REGREEN
NATURE-BASED SOLUTIONS

FOSTERING NATURE-BASED SOLUTIONS FOR SMART, GREEN AND HEALTHY URBAN TRANSITIONS IN EUROPE AND CHINA

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PROSPECTUS FOR NATURE-BASED SOLUTIONS BUSINESS INVESTMENT

Author(s):

Hans-Peter Ellmer (JR)

David Blaettner (JR)

Andreas Tuerk (JR)

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EXECUTIVE SUMMARY

Urban areas are increasingly experiencing the consequences of climate change. The awareness that Nature-based solutions (NBS) will play a central role in the process to more sustainable and resilient cities is growing. However, in order to achieve ambitious climate goals, large amounts of capital are needed, and the public sector alone will not be able to cope with that. The participation of the private sector is a question of necessity, due to the high investment sums required.

This report provides an outlook on the NBS market and corporate investment, and offers an approach from a business model perspective. It shows how the private and public sectors can develop, sharpen and improve their business activities around and with nature-based solutions. For this purpose, it needs an understanding of

a) how the NBS market is structured,
b) which regulations and frameworks are given, and
c) how sustainable business model development may proceed.

In desktop studies complemented with expert interviews, we tried to give answers to these points under investigation:

a) we worked out an overall assessment of the market, and estimates to increase private sector investments,
b) discussed the most effective regulations and policies to foster NBS, and
c) created three sustainable NBS business model approaches with best practices and recommendations.

The sections of this report are mostly structured in such a way that theoretical inputs are followed by practice-oriented expert assessments. We have taken into account the European and Chinese perspectives.

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ABRREVATION LIST

ABBREVATION	MEANING
BMA	Business Model Archetypes
CBD	Convention on Biological Diversity
CBI	Climate Bonds Initiative
CORPORATE SUSTAINABILITY DUE DILIGENCE DIRECTIVE	CSDDD
CSR	Corporate Social Responsibility
CSRD	Corporate Sustainability Reporting Directive
EIB	European Investment Bank
ESG	Environmental, Social and Governance
ESRS	Environmental Sustainability Reporting Standards
EU	European Union
GI	Green Infrastructure
GBP	The Green Bond Principles
ICMA	International Capital Markets Association
IUCN	International Union for Conservation of Nature
NCAVES	Natural Capital Accounting and Valuation of Ecosystem Services
NBE	nature-based enterprises
NBS	Nature based solutions
SAFE	Silvoarable Agroforestry for Europe
SFDR	Sustainable Finance Disclosure Regulation
ULLS	Urban Living Labs
UOP	Use of Proceed
USD	United States Dollar
USER EXPERIENCE	UX

INTRODUCTION

The diverse consequences of global warming, such as environmental hazards from heat, flooding, air pollution or loss of biodiversity, are exacerbated in urban areas. People and nature in cities experience the negative effects of climate change.

Today nearly 60% of the world's population lives in cities. By 2050, the expectation is an increase up to 70%, or more than 8 billion, urban inhabitants. But cities are not only home to the largest share of the global population, they also generate more than 80% of the global GDP (1). Unhealthy and less liveable cities therefore have an impact not only on lives and health, but also on economic development.

Nature-based solutions (NBS) are seen as a holistic answer for manifold challenges related to climate change, we are facing in the next decades. NBS are not one-dimensional but target social, environmental, economic or other issues, and even their benefits are multi-dimensional. On the one hand, this makes it impossible to create a blueprint for successful business or action. On the other hand, it offers opportunities for rethinking the nature-human relationship, with business opportunities along the road of green transformation. This again would be impossible with outdated, traditional (resource-wasting) views of business. Our report provides a concise prospectus on NBS investment with a strong connection to sustainable business model development.

Section 1 of the report clarifies the main definitions of NBS and nature-based enterprises (NBEs). Furthermore, the term "natural capital", which has been seen as key to the future growth of the NBS market by our experts, will be explained and discussed. Natural capital, because it is seen as a promising approach to overcome one of the main hurdles to higher NBS investment: the problem of evaluating and accounting. In this section, we will also clarify what a business model is and how it becomes a sustainable business model. Sustainable business models are a continuation of the upcoming business model concept of the 1990s, with the main focus on sustainability. Similar to NBS, sustainable business models also give respect to society and the environment.

Section 2 gives insights into the market and financing of NBS. In addition, a presentation and assessment of policies and regulations are provided in this section. To tackle global challenges related to climate change, loss of biodiversity, and land degradation, further investments in NBS of up to $400 billion a year would be necessary, as an evaluation of financial flows in NBS based on a data analysis by the UN Environment Programme regarding public and private investments in 2022 shows (2). Last year, only half of the estimated necessary investments were made. However, with 17%, the private sector's share of financing NBS is marginal (2). Although the possible business sectors are broadly diversified, as a sectoral listing in this section shows. We also discussed with experts how the overall and especially the private sector's sum of investments could increase. The EU aims to use research and innovation policy "to position the EU as a leader in innovating with nature to achieve more sustainable and resilient societies" (3). The experts assess the EU taxonomy as a most promising path to strongly increasing investments in NBS in the long run. Even though there are similar approaches in China and elsewhere, the EU taxonomy has been considered a role model for other nations.

Section 3 describes the research process for developing business models and the creation of this prospectus for NBS business investment. The five steps outlined can also be used as a basis for the development of NBS business models in the first phase. The steps indicated are "Exploration", "Collecting data with business model development tools", "Deconstruction and critical analysis", Forming/derivate general characteristics" and "Verification through experts in business and NBS".

Section 4 presents the results of a practical exercise with the experts regarding barriers to the financing of NBS. There are two main barriers in finance: a) the problem of poor coordination between private and public investors; and b) the validation and accounting of the multiple benefits of NBS. The experts had to complete a card sorting task by sorting different statements on how to overcome these barriers. A coordinator managing a diverse group of stakeholders and concrete investment strategies have been seen as the strongest arguments for leveraging the problem of coordination. For the accounting and valuation issue, natural capital, ecosystem services, or ecological footprint are seen as promising approaches. "Identify costs and benefits, resulting in a present value," has also been ranked highly by experts, but there is still no final solution for this challenge.

Section 5 gives a summary of the research on three contrasting business model approaches. The initial information has been collected with REGREEN partners using a business model canvas and sharpened. In addition, two best practices are described, and finally, general recommendations are derived for the three models.

1 DEFINITIONS AND CONTEXTUALIZATION

For the exploration of the field of business investments in NBS, a few general definitions are necessary. This section clarifies basic terms and concepts that are relevant in the discussion of the NBS market and for business model development.

1.1 NBS, NBE, Natural Capital

Although there is widespread agreement on the definition of NBS and nature-based enterprises (NBEs), the boundaries and what exactly is included in them are not as clear. Nevertheless, one of its strengths is the definitional space it allows to remain compatible with other concepts with a similar goal, such as natural capital or green bonds.

1.1.1 NBS

NBS is an umbrella concept uniting different approaches to pressing issues addressing climate change. Further, the multifunctional character of NBS and nature as the core element of solution-finding offer a fresh and promising starting point to find answers for the present and future societal and economic challenges on a local and global level. Linking topics such as ecosystem services, human well-being, and sustainable development, NBS is a connector for politics, society, and the economy on the path of the green transformation.

The European Union (EU) identified NBS as a policy, supporting major EU policy priorities, particularly the European Green Deal, biodiversity strategy, and climate adaptation strategy (4). Therefore, NBS are part of the EU's research and innovation focus, funded in the program Horizon 2020 and the follow-up program Horizon Europe. The European Commission defines NBS as:

> *Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions* (3).

This definition focuses on the diverse benefits of NBS and how it helps build resilience. The International Union for Conservation of Nature (IUCN) provides an apt and much quoted definition, stronger aligned to challenges and using slightly different terms than the EU's but predefining the same direction:

> *Nature-based Solutions are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.*
>
> *Nature-based Solutions address societal challenges through the protection, sustainable management and restoration of both natural and modified ecosystems, benefiting both biodiversity and human well-being. Nature-based Solutions are underpinned by benefits that flow from healthy ecosystems. They target major challenges like climate change, disaster risk reduction, food and water security, biodiversity loss and human health, and are critical to sustainable economic development* (5).

Both documents mention explicitly the economic aspect in a rather superficial sense: "economic benefits" (EC) and indirectly via the influence of functioning ecosystems for "sustainable economic development" (IUCN).

1.1.2 NBE

Nature-based enterprises (NBEs) are the relevant actors in the practical implementation of NBS. Their core good is nature, and they are the messengers as well as the deliverers of NBS in a sustainable-oriented market. Koojman et al. (6) define an NBE as:

> *An enterprise, engaged in economic activity, that uses nature sustainably as a core element of their product/service offering. Here, nature may be engaged directly by growing, harnessing, harvesting, or sustainably restoring natural ecosystems, and/or indirectly by contributing to the planning, delivery or stewardship of nature-based solutions. A nature-based enterprise must contribute positively to biodiversity and ecosystem services.*

Sectors in which nature or ecosystem services are used directly are ecosystem creation, restoration and management, NBS for green buildings and public spaces, water management, sustainable agriculture and food production, sustainable forestry and biomaterials, tourism, health, and wellbeing. Examples of indirectly oriented NBEs are advisory services, education, research and innovation activities, financial services, smart technology, and monitoring and assessment of NBS (6).

Obviously, the definition of NBEs is strongly connected to the definition of NBS. From a strictly economic perspective, it seems NBEs may have a disadvantage against conventional competitors because they must have a positive impact on biodiversity and ecosystem services. At second glance, however, the demarcation can mean a long-term advantage. Enterprises from all kinds of sectors have to reorganize and adjust their businesses regarding climate goals, reducing emissions, changing markets, or as part of their Corporate Social Responsibility (CSR). But this means that to foster NBEs, the regulatory framework, procurement directives for subsidies, and an integration of nature as a capital are key factors in activating private business activities on a large scale.

