URBAN GreenUP

# D7.4: Guidelines for the use of innovative financial instruments and to design business models to implement NBS

***WP 7, T7.2***

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**Technical References**

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[1] PU = Public

PP = Restricted to other programme participants (including the Commission Services)

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# 0 Abstract

The task 7.2 has been designed to develop innovative business models and associated financing mechanisms. At this purpose, *D 7.4 Guidelines for the use of innovative financial instruments and to design business models to implement NBS* will provide a clear and a comprehensive framework for the development of business models for NBS that can be used by cities.

The analysis has taken into consideration the general definition of business models in order to decline it for NBS implementation purposes. In order to analyse the adopted business models for NBS an assessment framework has been defined taking into account different elements such as: the value generated by the solutions, the stakeholders involved, the cost structure, the social and environmental benefits and the financial instruments adopted. The assessment of business models has been performed through the analysis of international case studies (business cases from TEEB for Business, GEF - Global Environmental Facilities projects, Global Sustainable Investments and Market Place of the European Innovation Partnership on Smart Cities and Communities databases and other results of SCC-02 H2020 projects). This will constitute a best practice review useful for all cities in order to capitalise on previous experience and to build up their own business models based on their needs.

At the same time, a categorization of the financial instruments that can be used by cities to finance local interventions will be structured allowing to better understand the potential of each instrument, the stakeholders that can be involved and the advantages and disadvantages of each financial instrument analysed.

Finally, a business models canvas for NBS together with guidelines for the development of business models will be provided in order to facilitate cities in the design of their models.

# 1 Introduction

## 1.1 Purpose and targets groups

WP7 of Urban GreenUP project is focused on exploitation and market deployment as well as on the identification and analysis of innovative business models defined and tested within the project. Specifically, Task 7.2 aims to identify innovative business models and financial mechanisms to foster the implementation of NBS. This deliverable (7.4) describes:

- the outcomes of the desk research on relevant projects and publications on NBS business models and possible financial instruments, as well as on the key dimensions and criteria to be considered in the definition of a business model, and of the values linked with NBS implementation;
- the analysis of financial mechanisms to implement NBS;
- the business model canvas for NBS that be used by cities to define an ad hoc business model.

The main target groups of this deliverable are the partners of the Urban GreenUP project, front-runner and follower cities. The deliverable can also be of interest for other cities, their technical and business partners, who wish to acquire information on business models and financial instruments for NBS and on Urban GreenUP specific approach on this.

## 1.2 Contributions from other partners

The following Table describes the main contributions from participant partners in the development of this deliverable.

| Partner | Contribution |
|---|---|
| UB | Research activities on NBS projects, criteria & dimensions for business model evaluation<br>Elaboration of research grid to analyse business models<br>Elaboration of business model canvas for NBS<br>Analysis of financial mechanisms for NBS implementation<br>Overall D7.4 coordination and writing |
| VAL and city technical partner | Front-runner cities and their technical partners will be involved in a survey in order to analyse the innovative business models (if there are any) adopted to implement NBS.<br>Front-runner cities and their technical partners have been involved in a workshop aimed to highlight the value proposition, value capture and value delivered by NBS implemented in cities. |
| LIV and city technical partner | Front-runner cities and their technical partners will be involved in a survey in order to analyse the innovative business models (if there are |

| Partner | Contribution |
|---|---|
| | any) adopted to implement NBS.<br>Front-runner cities and their technical partners have been involved in a workshop aimed to highlight the value proposition, value capture and value delivered/ by NBS implemented in cities. |
| IZM and city technical partner | Front-runner cities and their technical partners will be involved in a survey in order to analyse the innovative business models (if there are any) adopted to implement NBS.<br>Front-runner cities and their technical partners have been involved in a workshop aimed to highlight the value proposition, value capture and value delivered by NBS implemented in cities. |
| RMIT | Revision of overall deliverable |

**Table 1: Contribution form project partners**

## 1.3 Connection with other project activities

The following table summarises the main relationship of this deliverable to other activities (or deliverables) developed within Urban GreenUP Project and that should be considered along with this document for further understanding of its contents.

| Partner | WP | Relation |
|---|---|---|
| ACC | WP1 | Definition of the Renaturing Urban Plan |
| VAL | WP2 | Implementation of NBS in city and definition of financing schemes for the co-financing of the nature based solutions.<br>Monitoring and analysis of the performances.<br>Stakeholders' engagement analysis. |
| LIV | WP3 | Implementation of NBS in city and definition of financing schemes for the co-financing of the nature based solutions.<br>Monitoring and analysis of the performances.<br>Stakeholders' engagement analysis. |
| IZM | WP4 | Implementation of NBS in city and definition of financing schemes for the co-financing of the nature based solutions.<br>Monitoring and analysis of the performances.<br>Stakeholders' engagement analysis. |
| RMT | WP6 | Characterisation of front runner cities<br>Cluster of cities to foster transferability<br>Link with other SSC-02 projects |

**Table 2: Relation to other project activities**

# 2 Business models for nature-based solutions

The aim of this chapter is to define the characteristics of the business models (BMs) that are suitable for the implementation of NBS in cities. In order to achieve this aim, it will be important to give a general framework of the business models definition through a literature review highlighting which are the main characteristics of the BMs and then to scale down the models to the city's needs. In fact, existing BMs, finance and funding instruments and procurement schemes do not always fit cities' needs. There is a strong need for knowledge sharing on business models, funding and procurement. Fostering NBS in urban areas is an issue that receives increasing attention on the political agenda given the impacts and benefits generated by NBS. Nevertheless, in many cases, insufficient financial resources are available for the implementation of such solutions.

There are some barriers that cities can encounter when investing in nature. For example, the municipal budget has a rigid structure and the funds that cities can allocate for the implementation of NBS are limited. Besides this, there is a strong political will in NBS implementation. In order to generate new revenues for NBS implementation it is necessary to adopt a different approach at city level identifying new forms to finance NBS such as: land use taxation, natural resources taxation (e.g.: payments for ecosystem services) or purpose taxes.

Despite this, cities have taken the lead in demonstrating their commitment showing that investing in nature can provide substantial social, economic and environmental benefits by reducing pollution, improving health and well-being and increasing resilience to climate change and natural disasters (TEEB, 2010). In face of urban sustainability and challenges - such as climate change and urban densification - NBS can play an important role in addressing multiple sustainability challenges in a simultaneous way and therefore in a cost-effectiveness way.

The development of business models specifically for NBS can enable private actors to play a meaningful and profitable role for NBS uptake. The implementation and diffusion of NBS in cities can enhance the impacts and benefits provided by ecosystem services, but this will require new investments, which however are difficult to retrieve from public sources because of the tightness of public budgets. This demands new strategies of cooperation between public and private sectors to mobilize external investments, as well as new business models and financial instruments (EIP-SCC, 2013).

The methodological framework adopted to analyse and define business models for NBS is composed by two main blocks:

1. Assessment framework – literature review on BMs, definition of business models features for NBS, assessment framework for BMs definition and analysis, categorisation of financial mechanisms.
2. Application of assessment framework – BMs case studies will be reviewed through the application of the business models framework developed in the previous section.

Finally, a collection of guidelines for the design of business models have been defined in order to allow cities to define and adopt their own business models.

The following image represents the methodological framework that has been adopted to analyse the business models and financial instruments for NBS implementation. As already stated, the final aim of this deliverable is to build a framework for cities to design their own business model for the implementation of NBS.

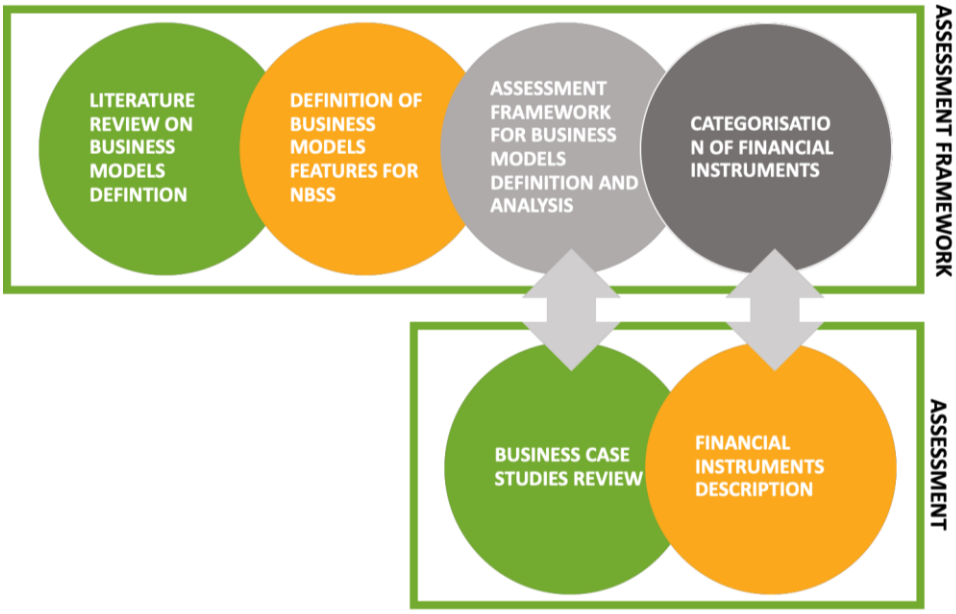


**Figure 1: Methodological framework for business models analysis**

## 2.1 Business models definition

The concept of "business model" was developed in the '60s and it has been increasingly used in the '90s in different domains (Diaz-Diaz et al., 2017). Several definitions of business models are available. One of the most recent and diffused definitions states that "business models describe the rationale of how an organization creates, delivers and captures value" (Osterwalder and Pigneur, 2010). In the corporate world, "value" is generally conceived in economic terms and referred to economic/financial performances (Tokoro, 2016). The concept of value has however evolved over time until the theorization by Porter of "creating shared value": companies are increasingly required by society to contribute also to the creation of social value.

Recently giving the increasing attention to sustainable development and environmental protection, several publications have been produced on business models that take into consideration environmental aspects and sustainability, called business models for sustainability - BMSs (Stubbs and Cocklin, 2008; OECD, 2013). The definition of this new typology of business models can help develop integrative and competitive solutions by either

radically reducing negative and/or creating positive external effects for the natural environment and society (Schaltegger, 2016).

*"A business model for sustainability helps describing, analysing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries."* (Schaltegger, 2016).

For this purpose, it is really interesting the reflection about SBMs made by the International Institute for the Environment (IIED, 2009) that defines the concept of value proposition, value delivered, and value captured: *"the centre of any business model is the company's 'value proposition': the products and services that yield tangible results for the company's target customers. Two broad areas for possible adaptation and innovation of a business model are production and marketing. The production side comprises the set of activities, mechanisms and relationships for providing a good or service — in other words, 'delivering/creating value'. The marketing side comprises the activities, mechanisms and relationships for selling that good or service — in other words, 'capturing value'"*. The business models for sustainable development aim to deliver economic, social and environmental benefits and in these models, the value proposition includes social, environmental and economic values, while value distribution within the whole market chain is a key feature.

IIED has also identified a number of factors that contribute to the success of business models for sustainable development:

- Businesses need to build their own capacities and strategic alliances with other enterprises, government agencies and development practitioners;
- Involving local communities as partners and co-designers of new models enhances local buy-in and ownership;
- Business models for sustainable development need to be self-sustaining in the long term. However, significant investment of time and resources at the start is key for successful innovation and scale-up;
- Trade-offs among different sustainable development goals – economic, social, environmental – need to be recognised and addressed;
- Ongoing monitoring and evaluation need to be built into the business model.

The definitions of business models cited refers to firms and private stakeholders, but these concepts can be applied for several city projects, since these kinds of city transformations and solutions are expected to contribute to better, more sustainable and low-carbon lifestyles and society and ultimately to create public value for people (Tokoro, 2016; Dameri, Rosenthal, 2014). In fact, in this context, the concept of NBS business model can be interpreted as the mechanisms through which a specific NBS (or a combination of interrelated solutions) is able to "create, deliver and capture" private and public (economic, social, environmental) value to society, consistently with EU NBS strategy and sustainability goals of the local government.

## 2.2 Value proposition, value delivery and value capture

The concepts of value proposition, value delivery and value capture are three fundamental elements of business models. As already said these concepts assume a more relevant importance in the case of business models for sustainable development in urban NBS. In fact, a specific feature of NBS BM is that the city government has a role in the value network, which can be direct (e.g. involvement in the design/provision/delivery of the solution), or indirect (e.g. setting the regulatory framework for the solution). In fact, a NBS can be initiated/governed/managed by the city authority itself, or by a different actor (e.g. public or private company). Therefore, the definition and analysis of these three values are fundamental for the definition of the business model. The concept of public value from NBS projects is multi-faceted since it comprises different types of values; this value can benefit different stakeholders, each one with their specific interests and motivations; and this value can be delivered over different periods of time (Dameri, Rosenthal, 2014).

Based on the literature review the following definition have been selected for the value proposition, value delivery and value capture for NBS projects implementation:

1. **Value proposition**: description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy;
2. **Value delivery**: production of social, environmental and economic benefits through activities, channels and partners;
3. **Value capture**: is about considering how to earn revenues from the provision of good, services or information to users and customers.

The definition of these three values can vary based on the NBS that will be implemented and, on the stakeholder considered. Through the correct definition of the value position, delivery and capture it will be possible to involve different typologies of stakeholder in the business model implementation.

The value proposition is referred to the objective that what to be achieved through the implementation of a specific action, it is central in the business model definition. In the following table the main objectives and motivations that drive different stakeholder categories in the pursuit of value from NBS have been summarised:

| Stakeholder | Economic and social value |
|---|---|
| *Public sector* | Economic development (growth of GDP, foreign direct investment)<br>Quality of life<br>Urban regeneration<br>Climate change mitigation<br>Climate change adaptation<br>Cost-to-serve the citizen<br>Environmental sustainability<br>Social sustainability |

| Stakeholder | Economic and social value |
|---|---|
| | Less negative externalities and more positive externalities |
| *Firms* | Climate change adaptation (decrease in risk)<br>Protection of a particular good or service that is fundamental for the business<br>New markets and new revenue opportunities<br>Brand recognition |
| *Citizens* | Aesthetic improvements<br>Neighbourhood regeneration<br>Cost savings<br>Health improvement<br>Well-being<br>Property values |

**Table 3: Value proposition in NBS projects (Source: adapted from CDP, 2013)**

The value delivery is related with the direct and indirect impacts and benefits generated by the actions implemented, in this case NBS. NBS generates several impact and benefits that can be measured using the ecosystem services approach. In facts, ecosystem services are defined as the direct and indirect contributions to human well-being. It will be necessary to adopt an approach able to value all the ecosystem services provided by NBS. Urban GreenUp project valuation approach[2] is based on the evaluation of the ecosystem services provided in cities though the implementation of NBS and it is explained in paragraph 2.4.

The value capture is related with the capacity to generate value from NBS and to catch that value through market or policy instruments. NBS, as already said, are multifunctional and generate different benefits that are perceived by different stakeholders. Based on the economic theory on the classification of goods (Ostrom, 1990) four categories of good have been individuated: private goods[3], public goods[4], tool goods[5] and common pool resource[6]. NBS often show characteristics of public goods or common pool resources and therefore can generate market failures, since the price mechanism does not guarantee an optimal level of their production and allocation.

[2] A specific deliverable (D7.2) is dedicate to the methodology evaluation and another one is focused on the economic valuation of NBS implementation in front-runner cities (D7.3).

[3] A private good is excludable, i.e. its owners can exercise private property rights, preventing those who have not paid for it from using the good or consuming its benefits; and rivalrous, i.e. consumption by one necessarily prevents that of another.

[4] A public good is non-excludable, non-rivalrous, and open to all in its consumption (clean air, soil water storage that yields flood control, and beautiful views over a landscape).

[5] A toll good is excludable, but non-rivalrous (such as access to private parks).

[6] A common pool resource is rival and non-excludable (such as fish stocks in an ocean).

In order to correct market failures in the presence of public goods the solution could be the intervention of the state in their production and management, through fiscal instruments (general or purpose ones). In the case of common pool resources, a solution could be achieved through the introduction of (in a voluntary way or through an institutional framework) governance tools to regulate its use - example: payments for ecosystem services.

In this way the public sector can decide to introduce policy instruments aimed to internalize positive externalities which are not reflected by market prices.

In order to better understand the different values generated by NBS for different stakeholders, a workshop has been organised during an Urban GreenUP periodic meeting in Liverpool (July, 2018). In the workshop we asked front-runner cities and their technical partners to determine the values associated to the NBS implementation in their cities. The outcomes have been elaborated by UB and integrated with literature review (Bocken et al., 2014; Toxopeus and Polizin, 2017). They are reported in the following tables.

| Stakeholder | Value proposition | Value delivery | Value capture |
|---|---|---|---|
| Public administration | Reduction of heat island effect | Creation of milder microclimate | Improvement of citizens health and comfort |
| Firms | Implementation of investments | Business opportunities (for utilities it depends on public incentive schemes) | Increase of revenues |
| Citizens | Energy savings | Reduction of heating and cooling systems | Savings in energy bill |

**Table 4: Values associated to green roofs and walls**

| Stakeholder | Value proposition | Value delivery | Value capture |
|---|---|---|---|
| Public administration | Reduction of water run-off | Decrease in flooding events | Reduction of restoration costs |
| Firms | Protection of natural assets | Decrease in flood events | Insurance value |
| Citizens | Protection of residential areas | Decrease in flood events and well-being improvement | Improvement of overall neighbourhood and increase of property values |

**Table 5: Values associated to sustainable urban drainage systems**

| Stakeholder | Value proposition | Value delivery | Value capture |
|---|---|---|---|
| Public administration | Reduction of the heat island effect | Increase of urban areas liveability | Health improvement |
| Firms | Improvement of brand recognition | Business opportunities | Increase in area attractiveness and in the economic activity |
| Citizens | Tree cover in residential areas leading to health, aesthetic and biodiversity benefits | Health benefits | Improvement of overall neighbourhood |

**Table 6: Values associated to tree planting**

| Stakeholder | Value proposition | Value delivery | Value capture |
|---|---|---|---|
| Public administration | Regeneration of neglected areas | Improvement of urban well-being and social cohesion | New businesses and new economic opportunities |
| Firms | Implementation of investments | Business opportunities (for utilities it depends on public incentive schemes) | Increase of revenues |
| Citizens | Recreation | Improvement of health and wellbeing | Increase in value properties |

**Table 7: Values associated to parks**

## 2.3 Business models for NBS

Several approaches have been defined over time to develop new business models, with the aim to support private and public organizations to enhance their mechanisms to deliver value. These approaches vary according to the context in which they were developed, the specific objectives of the analysis, the types of solutions/technologies/business sectors they are applied to, as well as the type of users of evaluation results.

