concepts, namely, the sustainable business model archetypes and technological entrepreneurship activities. This framework is underpinned and illustrated by a variety of relevant green technology solutions that the authors have identified through a systematic review of existing, empirically grounded literature on the subject. The authors believe that this framework would be useful for future research on policy making based on cleaner production.

<p>Ulvenblad, Ulvenblad, & Tell, 2019</p>	<p>An overview of sustainable business models for innovation in Swedish agri-food production</p>	<p>Journal of Integrative Environmental Sciences</p>	<p>Companies in the agri-food sector are under increasing pressure to adopt sustainable business models that consider not only economic but also both social and environmental aspects. This paper examines how Swedish food producers use sustainable business models to innovate their businesses. The empirical data comes from a telephone survey with 204 companies and from case studies of 4 companies. A conceptual framework regarding sustainability-oriented innovation (SOI) and a eight sustainable business model archetypes are used to map and analyze the sustainability innovation practices and the sustainable business models. The results show a surprisingly sustainable business focus taken by many companies, which is not only on optimization, but also on organizational transformation and on systems building. The results show the companies vary as far as which archetypes they match. The most common archetype matches are 'Maximize material and energy efficiency' and 'Adopt a stewardship role'. Only 10% measure success solely in financial terms, while 80% measure success in financial terms as well as social and environmental terms. Another conclusion is that companies in the agri-food sector have unique characteristics and the value intention of the entrepreneurs is an important building block in sustainable business model innovation.</p>
<p>van Giezen & Wiegmans, 2020</p>	<p>Spoilt - Ocean Cleanup: Alternative logistics chains to accommodate plastic waste recycling: An economic evaluation</p>	<p>Transportation Research Interdisciplinary Perspectives</p>	<p>The Ocean Cleanup is testing a method to passively collect this floating plastic debris, transport, recycle, process and sell it. The purpose of this paper is to evaluate alternative logistics chains to accommodate ocean plastic waste recycling by connecting transport with data collection and data analytics. The scenarios are based on different geographical destinations, supply chain lengths and types, and offered local development opportunities. A new reverse logistics channel dedicated to the Ocean Cleanup is developed, as existing reverse logistics supply chains are not able to capture the specifics of the plastic waste collection. The cheapest and most disappointing solution would be to do nothing. However, the analysis shows that more complicated logistic structures whereby the collected plastic waste is used to produce glasses, socks, and carpets can lead to sustainable business models for cleaning up the Oceans. If the focus would be only on cost, the best model would be to minimize the transport distance and focus on San Francisco as closest port for the selected gyre to be analyzed.</p>

Varela-Candamio, Calvo, & Novo-Corti, 2018	The role of public subsidies for efficiency and environmental adaptation of farming: A multi-layered business model based on functional foods and rural women	Journal of Cleaner Production	This paper examines the role of public subsidies on farming efficiency for Spain by using a Data Envelopment Analysis (DEA) approach followed by a nonparametric regression of efficiency to farm specific factors (economic size, environmentally friendly behavior, and regional aspects). The empirical analysis suggests that although a higher degree of direct payments negatively affects farm efficiency, these subsidies become an incentive for environmentally friendly behavior by farmers to improve the productive efficiency. In turn, this proposition leads to a careful attention for the roots of agricultural productions in line to the EU aim of more market-oriented agriculture. Then, a conceptual framework was elaborated to propose a multi-layered model for supporting the design of a green business plan based on functional foods. This study also explores the process of generation-production-consumption of functional foods, involving not only the knowledge transfer of the healthy properties of these products but also the multiple roles of rural women as producers, educators/advisors, and buyers of these foods. The positioning of rural women in the whole process of functional foods results relevant to build their competitive advantage as local entrepreneurs. The leverage points of the strategic formulation of green business models were reinforced following the road mapping methodology from a dynamic perspective: alliances with suppliers of knowledge (researchers), identification with their reference groups (investors, clients) and management of intellectual capital (structural, human, relational).
Yang, Evans, Vladimirova, & Rana, 2017	Value uncaptured perspective for sustainable business model innovation	Journal of Cleaner Production	To date business models have been examined mostly from the perspectives of value proposition, value capture, value creation and delivery. There is a need for a more comprehensive understanding of value in order to promote sustainability. This paper proposes value uncaptured as a new perspective for sustainable business model innovation and develops four forms of value uncaptured: value surplus, value absence, value missed and value destroyed. This paper also proposes a framework of using value uncaptured for sustainable business model innovation. This framework has been validated in case studies in six product-service systems firms with advanced manufacturing technologies.
Yip & Bocken, 2018	Sustainable business model archetypes for the banking industry	Journal of Cleaner Production	Sustainable business model innovation is increasingly viewed as a lever for systems change for sustainability across businesses and industries. Banks hold a unique intermediary role in sustainable development, but also have a difficult position after the 2008 financial crisis. This paper aims to explore business models for sustainability in the service industry, particularly banking. It explores the receptiveness of customers towards sustainable business models pursued by banks. Eight sustainable business model archetypes for banking are developed and validated. “Substitute with digital processes”, “adopt a stewardship role” and “encourage sufficiency” are most welcomed by customers. Some archetypes seem at direct odds with current business practice, such as “encourage sufficiency”. This study gives an insight to how to “do good and do well” in the banking industry.