For more information on the market and sectors of NBEs, please look at section 2 in this report.

1.1.3 Natural capital

A possible link between the economy and ecosystems is the natural capital approach. The United Nations, EU, and Convention on Biological Diversity (CBD) launched a program named "Natural Capital Accounting and Valuation of Ecosystem Services" (NCAVES) to develop and establish a framework that also includes the finiteness of nature goods and could be important for sustainable business decisions and protecting nature. The condensed UN's definition is:

"Natural capital is another term for the stock of renewable and non-renewable resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people" (7).

Here, the term ecosystem is not used explicitly, even though all of the named resources can be seen as ecosystem services. CBD emphasizes that, beside these obvious ecosystem services,

> *[t]here are also many less visible ecosystem services such as the climate regulation and natural flood defences provided by forests, the billions of tonnes of carbon stored by peatlands, or the pollination of crops by insects. Even less visible are cultural ecosystem services such as the inspiration taken from wildlife and the natural environment* (8).

The "Natural Capitals Coalition" is a global collaboration of over 400 leading organisations working with the "Natural Capital Protocol" and the "Social & Human Capital Protocol". Both protocols are decision-making frameworks that help to identify, measure, and value their impacts and dependencies on natural capital and social/human capital, respectively. The strength of the capital approach is that, beside goods and financial assets (produced capital), nature conservation, human well-being, and social relations are equal and presentable.

1.2 Sustainable business model innovation and archetypes

In the context of NBS projects, especially in the first phase, a business model concept is a potential planning tool to clarify what the value proposition is, what is important for finding investments, engage stakeholders, and get a project started.
Business models are for the public and private sector. There is no strict separation, and hybrid models with flexible, adjusted elements are also possible.

1.2.1 Business models

The business model concept became popular in the 1990s with the dotcom boom, e-commerce and business innovations associated with the new possibilities the internet offered. Originally, it was used as a communication tool to present new, complex business ideas to investors to raise money (9) (10). Porter notes in 2001 that "[t]he definition of a business model is murky at best" (9). Since then, intensive research in this field has taken place, resulting in a wide range of definitions and interpretations emphasizing different aspects. An excellent overview of different definitions is given in a meta-study by Geissdoerfer (11).

Three selected business model definitions (more are listed in the annex):

- a business model is “an architecture of the product, service and information flows, including a description of the various business actors and their roles” (p. 4 (12)).
- a business model is “a conceptual framework that helps to link the firm`s strategy, or theory of how to compete, to its activities, or execution of the strategy” (p. 138 (13)).
- “we describe business models as simplified representations of the elements e and interactions between these elements e that an organisational unit chooses in order to create, deliver, capture, and exchange value” (p. 1218 (14)).

These general statements give an impression of the purpose and strategic relevance of business models. For practical use, the models should be considered in a more differentiated way. Business models can be seen as representations of three core elements and the interactions between them. According to Richardson, 2008 (13), a business model framework would capture these elements:

Value proposition – What is the product or service, and why are customers paying for it?

The value proposition covers the specific offer of the firm or organisation, the sharpening of the target customers, the strategy to win customers, and the unique selling point compared to the competitors.

Value creation and delivery – How to create the proposed value and deliver it to the customers?

Value creation and delivery is also an important aspect to achieve competitive advantages. Firstly, use a strategic tool (e.g. the VRIO analysis, “Valuable, Rare, Inimitable and Organized” by Barney, (22)) to identify resources and capabilities. The organisation, containing the value chain, activity system and business processes, is another aspect. And third, compile links to suppliers, partners, and customers to establish a position in the value network.

Value capture – How to generate revenue, and what are the costs?

Value capture includes economic indicators, revenue sources, and expenses. Here is the crucial point: keep costs under the firm's revenues to stay profitable.

1.2.2 Sustainable business models, business models innovation and archetypes

On the way to moving from a conventional business model to a sustainable business model, we face the same challenges regarding business activities that also apply to NBS in general. The biggest

challenge remains: How to recognize and present the multiple benefits nature delivers? And in addition: How can these become key indicators of economic activity?

Sustainable business models

As defined above, value proposition, value creation/provision and value capture also apply to sustainable business models with an extended value proposition. In addition to the economic values, this particular type of business model also incorporates social and environmental values.

The interest in corporate sustainability issues has increased since the 2000s and continues to grow. It is seen as a response to the growing environmental problems, such as resource depletion, climate change, water and air pollution, as well as social pressure, caused by low economic development and a dynamic population growth. Environmental destruction and high resource consumption have effected policy changes. In addition, growing consumer awareness for sustainable consumption and behaviour is affecting the whole market, as well as corporate activity and sustainable business innovation (23).

Sustainable business models and NBS share the fact that both take a holistic approach to addressing future challenges. Non-monetary value, social embedding, and long-term character are categories to be considered. The following general definition covers this perspective:

Sustainable business models are “business models that incorporate pro-active multi-stakeholder management, the creation of monetary and non-monetary value for a broad range of stakeholders, and hold a long-term perspective” (11).

Three more selected sustainable business model definitions (more are listed in the annex):

- a sustainable business model differs from a conventional through four propositions:
  1. The value proposition provides measurable ecological and/or social value in concert with economic value […].
  2. The supply chain involves suppliers who take responsibility towards their own as well as the focal company's stakeholders […].
  3. The customer interface motivates customers to take responsibility for their consumption as well as for the focal company's stakeholders […].
  4. The financial model reflects an appropriate distribution of economic costs and benefits among actors involved in the business model and accounts for the company's ecological and social impacts” (p. 13 (24)).
- a sustainable business model “assists to achieve sustainability through six principles: “Resource efficiency, social relevance, localisation and engagement, longevity, ethical sourcing and work enrichment” (p. 65 (25)).
- we define a sustainable business model as a simplified representation of the elements, the interrelation between these elements, and the interactions with its stakeholders that an organisational unit uses to create, deliver, capture, and exchange sustainable value for, and in collaboration with, a broad range of stakeholders.” (p. 1219 (14))

Sustainable business models innovation

In literature and practice, an increased interest in sustainable business models innovation is observed (29) (30). New or adapted business models, aligned with sustainability, offer a chance to tackle global issues as a consequence of climate change-related environmental and societal challenges.

Sustainable business models innovation is defined as:

> *Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver value and capture value (i.e. create economic value) or change their value propositions* (31).

In literature, sustainable business models innovation can be distinguished according to its aims:

1. Focusing on the characteristics of the model, such as sustainable value creation, proactive multi-stakeholder management, and a long-term perspective.
2. The categorization is made according to the type of innovation: Sustainable start-ups are needed if there is no current model and a new business model has to be created. A sustainable business model transformation happens if the current model is changed into another. Sustainable business model diversification means that the base model stays in place and an additional model is created. If an additional business model is identified and integrated, it corresponds with the type of sustainable business model acquisition.
3. The aim is to create a sustainable business model type, such as circular business models, social enterprises, bottom of the pyramid solutions, or product-service systems.
4. The degree of implementation of one or more sustainable business model strategies (11).

Business model archetypes

Another potential enabler of sustainability and NBS with a helpful framework is the development of archetypes. Originally, archetypes were popular and helpful in organizing consumer communication and product development in marketing and User Experience (UX). In the context of sustainable business development, Brocken et al. (31) established a framework with eight different business model archetypes (BMA), each classified into one of three higher groupings: technological, social, and organisational. The Horizon 2020 project *Naturvation*[3] used this framework to categorize different urban NBS, focusing on green roofs and urban agriculture. In the following, the original archetypes are described with an example of an NBS value proposition from *Naturvation* (32):

1) The archetype "maximise material and energy efficiency" (technological) aims for higher output with fewer resources – e.g. green roofs prolong the life span of roofs and reduce the energy demand of buildings.
2) The archetype "create value from waste" (II) (technological) amplifies the idea of using building waste, such as water, heat or organics, for rooftop and building-integrated urban farming.
3) The third technological archetype, "substitute with renewables and natural processes," proposes a reduction of heat island effects and improved air quality through green urban spaces.
4) An example of the social archetype "deliver functionality rather than ownership" with effects on the environment and human health is to provide access to clean unbottled water instead of bottled water.

[3] Naturvation project, funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 730243.

5) "Adopt a stewardship role" is another social archetype. Involving local residents in urban community farming helps educate them about the food chain.
6) The archetype "encourage sufficiency" could be valuable in a social context if local urban farming helps to combat poverty, foster social inclusion, and provide recreation and green space.
7) An organisational archetype is "repurpose for society/environment" with the potential value proposition of installing social enterprises that facilitate self-sustaining urban agricultural initiatives.
8) The last archetype, "develop scale-up solutions," is grouped as organisational and could work with the value of providing subsidies for green roofs to encourage private investments in green roofs.

In the context of NBS interventions, especially in the first phase, a business model concept is a potential planning tool to make clear what is the value proposition, what is important for finding investments, engage stakeholders and get a project started.

2 NBS MARKET, FINANCING AND POLICIES

In the following, we provide an overview of the NBS market, followed by an expert assessment of the market as a whole and also in the context of policy and regulation. Although the measured figures certainly have some inaccuracies, the following key figures are necessary in order to be able to set up long-term goals and planning horizons at all.

2.1 Market and financing overview

To limit global warming, halt biodiversity loss, stop land degradation, and achieve sustainable development goals, investments from the public and private sectors have to increase massively. The awareness of the need to act—for governments, private companies, and financial institutes—is rising, and the recognition that NBS plays a significant role in this is also increasing. However, the question that arises with a view to current numbers and data is:

How do we raise the missing capital for NBS, and can we manage this in the limited time available?

At this point, a brief overview of the current and needed investments in tackling climate goals and NBS The second edition of the "State of Finance for Nature" report calls directly for action on the cover of the report: "Time to act: Doubling investment by 2025 and eliminating nature-negative finance flows" (2). Yet, the estimated investments in NBS worldwide needed are USD 384 billion per year by 2025 and USD 484 billion per year by 2030. At the moment, investments in NBS—USD 154 billion per year—are less than half of the required amount. Of the current total investments in NBS, only 17% are financed by private capital (2).