To develop business models, it is necessary to identify a set of key parameters, which in the business model literature are usually named as ‘‘business model dimensions’’, ‘‘business model building blocks’’, or ‘‘business model elements’’ (Ballon, 2007). The number of parameters used can vary from two to several dimensions, and these diverse classification systems lead to several different typologies and taxonomies of business models, which can amount to a few up to over 30. One of the most diffused business model evaluation frameworks in the literature is the Business Model Canvas developed by Osterwalder and

Pigneur (2010), which identifies the following main building blocks that should be considered when analysing a business model:

- value proposition
- target customer
- distribution channel
- customer relationship
- value configuration
- capabilities
- partnership
- cost structure
- revenue model

The canvas has also been implemented for Non-Profit business models, by including social and environmental costs as well as social and environmental benefits linked to the business model, with the aim to take into account also "not purely economic values that are important when making decisions that affect the society" (Diaz-Diaz et al., 2017). The Non-profit canvas has been specifically applied to smart city business models by Diaz-Diaz and colleagues (ibid).

A visualization of the Non-Profit Business Model Canvas is provided below:

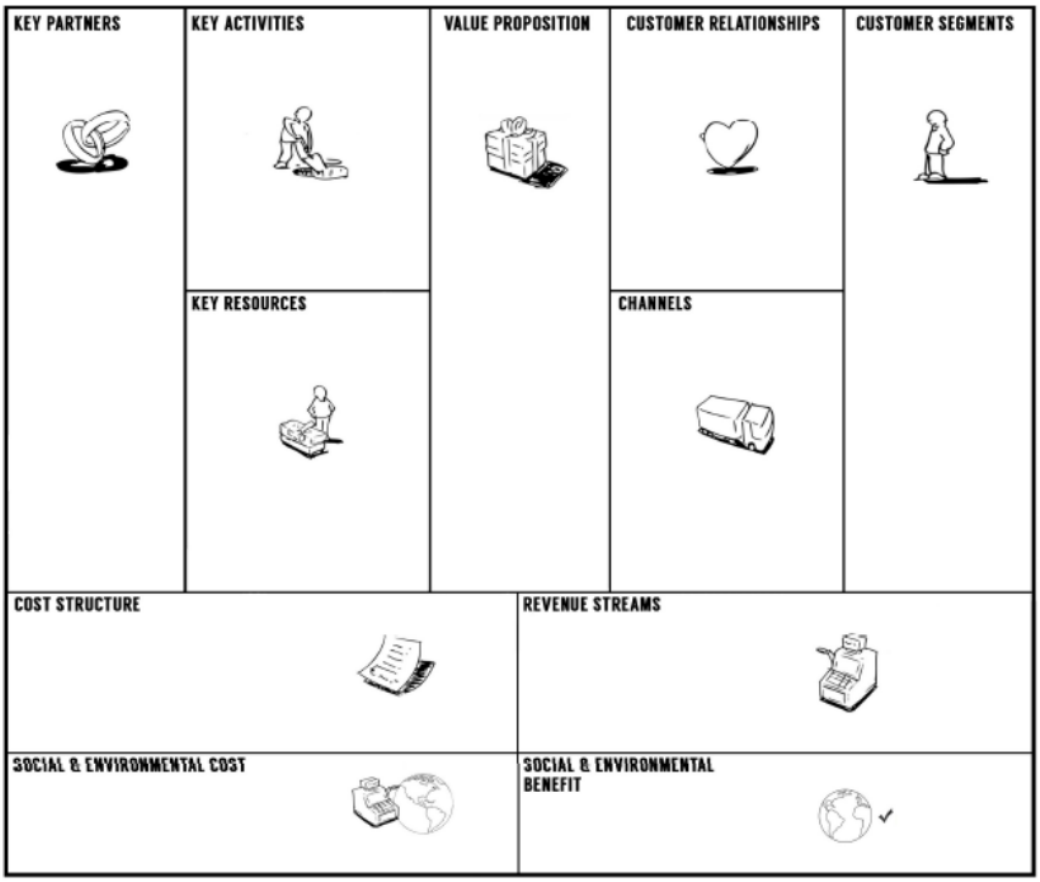


**Figure 2: Non-Profit Business Model canvas (Osterwalder, Pigneur, 2010)**

Similar approaches have been adopted at city level for the definition of business models for smart cities. For example, the REPLICATE project developed a framework named "Smart City Model Canvas" based on the original business model canvas. This framework allows municipal authorities to assess their business models and incorporates the consideration of environmental/social costs and benefits associated with a smart city service (Timeus et al., 2017). Other frameworks have been developed for the analysis of business models involving city governments in relation to smart city projects. Walraven (2015) elaborates a theoretical framework for the analysis of smart city business models, where city governments are involved at various degrees in the value network. The framework comprises a set of qualitative indicators to capture and define the dimensions of governments' involvement in the business model and the type of public value generated by the smart city solutions. Specifically, he applies the framework to mobile city services, mapping a set of case studies. The framework can be used to compare different cases and their underlying strategies.

An example of the business model template of the packaging activity is provided below.

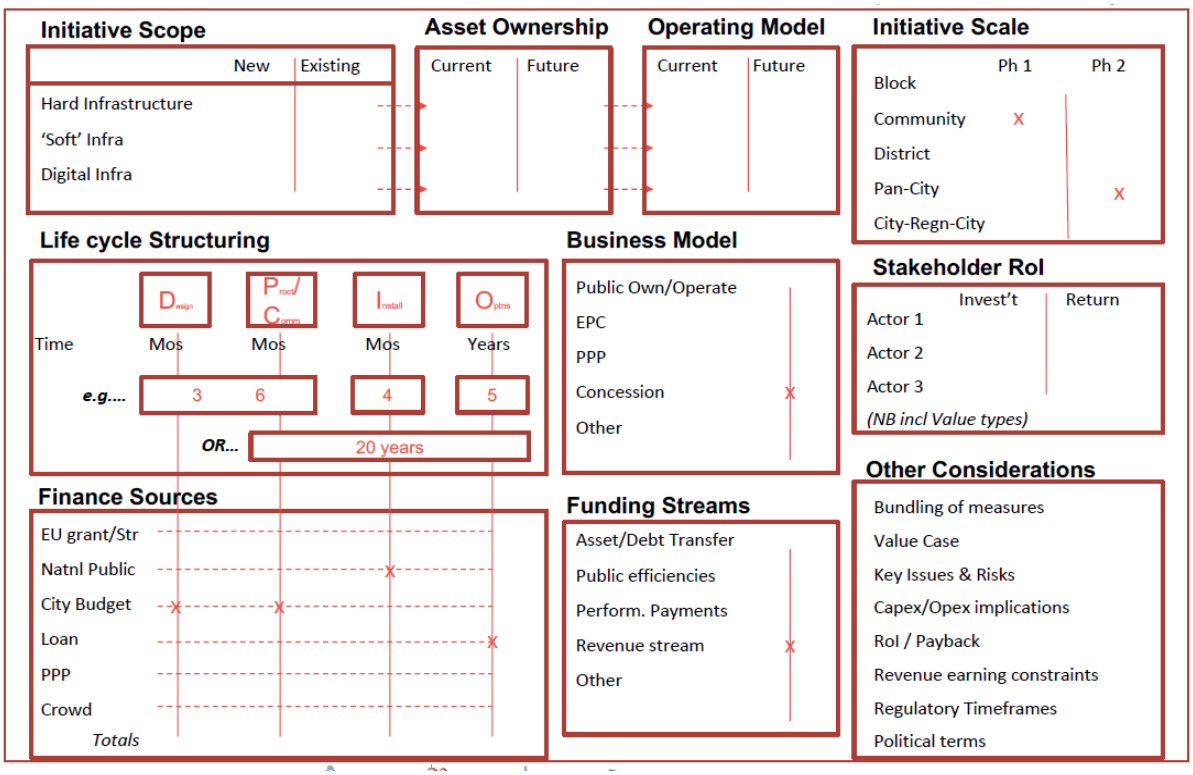


**Figure 3: City Business Model & Financing template (Source: Cross-SCC01 Packaging Strategy, 2018)**

Literature about business model for NBS is missing, even if several Horizon2020 projects related with NBS (SCC-03 and SCC-02: Naiad, Naturvation, ConnectingNature, etc.) are working on the concept of business models for NBS. The European Investment Bank has recently developed the Natural Capital Financing Facility ('NCFF') program dedicated programme to support pioneering conservation and nature-based solutions projects. The report "Investing in nature: financing conservation and nature-based solutions" - published in 2018 – aims to guide public and private stakeholders in financing nature protection at city and territorial level. Based on the report it is fundamental to develop a specific summary of the business case

helping potential lenders or investors understand the vision and potential environmental and social impact of NBS. The EIB defined a list of questions that should be addressed during a business model definition about the project and its expected impact:

| Project |
|---|
| 1. What problem are you trying to solve?<br>2. Will your project increase your revenue or reduce your costs?<br>3. How much investment is needed to make it happen?<br>4. Is it forming part of an on-going (mature) business or is it a stand-alone (new) initiative?<br>5. Are other players also seeking to address the same problem? Will it outperform other solutions?<br>6. Is your solution replicating a proven model or introducing new innovative features?<br>7. Could the proposed solution be replicated by others and scaled?<br>8. Is it generally hard to obtain private financing for this type of project? |
| **Impacts** |
| 1. What social and environmental impact will the project have?<br>2. Are you trying to solve local, regional (European) or global issues?<br>3. Do you have clear goals and identifiable outcomes? Are they reasonable and measurable?<br>4. Is the project fighting biodiversity loss or improving climate adaption using nature-based solutions?<br>5. Are there any potential negative side effects? If yes, how are you taking them into account? |

**Table 8: Business model definition for NBS (Source: EIB, 2018)**

All these frameworks have been taken into account for the definition of the business model guidelines for NBS and to design a business model canvas for NBS (see chapter 6). Furthermore, also the analysis of the business model case studies that have been carried out contributed at the definition of the guidelines (see chapter 5).

## 2.4 The economic value of NBS – Ecosystem Services Assessment (ESA)

The financial analysis of a project is focused on its profitability for the investor. It compares the project costs with its revenues over the project lifetime, in order to calculate the project return on investment and assess its performance. The financial analysis is based on market prices and does not consider external effects (i.e. externalities) generated by the investment.

Several tools are available to perform project financial analysis, including indicators such as the Return of Investment, Financial Net Present Value and Financial Internal Rate of Return.

The economic analysis aims to evaluate if the project is beneficial to the society. It compares the overall costs and benefits deriving from a project, including its external effects (e.g. environmental or health externalities), by translating them into monetary values by means of different techniques. Giving a value to the impacts generated by NBS in cities will be useful to facilitate the introduction of policies and standards in order to enhance the implementation of NBS but also to allow municipalities to communicate the economic impacts of NBS showing how many revenues could be generated and attracting new investors.

Urban GreenUP will evaluate economic impacts of NBS in front runner cities in order to provide evidence about the cost-effectiveness of the measure implemented (D7.2 and D7.4). Data can be used in further analysis to calculate the revenues generated by NBS implemented. The methodology adopted in Urban GreenUP project is the Ecosystem Services Assessment (ESA) approach. ESA will identify and assess the generation of new, enhanced, restored flows of ecosystem services promoted by urban renaturing and the NBS implemented in coach cities, quantifying these flows in physical and monetary terms. The ESA approach could be integrated into commonly used decision-making mechanisms, ranging from the more general trade-off analysis and scenario analysis, to specifically cost-benefit analysis and cost-effectiveness analysis.

NBS have the ability to reinforce ecosystem services at urban level creating or enhancing the connections between urban and natural areas, ecosystem services are “the direct and indirect contributions of ecosystems to human wellbeing”.

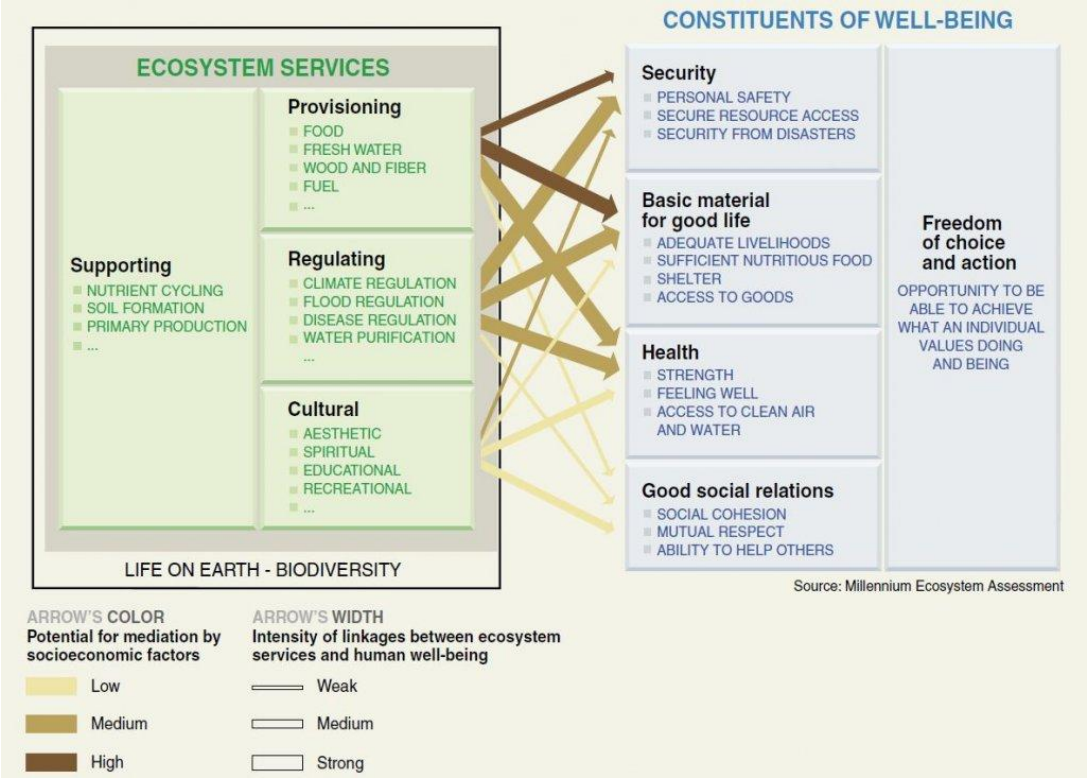


**Figure 4: Ecosystem services and human well-being, Millennium Ecosystem Assessment (MA, 2005)**

Examples of important urban ecosystem services provided by NBS include:

1. reduction of local air pollution (Gomez-Baggethun et al., 2013);
2. microclimatic regulation: heat island phenomenon reduction and temperature increase due to climate change (Schwarz et al., 2011.);
3. direct health benefits, such as a lower prevalence of asthma in early childhood (Lovasi et al 2008).
4. mortality reduction, and general health improvements (Maas et al 2006; Mitchell and Popham, 2008; van de Bosh and Ode Sang, 2017);
5. flood risk reduction (Cohen et al., 2016);
6. quality of life improvement: social inclusion, safety, cultural aspects (van de Bosh and Ode Sang, 2017).

Several studies (Escobedo and Nowak, 2008; Churkina, 2017) confirm that urban vegetation has positive effects on air quality by eliminating polluting determinants, altering the urban microclimate and reducing temperatures through the produced shadow, the evapotranspiration processes, attenuating the winds and decreasing the energy consumption of the buildings, also generating a reduction in $CO_2$ emissions from power plants. Furthermore, the dependence of cities on the surrounding landscape and its biodiversity is essential to support the production, enhancement, and maintenance of ecosystem services and to guarantee the resilience of urban systems as a whole.

Some ecosystem services, such as provisioning services, are exchanged on markets so they can be evaluated through prices, but many other services present characteristics of public goods and markets cannot capture their value. Consequently, price signals do not correctly indicate the scarcity of natural capital from which the ecosystem services originate. Economic valuation can show the "hidden" values of natural capital and of its services. The logic behind the valuation of ecosystem services is to reveal the socio-economic impacts and to explain how human choices and activities can affect ecosystem functions. The topic has been analysed by several studies within the category of market failures (TEEB, 2010): ecosystem services are characterized as externalities that do not find adequate remuneration since are used without any cost by consumers. Assessing the economic value of ecosystem services is fundamental to manage and protect them and to define appropriate compensation mechanisms aimed to internalise the externalities generated by human activities. In literature, there are several methodologies for the evaluation of ecosystem services (System of Environmental-Economic Accounting Experimental Ecosystem Accounting - SEEA-EEA adopted by United Nations Statistical Commission, Mapping and Assessment of Ecosystems and their Services - MAES Urban developed by the European Joint Research Centre JRC, etc.). The Economics of Ecosystems and Biodiversity - TEEB (2010) requires considering the Total Economic Value (TEV) generated by ecosystem services, defined as the sum of the values of all the services that natural capital flows generate[7].

[7] The values generated are divided into: *use value* - direct (benefits obtained from the direct use of services), indirect ("public services" that do not find a value on the markets) and option (related with the importance that people give to future availability); *non-use value* - existence (satisfaction that individuals derive from the existence

In that way, it will be possible to use different evaluation methodologies based on markets[8] or methodologies based on surrogated markets[9]. The methodologies used for the evaluation/accounting of the services provided by the ecosystems are different and often the combination of several assessment methods is necessary. For example, the methodology of damage avoided costs and replacement costs is often used to calculate the values of regulating services such as atmospheric pollution, climate mitigation and microclimatic regulation (Sander et al., 2010). The methods most used for the evaluation of ecosystem services in urban areas are the hedonic prices, stated preferences and contingent evaluation (OECD, 2006).

The scientific production focused on the economic valuation of ecosystem services in urban areas is growing. In fact, the impacts and benefits generated by NBS have been measured and valuated in different cities. Naturvation project (SCC-03 H2020 project) has collected different case studies of the application of different economic evaluation methods to assess NBS. The database[10] was created from a review of assessment methods (i.e. frameworks, models and tools) currently used to assess the ecological, economic and social benefits of urban NBS.

of ecosystems), heritage (inter-generational equity) and altruism (intra-generational equity) (Gomes-Bazzethun and de Groot, 2010).