6.2 Appendix 2

What are the main obstacles or gaps in making existing funding and business models more effective?

[E.g., design or implementation obstacle, wrong thematic or territorial scope, etc.]

1. **Specificity vs. Broad Scope:** The blue economy is vast, and organizations supporting businesses find it challenging to address specific obstacles within such a broad area.
2. **Lack of Experience in Green Transition:** There is a shortage of experience and knowledge in the business community for the green transition in the blue economy, making it a somewhat uncharted territory.
3. **Financing Challenges for Established Businesses:** Established businesses struggle to secure financing, with a perception that (public) funding is more directed towards research rather than operational business needs.
4. **Long-term Investment Requirements:** Primary production, especially in agriculture and aquaculture, requires substantial upfront investments, and the lengthy timescales involved make the investment landscape unique and more akin to industries like mining or shipbuilding.
5. **Innovative Business Models and Funding Sources:** Difficulty in fitting innovative business models and funding sources into existing categories, potentially hindering eligibility for various types of funding.
6. **Involvement in Research Agenda:** Businesses face challenges in participating in setting the national research agenda, influencing funding topics, and ensuring room for innovative initiatives.
7. **Predictable and Long-term Concessions:** Investors in the blue economy need long-term and predictable concessions for space to ensure a stable future, similar to investments in mining.
8. **Subsidy Challenges:** Because they may not be seen as part of agriculture, certain sectors like aquaculture face challenges in receiving subsidies, impacting competition dynamics and relations with traditional industries.
9. **Interactions with Stakeholders:** Businesses have to navigate interactions with multiple stakeholders, and the process is subject to vetoes, posing a considerable risk, especially for small businesses with narrow profit margins.
10. **Scaling Challenges:** The need for small setups before larger ones, coupled with a traditional mindset focused on upscaling rather than outscaling, poses challenges for blue economy ventures.
11. **Tax System Implications:** Tax systems favoring large producers can be burdensome for small producers with innovative business models.

12. **Administrative Burden:** Heavy administrative burdens, including licensing and environmental regulations, present challenges that could be addressed to support businesses.
13. **Cultural and Regulatory Differences:** Variances in administrative processes and timelines across different countries, as well as cultural disparities, create additional hurdles.
14. **High Startup Costs for Fishermen:** The high initial costs for fishermen entering the blue economy hinder their participation.
15. **Lack of Proactivity in Policymakers:** Policymakers at various levels exhibit a lack of proactivity, hindering effective support for blue economy initiatives.
16. **Generic Nature of the Question:** The question regarding funding and business models may be perceived as too general, lacking specificity.
17. **Complexity in Franchise Models:** Complexities in franchise models, especially for innovative projects like <https://www.redrosedevelopments.com/>, can pose challenges in attracting funders and investors.
18. **Shared Value Proposition and Partnerships:** Emphasizing shared value propositions and partnerships is crucial for financial sustainability in the blue economy.