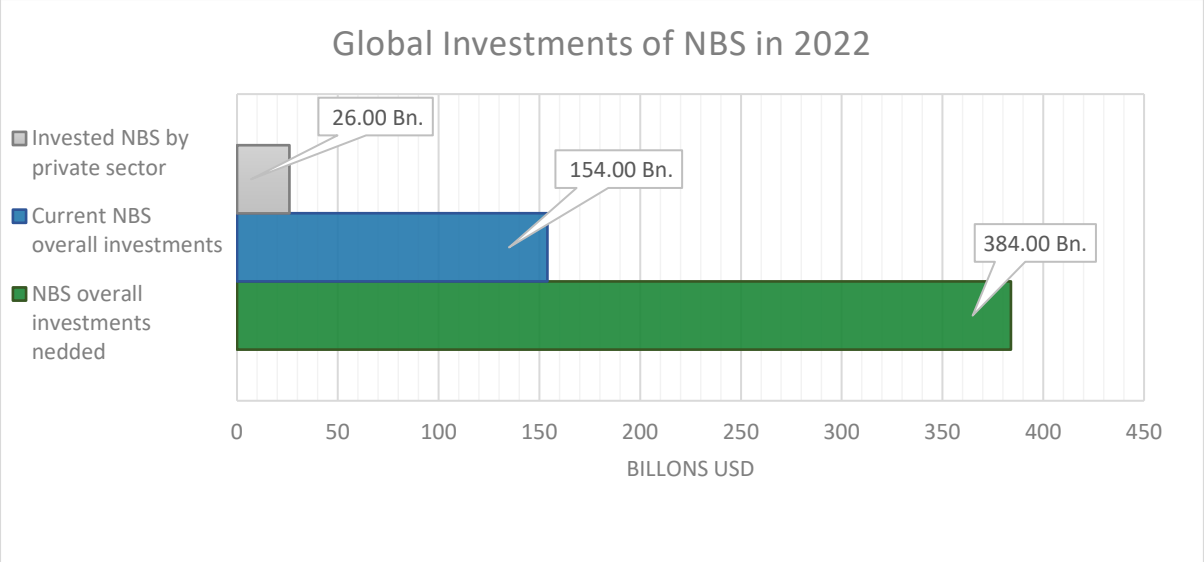


Figure 1 Global investments of NBS, own figure, data UNEP (2)

Total and private investment in NBS needs to increase in the coming years, especially with a different mind-set that focuses on nature-enhancing activities and the added value of NBS. Taxes, Subsidies and other incentives for private sector need to be adjusted to motivate companies and avoid business activities with a negative impact on nature and instead of this to invest in NBS. The current situation where negative cash flows from the public sector into the private sector are three to seven times higher than into the NBS needs to be reversed. One main issue in this context is that “the estimates are uncertain because capital flows into NBS are not tracked or reported consistently” (2). This important barrier is addressed later in this report.

An excellent expert report on the NBS market, case studies, NBS for a nature-positive economy, and recommendations is "The Vital Role of Nature-Based Solutions in a Nature-Positive Economy" (33), published by the European Commission. It is a reference guide for policymakers and practitioners. 170 stakeholders have been consulted for the report, and all 15 Horizon 2020 projects (also REGREEN), which are or have been members of the EC Taskforce on Nature-Based Economy, contributed. The table 3 below shows a typology of sectors for the economic activities of organisations delivering NBS.

Direct use of nature	
Sector	Sub-Sector
Ecosystem creation, restoration and management	Ecological & landscape restoration Ecosystem conservation and management Biodiversity conservation Reforestation Marine and freshwater Ecosystem restoration Marine and freshwater ecosystem conservation and management
NBS for green buildings	Living green roofs and facades Living green wall indoor Living green walls outdoor
NBS for public and urban spaces	Green areas, parks and gardens Green infrastructure Green space management Urban forestry Urban regeneration projects
NBS for water management and treatment	Natural flood & surface water management Urban green and blue infrastructure Urban water management Wastewater management
Sustainable agriculture & food production	Agroforestry Beekeeping Horticulture Plant and soil improvement Regenerative farming
Sustainable forestry and biomaterials	Sustainable forestry Biomaterials for construction Biomaterials for food preservation
Sustainable tourism and health & wellbeing	NBS for health & wellbeing Agritourism Eco-tourism and nature-based tourism Forestry tourism
Indirect use of nature	
Advisory services	Biodiversity and ecosystems Urban greening design & planning Landscape architecture Water management Community engagement for NBS
Education, research & innovation activities	Ecological research Environmental awareness education Research & innovation projects Vocational & skills training
Financial services	Carbon offsetting Investment for biodiversity and conservation Natural capital accounting
Smart technology, monitoring and assessment of NBS	Smart technology solutions for NBS Environmental monitoring Spatial tools for environment

Table 1 Typology of sectors working with NBS, Source: Kooljman et al. (6)

Experts assessment of the market and financing

Here we provide insights from expert interviews regarding overall investments, the role of private sector, and Chinese market specifics.

Overall Investments

More market thinking should be adopted when it comes to NBS. The investments from the private sector are far too low, but this is not surprising, as an expert has noted. Also, an increase to at least one third or a minimum of 50 billion USD a year, which means to double the actual private investments in NBS, seems reasonable and reachable. This is an estimation by experts, but it seems realistic with regard to "the relative novelty of investing in natural capital and suggests that the investment case, i.e., the return to the investor relative to the level of risk, needs to be stronger" (2).

It is also a question of how to define NBS: if you take NBS investment only into account when it targets climate change, it is reduced compared to also taking other reasons into account. There is investment in nature that is not targeted primarily to solve something but eventually does. Furthermore, the amount of investment also depends on the country's tax system and policies. Financing NBS can also be provided indirectly, through taxes. For example, if companies are charged for not doing anything with their green space, these special taxes could be used for NBS in the city.

In terms of overall investments in NBS, China faces similar challenges to those in Europe:

There needs to be higher investment, but it also has to be clarified what costs NBS will cause compared to the benefits it brings. This aspect has been identified as a main barrier to NBS investments in this report (see section 4). Comparable to the situation of many countries in Europe, the main investor in NBS projects in China is also the state. The same question arises: How can a larger financial share be transferred from public to private sector? In addition, it has to be mentioned that China has completely new planned and built cities, and regional differences are huge. Those new cities have a lot more of environmentally friendly thoughts incorporated – an exceptional project of a new city that is still in the planning stage ,is Forest City Liuzhou, a futuristic city almost completely covered by plants. More than in Europe, NBS are rather regarded as something of public concern. In China, NBS are seen as something connected to public or shared space, than an investment, which can also be made by private companies, according to the experiences of our China expert.

Increase private sector involvement

It should be a duty to be concerned about nature as a company. Urban areas are, to a large extent, in private hands (e.g. large housing companies). Therefore, investments also have to be made on a larger scale by private parties and NBS on private property. Furthermore, it is a question of the companies' image, or CSR. Compactly, CSR is defined as "a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders" (34). Companies should develop an environmental conscience. If companies invest in NBS, they also improve their image because of the Co-benefits of NBS, but they also fulfil their social responsibilities. Local or regional anchoring of a company may also play a role in this context. Our Croatian expert reported that, especially for small companies, commitment to the region could be a reason to spend more money on social concerns.

Following the experience of an expert, working with NBS is a challenge for new companies or start-ups. According to him, it can be hard to run a business, and small companies often do not achieve a big impact compared to the efforts they make. A possible way for such small, project-oriented

enterprises is to evaluate and prove their work, and then replicate or scale up. Another option is to make a distinction between whether a company solves its own problems (and has its own benefits) or wants to solve problems that go beyond their businesses (and has other beneficiaries too). If companies invest to tackle their own climate change-related struggles (for example, green facades to reduce heat in a building), the public does not necessarily know about it. This knowledge gap has to be overcome.

Another recommendation by experts is to improve and increase communication on positive aspects of NBS. Companies need to understand the benefits of NBS. Pointing out the advantages of NBS is an important decision criteria for larger investments by private sector companies. For this purpose, a matrix or cost-benefit analysis offers a basis for corporate decision making connected to NBS. A monetary valuation of NBS is helpful and necessary to a certain extent. However, due to the multiple benefits, it can never express the overall environmental and social value of NBS. So far, there are no clear calculations in the monetary category, and it can be doubted whether this will occur.

How to demonstrate the opportunities NBS could offer to the private sector?

There is a need to differentiate between external financial managers, or asset investors, and the investments of companies. It also has to be made clear for investors which projects are seen as 100% sustainable investments. If there is a clear understanding of what a green investment is and what it is not, several possible instruments providing incentives for enterprises are possible. For example, investments could be paid back indirectly by reduced taxes, connection fees, or other public charges.

Furthermore, companies need to be aware that NBS can solve problems for them. An investment in NBS is a possible chance to fight their own climate change-related struggles. But investments still have to guarantee some kind of return on investment. Here we meet one of the main barriers to investing in NBS: valuation and accounting of the multiple benefits of NBS, which are going to be dealt with separately in this report in section 4.

China

In China, too, the emphasis on the benefits is a means to encourage the private sector.

If NBS really improved the quality of life, people might be willing to contribute. An improvement in property values through NBS could attract more private capital. Our experts report that big Chinese companies have set up a fund for CSR strategies, and a part of this money goes to NBS projects. Like in Europe, also in China, sustainability becomes increasingly a question of a positive brand image for companies to be market competitive, and companies have to take steps in this direction. Overall, the private sector is less important in China. In urban planning and development, there is also rising demand for private investors, but the government is of higher relevance and power compared to Europe.