[8] These methodologies reflect the actual preferences or costs for individuals like market priced based, cost-based and production function-based approaches.

[9] Surrogated markets allow to investigate the preferences in terms of willingness to pay for a service through interviews and surveys (contingent evaluation, group evaluation, and modelling choice)

[10] https://naturvation.eu/result/value-and-benefit-assessment-methods-database-urban-nature-based-solutions

# 3 Financial instruments

## 3.1 Financing for sustainable urban development

About 70% of global infrastructure demand is concentrated at city level. To meet all these investments, about $ 4.1-4.3 trillion per year will be needed from 2015 to 2030. This prevision is going to grow up to $ 5 trillion while considering low-carbon infrastructure development (CCFLA, 2015). This infrastructural gap must be placed in a context in which local resources are not able to cover the needs for current liquidity and capital. This imbalance between the responsibilities of local authorities and their budgetary resources is common to most regions:

| Regions | Local Government Shares of Total Public Sector | |
|---|---|---|
| | Revenues | Expenditures |
| North America | 17.8 | 26.8 |
| South Asia | 1.5 | 16.0 |
| East Asia | 20.0 | 40.0 |
| Southeast Asia | 5.3 | 15.5 |
| Europe (2008) | 13.0 | 23.9 |
| Middle East & Western Asia | N.A. | 4.6 |
| Eurasia | N.A. | 26.5 |
| Latin America | 4.0 | 11.1 |
| Africa | 3.2 | 7.9 |

**Figure 5: Comparative fiscal role of local government (Gold II report, UCLG 2010)**

A series of initiatives with a specific focus on cities and urban development were launched after the COP21 by National and International Development Banks. For example, the German Reconstruction Bank (Kreditanstalt für Wiederaufbau, KfW), started a financing program expressly in October 2016 dedicated to mobility and urban transport, for a total of € 1 billion to be placed exclusively in 2017 (KfW, 2016) on a global scale.

The World Bank launched the “Global platform for Sustainable Cities” program, which supports 30 cities around the world in the definition and inclusion of climate objectives into their urban development plans and strategies, with the aim of attracting private capital investments, at least 140 billion $ per each city. WB, 2016).

Furthermore, in 2014 the Cities Climate Finance Leadership Alliance (CCFLA), a coalition lead by the United Nations to facilitate cooperation between international financial institutions, national and local governments, investors, international associations and communities of citizens was launched. The CCFLA has managed 78 regional and global initiatives since its establishment, mainly focused on increasing capacity building in at municipal level (48%) and promotion and awareness raising (19%) (CCFLA, 2016). The re-orientation of local finance will constitute a key strategy to enable local public administrations finding additional resources for

sustainable urban development. In particular, the cities should adopt new tax systems, such as 'green' tax reforms and local tax reforms or use innovative financial instruments that are able to attract investors specifically aimed at financing sustainable infrastructures and services.

The finance system in Europe currently meets only a small portion of the investment needed in infrastructure renovation and climate change mitigation and adaptation areas. Public investment can act as “seed money” unlocking additional major private investment of a different type and scale (UN-Habitat, 2017). Furthermore, by different funding options, cities can find a way to foster a systemic approach to finance urban sustainable development.

To provide services and infrastructure to cope with increasing challenges it is necessary to maintain and sustain a certain level of revenues. Thus, most experts recommend that, where possible, city governments generate a diverse portfolio of income streams so that they are not dependent on any given flow of revenue (Chernick et al., 2011). This requires city leaders to think about how revenues can be generated not just from different taxes, but also from taxes on a diverse range of economic activities. Building a city’s income in this way ensures that a shock to one part of the economy will not undermine its revenue base. The source of income also matters for other reasons (UN-Habitat, 2017). In facts, in order to raise subnational borrowing, it is necessary to demonstrate the capacity to maintain a reliable surplus of revenues over expenditures (EY, 2016). Municipal governments, as already highlighted, have the possibility to use different sources of revenues like user fees and charges, taxes levies, and intergovernmental transfers, sometimes supplemented by bilateral or multilateral development assistance. Further potential sources include investment income, property sales, land value capture, and licenses (UN-Habitat, 2017). User charges and fees are mostly levied where people pay for the benefits and utilities they receive (e.g., water supply, sanitation, energy, parking space). At the same time, taxes are the more appropriate tool to finance the provision of public goods for the entire community, such as police, ambulance, firefighters, streetlights, etc. At the moment, there are some barriers at the involvement of private investors in the development of public infrastructures and services. The barriers of financing sustainable urban development have been identified at international and European level by the International Conference on Financing for Development in Addis Ababa, promoted by the United Nations in June 2015. There are three main barriers that emerge from the considerations of these initiatives, which correspond to a series of guidelines and principles of action (Gorelick, 2016).

| Barriers | Possible solutions |
|---|---|
| Creditworthiness (lack of correspondence between the investment risks and the revenues generated by the projects) | Define detailed information about the project in order to ensure transparency |
| Lack of co-financing by municipalities | Identify and plan a project portfolio that can be attractive for private investors |
| Lack of capacity building at local level | Ensure a certain municipal level of revenues (e.g. taxes and tariffs) |

| Barriers | Possible solutions |
|---|---|
| | Ensure an appropriate implementation and planning of the project in order to decrease risks and to ensure an adequate cash flow |

**Table 9: Barriers and guidelines for sustainable urban finance (Gorelick, 2016)**

One of the main obstacles in the involvement of private investors is the creditworthiness. Creditworthiness is a risk assessment made for potential investors to estimate the ability and willingness of an entity to repay its financial obligations (Moody's, 2016). This estimation is used mostly by sources of commercial investment capital to assess the likelihood that a city will not pay as per agreed terms of an investment arrangement. The overall creditworthiness of a city is determined by many contributing factors that are used by commercial investors to make an assessment.

Creditworthiness is not an absolute, binary state between creditworthy and not creditworthy. Between the most and least creditworthy states, there are many possible stages of creditworthiness for a given city (UN-Habitat, 2017). In fact, it must be highlighted that there is a continuum in the creditworthiness: this will be a driver for the investor community to assess the balance of contributing factors to overall creditworthiness. For example, Own Source Revenues (OSRs) are one of the most important factors that can affect municipal creditworthiness[11]. Similarly to OSRs, there is a line of progression between the worst and the best state from a creditworthiness. The balance of all of these factors and how they relate to a possible default risk is what determines the creditworthiness position of a municipality. The factors that can reduce the risk and ensure a certain level of revenues will therefore improve creditworthiness.

For example, large projects in areas such as energy, transportation, water and sanitation and housing require significant upfront costs and have lifetimes that span long periods. The ideal financing structure for such projects similarly requires payback periods that match the life of such investments. Commercial investors that may potentially provide debt and equity for will require robust risk assessments of a city's ability and willingness to pay over these long terms. Without a positive assessment of that risk, the needed capital will not be forthcoming. Therefore municipal 'creditworthiness' from a demand-side perspective is one of the necessary ingredients to unlocking the capital and filling the infrastructure-financing gap. The accepted metric for the ability and willingness to repay debt is a credit rating.

These are assigned by a rating agency[12] and are characterized by a letter score denoting the degree of creditworthiness, with AAA being the highest rating and denoting extremely low risk

[11] A city with high yielding and diversified sources of OSRs has a greater ability to maintain predictable schedule of payments of its debt obligations, regardless if one revenue source were to be suddenly interrupted. The relative creditworthiness of a city in the area of OSRs will be determined by how likely it is that such revenues will be curtailed, or dedicated elsewhere, such that there will be a default on the financial obligations of the city.

[12] The three largest being Fitch, Moody's and Standard & Poors with close to 95% of the market.

of financial default. In developing regions, there are local rating agencies that operate in addition to the big three, and these local agencies contribute significantly to the development of the rating market (UN-Habitat, 2017)

In the NCFF first report (EIB, 2019) several risk in financing project related with nature and the related instruments that can be adopted to mitigate risks have been individuated. The table below summarises the EIB findings.

| RISK MITIGANT TOOLS | DESCRIPTION | TYPICAL BARRIERS OR RISKS IT CAN ADDRESS |
|---|---|---|
| ADDITIONAL EQUITY | Raising more capital from new and/or existing shareholders | Lack of equity overall or high **financial leverage** (e.g. relatively high debt compared to balance sheet size, potential risk that cash flows will not be sufficient to service debt) |
| GUARANTEES | Third-party that can step in to cover financial obligations in adverse scenarios | Can help to improve access to financing (and potentially reduce **pricing** / interest margin), overcome lack of **credit history**, novelty of concept or other risks (including lack of financial experience) |
| COLLATERAL | Pledging security for the payment of loans (e.g. property or land) | Same as above (guarantees). However, land tenure challenges can be a common reason that prevents land being used as collateral |
| OFF-TAKE AGREEMENTS OR SALES CONTRACTS | Entering into contractual arrangements with future buyers of products | Can help to improve credit profile and reduce **demand risk** (increase visibiblity and predictability of sales and cash flows) |
| TECHNICAL ASSISTANCE | Support programmes for capacity building and pipeline development (typically grants) | Support from external professionals (including mentoring, board advisors, consultants) or strengthening **internal skills** and **capability** to overcome lack of financial or project development experience |
| FIRST-LOSS OR SUBORDINATE CAPITAL | Subordinate capital layer in a fund acting as "buffer" for a portfolio | Having layers in a fund structure (with differentiated **risk and return expectations** instead of on equal terms) can help to increase access to risk-adverse investors |
| INSURANCE AND HEDGING | Standard or bespoke finance solutions to protect against specific risks or fluctuations in commodity prices | Can act to improve access to financing and potentially improve pricing / interest margin as certain **risks are transferred** to other parties. Adds complexity and costs. Standard "business as usual" insurance tends to be a requirement by lenders |
| RESULTS-BASED INCENTIVES | Contractual arrangement offering financial reward based on achievement of performance criteria | Additional (conditional) **revenue stream** by identifying partners willing to pay for impact or performance, which can strengthen credit profile and improve **predictability of cash flows**. Incentive mechanism which acts to compensate for the opportunity cost of alternative revenue options |

**Figure 6: Risk mitigation tools (NCFF, 2018)**

## 3.2 Financial instrument for NBS

Several studies have been developed based on the analysis of financial instruments application at city level. For example, the EEA, have analysed several financial mechanisms aimed to implement adaptation measures to fight climate change in cities. EEA stated that financing for local adaptation can be available through three main sources:

1. Governmental sources (grants, EU funding instruments, national, regional and local/municipality budgets);
2. Banks and other financial institutions (loans or guarantees);
3. Private stakeholders (crowdfunding, green bonds, etc.).

The image below represents the different financial instruments and the possibility for Municipalities to engage other stakeholders through their adoption. The image is also useful to understand the relations between the different stakeholders and the possible revenues available for cities.

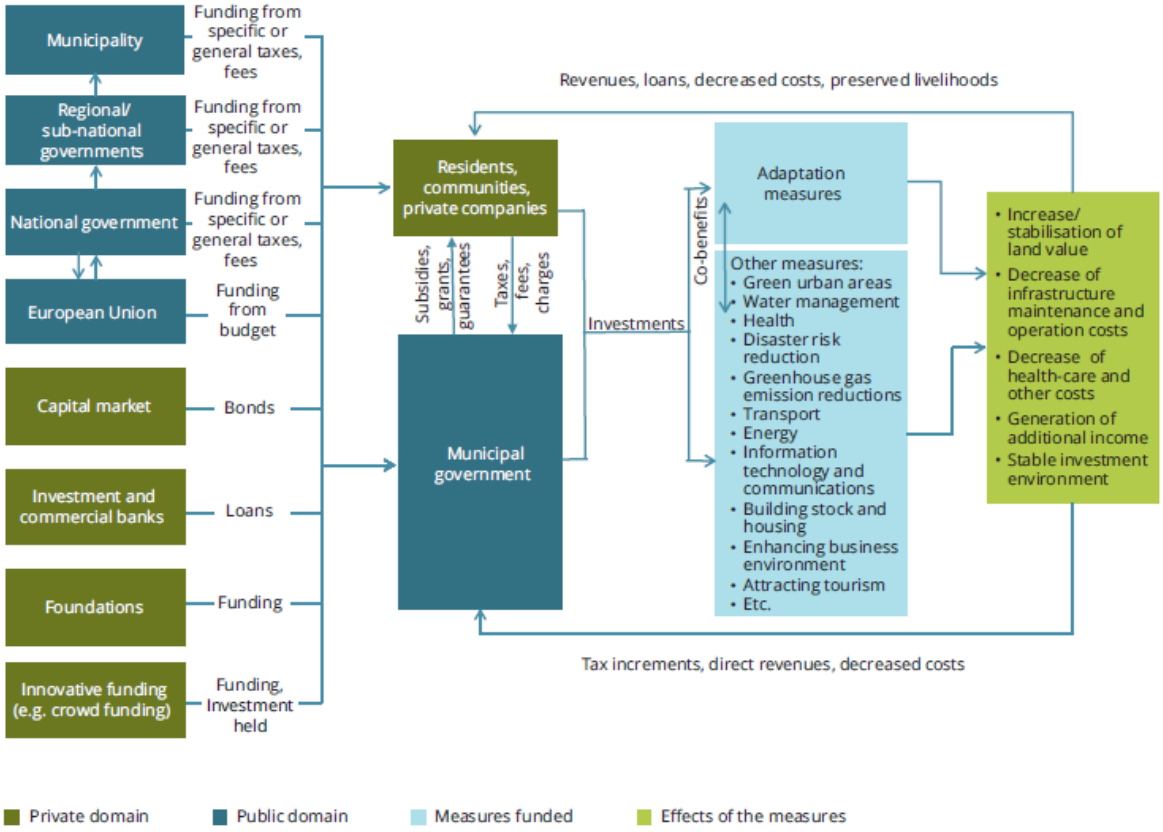


**Figure 7: Opportunities for financing climate change adaptation in municipalities, and the interplay between the various stakeholders involved (EEA, 2017)**

UN-Habitat in the *"Finance for city leaders handbook"* (UN-Habitat, 2017) report proposes another classification of the financial instruments that cities can adopt for the realization of several project. These include local government-based financing options (e.g., general obligation bonds, revenue bonds, green bonds), development exactions (e.g., linkage fees, impact fees), public and private options (e.g., public–private partnerships [PPPs], pay for performance), and mechanisms to leverage the private sector (e.g., loan guarantees, tax increment financing).

| Government-based finance options | Development exactions | Public and private options | Private sector leveraging |
|---|---|---|---|
| General obligation bonds | Dedication requirements | Public–private partnerships | Loan loss reserve funds |
| Revenue bonds | Linkage fees | Pay for performance | Debt service reserves |
| Industrial revenue bonds | Impact fees | Securitization and structured finance | Loan guarantees |
| Green bonds | | Catastrophe bonds | On-bill financing |
| Qualified energy conservation bonds | | | Pooled bond financing |
| Social impact bonds | | | Pooled lease-purchasing finance |
| Public benefit funds | | | Tax increment financing |
| Linked deposit programs | | | Value capture |
| Energy efficiency loans | | | |
| Property-assessed clean energy programs | | | |
| Greenhouse emissions allowance auctions | | | |

**Figure 8: Municipal finance tool (UN-Habitat)**

Finally, also the NCFF, the initiative launched by EIB, has defined several financial instruments that can be used by stakeholders to implement projects related with nature, including green infrastructures and NBS in cities (see NCFF, 2018).

Based on the literature review that has been conducted, on the features and characteristic of NBS and on the international case studies analysis the table below summarises the financial instruments that are suitable for the implementation of NBS in cities. The financial instruments that have been identifies are categorise into two groups:

16. ON-BUDGET: instruments which are directly included in the municipal budget like municipal 'green' bonds or social impact bonds;
17. OFF BUDGET: instruments for sustainable project financing channel funds with no direct impact on the municipal's budget.

At the same time, a distinction between innovative and traditional financial instruments has been performed.

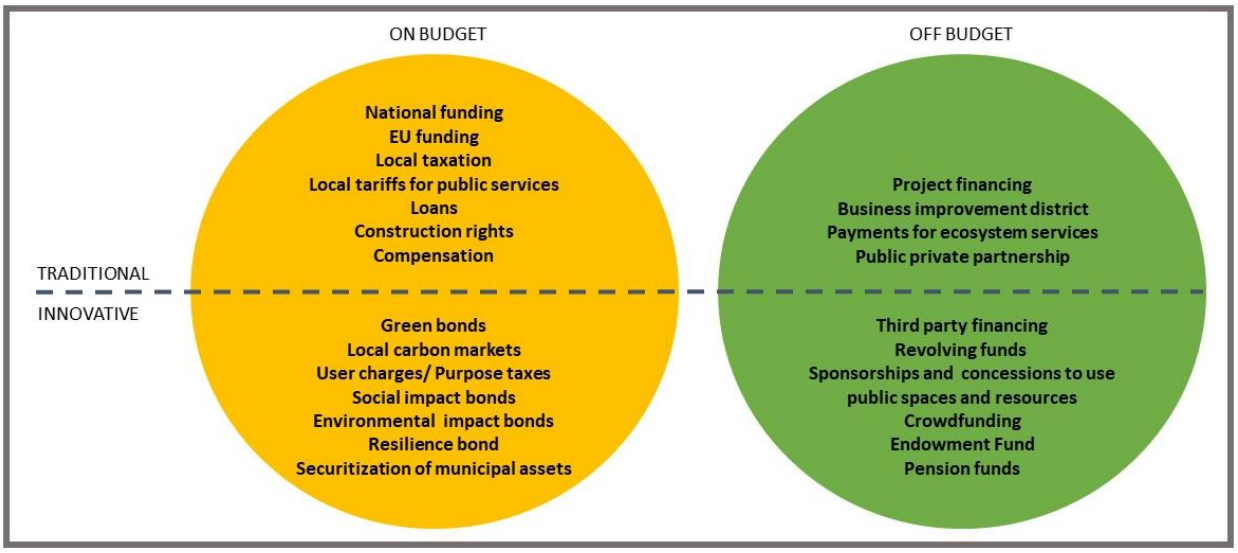


**Figure 9: Financial instruments for NBS categorization (based on Croci and Colelli, 2017)**

The above-mentioned mechanisms are listed in a table below. Per each instrument, an exhaustive explanation about the main characteristics has been provided and several case studies have been associated to each financial instrument. The case studies have been selected using different sources (e.g.: 100 Resilience City, Climate Adapt, H2020 SCC02 projects, etc.), all of them are referred at the implementation of NBS in urban areas.