These identified obstacles and gaps highlight the multifaceted challenges faced by businesses in the blue economy and underscore the need for targeted solutions and supportive policies.

In your experience, which funding and business models will be most effective in achieving the mission objectives and why?

1. **Global Learning Exchange:** Learn from successful blue economy projects worldwide, not limited to Europe but also exploring Asia and other global markets.
2. **Public Funding Over Venture Capital:** Venture capital is viewed as limiting for scaling due to fast return expectations. Preference for public funding, despite challenges in response times.
3. **Diversification of Business Models:** Avoid reliance on a single type of business model, emphasizing diversification for sustainability.
4. **Public Funds Facilitating Private Investment:** Utilize public funds to facilitate and attract private investments for the takeover of blue economy projects.
5. **Blended Financing:** Use blended financing models to address the high-risk nature of certain blue economy ideas.
6. **Steward Ownership:** Explore steward ownership models to ensure long-term commitment and responsible management.

7. **Challenges in Funding Rules and Schemes:** Address challenges in navigating funding rules and schemes for blue economy projects.
8. **Bridging Existing Businesses:** Develop strategies to transition existing businesses into the blue economy, involving BioInvestments and other relevant approaches.
9. **Defining Profit in Varied Business Goals:** Clearly define the concept of profit in alignment with different business goals and objectives.
10. **Aligning Business and Research Goals:** Recognize the difference in motivation between business and research perspectives, acknowledging the importance of pursuing profits.
11. **Comprehensive Startup Funding:** Acknowledge that startups require funding not only for initial setup but also for researchers, experts, and ongoing development.
12. **Guidelines for EU Funding:** Advocate for improved guidelines for EU funding to ensure fairness and prevent competitive advantages over existing businesses.
13. **Resource Combination:** Encourage the combination of resources to enhance the scalability and impact of blue economy projects.
14. **Promoting Multitrophic Resources:** Make a compelling case for the success of multitrophic resources and promote their adoption.
15. **Angels Understanding Sustainability Models:** Recognize a growing understanding among angel investors regarding sustainability models, although challenges still exist.
16. **Community-Based Approaches:** Explore community-based funding models to garner support and involvement in blue economy projects.
17. **Collaboration Among Small Farms:** Highlight the advantages of small farms collaborating to generate benefits similar to large producers.
18. **Low Upfront Costs Advantage:** Acknowledge the advantages of projects like spirulina, which may have fewer upfront costs, contributing to their feasibility.
19. **Challenges for Female Founders:** Recognize the struggles that female founders face in securing funding and explore ways to address these challenges.

These insights provide a comprehensive overview of diverse funding and business models that can contribute to the effective upscaling of blue economy projects.

Do you have any examples of successful business or funding models, and which models are supporting the blue economy would you like to see more of? E.g. innovative business/ funding models.

1. **Jordbruksverket Model:** Covers a significant portion (40%) of heavy investment costs, especially for infrastructure. This model could benefit smaller producers by reducing costs, potentially incentivizing their involvement.
2. **Ecosystem Services Funding:** Exploring opportunities to receive funds for contributing to ecosystem services, similar to the model where solar panels connected to the energy grid receive payments. The challenge is identifying which part of the government would fund this, possibly through voluntary preservation funds.
3. **Microloans Fund:** Establishing a fund specifically for microloans, particularly beneficial in industries like seaweed where obtaining insurance is challenging due to high risks. Soft interest loans could support growth in this sector.
4. **Tax Returns for R&D:** Encouraging businesses through tax returns for research and development (R&D) activities, fostering innovation and growth.
5. **Individual Farmer Incentives:** Creating a system based on angel capital where individual farmers receive payment per unit of their produce, such as \$1 per foot of kelp, facilitated through an app. This approach closes the gap for individual farmers.
6. **Biodiversity Measurement Module:** Developing a module based on research for measuring biodiversity and other factors, potentially aiding documentation and financial support.
7. **Kelp Climate Fund:** Example from the East Coast of the US, where the GreenWave initiative's kelp climate fund aims to bridge the gap between current and future allocation of funds for sustainable practices.
8. **Angel and Crowdfunding with No Return:** Exploring models of angel and crowdfunding where there is no expected financial return, potentially supporting innovative and high-risk projects.
9. **Outscaling Approach:** Advocating for an outscaling approach rather than upscaling, involving diverse small-scale projects that create multiple products, providing resilience during economic downturns.
10. **Uber System for Carbon Credits:** Example from a European startup in Brest that created an Uber-like system for accruing carbon credits, generating income to be invested in specific causes.
11. **App-based Income Generation:** Considering the future potential of app-based methods to generate income, such as apps that provide offsetting solutions for individual carbon footprints.