2.2 Policies and regulations

According to experts, the most effective approach to increasing investments in NBS lies in rules, programs, and guidelines at the EU or national political level. With the Green Deal and circularity as core topics of EU policymaking, the EU is creating new transformational pathways to a sustainable future. These drivers are also very important for the implementation of NBS. Fostering sustainable investment and thus development, one of the most important vehicles is the EU taxonomy. However, it is not the purpose to establish some kind of sanction system. The overall intention is to create a framework to improve the interaction between the private and public sectors to facilitate and promote bottom-up activities.

"The EU taxonomy is a cornerstone of the EU's sustainable finance framework and an important market transparency tool that helps direct investments to the economic activities most needed for the transition" (35).

New EU Legislatives like the EU-Taxonomy and Corporate Sustainability Reporting Directive (CSRD) are seen as aspects with a possibly huge impact on the private NBS sector. As they are strengthening the climate responsibility and sustainable behaviour of EU-based companies.

As defined by the EU, the taxonomy is a "transparency tool based on a classification system translating the EU's climate and environmental objectives into criteria for specific economic activities for private investment purposes" (36). Setting the technical evaluation criteria, the taxonomy determines to what extent economic activities within the EU entail significant impacts on the EU environment and climate objectives, as well as determining that an essential contribution to climate protection or adaptation to climate change shall be made. It specifies six climate and environmental objectives (37):

1. Climate change mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine resources
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems

Contributing to most of those objectives, NBS might gain more importance for companies in the near future. While the taxonomy is already being realised but targeting only major companies in the financial and industrial sectors, the Corporate Sustainability Reporting Directive (CSRD) defined by the Environmental Sustainability Standards (ESRS) will create even more attention to the topic in the next few years, as it will stepwise also target medium and small-sized enterprises.

By defining binding reporting standards at EU level for the first time in Europe, the CSRD aims to close existing gaps in reporting requirements and expand sustainability reporting overall. Companies will be required to report on the influence of their own company regarding the same issues as in the taxonomy specified in ESRS 1+2 and also concerning supply chains and social aspects. The reporting requirements will take effect between 2024 and 2028, depending on the size of the concerned company.

Experts' assessment of policies and regulations

All experts emphasised that policies need to drive action. In international comparison, the policymaking in Europe is going well. It is necessary to evaluate tax systems and regulations on different levels (EU, national, and local) without neglecting the connection between the levels.

At EU-level, regulations for green investments, green bonds, and green washing are located. Banks, financial institutes, and other financially strong companies, on the one hand, have to have clear advantages when investing in NBS; on the other hand transparency has to be granted on all stages. But the EU also has to provide a framework that gives freedom of action and choice to national and local levels without loosening mandatory standards. Furthermore, in regulations, there is a need to differentiate between investors and the investments of companies. The EU taxonomy, described above, is the most important piece of regulation because it defines what is legitimately sustainable in the economy. NBS has to be integrated into the EU taxonomy. If NBS is included, it guarantees that investing in NBS is a sustainable Investment. In addition, the CSRD has a positive impact, especially for corporations and larger enterprises to keep up a high ambition level. This could help boost

investments because it makes the subject relevant to the financial sector and puts market pressure on companies that ignore sustainability aspects.

The EU taxonomy and CSRD are part of the EU "Sustainable Finance Framework". It also includes the "Sustainable Finance Disclosure Regulation" (SFDR) and the "Corporate Sustainability Due Diligence" (CSDD). These directives and regulations are key to defining standards for businesses to act sustainably. They are very important because they drive further accountability and transparency. Transparency is a major issue because it also brings comparability to the market. A gap that is not covered by CSRD affects smaller companies for whom it doesn't apply. For them, there should also be an obligation to provide evidence of sustainable behaviour.

At national level, the approach 'encourage rather than punish' is to recommend. Companies, as well as municipalities, investing more in NBS than others should have advantages in form of lower taxes or other financial vehicles. This is preferable to charges and penalties. Furthermore, NBS have to make it into the accounting of enterprises, then it becomes relevant for their value creation. Another approach is to separate the benefits and show, who are the beneficiaries of NBS interventions. This would to share responsibility, but leading to the challenge of valuation and accounting which will be discussed in section 4.

Political support is very important on all levels to move NBS forward and also to have a positive connection between the topics of climate resilience, sustainability, and climate change adaptation. It is also necessary to improve and increase communication on positive aspects and to point out the advantages of NBS, which is an important point for larger investments by the private sector. In this context, it would be helpful if cities had communication strategies with companies and a portfolio of successful projects to convince them to contribute to or invest in NBS. Overall, the communication between public and private has to be continuous and reliable because there is no clear dividing line: private investments will also have social benefit, and vice versa.

China

In China, the different levels of government do not always have the same interests. Especially on local levels, there is strong local interest, and local politicians always question what benefit such projects would generate. The general awareness at the city level of administration is not that high. The need for sharing experience and argumentation for the value of NBS is high. The understanding of NBS and visions regarding their role in urban areas are somehow different than in Europe. NBS is seen positively when it is part of economic development. In that sense, the Chinese way can be summarized as 'balance over compromise'. This means a green area offers social and environmental benefits but also allows income generation within this area, which enables private sector involvement but is controlled and regulated by state law.

The EU-Taxonomy is a role model for China in building up a nationwide framework. The Chinese state is at an earlier stage, but similar mechanisms have been developed or are in development: Guidelines for financial services, as well as specific standards and guidelines for green bonds and green loans (all developed by the People's Bank of China). A CSRD is upcoming but still in an early phase. Green finance is a big topic globally. China is at the top of global investments in green finance. There is no clear global standard definition of what green investments are. The understanding and definition of what constitutes a green investment might be a bit different in China, but there is a lot of budget available for projects supporting environmental projects. The Chinese market for green bonds is still relatively young. By international comparison, the Chinese green bond standards are less green than others. However, there is a strong dynamics in this market, and the development is not over yet.

Excursus on Green Bonds

Green bonds are seen as one of the financial instruments that play an essential role in financing the green transformation. A bond, in finance, is a loan contract issued by a borrower, who wants to acquire money, and lenders, or bondholders. The borrower can be a local, state, or national government, as well as private corporations, and there are some obligations associated with the issuance of bonds: paying interest on the debts (mostly twice a year), paying back the debts according to a predefined schedule, and the complete value of the bond at maturity. Bonds are rated on the basis of the creditworthiness of governments, municipalities, or corporations (e.g., Standard & Poor's or Moody's Investors Service), and in general, they run from AAA to D. While bonds with a rating below BBB are considered "junk", offering higher interest rates but also a higher risk of default, bonds with better ratings are seen as solid and safe investments (38).

Green bonds are designed to support sustainable development by financing environmentally friendly projects. They are seen as a powerful financial instrument to achieve sustainable development goals and, overall, to raise capital for necessary investments in climate adaptation and for changes in business practices with respect to reduced CO_2 emissions (39).

The relevance of green bonds is constantly increasing since the first green bond, named the Climate Awareness Bond, was issued in 2007 by the European Investment Bank (EIB) (39). In 2008, the World Bank first issued green bonds labelled this way. Since then, the volume of the market has grown from USD 1.5 billion in 2007 to USD 582.4 billion in 2021. Due to difficult global market conditions, the size of the market decreased to USD 487.1 billion in 2022. In 2022, the largest Green Bond came from the European Union with a volume of USD 6.5 billion. The Use of Proceed (UoP) specifies for which fields the bond is to be used to finance. A closer look at these uses shows why green bonds play an important role in financing NBS: (1) Research and innovation activities supporting the green transition; (2) Digital technologies supporting the green transition; (3) Energy efficiency; (4) Clean energy and networks; (5) Climate change adaptation; (6) Water and waste management; (7) Clean transport and infrastructure; (8) Nature protection, rehabilitation, and biodiversity; (9) Other enabling. The countries leading the global green bond market are China (USD 85.4 billion), the USA (USD 64.4 billion), and Germany (USD 61.2 billion) (40).

Several frameworks define green bonds. There are many national and regional regulatories, and in a global context, The Green Bond Principles (GBP) and a certification of The Climate Bonds Initiative (CBI) are of particular significance. The GBP are voluntary guidelines for the issuance of green bonds, published by the International Capital Markets Association (ICMA). The principles, in short, are: use of funds, selection and evaluation of projects, fund management, and reporting (41). There has to be a clear environmental benefit to the project; the categories of relevant projects are similar to the UoPs in the paragraph mentioned above.