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| **ON BUDGET** | | | |
| **TRADITIONAL** | **National funding** | Local authorities may access grants for environmental projects provided by upper levels of government. | Financial contributions of planning applications to prevention of heathland fires in Dorset, (UK) https://climate-adapt.eea.europa.eu/metadata/case-studies/financial-contributions-of-planning-applications-to-prevention-of-heathland-fires-in-dorset-uk |
| | **EU funding** | In 2014, the European Commission adopted the "Partnership Agreement" about the European Structural and Investment Funds for the 2014-2020 period, the Partnership Agreement is being implemented through various national operational programs and regional (European Commission, 2014). Furthermore, EU funding is channelled through the 5 European structural and investment funds. In addition, there are several other funding programs promoted by the European Commission that can support the urban dimension, such as the LIFE programs, Interreg, Innovative Urban Actions, the Civitas Fund, URBACT III and Horizon 2020. | Several projects aim to protect and implement NBS have been financed through EU fund. All of them are available online on the Cordis website: https://cordis.europa.eu/ |
| | **Local taxation** | Municipal income can come from taxes that are completely or partly under the authority of municipalities, or from taxes collected at other administrative levels and redistributed to the local level (Droste et al., 2017). | |
| | **Local tariffs for public services** | Local tariffs for public services can be an efficient instrument to be used by Municipalities to finance or maintain particular NBS that generates a service for the citizens. Local tariffs are able to capture the value generated by NBS. | https://www.rrstormwater.com/city-melbourne |
| | **Loans** | Cities can apply for loans from public or private financial institutions. Some public financial institutions offer low-interest loans for projects delivering environmental and/or social benefits. | |
| | **Construction rights** | One-off compulsory charges paid by property developers as a condition of | Berlin Biotope Area factor (GR): |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | | receiving development approval or as a condition of rezoning prior to development (Infrastructure Victoria, 2016) | https://climate-adapt.eea.europa.eu/metadata/case-studies/berlin-biotope-area-factor-2013-implementation-of-guidelines-helping-to-control-temperature-and-runoff<br>Italian urbanisation charges: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjY7ZjNotThAhVSsaQKHc17BZcQFjAAegQIABAC&url=http%3A%2F%2Fjournals.lepenseur.it%2Findex.php%2Fcse%2Farticle%2Fdownload%2F2%2F3&usg=AOvVaw38bncRIVcVseEVCQ8chbbd |
| | **Compensation** | Funds linked to offsetting/compensation requirements: where compensation is required for developments detrimental to nature, the compensation payments could be pooled into a fund which is then used to finance nature projects | German eco-account (GR): https://www.stadtlandfluss.org/fileadmin/user_upload/text_files/the_eco_account.pdf<br>https://ieep.eu/uploads/articles/attachments/9c664c89-f01f-4690-a64b-3eb06244ebee/Eco-Accounts_BW_case_study_final_221114.pdf?v=63664509880<br><br>GAIA Bologna (IT): http://www.derris.eu/wp-content/uploads/2017/08/eea-financing-urban-adaptation-thal17002enn.pdf |
| **INNOVATIVE** | **Green bonds** | Bonds are an instrument for raising capital through the debt capital market (UN-Habitat, 2017). They are essentially a type of loan. The bond issuer (debtor) borrows a fixed amount of capital from investors (creditors) over a defined period of time (the “maturity” of the bond), repays the capital (the | Climate bond financing adaptation actions in Paris (FR): https://climate-adapt.eea.europa.eu/metadata/case- |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | | "principal") when the bond matures, and pays an agreed-upon amount of interest ("coupons") during that period (UN-Habitat, 2017). In the case of a 'municipal green bond', the issuer (the city) commits to use the bond proceeds exclusively for projects with an environmental benefit (UN-Habitat, 2017). | studies/climate-bond-financing-adaptation-actions-in-paris https://www.environmental-finance.com/content/awards/green-bond-awards-2018/winners/sustainability-bond-of-the-year-city-of-paris.html |
| | **Local carbon markets** | Credit-trading systems organise the exchange of rights to emit a particular pollutant into a receptor environment (Common and Stagl, 2005). The EU ETS works on the 'cap and trade' principle. A cap is set on the total amount of certain greenhouse gases that can be emitted by installations covered by the system. The cap is reduced overtime so that total emissions fall. Within the cap, entities receive or buy emission allowances, which they can trade with one another as needed. They can also buy limited amounts of international credits from emission-saving projects around the world. The limit on the total number of allowances available ensures that they have a value. After each year an entity must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed. If an entity reduces its emissions, it can keep the spare allowances to cover its future needs or else sell them to another entity that is short of allowances. In relation to NBS, mechanisms following a similar logic are starting to be used to achieve storm water management targets but could potentially be envisaged in other areas also. | DC stormwater credit market (USA): https://www.citylab.com/solutions/2016/03/stormwater-runoff-credits-nature-conservancy-washington-dc/473700/ https://www.conservationfinancenetwork.org/2018/08/27/focus-on-investors-boosts-dcs-stormwater-credit-market<br><br>Creating Clean Water Cash Flows in Philadelphia (USA): http://encouragecapital.com/wp-content/uploads/2015/09/StormWater_Report_11.pdf |
| | **User charges/ Purpose taxes** | Charges on the use of 'grey' infrastructure can act as an incentive to reduce use by implementing green infrastructure. At present, this mechanism is being used in some cities to encourage the implementation of Sustainable Drainage Systems (SuDS) on properties. | Melbourne Water Stormwater Fees: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&cad=rja&uact=8&ved=2ahUKEwiS8LL6vdLhAhXQ26QKHWdJClEQFjAFegQICBAC&url=https%3A%2F%2Fwww.mdpi.com%2F2071-1050%2F11%2F7%2F1913%2Fpdf&usg=AOvVaw21X3o1yR-y1Gv-k5lK2DM8 |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | | | Managing heavy rains and stormwater in Copenhagen (DK): http://www.derris.eu/wp-content/uploads/2017/08/eea-financing-urban-adaptation-thal17002enn.pdf |
| | **Social impact bonds** | Social Impact Bonds are based on government grants that meet the principle of pay-for-results (PfR) or "payment against results". The first PfR mechanisms were adopted in the United Kingdom and the United States in the 1990s to finance public health and welfare services, allowing the Government to pay outsourced public service providers based on the achievement of calculated results, thus transferring the financial risk to the supplier. In "pay-for-result" mechanisms, the operator's performance depends, in whole or in part, on the success and the results obtained from the funded activity or project (Social Finance, 2017). | The Rotterdam Businezzclub SIB (NL)[13] https://www.oecd.org/cfe/leed/SIBsExpertSeminar-SummaryReport-FINAL.pdf<br><br>https://www.thehagueuniversity.com/docs/default-source/studie-kiezen/whitepapers/t17618-mpc-social-impact-bond_gb.pdf |
| | **Environmental impact bonds** | An Environmental Impact Bond (EIB) is an innovative financing tool that uses a Pay for Success approach to provide up-front capital from private investors for environmental projects, either to pilot a new approach whose performance is viewed as uncertain or to scale up a solution that has been tested in a pilot program. In its most basic form, investors pay the upfront costs for deploying these environmental solutions. Following deployment and program evaluation, the “payor”—whether it’s the public agency or private institution that benefits from these solutions—repays investors an amount linked to the achievement of agreed-upon outcomes of the program. The bond structure is designed to meet the payor’s needs—whether that’s providing risk coverage in the case of underperformance, or a benefits share with investors and contractors to incentivize exceeding performance. By identifying, quantifying, and transferring project risks, the EIB creates | District Columbia Water and Sewer Authority – Environmental Impact Bond (USA): https://conservationfinancenetwork.org/2017/01/02/pioneering-environmental-impact-bond-for-dc-water https://govlab.hks.harvard.edu/files/govlabs/files/dc_water_environmental_impact_bond.pdf |

[13] The file contains more than one case study

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | | incentives to deploy innovative solutions. | |
| | **Resilience bonds** | A Resilience Bond is a new insurance instrument designed to help cash-strapped governments increase both physical protection and financial insurance against disasters. These bonds link insurance coverage that public sector entities can already purchase (including parametric insurance policies and catastrophe bonds) with capital investments in resilience projects (such as, flood barriers and building retrofits) that reduce expected losses from disasters. This connection between insurance and infrastructure is important, because just as life insurance doesn't actually make you physically healthier, catastrophe bonds do not reduce physical risks and only pay out when disasters strike. | https://www.wri.org/news/2018/11/release-forest-resilience-bond-help-fund-46-million-restoration-project-mitigate |
| | **Securitization of municipal assets** | An asset-backed security (ABS) is a fixed-income security guaranteed by an asset that generates adequate income to return the total amount of its cost to the holder of the security through payments based on cash flow from the assets. The process of creating ABS is known as securitization. Financial institutions create them by buying so-called "self-liquidating assets" such as loans, leases or receivables and placing them in a trust or a special-purpose vehicle (SPV) whose sole function is to buy and bundle such assets. The bundled assets are typically divided into separate "tranches," which represent new securities with different levels of risks and returns that are sold to investors in the secondary market. (Municipal Securities Rulemaking Board, 2015) | |
| **OFF BUDGET** | | | |
| | **FINANCIAL INSTRUMENTS** | **DEFINITION** | **CASE STUDY** |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| **TRADITIONAL** | **Project financing** | Project finance can be seen as a multidisciplinary approach for the funding of specific investments that present high degrees of complexity. It is an extremely structured way of financing that is closely linked to the economic and financial balance of the specific project it refers to rather than to the balance within the enterprise where the project is carried out. Indeed, the servicing of debt and the remuneration of capital are based on the cash-flows and profits generated by the project. The evaluation of the economic and financial sustainability of a project is based on its actual quality, in terms of the capability of generating cash-flows given a certain level of risk, and it does not depend on the creditworthiness of individual shareholders. These cash-flows are the primary mean used to service the debt. One of the principal characteristics of PF is the fact that a Special Purpose Vehicle(SPV)is created in an "ad hoc" fashion, in order to establish an independent entity, completely separated from the participating enterprises/entities. (Vacca e Solustri, 2003). | |
| | **Business improvement district** | Originally introduced in Ontario, Canada, BIDs have been widely used in the US and Europe since the 1960s to finance and deliver improvements to commercial and industrial environments, and the model has been applied in some cases to GI improvements (McNeill and Rayment, 2015). Businesses and other stakeholders enter an agreement with local government to contribute an additional levy to finance improvements in a specific area. Once established, BIDs are free to constitute their own management body, make spending decisions, and seek additional income through various instruments (Sandford, 2018). An Improvement District is a private, non-profit controlled, carved-out area within the city. It is mechanism through which property owners pay in the district pay special taxes or assessment, which in turn, the BID uses to fund various initiatives, such as beautification efforts or additional security. | Greening Growth in Victoria (UK): https://www.victoriabid.co.uk/about-the-bid/ https://www.treeconomics.co.uk/wp-content/uploads/2018/08/Victoria-BID-I-Tree-Report.pdf<br><br>DC Business Improvement District - Innovative Stormwater Management Installations (USA) https://www.vibrantcitieslab.com/resources/dc-business-improvement-district-underwrites-innovative-stormwater-management-installations/ |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | **Payments for ecosystem services** | PES are generally voluntary transactions between service users and service providers, conditional on agreed rules of natural resource management, in order to generate offsite services (Wunder, 2015). Payments can be input-based (e.g. based on the costs of managing a site) or output-based, i.e. depending on the achieved level of ecosystem service provision (Illes et al., 2017). | New York water quality PES (USA): https://www.cbd.int/financial/pes/usa-pesnewyork.pdf |
| | **Public private partnership** | PPPs can be defined as "long-term contracts between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility" (UN-Habitat, 2017). PPPs have been used for a range of infrastructure services (government entities 'delegate' service provision to a private entity) and can also be developed for the delivery and/or maintenance of GI. In general, PPPs can take various forms, including operation and maintenance contracts, leases, concessions, etc. (UN-Habitat, 2017). | Public-private partnership for a new flood proof district in Bilbao (SP): https://climate-adapt.eea.europa.eu/metadata/case-studies/public-private-partnership-for-a-new-flood-proof-district-in-bilbao |
| **INNOVATIVE** | **Third party financing** | The Third-Party Financing refers solely to debt financing. The project financing comes from a third party, usually a financial institution or other investor, or the ESCO, which is not the user or customer. NFFC is a financing facility set up by the European Commission and the European Investment Bank (EIB) to support projects focusing on nature and biodiversity and ecosystem-based adaptation to climate change. The NCFF provides funding in two main ways: direct lending or setting up intermediated structures (such as funds or credit lines) via a financial intermediary. The facility is currently in a pilot phase and can sign projects until the end of 2019 (EIB, 2019). | Athens resilient city and natural capital (GR): https://www.eib.org/en/projects/pipelines/pipeline/20180050.htm |
| | **Revolving funds** | A revolving fund is a fund or account that remains available to finance an organization's continuing operations without any fiscal year limitation, because the organization replenishes the fund by repaying money used from the account. Revolving funds have been used to support both government and non-profit operations. In the case of revolving funds for a government project whose budget goes through annual parliamentary or other legislative appropriations that relate to a fiscal year then the unutilized balance may | Clean Water State Revolving Fund (USA): https://www.epa.gov/sites/production/files/2018-09/documents/srf_gpr_case_studies.pdf |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | | lapse after the close of the financial year. However, it is restored the next year provided the agency concerned includes the amount in next year's appropriation | |
| | **Sponsorships and concessions to use public spaces and resources** | Sponsorship is a financial or in-kind support by a for profit entity for a specific program, event or site in exchange of tangible and intangible benefits for the sponsor. | Liverpool sponsor and grants (UK): https://www.liverpool.nsw.gov.au/community/grants-and-sponsorship<br><br>Milan adopt a green spot (IT): http://www.comune.milano.it/wps/portal/ist/it/vivicitta/verde/adotta_verde/adotta_verde_pubblico<br><br>Paris green permit (FR): https://greeninfrastructureconsultancy.com/the-greening-permit-in-paris/ |
| | **Crowdfunding** | Raising funds for a project (usually of public interest) through the donation of small amounts from a large number of individuals. Suitable especially for supporting small-scale projects that are not necessarily suitable for other financing instruments. Crowdfunding can be a powerful instrument to • fund sustainable urban development either by investing in 'green' SMEs, by funding NGOs and cooperatives for green projects or by allowing citizens participation in the financing of small • public works. | Ghent urban greening for climate adaptation: https://climate-adapt.eea.europa.eu/metadata/case-studies/ghent-crowdfunding-platform-realising-climate-change-adaptation-through-urban-greening/#implementation_time_anchor |
| | **Endowment Fund** | Endowment Funds allow residents to contribute to their community with financial gifts. Typically, the funds are used to carry out community projects and programs for the public good within the City. | MillionTreesNYC Tree Initiative (USA): https://www.nature.org/content/dam/tnc/nature/en/documents/Trees4Health_FINAL.pdf https://www.milliontreesnyc.org |

| | FINANCIAL INSTRUMENTS | DEFINITION | CASE STUDY |
|---|---|---|---|
| | | | Vrijburcht, a privately funded climate-proof collective garden in Amsterdam (NL): http://www.derris.eu/wp-content/uploads/2017/08/eea-financing-urban-adaptation-thal17002enn.pdf |
| | **Pension funds** | Infrastructure assets are well suited to match long-term liabilities of institutional investors, such as pension funds and insurance companies. Once operational stability is achieved, most infrastructure assets generate stable, long-term cash flows—some even inflation-linked—which are particularly attractive in meeting their long-dated liabilities (Della Croce et. al). | Pension funds (NL): Bennon, M., A. Monk, and C. Nowacki, "Dutch Pensions Paving the Way for Infrastructure Development" |

**Table 10: Financial instrument for NBS categorisation**

# 4 Assessment framework for business models case study

The definition and adoption of a business model in cities have been analysed through a literature review of the best practices and case study of BMs for NBS in European cities and non-EU cities. The aim is to understand the structure and the characteristics of the successful business models in order to be able to replicate them in different contexts.

In order to describe the business models a template for the assessment framework has been developed based on the previous chapter of the deliverable (see chapter 2). The template takes into account all the main features characterising business models.

It is composed by two main blocks: the first one is related with the general information about the project implemented, the objectives and the main challenges faced by the city. The second block is related with the business model: stakeholders involved, description of the value proposition, value delivery and value capture, the cost structures, the revenues, etc.

The assessment framework template that has been used for the business model case study analysis is shown below.