12. **FFF Model in Finland:** Referring to the Finnish case where the Friends, Family, and Fools (FFF) model was used initially, transitioning to project funding over time.
13. **Side Projects in NE USA:** Observing the success of the NE in the USA, where individuals engage in blue economy practices on the side rather than focusing solely on them, contrasting with the EU approach.
14. **Franchise System Success:** Recognizing the potential success of a franchise system, particularly in controlling inputs and outputs, with local partners acting as franchisees. Emphasizing the need for intellectual property (IP) protection.

These diverse models showcase innovative ways to support and fund blue economy projects, from financial incentives for individual farmers to franchise systems and creative carbon credit initiatives.

Can you think of any policies that would support the operational deployment of useful innovations to support the sustainable blue economy?

1. **Equating Aquaculture to Agriculture:** Treat aquaculture investments similarly to agriculture investments, creating a link between regulations, taxation, subsidies, and support.
2. **Green Taxonomy Utilization:** Explore ways for sustainable businesses to benefit from green taxonomy, influencing labeling, and enhancing transparency.
3. **Policy Streamlining and Database:** Avoid policy duplication and establish a common database for policies to streamline efforts and enhance efficiency.
4. **Simplified Language in Policies:** Use clearer and easier language in policies, initiatives, and regulations to enhance understanding.
5. **Effective Communication of Policies:** Develop strategies for effectively communicating policies to diverse audiences.
6. **Identification of Hindering Factors:** Communicate factors hindering the development of businesses or initiatives to foster awareness and potential solutions.
7. **Political Will for Cooperation:** Emphasize the need for political will to facilitate a cooperative framework.
8. **Goal-Driven and Flexible Policies:** Advocate for goal-driven policies that are flexible, adapting to the evolving needs of the sustainable blue economy.
9. **Fast Track for Small-Scale Innovators:** Implement a fast track for small-scale innovators to encourage rapid innovation and deployment.
10. **Support for University Labs:** Address high costs for labs, potentially involving support from universities to facilitate innovation.

11. **Standardization Challenges at University Level:** Recognize the difficulties in standardizing at the university level and explore solutions.
12. **Fast Financing Opportunities:** Provide fast financing opportunities to support timely innovation.
13. **Streamlined Licensing for Small-Scale Farms:** Simplify licensing procedures for small-scale farms to operationalize their business models effectively.
14. **Infrastructure Establishment:** Establish necessary infrastructure such as moorings to support sustainable initiatives.
15. **Partnerships and IP Protection:** Encourage partnerships, with a reminder of the importance of protecting intellectual property (IP) for new business models.
16. **Market Studies for Seaweed Products:** Conduct market studies and analysis to understand downstream uses of seaweed, exploring disruptive innovations and potential consumer demand.
17. **Utilization of All Seaweed Parts:** Find ways to use all parts of seaweed, exploring applications in pharmaceuticals, feed, food, and other compounds.
18. **Complex Business Models and Investment Challenges:** Recognize the complexity of business models and the need for more time to generate revenue, emphasizing the requirement for redefining profit and addressing the unique investment needs of the blue economy.

These ideas underscore the importance of a comprehensive and supportive policy framework to encourage innovation and sustainability in the blue economy.