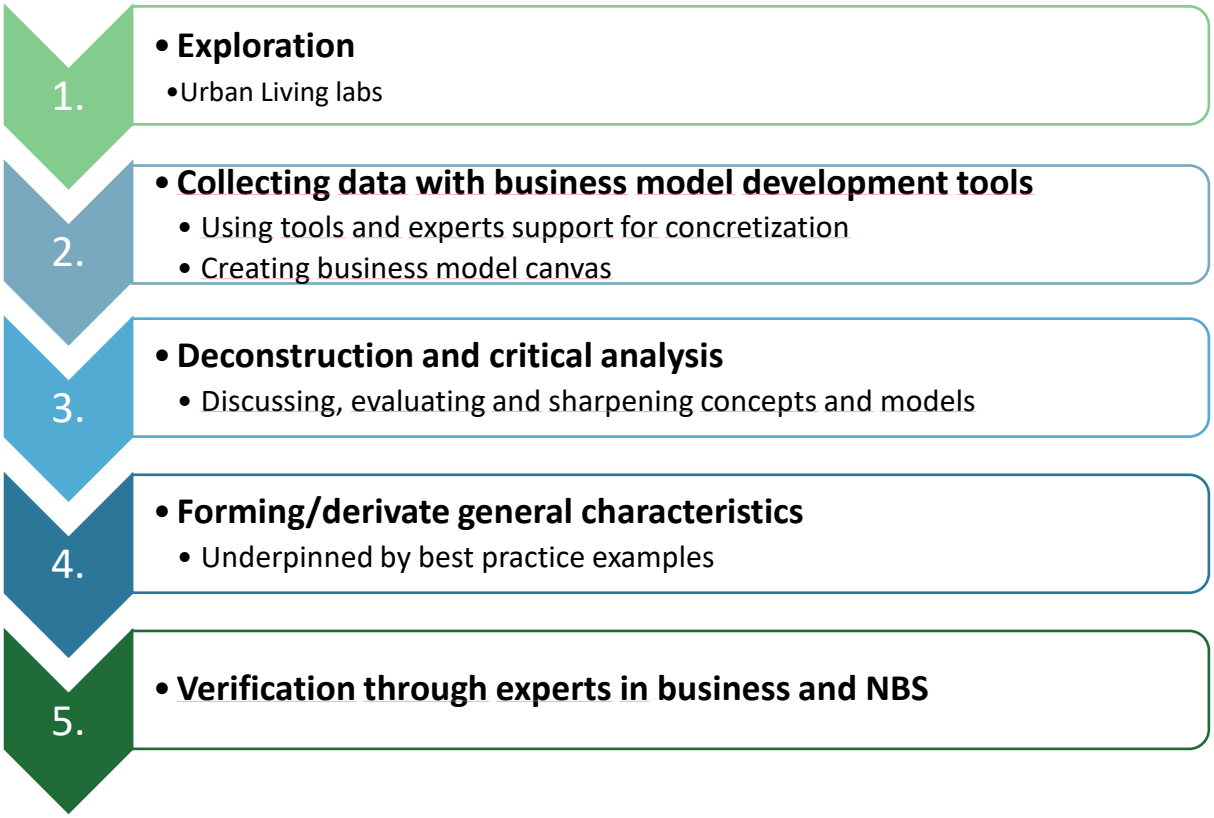
The Climate Bonds Initiative (CBI) is an international organisation promoting investments in projects and assets for green transformation and a climate-resilient economy. It is investor-focused and not-for-profit-oriented. With the Climate Bond Taxonomy and a standard for climate bond certification, CBI offers safety in planning and evaluation, which is very important because green washing is always an issue when it comes to green bonds.

As part of the European Green Deal and in accordance with the EU Taxonomy, the European Parliament has agreed on new green bond standards (42). This should help public and private entities raise funds on the capital markets to finance their green projects. The objectives are better

assessment and comparability of sustainable investments, as well as an increase in trust. It is also intended to make green washing more difficult.

3 REGREEN SUSTAINABLE BUSINESS MODEL DEVELOPMENT

The research process of developing business models and their overall economic embedding in the REGREEN project can be described as an iterative process with a focus on keeping the balance between theoretical inputs and practical experiences. This section can be read as a description of our approach and how we proceed in this report, as well as possible steps for imitation in the development of a NBS business model in the first phase of development. The research process is summarised here in five steps.



Step One: Exploration

In REGREEN, Urban Living Labs (ULLs) are central partners in the project. There are three European ULLs (Aarhus, Paris Region, and Velika Gorica) and three Chinese ULLs (Beijing, Shanghai, and Ningbo), which differ in size, location, climate, and socio-economics. Due to the importance of a holistic approach in the development of NBS business models, the starting phase focused on exchange via online meetings with project partners and discussions, as well as informal talks during pin-person meetings. As is known, for NBS interventions and business governance, broad stakeholders and financing are key aspects. Therefore, at this stage, it is important to find concrete business cases to work with. At this moment, existing models were discussed with caution to make a clear distinction between them. Parallel desk research has been conducted in three strands:

1. Collecting information on business models, sustainable business models, and business innovation.
2. General research to get the relevant definitions and information on NBS with a view on business, governance, and financial content.
3. Focusing on tools and guidance regarding NBS and business.

Step Two: Collect data with business model development tools

After "Step One", which aims to lay the theoretical foundation and brings together a small group of people for a first exchange on potential directions or starting points for business models, for the formulation of first ideas, the knowledge of experts has been shown to be useful. Another option are contact points that can provide inspiration and support. Innovative tools have been developed in H2020 projects on NBS for this stage.

In our case, we started working with the business model canvas. Based on the original Canvas by Osterwalder et al. (18), we prepared a template with guidelines on how to use it, and our partners in European ULLs filled it out, and afterwards the content was discussed.

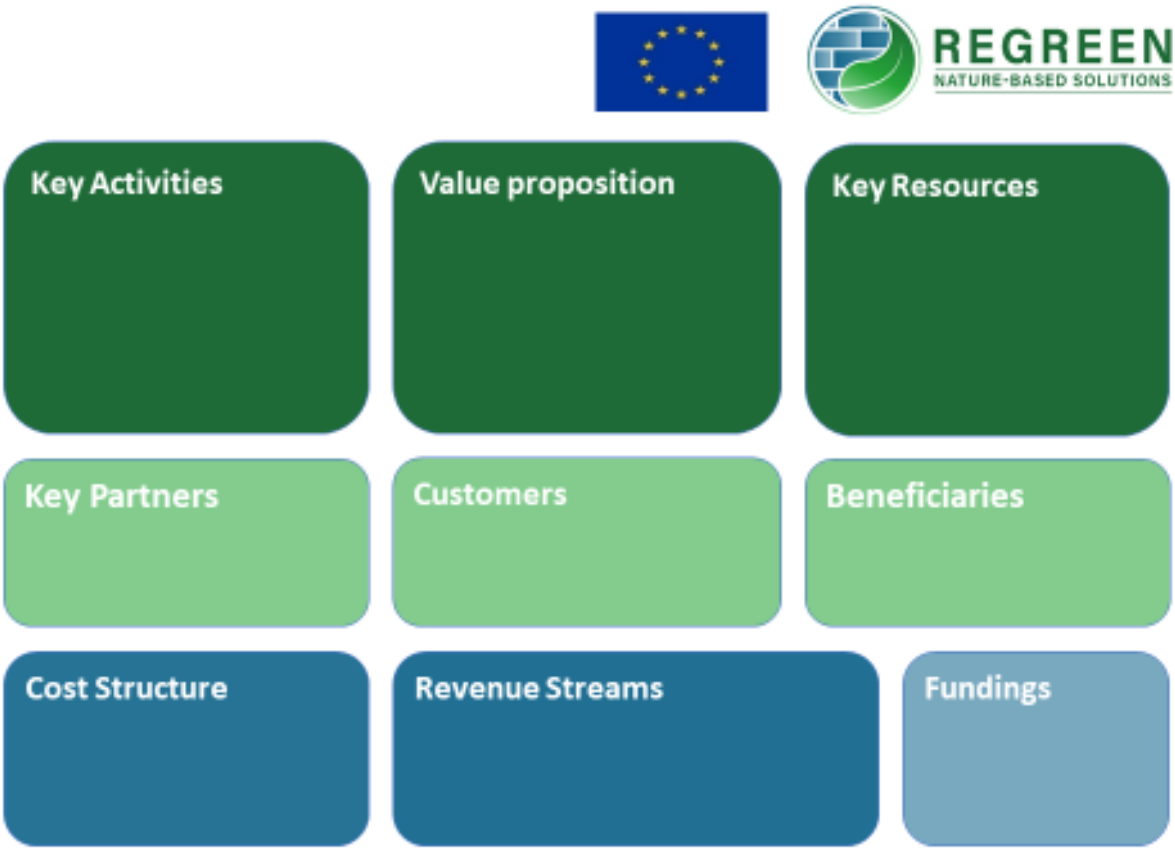


Figure 2 Business Model Canvas - based on Business Model Canvas by Osterwalder et al. (19)

However categories are named, the key is to have a common understanding of the categories to capture and evaluate the proposed value of the business model—what is achieved by a clear description—and to have a first assessment of the initial idea.

Another useful tool for the first development phase of NBEs is the business model puzzle, developed in the EU Horizon 2020 project *Naturvation*. The business model puzzle captures, in a slightly different way, the same categories as in the business model canvas, but with a special focus on the different stakeholders. That's why it can be seen as a dialogue tool for the implementation of urban NBS, aiming towards healthy and lively communication between different stakeholders, which was identified as a critical point by our interviewed experts.

The Nature Solutions Platform is a stand-alone webpage of the REGREEN project for sharing insights, knowledge, and experience on NBS with SMEs, NGOs, cities, schools, and other interested communities. The page can be a first point of contact or for research in the initial phase of NBS business model development. Next to a section for "Fund and Share" projects, an online decision support tool (DST) offers help for decision-making. The DST is filled with output from REGREEN activities and gives advice on planning and management, co-benefit optimisation of NBS, and building business models.

Step Three: Deconstruction and critical analysis: sharpening concepts and models

In this stage, the created content from step two (nine categories of business model canvas and the connected contents) has been critically evaluated, discussed, and sharpened. Since we have two models in the early stages (commercially driven consultancy and citizen-driven model), financial aspects on cost structure, revenue streams, and funding could be answered only superficially (see financing in section 5). Detailed information on financing is confidential for the public-private model. Our approach and the steps described are intended for the first phase of developing business models. If the aim is to achieve market maturity, cost-benefit calculations, possible fundings, revenues, and costs must be worked out separately and in detail, along with risk assessments.

We concentrated on the following questions:

- How is the value created and delivered, and to whom?
- Who are potential partners and customers? Who are the beneficiaries of extra NBS benefits?

Step four: Forming/derivate general characteristics underpinned by best practices

In order to gain general insights from the case-specific information, a market and best practice analysis is the best way to go. Therefore, other European Horizon 2020 projects under the same call have been a sufficient source.

In REGREEN, 13 factsheets with NBS-applied case studies have been worked out with a stringent procedure and categories: addressed SDGs, objectives, descriptions, challenges, opportunities, lessons learned, inspiration for others, and further information.

Other platforms with many case studies from all over the world, which we also used in our research, and with a comparable structure:

- *Network Nature*[4] Case Study Finder includes 560 cases: https://networknature.eu/network-nature-case-study-finder.
- The Urban Nature Atlas has over 1000 NBS examples from Europe and beyond, and it is an output of the EU H2020 project *Naturvation*: Urban Nature Atlas (una.city).