**URBAN GREENUP BUSINESS MODEL ASSESSMENT FRAMEWORK**

1. **Case study name**
2. **Contact person**
3. **Reference material web link**
4. **City**
   - ☐ Valladolid
   - ☐ Liverpool
   - ☐ Izmir
   - ☐ Other (specify)
5. **Project description and objectives**
6. **Project scale**
   - ☐ National
   - ☐ Regional
   - ☐ Metropolitan
   - ☐ Urban
   - ☐ Street
   - ☐ Building
7. **Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *PROVISIONING* | *SUPPORTING* |
|---|---|---|---|
| ☐ Water flow regulation and runoff mitigation | ☐ Recreation and health<br>☐ Cognitive | ☐ Food supply<br>☐ Freshwater supply | ☐ Creation of habitat for species |

| | | | |
|---|---|---|---|
| □ Flood risk reduction<br>□ Urban temperature regulation<br>□ Noise reduction<br>□ Air purification<br>□ Carbon sequestration | development<br>□knowledge preservation<br>Aesthetic | | □ Biodiversity improvement |

8. **Project realisation time from design to start operating of the infrastructure (months)**
9. **Project duration (lifetime of the solution from start operating, years)**
10. **Actors involved in the design, construction and management of the NBS?**

| | Design | Construction | Management |
|---|---|---|---|
| City government | | | |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | | | |
| Urban designers and planners | | | |
| Developers | | | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centers) | | | |
| Other (please specify…) | | | |

11. **Description of the co-design actions implemented (if any)**
12. **Owner of the area in which the NBS was implemented**
    - □ City government
    - □ Public company
    - □ Private company
    - □ Non-governmental association
    - □ Other (please specify…)
13. **Responsible for operations related to the NBS**
    - □ City government
    - □ Public company
    - □ Private company
    - □ Non-governmental association
    - □ Other (please specify…)
14. **Main target users of the NBS? (you can select one or more answers)**

| | |
|---|---|
| City government | Tourists |
| City agencies | Utility companies |
| NGOs | Other companies |

| | |
|---|---|
| Citizens | Other target users (please specify…) |
| Commuters | |

**15. Beneficiaries of the NBS implemented? (you can select one or more answers)**

- ☐ City government
- ☐ City agencies
- ☐ NGOs
- ☐ Citizens
- ☐ Commuters
- ☐ Tourists
- ☐ Utility companies
- ☐ Other companies
- ☐ Other target users (please specify…)

16. **Description of the value proposition, the value delivery and the value capture of the NBS.**

| **Value proposition**[14] | **Value delivery**[15] | **Value capture**[16] |
|---|---|---|
| | | |

**17. Financial instruments adopted**

| | **ON-Budget** | **OFF-Budget** |
|---|---|---|
| **Traditional** | ☐EU grants<br>☐National grants<br>☐Regional grants<br>☐Local taxation<br>☐Local tariffs for public services<br>☐Loans<br>☐Bonds<br>☐Construction rights<br>☐Environmental compensation<br>☐Others | ☐ Project financing<br>☐ Others |
| **Innovative** | ☐ Green bonds<br>☐ Impact bonds (environmental, social,)<br>☐ Resilience bonds<br>☐ User charges/ Purpose taxes<br>☐ Others | ☐ Third party financing<br>☐ Revolving funds<br>☐ Endowment funds<br>☐ Sponsorships and concessions to use public spaces and resources<br>☐ Business improvement district<br>☐ Payments for ecosystem services |

[14] description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.
[15] production of social, environmental and economic benefits through activities, channels and partners.
[16] is about considering how to earn revenues from the provision of good, services or information to users and customers

| | | |
|---|---|---|
| | | ☐ Crowdfunding<br>☐ Others |

**18. Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | |
| National government | |
| Regional government | |
| City government | |
| Real estate operators | |
| Financing and insurance institutions | |
| Utilities | |
| Citizens | |
| Other companies | |
| Other (please specify…) | |

**19. Cost structure[17]**

| | |
|---|---|
| Capital costs (euro)[18] | |
| Average operational and maintenance cost (euro/year) | |

**20. Revenue streams[19] of the NBS implemented**

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | |
| cost savings (please specify the sector) | |
| payments/tariffs for the use of service | |
| other (please specify) | |

**21. Environmental and social benefits[20] generated**

[17] capital expenses and maintenance costs

[18] are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible

[19] Identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)

[20] non-financial aspects of the business model that are beneficial for cities (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion, energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience, other social/environmental benefits (please specify…)

| | No or negative contribution | Low contribution | Moderate contribution | Relevant contribution | Very relevant contribution |
|---|---|---|---|---|---|
| job creation | | | | | |
| business generation (e.g. activation of start-ups or innovative businesses) | | | | | |
| social inclusion | | | | | |
| access to new services | | | | | |
| creation of education/training opportunities | | | | | |
| increase of wellbeing | | | | | |
| increase of environmental awareness | | | | | |
| increase of road/personal safety | | | | | |
| noise reduction | | | | | |
| reduction of energy consumption/ | | | | | |
| GHG emissions reduction | | | | | |
| reduction of local air pollutants emissions | | | | | |
| increased water use efficiency | | | | | |
| increased efficiency in public services | | | | | |
| traffic/road congestion reduction | | | | | |
| better use of existing public spaces | | | | | |
| contribution to vulnerability reduction and resilience | | | | | |
| other social/environmental benefits (please specify…) | | | | | |

22. **Main barriers and enabling factors in influencing the success of the business model**

# 5 Business models for NBS case studies

The chapter is dedicated at the analysis of the business models implemented in EU and non-EU cities for the implementation of NBS. The case studies have been analysed following the assessment template described in chapter 4. The case studies have been selected based on:

1. Typology of the financial instrument selected;
2. NBS implemented;
3. Stakeholders involvement;
4. Impacts generated;
5. Replication potential in other cities;
6. Data availability.

Based on these criteria ten case studies have been selected: Paris Climate bond (France), Milan Adopt a green spot initiative (Italy), Victoria Business Improvement District (UK), PPP for a flood proof district in Bilbao (Spain), Million Trees NYC (USA), DC' Stormwater Credit Market (USA), Valladolid green wall (Spain), Ghent climate change adaptation through urban greening (Germany), City of Melbourne urban forest fund (Australia).

The data on the revenues generated by the implemented actions in some case studies are missing because the data could not be found.

| Case study | Scale of intervention | NBS implemented | Financial instrument | Stakeholders involved |
|---|---|---|---|---|
| **Paris climate bond** | Urban | Parks and trees planting | Climate bond | Municipality, financial institutions |
| **Milan adopt a green spot** | Urban | Tree planting, flowerbeds, parks | Payment for ecosystem services | Municipality, NGOs, citizens, private companies, universities |
| **Victoria Business improvement district** | Urban | Green wall, tree planting, rain garden | Business improvement district | Municipality, Firms, businesses and hotels |
| **Flood proof district in Bilbao** | Urban | Park | Public-private partnership | Municipality, National government, private companies |
| **Million Trees NYC** | Metropolitan | Tree planting | Endowment fund, sponsorship and donations | Municipality, NGOs, citizens, private companies, universities, |

| Case study | Scale of intervention | NBS implemented | Financial instrument | Stakeholders involved |
|---|---|---|---|---|
| | | | | foundations, financial institutions |
| **DC's Stormwater Credit Market** | Metropolitan | SUDs, rain gardens, etc. | Local credit market | Municipality, NGOs, citizens, private companies |
| **Valladolid Green wall** | Street | Green wall | Project financing and third-party financing | Municipality and private company |
| **DC's Environmental Impact Bond** | Metropolitan | SUDs | Environmental impact bond | Municipality, financial institutions |
| **Ghent climate change adaptation through urban greening** | Urban | Different NBS based on the project proposed | Crowdfunding | Municipality, citizens and firms |
| **City of Melbourne urban forest fund** | Urban | new green open spaces, tree planting, green roofs, green walls or facades, water sensitive urban design projects | Sponsorship, environmental compensation, crowdfunding | Municipality, NGOs, citizens, private companies |

**Table 11: Business model case studies summary**

The case study analysed and the review of the literature on business models highlights some common success factors in business model development in cities. These are:

- **Political commitment:** long-term change at scale requires supporting policy mechanisms and procedures that build institutional memory and practice to make the management of natural infrastructure assets routine and efficient. Political commitment and support will facilitate the engagement of different typologies of stakeholders in the definition, implementation and maintenance of solutions implemented in cities.
- **Financial support:** the roles of the involved actors and the provision of assets and the management of the operational phase are fundamental in order to determine whether the scheme can be effective. Even though it is universally accepted that some sort of financial public support is justified and necessary due to the fact the solutions are promoted for public objectives, the aim for a successful scheme should be to gain a financial viability in their operational phase.

- **Stakeholders' involvement:** implementing measures successfully requires more than financial resources. It also requires sufficient awareness and support among decision-makers in the public and private domain, and among citizens and other stakeholders. Stressing the many benefits across various dimensions, which include reduced risks, longer lifetime and greater resilience of infrastructure, leading to long-term payoffs, market advantage, and increase in property values, can help to mobilise funding from various municipal sectoral budgets and from private sources or societal organisations. Early and active stakeholder engagement – in particular through co-design actions - helps to ensure wider awareness, ownership and involvement of citizens in developing creative solutions with broad support; it also provides an opportunity to raise funds from private contributions such as crowdfunding or donations.

## 5.1 Paris Climate Bond

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**Reference material web link**
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**Project description and objectives**
In 2015, the City of Paris erected the climate bond to finance climate and energy projects. The aim of Paris climate bond is to finance energy-climate projects, covering the 4 main goals of the Paris Climate & Energy Action Plan: reduction of GHG emissions, improvement of energy efficiency, production of renewable and/or recovered energy, and adaptation to climate change. The purpose of the Adaptation Strategy, one of the operational documents of the Paris Climate & Energy Action Plan, is to prepare the city for both future climate changes as well as for future scarcity of certain resources such as water, energy, food and biodiversity. This is translated into four main objectives:

- protect Parisians from extreme climate events;
- ensure the supply of water, food and energy;
- live with climate change: more sustainable city planning;
- foster new lifestyles and boost solidarity.

The total size of the climate bond of Paris is €300 million and promises an annual interest rate of 1.75%. The bond is broken down as follows: €120 million for reduction of greenhouse gas emissions, €115 million for energy efficiency, €5 million for production of renewable and/or recovered energy and €60 million for adaptation to climate change. Two adaptation projects are currently included in the climate bond:

- planting 20.000 trees (€18 million in total, €15 million will be financed from the proceeds of the climate bond the remaining €3 million directly financed from the greening budget of the City of Paris);

creating 30 ha of new parks (the realization of the parks will cost €67 million, €45 million will be financed by the climate bond and €23 directly from the greening budget of the City of Paris).

**Project scale**
Metropolitan

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Urban temperature regulation<br>Air purification<br>Carbon sequestration | Recreation and health<br>Aesthetic | Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**
60 months (the entire project will be finished within 2020)

**Project duration (lifetime of the solution from start operating, years)**
Lifetime for trees in Paris is generally around 70 years. Regarding the parks, the intention is that they will last forever.

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | X | | X |
| City agencies | | | |
| Utilities | | | X |
| Non-governmental associations | X | | |
| Urban designers and planners | | | |
| Developers | X | X | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centres) | | | |
| Firms | | X | |
| Other (please specify…) | | | |

**Co-design actions implemented**
n/a

**Owner of the area**
Municipality

**Responsible for operations related to the NBS**
Municipality

**Target users of the NBS**

| | |
|---|---|
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |
| Commuters | |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |

| | |
|---|---|
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Implementation of the energy and adaptation plan of Paris | Improvement of the overall wellbeing in city and reduction of the urban heat island effect and run-off | Avoided cost generated by climate change impacts on ci5tizens and city areas |

**Financial instruments adopted**

Climate bond

**Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | / |
| National government | 7.050.000 |
| Regional government | / |
| City government | 38.000.000 |
| Real estate operators | / |
| Financing and insurance institutions | 39.950.000 |
| Utilities | / |
| Citizens | / |
| Firms | / |
| Other: NGOs and universities | / |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | 85.000.000 |
| Average operational and maintenance cost (euro/year) | data not available |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | / |
| cost savings (green area design and maintenance costs) | Decrease of the heat island effect and cost reduction in stormwater management |
| payments/tariffs for the use of service | / |
| other (please specify) | Increase in property values and increase in economic activities |

The adaptation projects will not lead to direct financial benefits that will help reimbursing the investors, but through the mitigation projects in the bond and under the Paris Climate and Energy Action Plan, the City of Paris expects to reduce its energy consumption and thus generate extra revenue for the City. As it is not allowed to earmark revenues for specific expenditures (rule of non-assignment), this revenue will not be used directly to pay interest to the investors of the bond and repay them the full amount borrowed at the end of the bond term, but this will be paid out of the general City budget.

**Barriers and enabling factors influencing the success of the business model**

T Few important elements have to be taken into account when considering a green or climate bond:

- a green or climate bond is a long process. This might be more difficult to organize within smaller authorities, the advantage is that it creates a real internal synergy (financial matter and operational projects need each other).
- transparency and accountability. The process may imply a different working organization or may require new procedures or tools (for instance, for budget monitoring). It also costs money; to acquire extra-financial rating, to hire support for the creation and structure of this kind of bond, to mobilize a team, etc.
- necessary to erect an attractive green bond. In the opinion of investors, independence guarantees security and an honest process. Furthermore, it is essential that the local authority has expertise on the green market and has knowledge of what is expected or valued by investors.

For Paris this worked out well with regard to the applied methodology, collaboration and coordination by the financial office. The city did not have all the required knowledge and resources in-house, but they knew where to get it and this input proved very valuable. Paris has, for example, an efficient network with bankers as they regularly trade with them. It is then crucial to connect all the different expertise and the city was successful at this due to internal competences. If the connection is not being made, which is especially difficult if all expertise is external to the local authority, this could become a serious impediment to launch a green bond. However, this connection is also what makes the process interesting as it creates synergy. Finally, another important factor of success was the rating by Vigeo, which rated Paris as the leader of the sector in climate bonds (1st among local authorities) and made Paris attractive for investors.

**Social and environmental benefits**

| | |
|---|---|
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of local air pollutants emissions |
| increase of wellbeing | better use of existing public spaces |
| increase of environmental awareness | contribution to vulnerability reduction and resilience |

## 5.2 Milan Adopt a green spot

**Contact person**

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**Reference material web link**

http://www.comune.milano.it/wps/portal/ist/it/vivicitta/verde/adotta_verde/adotta_verde_pubblico

**Project description and objectives**

Milan Municipality in 2005 launched the "adopt a green spot" initiative. This initiative foresees the engagement of various stakeholders in the management of urban green areas.

Citizens, NGOs, private companies, universities can, directly or indirectly, provide for the maintenance of green areas within the city through standardised voluntary agreements designed by the Municipality. The city designed two typologies of contracts (technical collaboration and technical sponsorship). The duration of the contracts varies from 3 to 5 years based on the agreement typology. The areas under the initiative are flowerbeds, urban parks and gardens, recreational areas, roundabouts, tree lines and trees.

**Project scale**

Urban

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Climate regulation<br>Noise reduction | Aesthetic | Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**

6 months

**Project duration (lifetime of the solution from start operating, years)**

The contracts can vary from 3 to 5 years

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | | | |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | X | X | X |
| Urban designers and planners | | | |
| Developers | X | X | X |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | X | X | X |
| Research (Universities, research centres) | | | |
| Firms | X | X | X |
| Other (please specify…) | | | |

**Co-design actions implemented**

n/a

**Owner of the area**

Municipality

**Responsible for operations related to the NBS**

Private company

**Target users of the NBS**

| | |
|---|---|
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |
| Commuters | |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Involvement of the stakeholders in the management of Milan urban green areas | Improvement of the quality of green areas | Reduction of the management costs for green area maintenance |

**Financial instruments adopted**

Payment for ecosystem services

**Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | / |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens | 1.630.001 |
| Firms | 690.000 |
| Other: NGOs and universities | 263.840,00 |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | 1.938.034,75 |
| Average operational and maintenance cost (euro/year) | 645.806,25 |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | / |
| cost savings (green area design and maintenance costs) | 645.806,25 |
| payments/tariffs for the use of service | / |
| other (please specify) | / |

**Barriers and enabling factors influencing the success of the business model**
The main enabling factors are:

- Structure and the flexibility of the agreements design by the Municipality that allow to involve different stakeholders (firms, citizens, NGO and schools)

**Social and environmental benefits**

| | |
|---|---|
| access to new services | noise reduction |
| creation of education/training opportunities | GHG emissions reduction |
| increase of wellbeing | reduction of local air pollutants emissions |
| increase of environmental awareness | increased efficiency in public services |
| increase of road/personal safety | better use of existing public spaces |

## 5.3 Victoria Business Improvement District

**Contact person**
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**Reference material web link**
https://www.victoriabid.co.uk/
https://www.victoriabid.co.uk/wp-content/uploads/2015/02/VBID_i-Tree_Report_2012.pdf

**Project description and objectives**
Victoria Business Improvement District (VBID) was established in 2010 after a successful ballot of businesses liable to pay the business rate levy in the area. VBID's first five-year term ended in 2015 and businesses overwhelmingly decided to renew the BID. VBID works in partnership with businesses in the area. It was formed to support the development of the area and create a vibrant destination for those working, visiting and living in the area. VBID have five key work programmes for the next five years, which are: clean and green, safe and secure, sustainable prosperity, destination Victoria and public realm.
The Greater London Authority (GLA) is working with BIDs in central London to identify and then deliver opportunities for increasing green cover. The Mayor has set an ambitious target of increasing the amount of green cover in central London by 5% by 2030 and by 10% by 2050 (based on a 2008 baseline). In order to meet the mayoral greening target, green infrastructure must be delivered though both new developments and retrofit of the existing built environment. With limited budget and land ownership in central London, the GLA decided to work with others to help meet this mayoral objective. The **GLA has therefore developed partnerships with BIDs**, through the **Cross River Partnership public-private sector alliance**. The **Greening the BIDs** delivered 19 Green Infrastructure Audits and 16 GI installations, including rain gardens, green walls and green roofs, across central London.
Between 2010 and 2015 thanks to the VBID investments several NBS have been realised:

- installation of 30 trees
- realisation of the Diamond Garden (including pollinator-friendly plants)
- design of the John Lewis Rain Garden (the garden will tap into a water downpipe and make better use of water to feed garden plants)

realisation of the living wall on the side of The Rubens at the Palace Hotel (the wall comprises 450m$^2$ and uses rainwater harvesting) installed by Red Carnation Hotel.

**Project scale**
Urban

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Urban temperature regulation<br>Noise reduction<br>Air purification<br>Carbon sequestration | Recreation and health<br>Aesthetic | Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**
60 months

**Project duration (lifetime of the solution from start operating, years)**
n/a

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | X | | X |
| City agencies | | | |
| Utilities | | | X |
| Non-governmental associations | | | |
| Urban designers and planners | | | |
| Developers | X | X | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centres) | | | |
| Firms | | X | X |
| Other (please specify…) | | | |

**Co-design actions implemented**
n/a

**Owner of the area**
Municipality, private companies

**Responsible for operations related to the NBS**
Municipality, private companies

**Target users of the NBS**

| | |
|---|---|
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |
| Commuters | |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Improvement of the overall district to increase attractiveness and well-being | Improvement of the overall wellbeing in city and reduction of the urban heat island effect and run-off | Avoided cost generated by climate change impacts and improvement of the area attractiveness |

**Financial instruments adopted**

Business improvement district

**Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | / |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens | / |
| Firms | data not available |
| Other: NGOs and universities | data not available |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | data not available |
| Average operational and maintenance cost (euro/year) | data not available |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | / |
| cost savings | green area design and maintenance costs; energy savings; reduction of water run-off |
| payments/tariffs for the use of service | / |
| other (please specify) | Increase in property value and of area attractiveness |

For more details about the economic evaluation of the Victoria BID green system consult the report at this link: https://www.treeconomics.co.uk/projects/london-victoria-bid-i-tree-project/

**Barriers and enabling factors influencing the success of the business model**

The Victoria BID experience is an example of a bottom-up initiative aimed to improve the urban area and the quality of life in a particular area of a city. In this case the BID has been established by the firms and businesses located in Victoria district, the successful factors of the initiative are:

- Partnership with the GLA for the implementation of NBS;
- Differentiation in the investments made in the BID;
- Definition of a BID manager no-profit agency for the management, control and monitoring of the initiative.

**Social and environmental benefits**

| | |
|---|---|
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of local air pollutants emissions |
| increase of wellbeing | better use of existing public spaces |
| increase of environmental awareness | contribution to vulnerability reduction and resilience |

## 5.4 Flood proof district in Bilbao

**Contact person**

Pablo Otaola - General manager of 'Comisión Gestora de Zorrotzaurre', Junta de Concertación de la Unidad de Ejecución 1 de Zorrotzaurre
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**Reference material web link**

http://www.zorrotzaurre.com/

**Project description and objectives**

Bilbao's 'Zorrotzaurre' district is currently a degraded, flood-prone industrial peninsula. With increasing extreme precipitation predicted across the Basque country in the future due to climate change and a need for new housing to accommodate citizens of Bilbao, a major urban regeneration project is currently underway to redevelop Zorrotzaurre district into a new flood-proof residential quarter. Flood protection includes five key measures: (1) opening the Deusto canal (turning the peninsula into an island), (2) providing a flood protection wall, (3) elevating the ground level by 1,5 meters for new buildings, (4) installing storm water tanks and (5) providing green, public spaces.

To realise this urban regeneration project, a public-private partnership was established for financing and managing the plan. The costs for the redevelopment works will be covered by the public-private partnership, i.e. the owners of the land, according to their share of ownership. The PPP was created by the landowners of Zorrotzaurre and it is called the "Comisión Gestora de Zorrotzaurre". The private sector initiated the partnership, and, due to the importance of the project and the amount of land owned by public authorities (Port, City and Province), the public sector joined the 'Comisión Gestora'. The 'Comisión Gestora' is a union of owners with no special legal status. The 'Junta de Concertación', the organization that was created to develop the first phase of the project, is an organisation defined in the Basque law for urbanism. Both are not-for-profit, since the final objective is to balance the costs with investments made by the owners. The current members of the 'Comisión Gestora

de Zorrotzaurre' own 65% of the land in Zorrotzaurre; these are: The Regional Basque Government (through the Department of Employment and Social Affairs and the publicly owned company Visesa), Bilbao City Council, the Port Authority of Bilbao, and private entities 'Sociedad Promotora Inmobiliaria Margen Derecha S.A.' and 'Vicinay Cadenas S.A.'. The 'Comisión Gestora de Zorrotzaurre' supervises the redevelopment plan of Zorrotzaurre (the 'Master Plan Zorrotzaurre') and the members pay for all the expenses of the project and contribute financially relative to the share of land they own (51% public, 49% private).

**Project scale**

Urban

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Flood risk reduction<br>Carbon sequestration | Recreation and health<br>Aesthetic | Biodiversity improvement<br>Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**

The bridge over the canal has been constructed (2016) and work on the opening of the canal is have been completed by the end of 2017. The urban redevelopment of the island started in 2017 and is not expected to be finished within 30 years.

**Project duration (lifetime of the solution from start operating, years)**

The flood protection measures are expected to last the lifetime of the buildings.

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | X | X | X |
| City agencies | X | X | X |
| Utilities | | | |
| Non-governmental associations | X | | |
| Urban designers and planners | | | |
| Developers | X | X | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | X | | |
| Research (Universities, research centres) | | | |
| Firms | X | X | X |
| Other (please specify…) | X | X | X |

**Co-design actions implemented (if any)**

Citizens have been involved in the design and development of the plans for which various interactions with the project managers have taken place. Among the results of these discussion has been a programme established by the 'Society for Municipal Restoration', or Surbisa, with a ring-fenced budget (donated 50% by developers of the general project and 50% by the municipality) to support and help existing owners and tenants to restore their buildings with special attention to improve accessibility and energy saving.

**Owner of the area**
Municipality and private company

**Responsible for operations related to the NBS**
Municipality and private company

**Target users of the NBS**

| | |
|---|---|
| NGOs | Utility companies |
| Citizens | Other companies |
| Commuters | Tourists |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| NGOs | Utility companies |
| Citizens | Other companies |
| Commuters | |
| Tourists | |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Creation of a water proof district | Regeneration of a degraded area of the city of Bilbao | Improvement of the quality of life and creation of a new residential and commercial area for the city |

**Financial instruments adopted**
Public private partnership

**Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | 30.740.000 |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens | / |
| Firms | / |
| Other: NGOs and universities | 3.500.000 |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | Deusto canal 20.900.000<br>Flood protection barrier 5.100.000<br>Storm water tanks 4.740.000<br>Ground level elevation and green spaces 3.500.000 |
| Average operational and maintenance cost (euro/year) | data not available |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | data not available |
| cost savings | data not available |
| payments/tariffs for the use of service | data not available |
| other (please specify) | data not available |

**Barriers and enabling factors influencing the success of the business model**

The redevelopment of Zorrotzaurre is a slow and complex project which was also affected by the economic crisis that unfolded since the publication of the revised plan in 2007. Therefore, it was decided to split the plan for the peninsula/island into two areas. Several factors have contributed to the delay in the project development:

- number of stakeholders involved, including the municipality, land owners and residents;
- decontamination of polluted soil;
- implementation of the "Re Allotment project" that aimed to move the industries outside of Zorrotzaurre area (the plan also involves the demolishment of several buildings and the relocation of 30 companies and a compensation payment).

On the other hand, one of the greatest assets to the project is the investment vehicle that has been concluded: the great number of land owners of all sizes gathered in the public-private partnership (the 'Comisión Gestora de Zorrotzaurre'). The partnership includes a Coordination Board and a Management Board, which oversees the execution of the works and facilitates the coordination and operation of the project.

**Social and environmental benefits**

| | |
|---|---|
| job creation | increase of wellbeing |
| business generation | increase of environmental awareness |
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of energy consumption/ |
| reduction of local air pollutants emissions | contribution to vulnerability reduction and resilience |
| better use of existing public spaces | |

## 5.5 Million Trees NYC

**Contact person**

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**Reference material web link**

https://www.milliontreesnyc.org/

**Project description and objectives**

New York City is in the midst of a major planting initiative, MillionTreesNYC, with the ultimate goal of planting one million trees by the year 2017. Of the one million trees, 220,000 street trees, 380,000 reforestation efforts, and the remaining 400,000 have been planted on private property. By working together, New York Restoration Project and New York City were able to leverage the full range of financial resources, infrastructure, data,

expertise and volunteers necessary to set a new global standard for green space access. MillionTreesNYC was created as a public/private partnership between the City of New York Department of Parks & Recreation (NYC Parks) and the non-profit New York Restoration Project (NYRP). Core elements of the initiative include tree planting and care; education and outreach; marketing and public relations; urban forestry research; and program evaluation.
The main actions adopted are:
1. Trees for Neighbourhoods that Needed Them
2. Public and Private Funding
3. Committed Leadership
By planting one million trees, New York City increased its urban forest—our most valuable environmental asset made up of street trees, park trees, and trees on public, private and commercial land—by 20%, while achieving the many quality-of-life benefits that come with planting trees. The City of New York planted 70% of trees in parks and other public spaces. The other 30% have been planted in private organizations, homeowners, and community organizations. Different private sponsors (companies, firms, banks, etc.) and donors support the initiative but also citizens can participate at the initiative through donations.

**Project scale**

Urban

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Urban temperature regulation<br>Noise reduction<br>Air purification<br>Carbon sequestration | Recreation and health<br>Aesthetic | Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**

10 years

**Project duration (lifetime of the solution from start operating, years)**

n/a

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | X | X | X |
| City agencies | | | |
| Utilities | | | X |
| Non-governmental associations | X | X | X |
| Urban designers and planners | | | |
| Developers | | | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | X | X | X |
| Research (Universities, research centres) | X | X | X |
| Firms | X | X | X |

| | | | |
|---|---|---|---|
| Other (please specify…) | | | |

**Co-design actions implemented**
n/a

**Owner of the area**
Municipality, private companies and citizens

**Responsible for operations related to the NBS**
Municipality

**Target users of the NBS**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Increase urban forest | Improvement of the overall wellbeing in city and reduction of the urban heat island effect, water run-off, air pollution | Avoided cost generated by climate change impacts and improvement of the area attractiveness, raising awareness and social inclusion |

**Financial instruments adopted**
Project financing, third party financing and crowdfunding

**Financial resources for investment provided by categories of funders (dollars)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | 350.000.000 |
| Real estate operators | / |
| Financing and insurance institutions | 1.000.000 |
| Utilities | / |
| Citizens | data not available |
| Firms | / |
| Other: Rockefeller Foundation | 10.000.000 |

**Cost structure**

| | |
|---|---|
| Capital costs | $361 million |
| Average operational and maintenance cost (dollars/year) | data not available |

**Revenues stream of the NBS implemented**

New York was receiving $5.60 in benefits for every dollar it was spending to plant and maintain its trees

| **Revenue streams** | **Average annual amount (in $)** |
|---|---|
| asset transfer | / |
| cost savings (green area design and maintenance costs) | / |
| payments/tariffs for the use of service | / |
| Energy savings alone | 27.000.000 year |
| Air pollution removal | 9.500.000 per year |
| Water storage | 35.000.000 per year |
| Increase in property values | 57.000.000 per year |

**Barriers and enabling factors influencing the success of the business model**

The main enabling factors that facilitate the success of the initiative are:

- Political and leadership commitment
- Involvement of all stakeholders
- Collaboration with associations
- Collaboration with research centres and universities
- Raising awareness campaign

**Social and environmental benefits**

| | |
|---|---|
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of local air pollutants emissions |
| increase of wellbeing | better use of existing public spaces |
| Job creation | better use of existing public spaces |
| increase of environmental awareness | contribution to vulnerability reduction and resilience |

## 5.6 DC's Stormwater Credit Market

**Contact person**

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**Reference material web link**

https://doee.dc.gov/src

**Project description and objectives**

The Washington DC District Department of the Environment (DDOE) introduced new standards by which to determine whether an area needed to be retrofit with runoff-reducing green infrastructure. The question of who should pay for the necessary retrofits

was controversial, however. The DDOE has an annual budget of USD $17 million for stormwater policies, whereas the total cost for retrofitting all areas affected by the new standards could cost up to USD $7 billion. The DDOE therefore created the Stormwater Retention Credit trading program (SRC) to lower compliance costs of regulated sites while maximizing benefits for District water bodies.

The SRC program creates a market for voluntary stormwater retrofits in Washington DC. The program also allows regulated sites to meet their obligations by buying SRCs from unregulated properties elsewhere in the city. Other District properties generate SRCs by exceeding their own regulatory requirements or voluntarily installing retention infrastructure such as green roofs and rain gardens. The SRC market provides flexible and cost-effective compliance options for the regulated community as well as financial incentives to voluntarily increase stormwater retention in the District. The SRC is expected to achieve an overall better score in terms of required retention volumes throughout the district. Additionally, because the SRC allows areas to comply with the new regulations by supporting the installation of green infrastructure off-site, it should result in a greater number of small green infrastructure units that are more able to drain “first flush” stormwaters, which are the most polluting. Moreover, the off-site provisions in the regulations have the potential to result in a large amount of green infrastructure being installed in less affluent parts of the city.

Stakeholders can generate and sell Stormwater Retention Credits (SRCs) to earn revenue for projects that reduce harmful stormwater runoff by installing green infrastructure (GI) or by removing impervious surfaces. Furthermore, it is possible to lock in an SRC sale price by selling to DOEE through the SRC Price Lock Program, and you’ll still have the option to sell your SRCs in an open market to properties that have regulatory requirements for managing stormwater. DOEE offers many resources helping stakeholders getting started on an SRC-generating project. It is possible to generate SRCs through a single property or starting an SRC-aggregating business to generate SRC from multiple properties.

Sevral programs have been defined to help stakeholders to engage in the initiative. For example, the Stormwater Retention Credit. Through DOEE's Stormwater Retention Credit (SRC) Price Lock Program, eligible SRC generators have the option to sell SRCs to DOEE at fixed prices. SRC generators can participate without losing the option to sell to another buyer. The option to sell to DOEE effectively constitutes a price floor in the SRC market and offers certainty about the revenue from an SRC-generating project.

New, voluntary green infrastructure (GI) projects in the Municipal Separate Storm Sewer System (MS4) are eligible to enter into an SRC Purchase Agreement to sell their SRCs to DOEE. Prior to construction of the SRC-generating project, participants will receive a confirmed SRC selling price from DOEE. Once an SRC Purchase Agreement is signed, its terms will not change. After completing the SRC-generating project, participants have the option to sell their SRCs to DOEE at the price specified in the SRC Purchase Agreement or sell on the SRC market (at a price negotiated with the buyer).

DOEE expects that the SRC Price Lock Program will make it easier to generate SRCs on land owned by non-profits, such as churches, cemeteries, schools, and similar institutions. DOEE will prioritize funding for these projects. DOEE has made an initial commitment of $11,500,000 to purchase SRCs through this program.

**Project scale**

Metropolitan

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Flood risk reduction<br>Urban temperature regulation | Recreation and health<br>Aesthetic | Biodiversity improvement<br>Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**
n/a

**Project duration (lifetime of the solution from start operating, years)**
n/a

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | X | X | X |
| City agencies | X | X | X |
| Utilities | | | |
| Non-governmental associations | X | X | X |
| Urban designers and planners | X | X | X |
| Developers | X | X | X |
| Real estate | X | X | X |
| Financing and insurance institutions | X | X | X |
| Citizens | X | X | X |
| Research (Universities, research centres) | X | X | X |
| Firms | X | X | X |
| Other: start up | X | X | X |

**Co-design actions implemented (if any)**
n/a

**Owner of the area**
City government, Public company, Private company, Non-governmental association, citizens, banks, etc.

**Responsible for operations related to the NBS**
City government, Public company, Private company, Non-governmental association, citizens, banks, etc.

**Target users of the NBS**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Improvement of stormwater management in the overall city | Improvement of the water management in city and reduction of water run-off and flood events | Creation of a stormwater credit market |

**Financial instruments adopted**

Local credit market

**Financial resources for investment provided by categories of funders (dollars)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | 11.500.000 |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens | / |
| Firms | / |
| Other: NGOs and universities | / |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | Based on the project implemented |
| Average operational and maintenance cost (euro/year) | Based on the project implemented |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in $) |
|---|---|
| asset transfer | data not available |
| cost savings (green area design and maintenance costs) | data not available |
| payments/tariffs for the use of service | data not available |
| other (please specify) | Credits |

**Barriers and enabling factors influencing the success of the business model**

The main enabling factors that facilitate the success of the initiative are:

- Political and leadership commitment
- Involvement of all stakeholders
- Collaboration with associations

**Social and environmental benefits**

| | |
|---|---|
| job creation | increase of wellbeing |
| business generation | increase of environmental awareness |
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of energy consumption/ |

| | |
|---|---|
| reduction of local air pollutants emissions | contribution to vulnerability reduction and resilience |
| better use of existing public spaces | |

## 5.7 Valladolid green wall

**Contact person**
Isabel Sánchez

**Reference material web link**
http://www.valladolidadelante.es/node/13311

**Project description and objectives**
The vertical garden in the city of Valladolid is planned to be installed in the private building of the department store 'El Corte Inglés'. Initial design has a total dimension of 351.05 m2 divided into two façades. The north façade is going to have an area of 271.80 m2, and the east facade is going to have 79.25 m2.
El Corte Inglés is a private commercial department store, which has a building located in Constitución Street, in the heart of Valladolid, very well connected with other NBS. This building was chosen, among other reasons, because it is a very busy department store and it will have a large impact in the citizens. It is also interesting to involve a private company in the green infrastructure development through the URBAN GreenUP project, as it will have a demonstrator and leading effect on other private companies and stakeholders.
The execution of the works will be carried out by means of a public bidding procedure that will soon be the light and will be financed by the European Union within the framework of the European project and the city Council of Valladolid. El Corte Inglés will also contribute to the financing, as it is responsible for the adaptation of the existing building to the new facade (structural reinforcement) as well as the maintenance of the vertical garden.

**Project scale**
Building

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Urban temperature regulation<br>Noise reduction<br>Air purification<br>Carbon sequestration | Aesthetic | Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**
One year. It important to take into account that the green façade intervention is divided in two projects, one elaborated by El Corte Inglés, another elaborated by SingularGreen under the Urban GreenUP project. So that, a co-creation and a co-design process has been development, and this means time for meetings, discussions, agreements, which makes the design process longer.
**Project duration (lifetime of the solution from start operating, years)**
The lifetime of a green facade like that depends a lot on the maintenance. If there is a continuous and correct maintenance, the materials are selected to last forever, there is not a limited number of life years. But if we have to establish a quantity of years: 50 years.

**Actors involved in the design, construction and management of the NBS**

| | Design | Construction | Management |
|---|---|---|---|
| City government | X | X | X |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | | | |
| Urban designers and planners | | | |
| Developers | | | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centres) | | | |
| Firms | | | |
| Other: El Corte Ingles | X | X | X |

**Co-design actions implemented**

El Corte Inglés architects and engineers, SingularGreen as partner of the URBAN GreenUP project specialist in green solutions, and technicians of the Valladolid city council have been working together in the definitions of the technical specifications of the projects, legal aspects, and communication activities. Once the façade will be installed, the three parts will collaborate in the diffusion of results and on the preparation of different engagement activities with stakeholders and citizens, to enhance the replication of this kind of projects.