Step five: Verification through experts in business and NBS

The results available up to this point were the subject of discussions in-house, in Work Package 8, and in REGREEN project meetings.

[4] Network Nature project, funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 887396.

For our purpose, we have chosen interview partners who are able to help us with their knowledge and experience in a general evaluation of the market as well as in concrete business model approaches. Our experts were from:

- REGREEN partner Zelena Energetska Zadruga" (ZEZ), a green energy cooperative from Croatia;
- 'Fresh Thoughts Consulting', a private consulting company at the interface between science and policies, based in Vienna;
- 'Greenpass', a private climate-tech company with expertise in climate resilience and software development.

The participants for the group discussion were REGREEN colleagues Richard Hardiman (Hebrew University of Jerusalem), Yao-Yang Xu (Institute of Urban Environment, Chinese Academy of Sciences), and Hew Slater (Client Earth, China).

4 MAIN BARRIERS FOR FINANCING NBS AND HOW TO OVERCOME

In the next few years, increasing investments from the public and private sectors will be key to reaching an adequate level of climate adaptation and mitigation, especially in urban regions. Strategies for mobilising finance for urban NBS need the joint effort and coordination of governments, private and public organisations and firms, and the general public.

From literature and discussions in REGREEN, we extracted two general barriers to financing NBS:

1. Coordination of private and public investors, and
2. Valuation and accounting for benefits of urban NBS

For our expert interviews, we prepared a Google Jamboard with different statements (based on (32)) to overcome these obstacles. The interlocutors were asked to sort these cards according to their priority, from low to high.

The cards for "How to overcome the barrier 'coordination of private and public investors'?" included:

- Adjust tax rates per geographical location
- Capture increases in land values through lease charges and connection fees
- A public-private investment strategy is needed for investments in NBS projects at the city level
- A diverse group of partners and financiers supported by state money
- Balance costs and benefits between the public, businesses, and citizens
- Starting an NBS intervention with a demo or pilot phase
- Alternative financing schemes, like Crowdfunding
- Social/environmental impact bond schemes (to shift the risks of reaching climate goals from the public to the private sector / investor)

The cards for „How to overcome the barrier of valuation and accounting for the benefits of urban NBS" included:

- Identifying costs and benefits, resulting in a net present value.
- Including factors like quality of life and job creation.
- Natural capital, ecosystem services, and ecological footprint base accounting.

- NBS are not traditional assets; they should be treated as infinite.
- Accounting for the value of ecosystems at the national and firm level.
- Better integration of new information technologies for better data.
- How you communicate the results can make all the difference in NBS uptake (continuously).

Main Barriers	Solutions							
Coordination of private and public investors	Adjust tax rates per geographical location	Capture increases in land values through leas charges and connection fees	Public/private investment strategy needed for investments in NBS G6projects on city level	A diverse group of partners and financiers supported by state money	Balance costs and benefits between public, businesses and citizens	Starting a NbS - intervention with a demo or pilot phase	Alternative financing schemes, like Crowdfunding	Social/environmental impact bond schemes (to shift risks of reaching climate goals from public to private)
Validate and account the multiple benefits of NBS	Identifying costs and benefits, resulting in a net present value	Include factors, like quality of life and job creation	Natural capital, ecosystem services and ecological foodprint base accounting	NbS are no traditional assets, they should be treated as infinite	Accounting the value of ecosystems at national and firm level	Better integration of new information technologies for better data	How you communicate the results can make all the difference of NBS uptake (continuously)	

Table 2 Main barriers for financing NBS, from dark-green = highly rated to grey = low rated

There is no clear majority among experts on which actions or regulations are most helpful to overcome the issue of coordination between private and public investors. However, there are tendencies from which two insights can be derived:

1. When starting an NBS project, it is crucial to form a diverse group of partners and financiers and to have a balanced group of stakeholders: private and public, science and business, professional experts, and (local) laypeople. A coordinator can be the first point of contact for technical questions, monitor schedules and work plans, and also act as a mediator between parties if any problems arise. Depending on the funding system, these groups can be supported by state or city money (especially in the initial phase) when organisational and quality standards of the NBS projects are met. In this context, public structures have to be more agile. You will need a prioritised working group through all the city departments that acts agilely and has the job of coordinating, communicating, and organising. A reliable method to gain data and experience is through demos or pilot phases to start an NBS project. Our experts evaluated this controversial method as a good way to achieve the mentioned purpose when there is a lack of information, but with the limitation that it will not solve the overall coordination problem.
2. Not completely separated from the first point, but with a different emphasis, are investment plans, which include all funding opportunities and long-term benefits. Working investment strategies and business models for urban NBS interventions are still underdeveloped. It has to be a joint effort for the public and private sectors, as well as scientists who collect and prepare data, to advance this issue. Here, ‘think global and act local’, can be interpreted in this way: Collect information on financing, the early stages of projects, and finance-related experiences made in NBS projects all over the world, and use comparable experiences for your purpose. But if you are making an investment strategy for your city, be aware that the planned NBS project is authentic and has a local reference, ideally with historical or cultural importance.

This is not only supportive for communicating the project but also for activating and bringing together the local public and private players.

The expert's favourite statements to overcome the second barrier of valuation and accounting show clearer directions:

1. An accounting system has to be established based on natural capital, ecosystem services, or ecological footprint. The essence is to bring renewable and non-renewable resources into accounting; only then can the use of nature be organised in such a way that wasting resources becomes less attractive (and profitable) and the careful use of ecosystem services is rewarded. The natural capital approach (see section 1.1.3) is a promising strategy to bring less visible ecosystem services into accounting, as well as social and cultural values, with respect to long-term benefits to people, such as health and well-being resulting from functioning ecosystems. An accounting system that captures ecosystem services this way should function at the national, city, or firm level. This would offer planning and decision-making certainty for political or private sector actors.
2. Our experts also rated the statement "identifying costs and benefits, resulting in a net present value" highly. It is one of the main challenges in financing NBS to evaluate the multiple benefits of NBS and define a standardised procedure for evaluation. In business model development, a viable path is to distinguish between environmental, societal, economic, and other benefits. An often neglected aspect is maintenance and service costs. The complex interplay of multiple benefits and a realistic longer-term cost estimate are the first challenges for which research still has to be done. The second one, which builds on this, is to express these indicators in terms of a net present value. In this direction, there is certainly a long way to go.

For China, the previously mentioned barriers apply in a similar way, with varying emphasis. However, two peculiarities can be observed:

1. Understanding of NBS and visions regarding their role in urban areas are somehow different than in Europe. NBS are seen positively when they are part of economic development.
2. Aspects of governance are hurdles for more investments in NBS. Government employees sometimes tend to be quite resistant to change. If projects can get labels attached to their projects, then they are much more likely to get support from the government, which also helps them find financiers.

5 REGREEN BUSINESS MODELS APPROACHES

The REGREEN business models described below do not contain data on costs and revenues. Although they have been partly collected with business model canvas, these are sensitive data and should be treated as confidential.

The cases are based on actual business models with which our partners in the ULLs have gained experience. The models were further developed with the help of a business model canvas and in discussions. It is important to say that the boundaries between the models are fluid, and there are hybrid models that are possible.

5.1 Public-private driven model

The basis for the first model is a large tree planting project that has been running for several years throughout Denmark. It is a clear partnership between public and private parties, giving different options for how private parties can participate.

Outline of the REGREEN business model case

The purpose of Growing Trees Network is afforestation on land owned by municipalities, churches, the Danish Nature Agency or private people in Denmark and abroad to secure ground water, climate protection, and CO_2 reduction, and furthermore:

- Afforestation on land owned by companies, organisations, and private individuals with public access and where future maintenance is secured in an agreement with the project owner.
- Afforestation on municipality and state-owned land to make Denmark greener.
- To provide financial support for municipalities and the state buying land on top of groundwater reservoirs for fast protection.
- Afforestation in tropic and sub-tropical countries through projects run by us or in conjunction with other tree-planting NGOs.

Value proposition

- Private companies support a specific afforestation project, maybe in their local area, as part of their Corporate Social Responsibility (CSR) without offsetting CO_2.
- Or private companies are offered a way to offset their CO_2-emissions through afforestation projects. In both cases, the areas are publicly accessible.

Key Activities

- Cooperation with, e.g., municipalities or Danish Nature Agency around afforestation projects.
- Fitting customers with the right afforestation project.
- Telling the story.
- Dialogue with potential customers.

Key Resources

- Knowledge on offsetting CO_2
- Networking-skills
- Accounting
- Good at telling the story of Growing Trees Network and their value proposition
- Knowledge on afforestation

Key Partners

- Municipalities/Danish Nature Agency
- Partners with knowledge on CO_2-offsetting
- Wholesaler of trees

Customers

- Private companies, with a green profile/need for CO_2-off-setting
- Individuals, direct and personal relations.

Beneficiaries

- Local residents (recreational, health, engagement in small nature elements in the forest, rising house prices)
- Municipality (securing groundwater, enhancing biodiversity, providing recreational value for citizens, reducing health costs)

Financing

The land is provided by municipalities, churches, the Danish Nature Agency, or private individuals. Companies pay a fixed price per tree. How many companies buy depends on their self-chosen donation model, e.g., plant one tree per product sold, per employee, or reduce one's carbon footprint. The income goes to 80% to the project owner, and 20% stays in the "Growing Trees Network. Included are the preparation of the land, purchase of plants, planting of the trees, two years of maintenance, and guaranteeing the replacement of trees.

A strength of the model is the transparency it offers regarding the price per tree, how money is spent, and what is included. But this can also become a disadvantage: Increasing prices for the trees, higher maintenance costs, or other unexpected price increases (e.g., due to inflation) must be sufficiently taken into account for a one-time payment. Two solutions are possible: Higher prices per tree to cover unforeseen expenditures or a longer-term involvement of the private partners with a still-needed design concept.