**Owner of the area**

Public company

**Responsible for operations related to the NBS**

Public company, private company

**Target users of the NBS**

El Corte Inglés

**Beneficiaries of the NBS implemented**

City government, citizens, tourists

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Renaturing the historical centre of the city | Improvement the quality of life of citizens through its environmental benefits that influence their health | Focus of attraction that impact on the economic activity of the zone, increasing the municipal revenues by different rates associated |

**Financial instruments adopted**

EU grants, project financing and third party financing

**Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | 130.500 |
| National government | / |
| Regional government | / |

| | |
|---|---|
| City government | 84.287,26 |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens | / |
| Firms | 60.470,27 |
| Other: NGOs and universities | / |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | 275.257,53 |
| Average operational and maintenance cost (euro/year) | It's depending on the quantity of pruning that the client requires. The average can be from 5.000 to 8.000 €/year |

**Revenues stream of the NBS implemented**

| **Revenue streams** | **Average annual amount (in €)** |
|---|---|
| asset transfer | / |
| cost savings | Saving in energy bills |
| payments/tariffs for the use of service | / |
| other (please specify) | Increase of attractiveness and brand recognition |

**Barriers and enabling factors influencing the success of the business model**

Barriers:

- Long negotiating processes between the parties
- Compliance with different technical regulations
- Complicated administrative processes that slow down the process

Enabling factors:

- Political interest in the impact of the action that expedites the resolution of the problems mentioned in the previous point
- Well-qualified professionals
- Robust and demanding public procurement regulations that minimize the associated problems

EU grants

**Social and environmental benefits**

| | |
|---|---|
| job creation | better use of existing public spaces |
| increase of wellbeing | noise reduction |
| increase of environmental awareness | reduction of energy consumption/ |

## 5.8 DC's water management through nature based solutions

**Contact person**
waterfinancecenter@epa.gov

**Reference material web link**
https://govlab.hks.harvard.edu/files/govlabs/files/dc_water_environmental_impact_bond.pdf
https://www.epa.gov/sites/production/files/2017-04/documents/dc_waters_environmental_impact_bond_a_first_of_its_kind_final2.pdf

**Project description and objectives**

In 2005, EPA and the District of Columbia Water and Sewer Authority ("DC Water") entered into a Consent Decree ("CD") with a 20-year Long Term Control Plan ("LTCP") with an estimated $2.6 billion in planned investments to reduce CSOs ("Combined Sewer Overflows"). In 2015, DC Water renegotiated its CD and LTCP to incorporate large-scale Green Infrastructure ("GI") installations to replace one of three deep tunnels that were part of the original LTCP. The new CD requires DC Water to manage stormwater runoff produced by 1.2" of rainfall on 365 impervious acres of land in the Rock Creek Sewershed and 133 impervious acres in the Potomac River Sewershed. As part of its green infrastructure investment strategy, in September 2016, DC Water issued an Environmental Impact Bond ("EIB")[21] pursuant to the terms of a Private Placement Agreement ("PPA"). The EIB terms negotiated with Investors reflect key elements of the "Pay for Success" model used to pilot outcome-based initiatives in the social policy space. Pay for Success is a form of performance-based contracting between a public entity and the private sector where payment is based on measured outcomes. The DC Water EIB represents the first use of the Pay for Success model in the water space and the first to be issued as a tax-exempt municipal bond. DC Water's stated purpose for using this model was to isolate project performance risk associated with its initial investment in green infrastructure on public properties. The EIB is a 30-year tax-exempt municipal bond with a mandatory tender in year five. The bond issue was placed with two institutional investors, Goldman Sachs Urban Investment Group and Calvert Foundation (the "Investors"). The bonds were issued at a $25 million face value and an initial 3.43% interest coupon, payable semi-annually, for the first five years. The stated maturity date is October 1, 2046. The mandatory tender date is April 1, 2021.

Project overview:

- The proceeds from the EIB will provide the upfront capital needed to construct DC Water's inaugural green infrastructure project in the Rock Creek sewer shed (Rock Creek Project Aor RC-A).
- RC-A is part of the DC Clean Rivers Project, a $2.6billion long-term program to control CSOs that pollute the Anacostia River, Potomac River and Rock Creek.
- The green infrastructure practices will be installed primarily in the public right-of-way and include permeable pavement and bioretention facilities (e.g., rain gardens).

Stormwater runoff is the predominant cause of CSOs, and green infrastructure practices in RC-A are designed to meet the 1.2" Retention Standard for 20 impervious acres

**Project scale**

Urban

[21] Pay for Success delivery model. See: Rockefeller Foundation Initiative (www.rockefellerfoundation.org/our-work/initiatives/social-impact-bonds).

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and runoff mitigation<br>Air purification<br>Carbon sequestration | Recreation and health<br>Aesthetic | Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure (months)**
5 years

**Project duration (lifetime of the solution from start operating, years)**
50 years with proper maintenance and management of the infrastructures

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | X | X | X |
| City agencies | | | |
| Utilities | X | X | X |
| Non-governmental associations | | | |
| Urban designers and planners | X | | |
| Developers | | | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centres) | X | | |
| Firms | | | |
| Other (please specify…) | | | |

**Co-design actions implemented**
n/a

**Owner of the area**
Municipality

**Responsible for operations related to the NBS**
Municipality

**Target users of the NBS**

| | |
|---|---|
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |
| Commuters | |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Reduction of water run-off | Reduction of water run-off and of flood events; improvement of the overall wellbeing in the city | Avoided cost generated by flood impacts and improvement of the area attractiveness |

**Financial instruments adopted**

Environmental impact bond

**Financial resources for investment provided by categories of funders**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | / |
| Real estate operators | / |
| Financing and insurance institutions (Goldman Sachs; Calvert Foundation) | 25.000.000 |
| Utilities | / |
| Citizens | / |
| Firms | / |
| Other: NGOs and universities | / |

**Cost structure (dollars)**

| | |
|---|---|
| Capital costs | 25.000.000 |
| Average operational and maintenance cost | data not available |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount ($) |
|---|---|
| asset transfer | / |
| cost savings (green area design and maintenance costs) | Reduction of water run-off |
| payments/tariffs for the use of service | / |
| other (please specify) | Increase in property values |

**Barriers and enabling factors influencing the success of the business model**

Barriers:

- Definition of the risks associated with NBS
- Definition of the EIB structure

Enabling factors:

- Involvement of different stakeholders in the EIB definition
- Definition of a monitoring program
- Support of urban local authorities

- Political commitment
- Definition of an overall green infrastructure investment strategy
- Citizens involvement

**Social and environmental benefits**

| | |
|---|---|
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of local air pollutants emissions |
| increase of wellbeing | better use of existing public spaces |
| Job creation | contribution to vulnerability reduction and resilience |
| increase of environmental awareness | |

## 5.9 Ghent climate change adaptation through urban greening

**Contact person**

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**Reference material web link**

http://stad.gent/over-gent-en-het-stadsbestuur/producten/subsidie-voor-het-cofinancieren-van-non-profit-crowdfundingprojecten-wijs-van-gent
http://crowdfunding.gent/nl/projects/lekker-dichtbij/plan

**Project description and objectives**

The city of Ghent has set out to develop a policy instrument to support the facilitation of co-creation, including its application for climate change adaptation. The instrument should be able to generate wider (financial) impact compared to subsidies or tax-incentives. Co-creation entails the involvement of multiple stakeholders. These stakeholders should have the opportunity to either contribute financially, through volunteer time or advertising the project. All these elements are crucial to a project's success.

Therefore, the city developed a crowdfunding platform that allows citizens to share their ideas and raise the necessary funds to realize them. Ideas can vary and include the increase of the city's adaptation capacity. The person submitting an idea becomes a 'project initiator'. This person needs to provide a short description and a funding goal for the project. People who provide financial backing to a project are known as 'supporters'. Their minimum donation is €5. The donated amount per idea is viewed as an indicator of community support; only the projects with sufficient community support will become financially viable. The focus of crowdfunding.gent is on projects with a societal benefit, which sets the platform apart from other crowdfunding platforms. The platform was launched on March 16th in 2015. Crowdfunding.gent additionally offers initiators the opportunity to apply for a municipal subsidy of the project. The city has provided a fund of €55.000 per year specifically assigned to the crowdfunding platform. The request for municipal funding needs to be indicated in the original application form. Initiators can choose to apply for 25, 50 or 75% of municipal funding.

So far two initiatives that have been submitted through the crowdfunding platform can be considered contributions to the city's climate adaptation goals. These projects focus on sustainable food production and enhancing green areas. The first project "Lekker dichtbij!"

establishes mini-gardens on balconies of social housing. Through urban farming more green areas are created contributing to mitigate extreme temperatures in urban areas. In addition, local food production reduces the need for long-distance transportation and therefore prevents an exhaust of carbon dioxide emissions.
Another project, "the Edible Street", set-out to transform the traditional stone facades into vertical gardens to create additional green areas while stimulating local food production.

**Project scale**
Urban

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Urban temperature regulation<br>Noise reduction<br>Air purification<br>Carbon sequestration | Recreation and health<br>Aesthetic | Creation of habitat for species<br>Biodiversity improvement |

**Project realisation time from design to start operating of the infrastructure**
The necessary regulation to realise crowdfunding.gent was implemented on April 1st, 2015. It is evaluated every 2 years. The project "Lekker Dichtbij" submitted its application to the crowdfunding.gent platform in the spring of 2015. The funding deadline was reached at June 14, 2015. The project was implemented on June 19th, 2015. The project 'The edible street'" reached its funding deadline around the same time. The first "planter-placement-day" was already held in May 2015, before the end of the funding deadline.

**Project duration (lifetime of the solution from start operating, years)**
Crowdfunding.gent was launched in 2015 and will run at least till 2019

**Actors involved in the design, construction and management of the NBS**

| | **Design** | **Construction** | **Management** |
|---|---|---|---|
| City government | | | |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | X | X | X |
| Urban designers and planners | X | X | X |
| Developers | | | |
| Real estate | X | X | X |
| Financing and insurance institutions | | | |
| Citizens | X | X | X |
| Research (Universities, research centres) | X | X | X |
| Firms | X | X | X |
| Other (please specify…) | | | |

**Co-design actions implemented**
n/a

**Owner of the area**
Municipality, citizens, private companies

**Responsible for operations related to the NBS**
Municipality

**Target users of the NBS**

| | |
|---|---|
| City agencies | Utility companies |
| NGOs | Other companies |
| Citizens | |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| City government | Commuters |
| City agencies | Tourists |
| NGOs | Utility companies |
| Citizens | Other companies |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Climate change adaptation through urban greening | Improvement of the overall wellbeing in city, reduction of urban heat island effect, pollutant removal | Avoided cost generated by climate change impacts and improvement of the area attractiveness |

**Financial instruments adopted**
Crowdfunding

**Financial resources for investment provided by categories of funders (euro)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | 55.000 per year |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens<br>Firms<br>And other private stakeholder | 70.000 euro in the first year (2016) |

**Cost structure**

| | |
|---|---|
| Capital costs (euro) | data not available |
| Average operational and maintenance cost (euro/year) | data not available |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | / |
| cost savings | energy savings |
| payments/tariffs for the use of service | / |
| other (please specify) | Increase of urban attractiveness |

**Barriers and enabling factors influencing the success of the business model**

The crowdfunding platform has been successful in identifying ideas that are less suitable to be financed by subsidies. The fact that the crowdfunded projects have the potential to create larger ripple effect is demonstrated by 'the Edible Street' project. The implementation of this project was quickly followed by a similar project in Kortrijk; Groene Straat (Green Street). This initiative finances the realisation of planters and other forms of 'vertical green' by offering bulk purchasing. The initiator based the project on a quick assessment of the core elements of the Ghent project that would allow a scaling-up of the project to a city level. The Groene Straat website describes 22 projects where additional (edible) green has been realised. Another project that followed the Ghent example is 'Groenselare' in the city of Roeselare, which started providing information to citizens on ways to create green facades after the city was named the most 'grey' cities of Flanders in 2014.

A limiting factor of this type of instrument is financial resources needed to build and maintain the platform. In addition sufficient man hours need to be made available for a city staff member to manage the content of the platform. The use of crowdfunding as a policy instrument implies acceptance of the fact that the exact outcome cannot be controlled. On the other hand it offers a great opportunity to enhance innovation, cooperation and solidarity in a city.

**Social and environmental benefits**

| | |
|---|---|
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | reduction of local air pollutants emissions |
| increase of wellbeing | better use of existing public spaces |
| increase of environmental awareness | contribution to vulnerability reduction and resilience |

## 5.10 City of Melbourne urban forest fund

**Contact person**

Thami Croeser

**Reference material web link**

https://www.melbourne.vic.gov.au/community/greening-the-city/urban-forest-fund/Pages/apply-partnership-urban-forest-fund.aspx

**Project description and objectives**

The Urban Forest Fund is a grant that offers 50% funding to urban greening projects on private property that offer public benefit. The fund allocates money that is collected in two ways:

Funds collected from developers to offset the costs of removing street trees during construction

Funds provided by philanthropic donors.

**Project scale**

Urban

**Ecosystem services provided**

| *REGULATING* | *CULTURAL* | *SUPPORTING* |
|---|---|---|
| Water flow regulation and | Recreation and health | Biodiversity improvement |

| | | |
|---|---|---|
| runoff mitigation<br>Flood risk reduction<br>Carbon sequestration<br>Air purification<br>Temperature regulation | Aesthetic | Creation of habitat for species |

**Project realisation time from design to start operating of the infrastructure (months)**
The program takes ~6 Months to select a project and ~24 Months to realise projects.

**Project duration (lifetime of the solution from start operating, years)**
n/a

**Actors involved in the design, construction and management of the NBS**

| | Design | Construction | Management |
|---|---|---|---|
| City government | | | X |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | X | X | |
| Urban designers and planners | | | |
| Developers | X | X | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | X | X | X |
| Research (Universities, research centres) | X | X | X |
| Firms | X | X | |
| Other (please specify…) | | | |

**Co-design actions implemented (if any)**
This project is highly collaborative in that the City acts as a financier, but passes control of the design, construction and maintenance of each NBS to private parties that are often citizens, businesses or institutions (e.g. universities).

**Owner of the area**
Private company, Non-governmental association, Residents

**Responsible for operations related to the NBS**
Private company, Non-governmental association, Residents

**Target users of the NBS**

| | |
|---|---|
| NGOs | Private companies |
| Citizens | |

**Beneficiaries of the NBS implemented**

| | |
|---|---|
| NGOs | Private companies |
| Citizens | Tourists |
| Commuters | |

**Value proposition, the value delivery and the value capture of the NBS.**

| Value proposition | Value delivery | Value capture |
|---|---|---|
| Reduction of urban heat island effect and flood risks | Improvement of health in city and flood risk reduction | Improvement of the quality of life and increase in value properties |

**Financial instruments adopted**

Environmental compensation, sponsorship and crowdfunding

**Financial resources for investment provided by categories of funders (dollars)**

| | |
|---|---|
| European institutions | / |
| National government | / |
| Regional government | / |
| City government | 100.000 (first round) |
| Real estate operators | / |
| Financing and insurance institutions | / |
| Utilities | / |
| Citizens | data not available |
| Firms | data not available |
| Other: NGOs | data not available |

**Cost structure**

| | |
|---|---|
| Capital costs (dollars) | ~100.000 (first round) |
| Average operational and maintenance cost (dollars/year) | data not available |

**Revenues stream of the NBS implemented**

| Revenue streams | Average annual amount (in $) |
|---|---|
| asset transfer | / |
| cost savings | Avoided costs in water management |
| payments/tariffs for the use of service | / |
| other (please specify) | Increase in value properties |

**Barriers and enabling factors influencing the success of the business model**

The main enabling factors that facilitate the success of the initiative are:

- Political and leadership commitment
- Involvement of all stakeholders
- Public support in the action financing

**Social and environmental benefits**

| | |
|---|---|
| job creation | increase of wellbeing |
| business generation | increase of environmental awareness |
| social inclusion | increase of road/personal safety |
| access to new services | noise reduction |
| creation of education/training opportunities | better use of existing public spaces |
| reduction of local air pollutants emissions | contribution to vulnerability reduction and resilience |

# 6 Guidelines for business models development

Cities that aim to develop a business model for NBS implementation should take into consideration three main dimensions that can determine the type of business model:

1. **Governance.** Environmental goods - like trees, parks, etc. – are classified as common goods and for this reason are usually managed by public administrations. In some cases, public administration can introduce governance mechanisms to engage private stakeholders in the financing (or management) of natural resources in cities. In this case, it is necessary to identify a mechanism that will ensure the generation of public benefit over time in an efficient manner. On the other hand, private stakeholders invest in NBS for reasons related with public incentives (tax deductions) or with private benefits (public recognition).
2. **Stream of revenues generated by the solutions implemented.** A specific solution implemented at city level can be able to generate by its own a constant revenue stream - or avoid costs - (e.g.: Sustainable Urban Drainage Systems). In this case, the solution implemented is self-sustainable and can generate revenues (at least) for its maintenance. In other cases, the solution implemented can be non-self-sustainable so it will be necessary to individuate a source of funding to ensure its maintenance. The source of funding can be generated through: i) the monetisation of positive externalities (for example introducing payment for ecosystem services mechanisms), ii) public support or ii) private funding.
3. **Role and responsibilities of public and private actors in the building and management of NBS**: the role and responsibilities of the different stakeholders can influence the business model identification. In fact, based on the roles and responsibilities that the city government and its partners have in building the city infrastructure and providing the services, four main business models can be identified - Build Own Operate[22], Build Operate Transfer[23], Open Business Model[24], Build Operate Manage[25] (see Frost & Sullivan, 2017).

[22] Build Own Operate (BOO) – The planner independently builds the city infrastructure and delivers the services. The operation and maintenance of the services are fully under the planner's control.

[23] Build Operate Transfer (BOT) – The city planner appoints a trusted partner to build the city infrastructure and provide the services for a particular area within a period. After completion, the operation is handover to the planner.

[24] Open Business Model (OPM) – The city planner allows any qualified company or business organization to build city infrastructure and provide city services. The city planner, however, will impose some regulatory obligations.

[25] Build Operate Manage (BOM) – The city planner appoints a trusted partner to develop city infrastructure and services. The partner operates and manages the services. The city planner has no role further. Most of the public-private partnerships are built on this model.

A business model canvas has been defined in order to develop NBS. It has been defined capitalising on the literature review conducted, the business model case studies analysis, the financial instruments analysis and on the work developed by other SCC-02 H2020 projects.

The canvas can be used by cities or other stakeholders for definition of a business model for NBS implementation. The main elements that have to be taken into consideration are:

1. **definition of the NBS that has to be implemented**: detailed description (interventions planned, project scale, objectives, realisation time, duration, asset ownership)
2. **definition of the activities**: description of the key activities necessary to deliver your value proposition;
3. **definition of the value proposition**: description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy;
4. **identification of the stakeholders that have to be engaged in the project**: list of the stakeholders involved in the project activities and their role;
5. **identification of the target users and beneficiaries**;
6. **definition of the resources**: description of the resources necessary to deliver the project value proposition and to maintain it (time, expertise, working hours, etc.);
7. **identification of the risks** associated to the implementation of the NBS and the risks that can be encountered during the implementation process;
8. **identification of the most suitable financial instrument** (an extensive list of financial instruments for NBS is described in chapter 3)
9. **definition of the cost structure**: capital expenses, and maintenance costs (Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible)
10. **identification of the possible revenue streams**: identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other);
11. **analysis of the ecosystem services provided**: supporting, regulating, provisioning and cultural;
12. **identification of the social benefits related to the NBS implementation**: non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of start-ups or innovative businesses, social inclusion);
13. **identification of the environmental benefits related to the NBS implementation**: non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.