Characteristics

- It brings together private and public interests. There is a sharing of responsibility and risks for NBS in financing, implementation, and maintenance. The function of the private party may vary in scope and involve different fields of activities, such as design, build or rehabilitate, finance, maintain, or operate.
- Due to the diversity of the parties, organisation, communication, and sharing of responsibility can be difficult. The organisation of a project can be challenging.
- Because of their different financial structures, it can be hard to coordinate the evaluation of public and private projects.
- For the private sector, there are higher financial resources available to implement larger projects or to reduce their own capital investment and thus reduce the risk.

Best practices

Zorrotzaurre, Bilbao (Spain)

Description

Zorrotzaurre is an excellent example of a public-private partnership on a larger scale. The aim of the project is to build a new flood-proof district in Bilbao. The affected area is 130.000 m^2. The plan is to convert a former industrial peninsula with high flood risk into a safe and green residential area with affordable rents. 50% of the land is reserved for social housing for a certain time, even if privately financed. The rest of the industry is environmentally friendly. Two-thirds of the area are nature spaces reserved for public use. There are also measures against flooding: Opening up a canal, elevating the ground level, construction of a flood protection wall, and three storm water tanks (43).

How they got started

A commission as a private organisation was founded, including private and public landowners. This management board maked the decisions. The whole redevelopment started in 2017 and will last for three decades. It is part of the city masterplan 2050, and the first step of flood protection is done (43).

Financing

The overall project is divided into single projects on a smaller or larger scale. These projects have different shareholdings and stakeholders, so the financing varies between city, province, state and private companies (43).

Urban Agroforestry, Montpellier (France)

Description

Montpellier is a city located in the mediterranean-subtropical area in the south of France. As a result of climate change, agriculture will increasingly face pressures caused by drought and heat waves. To prepare for the impact of climate change on regional agriculture, suitable adaptation measures are being tested in Montpellier. Alternatives to conventional monoculture, such as the cultivation of mixed crops and species as in agroforestry, are considered to be much more resilient to climate change. In Montpellier, this approach is to be implemented as part of the SAFE project (Silvoarable Agroforestry for Europe), which is funded by the EU's Common Agricultural Policy and implemented together with local stakeholders. In the case of Montpellier, a combination of walnut trees and wheat cultivation was chosen. It protects the environment and has an obvious benefit for the landscape. In addition, it ensures a better use of environmental resources and the diversification of agriculture. Farmers can secure and increase their incomes by offering different products. They are also less dependent on cultivation subsidies and are less vulnerable to fluctuations in crop prices. The advantage for nature protection is that soil and water quality can improve, while farmers benefit because the risk of damage from (wind) erosion and flood damage is limited (44) (45).

How they get started

The project started in 2014. Various stakeholders from France, the Netherlands, and Greece were involved in the SAFE project. In France, APCA (the national chamber of agriculture in France) was the

organiser for agroforestry projects. The project was implemented together with local stakeholders (44) (45).

Financing

The project was entirely founded by the EU SAFE project but is thought to create local profit (44).

Recommendations

In the early stages of a project, incentives that strengthen the financial basis encourage companies and people to join.

Planning and organisation of schemes and strategies need to be developed precisely prematurely to ensure long-term maintenance.

Working together effectively, building trust and understanding what the other partners want, may require a lot time. A facilitator, coordinator or expert can overcome this barrier and mediate between the interests of the different parties. If necessary, this person can be publicly funded to support the successful implementation of a project.

Also, if a project starts as a private-public model, management and maintenance can be secured in the long term via the private stakeholders, as the stakeholders have become aware of the value of the solution and benefit from it.

Public Private Partnerships pose the possibility of value creation in both private-financial and public-non monetary benefits. If private companies experience the profitable benefits caused, this can show the path for private investors to scale up their investments in NBS even without public investment.

5.2 Commercially driven consultancy model

The second model is a purely private business.

Outline of the REGREEN business model case

NatureX (fictional name) is a purpose-driven company that aims to increase biodiversity by creating wild gardens and proposing new nature management techniques.

NatureX assists municipalities, housing associations, and private companies in the transformation of their green spaces into NBS that focus on increased biodiversity and water management and help communicate the process and positive impact of increased nature quality. The company offers different services with different foci, depending on the expertise available in the company: changes in nature management, landscape design, dissemination and communication, workshops, and events.

Key activities

- Changes in nature management
  - Plan of maintenance
  - Cost analysis
  - Advisory on new machinery, tools, and other
  - Monitoring the biodiversity efforts
- Landscape design
  - Research and site analysis
  - Project management
  - Advisory on landscape design

- Dissemination and communication
  - Signs
  - Photos
  - Communication material
- Workshops and events
  - Workshops for residents and employees
  - Training workshops for gardeners
  - Public/private presentations
  - Events

Value proposition

- Increasing biodiversity by rewilding areas
- Cost-effective by relocating already allocated nature or green spaces nature
- Training programs for gardeners
- Accompanying and monitoring the transformation process

Key Resources

- Biologists
- Landscape architects
- Communicators
- Office inventory

Key partners

- Municipalities
- Housing associations
- Suppliers (trees, plants)
- Gardeners and construction workers
- Network of professionals (designer, programmer, adviser, marketer)

Customers

- Municipalities
- Housing associations
- Private companies (architecture companies and organisations with access to outdoor/green spaces)

Beneficiaries

- Environmental: The more space is renatured the better the environmental impact (heat reduction, biodiversity increase, water management facilitation, etc.).

- Social inclusion: The residents of social housing benefit from green spaces mentally, physically, and socially. Urban nature spaces can strengthen social connection, and there are also positive impacts on people's sense of quality of life.

- Economical: Budgets from existing nature management can be relocated, which makes transformations cost-effective.

- Others: More green spaces in socially vulnerable areas decrease criminal activity and give a higher sense of safety.

Financing

- Consultancy taxes or complete packages for housing associations
- Fees for public talks, workshops, and events.

Characteristics

- Knowledge-based consultancy, flexible with regard to individual possibilities and needs
- NBS as a niche or extension of the portfolio of an existing enterprise
- Financial value creation is needed in a sustainable and responsible way
- Innovative power due to market pressure

The above-mentioned activities are costly. Bigger companies have small consulting departments themselves. An independent consultancy would counteract greenwashing and act as a controlling authority.

Best practices

Ovilleo Wetland, Lille (France)

Description

In the context of renovation work, a French wastewater treatment company invested in the artificial creation of a natural wetland. More than 20,000 trees and other plants have been planted in an area of about 7 hectares (69,000 m^2). Also, an educational garden and a green roof and façade are included in the project, which is also why it has been supported by regional and national authorities (46) (47).

How they got started

The project has been led by Veolia Water Technologies (a big European infrastructure company). The project has been implemented according to the French national Biodiversity Strategy, the "Grenelle Environment" plan, and the National Sustainable Development Strategy, but also takes local policies into account (48).

“The Green House”, Antwerpen (Belguim)

Description

This greening project resulted in the first green wall to be built in the city of Antwerpen, Belguim. In 2016, a private real estate company decided to green the façade of a building near the centre of the city. The "greenhouse" in Antwerpen is part of a real estate company's future-oriented campaign consisting of three greenhouse projects located in Brussels, Mechelen, and Antwerpen (35) (36). About 50,000 plants were used for the office building, and the greening has been carried out by two companies specializing in NBS for the building sector. The plants are watered by a pump using harvested rainwater from an underground water tank (37) (52).

The solution is able to regulate temperatures and reduce air pollution. Thereby contributing to lowering the effects of urban heat islands, rainwater management, urban biodiversity, and urban air quality. Also, the energy consumption of the building and noise pollution can be reduced. Meanwhile, there is also an image effect for the company investing in a climate-friendly solution. The company

also argues that wellbeing is a core element of their NBS, creating a pleasant working environment in the office building (52) (53).

How they got started

The project was started and realized in 2016. It was a private investment made by a company, which got implemented by two NBS-specialized companies (49).

Financing

The project was not funded or supported by national or public utilities or the EU. It was a direct investment from a company that simply decided to apply NBS within the office building. The investment relates to the strategic market positioning of the investing real estate company as a future-oriented company focused on sustainability and wellbeing for their customers (52).

Recommendations

Publicly funded independent consultants encourage and support smaller companies on the way to installing NBS.

The network of professionals available to a consulting agency makes it easier to find the right partners and companies and can thus accelerate NBS projects. Their expertise also leads to efficient implementation.

A grant scheme organises a part of the consultancy market for NBS.

Support for (smaller) private enterprises: a contact point where questions regarding financing, loans, subsidies, grants, rights, and obligations are answered.

5.3 Citizen driven model

Outline of the REGREEN business model case

The third model differs fundamentally from the other two cases. It is not primarily aimed at companies but rather at local citizens. It is a bottom-up implementation of NBS by private entities. Nevertheless, municipalities or real estate companies are desirable, and in the longer term, at least partly, they are also necessary partners. A local community, neighbourhood initiative, or citizens want to improve an existing place or want to install an NBS or GI.

In this specific case, there is an existing grey place with a few shrubs and small trees in poor condition. It is an unpopular and shunned place by local citizens. Local citizens have the idea to redesign to have a healthier public place where children can also play in a natural environment. Citizens bring in knowledge and time, but would need to be accompanied by experts.

Citizens bring in manpower and helping hands for construction and maintenance in the first years. Then the city takes over, like for other parks.

Value proposition

- Increase social and environmental value by donating
- Increase value of property
- Fostering the social cohesion and exchange in the neighbourhood

Key Activities

- Creating a little park with a playground in the neighbourhood
- Campaigning for funding

Key Resources

- (In best case) the city provides the space to upgrade
- Crowdfunding platform

Key Partners

- City, municipality
- Community
- Landscape architecture

Customers

- Local citizens

Beneficiaries

- Citizens
- Municipality
- House owners
- Real estate companies

Financing

Raising funds for a project through the donation of small amounts from a large number of individuals. Crowdfunding is a way to do this. If there is an existing platform, this will be used. A new platform would require additional financial resources for building, maintaining, and promoting it.

Characteristics

- Bottom-up initiatives and local stakeholders
- Greater commitment due to personal involvement and co-creation with citizens
- Needs a group of like-minded people to bring in time, manpower, and knowledge
- Support needed: setup and maintenance of a platform, promotion, experts
- Different types of crowdfunding are possible: based on donation, reward, lending, or equity

Best practices

City of Gent (Belgium) – Crowdfunding platform for realizing climate-change adaptation through urban greening

Description

Gent is a city in Flanders, in the northeastern part of Belgium. Also, climate change is starting to have a negative impact on the city. Excessive heat waves and heat stress are problems for the city. Since greening the city can help reduce such heat stress, Ghent is very active in implementing green solutions (54). Alongside a lot of other greening initiatives, an urban crowdfunding platform has been developed by the city to allow citizens to propose and fund projects to green the city (55); (56). The platform has now enabled two projects to be successfully implemented: one promotes urban

agriculture, and the other realizes the greening of a street with edible plants. The crowdfunding platform has proven to be an effective tool for successively achieving larger effects with small individual climate adaptation projects (56).

How they have got started

The setup of the platform was initiated, financed, and implemented by the city itself. Projects that want to receive funding through the platform have to propose their ideas to the city and then get access. The project was originally meant to run from 2015 to 2019, but has been expanded and is still running with a lot of projects in the pipeline (56); (57).

Financing

During the first year (2015) of the Crowdfunding Gent platform, total revenues of EUR 70,000 were successfully raised. More than 3/4 of the total number of projects received enough funding for implementation. The city itself provided grants for two projects amounting to a total of EUR 1480. But the city also invested in the maintenance of the platform, which required both fixed and recurring costs. In addition, an internal project manager has been engaged in order to act as a central point of contact on behalf of the city. Although the possibility of additional public funding is offered, it does not seem to be an important motivator for project initiators to apply. Other benefits, such as the publicity generated by publishing the project on the platform, seem to be a more crucial factor in deciding whether or not to apply. In addition, organisations, such as companies, foundations, and associations, can make a direct deposit into the account of the project and thus claim the expenses for tax purposes (56).

The Garden Factory, Utrecht (Netherlands)

Description

The example is a community vegetable garden on the roof of the central station in the city centre of Utrecht. Today, citizens of the neighbourhood around the Central Station, students, an elementary school, and the garden designer are responsible for maintaining the garden factory and are supported by the city of Utrecht and the company from which the idea came. The project is meant to produce food in an urban environment, and due to the founders' targets, it will become the biggest project producing food on an urban roof. It is not only a space-saving production of organic food, helps manage storm water, and serves a biodiversity-increasing habitat, but also has social and educational value (58).

How they get started

The idea to create a rooftop garden originally came from employees of a nearby company. The project's activities are self-initiated and shared between different volunteer actors (59).

Financing

The project was financed by a crowdfunding initiative. Nonfinancial goods have been donated by volunteers (voluntary labour) and partly by the city (goods) (58).

Recommendations

Integrate local, cultural specifics or identity into the project so that people want to be a part of it and feel it is a project that belongs to them.

Construct a participation structure in collaboration with the people on site.

Support for (smaller) private enterprises: a contact point where questions regarding financing, loans, subsidies, grants, rights, and obligations are answered.

CONCLUSION

In the context of innovation aspects and impact development on the NBS market, this report shows pioneering structures, provides insights into regulations and framework conditions and offers incentives for new NBS business models. This is done from a special perspective, namely from a sustainable business model approach. Even though the perspective has a certain narrowness, it is a concrete tool that offers practical advantages in promoting NBS. In particular, and with a view to a more sustainable economy in the future, terms and ways of thinking commonly used in the business world meet NBS, which is necessary if we want to finance actions against the multiple negative consequences of global warming.

Here are the most important findings from the assessment of the NBS market and the framework conditions, as well as the approaches presented for concrete business models:

The NBS market is not sharply defined, and the transitions to traditional markets are fluid. Even though the figures given for necessary total investments are estimates, it is clear that the total amount has to increase anyway. This is especially true for the private sector. When it comes to NBEs, on the one hand, greater attention should be given to economic market rules, and on the other hand, thinking and structures are needed that expand the concept of capital and thus also find their way into the accounting of enterprises. The natural capital approach offers a way to take social and environmental factors into account appropriately. Although other forms, for example, on the basis of ecosystem services, are also conceivable. Such a fundamental change in thinking and understanding gives respect to non-monetary values as well, and is thus helpful to overcome one of the main barriers to investments in NBS.

To order to achieve these objectives, the most appropriate rules and measures are required. These must ensure that there is transparency, accountability, and clarity for entrepreneurs regarding what sustainable investments, including NBS, are. The European Green Deal, which finds its most decisive implementation in the EU taxonomy, is globally seen as the main driver for sustainable investments, as our experts also noted. Due to their multiple benefits, NBS are suitable for achieving several climate-related goals set by the EU. There are certainly still gaps in how regulations and directives can be tailored even more closely to NBS. In addition, the next big challenge will be to integrate the European requirements into national legislation.

The development of sustainable business models according to the proposed five steps is especially suitable for the early phase of business development. However, individually listed tools, such as the business model canvas, can also be used for the further development or reorganisation of existing businesses. The three elaborated business models are not sharply separated, and hybrid forms are conceivable. For a private-public model, it is a challenge that a diverse group of stakeholders have to be brought together and their different background knowledge and interests have to be taken into account. An experienced coordinator, early planning, and organisation are particularly important for this model. In addition, long-term maintenance should be ensured, and the costs for this should be calculated correctly in advance. A commercially driven consultancy model needs to specialise in a niche with a clear value proposition, like in our case "to increase biodiversity by creating wild gardens and proposing new nature management techniques". Otherwise, it will be difficult to have the necessary staff with sufficient professional expertise, and if the quality does not match, it will be hard to survive on the market. However, such a model also offers more flexibility to react appropriately to changing market conditions. The third citizen-driven model is fundamentally different from the first two. Here, it is usually the case that there is already an association of people, like a neighbourhood initiative, who wants to carry out an NBS intervention together. The problem here is that the basis is

voluntary, but at least for a certain period of time, the participants have to make commitments. This should already be sufficiently taken into account in the planning so that a small park, for example, is also maintained.

In summary, it can be said that in the development of innovative business models in the field of NBS, there are still many opportunities, for new models, for the improvement and reorientation of existing business activities.

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ANNEX

Author/s	Definition: A business model is…
Timmers, 1998 (46)	… ”an architecture of the product, service and information flows, including a description of the various business actors and their roles” (p. 4).
Chesbrough and Rosenbloom, 2002 (47)	...“the heuristic logic that connects technical potential with the realization of economic value” (p. 529).
Magretta, 2002 (48)	Business models “are stories – stories that explain how enterprises work” (p. 87).
Richardson, 2008 (49)	…”a conceptual framework that helps to link the firm`s strategy, or theory of how to compete, to its activities, or execution of the strategy” (p. 138).
Doganova and Eyquem-Renault, 2009 (50)	...“a narrative and calculative device that allows entrepreneurs to explore a market and plays a performative role by contributing to the construction of the techno-economic network of an innovation” (p. 1559).
Casadesus-Masanell and Ricart, 2010 (51)	…“a reflection of the firm's realized strategy” (p. 195).
Osterwalder and Pigneur, 2010 (28)	“A business model describes the rationale of how an organisation creates, delivers, and captures value” (p.14).
Zott and Amit, 2010 (52)	…“a system of interdependent activities that transcends the focal firm and spans its boundaries” (p. 216).
Geissdorfer et al., 2016 (53)	“we describe business models as simplified a representations of the elements and interactions between these elements e that an organisational unit chooses in order to create, deliver, capture, and exchange value” (p. 1218).
Massa et al., 2017 (54)	…“a description of an organisation and how that organisation functions in achieving its goals (e.g., profitability, growth, social impact, …)” (p. 73).

Table 3 Business model definitions – selection from Geissdoerfer’s study 2018 (11)

Author/s	Definition: A sustainable business model …
Stubbs, Cocklin, 2008 (55)	"is a model where sustainability concepts shape the driving force of the firm and its decision making [so that] the dominant neoclassical model of the firm is transformed, rather than supplemented, by social and environmental priorities." (p. 103)
Schaltegger et al., 2012 (56)	"create customer and social value by integrating social, environmental, and business activities". (p.112)
Boons, Lüdeke-Freund, 2013 (57)	differs from a conventional through four propositions: "1. The value proposition provides measurable ecological and/or social value in concert with economic value […]. 2. The supply chain involves suppliers who take responsibility towards their own as well as the focal company's stakeholders […]. 3. The customer interface motivates customers to take responsibility for their consumption as well as for the focal company's stakeholders. […]. 4. The financial model reflects an appropriate distribution of economic costs and benefits among actors involved in the business model and accounts for the company's ecological and social impacts" (p. 13).
Wells, 2013 (58)	assists to achieve sustainability through six principles: "Resource efficiency, social relevance, localisation and engagement, longevitiy, ethical sourcing and work enrichment" (p. 65).
Abdelkafi, Tauscher, 2016 (28)	"incorporate sustainability as an integral part of the company's value proposition and value creation logic. [It] provides value to the customer and to the natural environment and/or society" (p. 75).
Geisdoerfer et al., 2016 (14)	"we define a sustainable business model as a simplified representation of the elements, the interrelation between these elements, and the interactions with its stakeholders that an organisational unit uses to create, deliver, capture, and exchange sustainable value for, and in collaboration with, a broad range of stakeholders" (p. 1219).

Table 4 Sustainable business model definitions – selection from Geissdoerfer' study 2018 (11)