The figure below summarises the elements that have been listed and can be used as a template for the definition of the business model for the implementation of NBS.

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakehodler involved in the project activitiesand their role<br><br>Target users</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)<br><br>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget<br>innovative/traditional<br>(see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
<tr><td>Ecosystem services<br>provisioning regulating, cultural, supporting</td><td>Social benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)</td><td colspan="3">Environmental benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.</td></tr>
</table>

**Figure 10: Business model canvas for NBS**

# 7 Conclusions

The implementation and uptake of NBS that can improve human health and wellbeing in cities will require new investments, which however are difficult to retrieve from public sources because of the tightness of public budgets. As highlighted in many documents, new financing sources, strategies of cooperation between public and private actors, as well as new business models will play a key role in supporting this transformation.

"Business models describe the rationale of how an organization creates, delivers and captures value" (Osterwalder and Pigneur, 2010). In the corporate world, "value" is generally conceived in economic terms and referred to economic/financial performances (Tokoro, 2016). The concept of value has however evolved over time until the theorization by Porter of "creating shared value": companies are increasingly required by society to contribute also to the creation of social value. Recently giving the increasing attention to sustainable development and environmental protection, several publications have been produced on business models that take into consideration environmental aspects and sustainability, called business models for sustainability - BMSs (Stubbs and Cocklin, 2008; OECD, 2013). The definition of this new typology of business models can help develop integrative and competitive solutions by either radically reducing negative and/or creating positive external effects for the natural environment and society (Schaltegger, 2016). In fact, the business models for sustainable development aim to deliver economic, social and environmental benefits and in these models, the value proposition includes social, environmental and economic values, while value distribution within the whole market chain is a key feature.

Through D7.4 Guidelines for the use of innovative financial instruments and to design business models to implement NBS it has been possible to investigate and analyse different forms of financial instruments and business model for NBS implementation at city level. The definition and adoption of a business model in cities have been analysed through a literature review of the best practices and case study of BMs for NBS in European cities and non-EU cities. The was to understand the structure and the characteristics of the successful business models in order to be able to replicate them in different contexts. The case studies have been analysed considering i) the general information about the project implemented, ii) the objectives and the main challenges faced by the city, iii) the stakeholders involved, iv) the value proposition, value delivery and value capture, v) the cost structures, the revenues, etc.

In this way, it has been possible to individuate the main elements that are necessary to develop ad hoc business models for the implementation of NBS and to define the business model canvas for NBS that can be adopted be cities.

In particular, based on the analysis of the sustainable business models for NBS and of the case studies three main dimensions that can determine the type of business model have been identified. The first element is the *governance*, the public administration can introduce governance mechanisms to engage private stakeholders in the financing (or management) of natural resources in cities through the identification of ad hoc mechanisms that will ensure the generation of public benefit over time. The second element is *the stream of revenues*

*generated by the solutions implemented*: if the solution implemented is not non-self-sustainable it is necessary to individuate a source of funding to ensure its maintenance (e.g. the monetisation of positive externalities, public support or private funding). Finally, the third element is the *role and responsibilities of public and private actors in the building and management of NBS*. This element is fundamental since it is related to the definition of the role and responsibilities of the different stakeholders and consequently it can influence the business model identification. Furthermore, a business model canvas has been defined in order to facilitate the development of NBS. It has been designed capitalising on the literature review conducted, the business model case studies analysis, the financial instruments analysis and on the work developed by other SCC-02 H2020 projects.

The results of the deliverable such as the business model canvas (and the operational guidelines, Appendix I) the financial instruments categorisation, the case studies definition and the business model review can be useful to Urban GreenUP partners – in particular front-runner and follower cities – to work on the definition of their own business model. Furthermore, results can also be used by other cities and stakeholders.

D 7.4 is connected with *D7.5: Table of exploitable results, business models and financial instrument to implement NBS for private sector* and *D7.6: Table of exploitable results and related business models and financial instrument to be used to implement NBS for public sector*. D 7.4 will be used as a basis to continue developing the work of analysis and definition of the business models for NBS with particular reference to the public and private sector through the involvement of the Urban GreenUP partners.

# 8 Bibliography

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# Appendix - Operational guidelines for the definition of the business model canvas

The "Operational guidelines for the definition of the business model canvas" aims to guide local administrators and public officers in the definition of a business model canvas for the implementation of NBS in cities. The business model canvas for NBS is made up of the following 13 steps:

1. definition of the NBS that has to be implemented
2. definition of the activities
3. definition of the value proposition
4. identification of the stakeholders that have to be engaged in the project
5. identification of the target users and beneficiaries
6. definition of the resources
7. identification of the risks
8. identification of the most suitable financial instrument
9. definition of the cost structure
10. identification of the possible revenue streams
11. analysis of the ecosystem services provided
12. identification of the social benefits related to the NBS implementation
13. identification of the environmental benefits related to the NBS implementation

The framework below represents the business model canvas defined in D7.4 for the identification of an had hoc business model for NBS and includes the 13 steps listed above.

<table>
<tr><td>NBS<br>project description (interventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td rowspan="2">Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakehodler involved in the project activitiesand their role</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>Target users</td><td>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
<tr><td>Ecosystem services<br>provisioning regulating, cultural, supporting</td><td colspan="2">Social benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)</td><td colspan="2">Environmental benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.</td></tr>
</table>

**Figure 11: Business model canvas for NBS**

For each section of the business model canvas, instructions have been given on how to fill it. Such instructions are structured in four parts: i) **brief description**: this section briefly describes the various elements that will be assessed in the block; ii) **how to proceed**: this section illustrates what public officers need to focus on in order to fill out the business model properly; iii) **steps to follow**: this section lists the items of the assessment frameworks related to the block; iv) **Examples**: this section illustrates examples drawn from the case studies.

## 1. Definition of the NBS that has to be implemented

<table>
<tr><td>NBS<br>project description (interventions planned, project scale, objectives, realisation time, duration, asset ownership)<br>1</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td rowspan="2">Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>Target users</td><td>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
<tr><td>Ecosystem services<br>provisioning regulating, cultural, supporting</td><td colspan="2">Social benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)</td><td colspan="2">Environmental benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.</td></tr>
</table>

**Figure 12: Business model canvas for NBS (1)**

**Brief description:**

This section focuses on the description of the project. There are six key elements that need to be touched upon: the intervention(s) planned, the objectives, the project scale, the realisation time, the duration, and the asset ownership.

**Steps to follow:**

1. Identify the objectives and provide a detailed description of the project
2. Choose the appropriate project scale among the following: National, Regional, Metropolitan, Urban, Street, Building
3. Calculate the project realisation time, that is, the time from designing to operating the infrastructure (in months)
4. Estimate the project duration, that is, the lifetime of the solution from when it starts operating (in years)
5. Identify the owner of the area in which the NBS is implemented among the following: City government, Public company, Private company, Non-governmental association, Other

**How to proceed:**

The **type of intervention** requires the most attention, along with the definition of the objectives. The local authority has to clearly describe the problem that it is tackling and whether it tries to solve local, regional or global issues. It needs to identify the most suitable NBS to implement in order to solve such problem. (the Urban GreenUP project has developed the deliverable 1.1 “NBS catalogue” which describes the characteristics of all the different NBS). Finally, an accurate computation of the necessary investment needs to be carried out. Related to the investment, the municipality has to assess the availability of private financing and how easy it is to obtain it for this kind of project Although this concerns the financing of the project, it is important to keep in mind that the various step of the business model canvas are connected with each other. This will be further discussed in step 8 “identification of the most suitable financial instrument”. Moreover, the project will have to either introduce an element of novelty with respect to other projects already dealing with the same issue or outperform them.

With respect to the **objectives**, the local authorities have to decide the type of NBS to implement for the project. Indeed, depending on the NBS, the impacts on society and on the environment are different. Thorough investigation needs to be done with respect to potential negative side effects, along with social and environmental spill overs, before choosing the NBS. This choice will also affect the selection of the stakeholders to involve.

The project realisation is the time from design to when the infrastructure starts to operate, while project duration concerns the lifetime of the infrastructure.

Below are summarised the questions that the municipality needs to ask itself in order to describe the project without leaving out important details.

| Project |
|---|
| 9. What problem are you trying to solve?<br>10. Will your project increase your revenue or reduce your costs?<br>11. How much investment is needed to make it happen?<br>12. Is it forming part of an on-going (mature) business or is it a stand-alone (new) initiative?<br>13. Are other players also seeking to address the same problem? Will it outperform other solutions?<br>14. Is your solution replicating a proven model or introducing new innovative features?<br>15. Could the proposed solution be replicated by others and scaled?<br>16. Is it generally hard to obtain private financing for this type of project? |
| **Impacts** |
| 6. What social and environmental impact will the project have?<br>7. Are you trying to solve local, regional (European) or global issues?<br>8. Do you have clear goals and identifiable outcomes? Are they reasonable and measurable?<br>9. Is the project fighting biodiversity loss or improving climate adaption using nature-based solutions?<br>10. Are there any potential negative side effects? If yes, how are you taking them into account? |

**Table 12: Business model definition for NBS (Source: EIB, 2018)**

**Examples:**

The project analysed in the deliverable 7.4 on page 47 (“Paris climate bond”) issued climate bonds to finance climate and energy projects. This led to the creation of parks and additional green areas within the city perimeter. The project aims at protecting Paris citizens from extreme climate events; ensuring the supply of water, food and energy; and creating a more sustainable city. DC’s water management project implemented SUDs financed through bonds with the goal of reducing water run-off.

## 2. Definition of the activities

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition<br>2</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role<br>Target users</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)<br>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
<tr><td>Ecosystem services<br>provisioning regulating, cultural, supporting</td><td colspan="2">Social benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)</td><td colspan="2">Environmental benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.</td></tr>
</table>

**Figure 13: Business model canvas for NBS (2)**

**Brief description:**

In this section, the city government carries out the description of the key activities necessary to deliver the value proposition. These activities (e.g. R&D, marketing, etc.) are the most important tasks to be carried out in order to achieve the project goals.

**How to proceed:**

The municipality is recommended to **create a Gannt chart** in order to illustrate the project schedule. The project is first divided into smaller key tasks, each with its own duration, start and completion dates. Different actors can be then assigned to work on different activities. These activities are fundamental towards the fulfilment of the value proposition, as they lead to the creation of the revenue streams. The fragmentation of the project into smaller tasks allows for a better understanding of which stakeholder to involve and when to do so. This will be further explained in step 4 “identification of the stakeholders to be engaged in the project”. It also lets the municipality manage its resources in a more efficient way by assigning the right amount to each task. Indeed, assessing the exact resources needed for a smaller activity is easier than evaluating them for the whole project.

Since business models for sustainable development aim to deliver economic, social and environmental benefits, the value proposition includes social, environmental and economic values. Therefore, **value distribution within the whole market chain** is a key activity. Activities of research and development contribute to innovation and scale-up required for the project to be self-sustaining in the long run. Moreover, it is important to involve local communities as partners and co-designers of new models to further raise awareness and increase participation in the project so that it provides benefits to the whole society. Again, this will be further explained in step 4 “identification of the stakeholders to be engaged in the project”.

**Steps to follow:**

1. Identify who is responsible for the operations related to the NBS among the following: City government, Public company, Private company, Non-governmental association, Other
2. Determine the actors involved in the design, construction and management of the NBS by using the table below:

| | Design | Construction | Management |
|---|---|---|---|
| City government | | | |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | | | |
| Urban designers and planners | | | |
| Developers | | | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centers) | | | |
| Other (please specify…) | | | |

**Examples:**

The project analysed in the deliverable 7.4 on page 71 (“Ghent climate change adaptation through urban greening”) involved citizens in the action planning and designing process through a crowdfunding platform. Also the project analysed on page 55 (“Flood proof district in Bilbao”) saw the involvement of citizens in the design and development of the plans. Instead, marketing and public relations and forestry research are among the key activities of the project on page 59 (“Million trees NYC”).

## 3. Definition of the value proposition

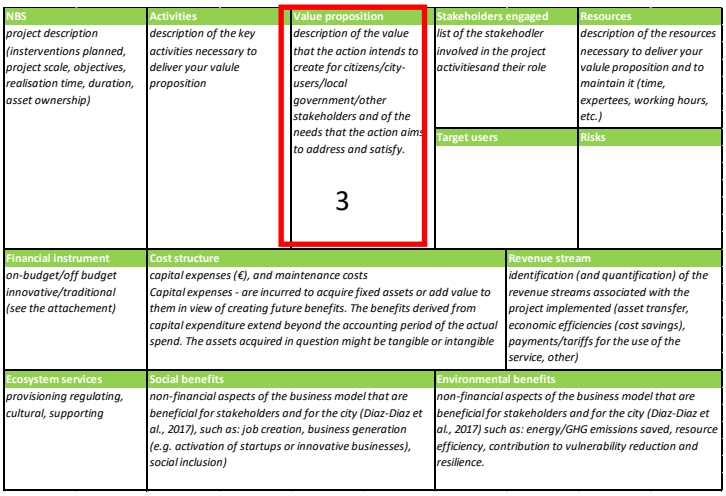


**Figure 14: Business model canvas for NBS (3)**

**Brief description:**

The section aims to explain the concept of the value proposition and how it can be applied to a NBS project. It consists of the description of the value that the project intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy. Indeed, for a project to be successful, the needs of the beneficiaries, along with the social and environmental benefits which can be generated (see steps 12 “identification of the social benefits related to the NBS implementation” and 13 “identification of the environmental benefits related to the NBS implementation”), have to be clearly defined.

**How to proceed:**

In order for the value proposition to be properly defined, the municipality needs to understand whether the service(s) they want to deliver through NBS **actually matters to its target users**. Different stakeholders are driven by different objectives and motivations.

| Stakeholder | Economic and social value |
|---|---|
| *Public sector* | Economic development (growth of GDP, foreign direct investment)<br>Quality of life<br>Urban regeneration<br>Climate change mitigation<br>Climate change adaptation<br>Cost-to-serve the citizen<br>Environmental sustainability<br>Social sustainability<br>Less negative externalities and more positive externalities |

| Stakeholder | Economic and social value |
|---|---|
| *Firms* | Climate change adaptation (decrease in risk)<br>Protection of a particular good or service that is fundamental for the business<br>New markets and new revenue opportunities<br>Brand recognition |
| *Citizens* | Aesthetic improvements<br>Neighbourhood regeneration<br>Cost savings<br>Health improvement<br>Well-being<br>Property values |

**Table 13: Value proposition in NBS projects (Source: adapted from CDP, 2013)**

Indeed, **the identification and analysis of the stakeholders** affects the different values associated to NBS implementation: citizens would like to obtain energy savings, protection of residential areas from floods, improved aesthetic and recreation around their neighbourhood; public administration attempts to combat the effect of climate change such as the heat island effect or water run-off and regenerate neglected areas through urban green; firms' goals include the implementation of their investments, the protection of natural assets, and of course higher brand recognition.

Therefore, local authorities have to fully **understand their customer profile**, especially their needs. Then, they need to focus on the product or service they are offering, taking into account how this is going to meet the customers' needs. When the service users and service to be delivered match, the value proposition can be considered to be properly defined.

**Steps to follow:**

1. Describe the value proposition[26], the value delivery[27] and the value capture[28] of the NBS by using the table below:

| Value proposition | Value delivery | Value capture |
|---|---|---|
| | | |

**Examples:**

[26] description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.

[27] production of social, environmental and economic benefits through activities, channels and partners.

[28] it is about considering how to earn revenues from the provision of good, services or information to users and customers

The project analysed in the deliverable 7.4 on page 47 ("Paris climate bond") aims at implementing the city energy adaptation plan, while the project on page 50 ("Milan adopt a green spot") involved stakeholders in the management of the city urban green areas.

## 4. Identification of the stakeholders that have to be engaged in the project

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role<br>4</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)</td></tr>
<tr><td></td><td></td><td></td><td>Target users</td><td>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
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</table>

**Figure 15: Business model canvas for NBS (4)**

**Brief description:**

In this section, the municipality focuses on the list of the stakeholders to involve in the project activities and their role. This is one of the most important blocks of the business model, since the choice of stakeholders affects the value proposition itself, as explained in the previous section.

**Steps to follow:**

1. Determine the actors involved in the design, construction and management of the NBS by using the table below:

| | Design | Construction | Management |
|---|---|---|---|
| City government | | | |
| City agencies | | | |
| Utilities | | | |
| Non-governmental associations | | | |
| Urban designers and planners | | | |
| Developers | | | |
| Real estate | | | |
| Financing and insurance institutions | | | |
| Citizens | | | |
| Research (Universities, research centers) | | | |
| Other (please specify…) | | | |

2. Describe the co-design actions implemented (if any)

**How to proceed:**

The municipality needs to understand whether it wants a more direct role which entails the design, provision and delivery of the solution or a more indirect one, by just setting the regulatory framework for the NBS. This decision needs to be taken while also considering the roles to be assigned to the other stakeholders involved.

In order to attract the stakeholders' interest, municipalities need to consider what those actors could benefit from the project. As said above, citizens want their neighbourhood to be improved, whereas firms want a return on their investments.

When it comes to implementing NBS, **stakeholders can contribute to three different phases**: the design, the construction, and the management. More than one stakeholder can be involved in the design, construction and management phases. Therefore, local authorities need to evaluate which stakeholder could be interested in the project and what role it could fulfil.

From the case studies analysed, the city government itself, non-governmental associations, developers, citizens, research institutes and firms are the most frequent stakeholders. More precisely, city government is mostly involved in the design and management phases, non-governmental associations, developers and citizens in the design and construction phases, research institutes in the design phase and firms in the construction phase.

**Examples:**

The project analysed in the deliverable 7.4 on page 47 ("Paris climate bond") saw the involvement of the un municipality itself along with financial institutions, which were needed to set up and issue the climate bonds. The project analysed on page 52 ("Victoria business improvement district") entailed the participation of local businesses, which directly contributed to making Victoria district more sustainable.

## 5. Identification of the target users and beneficiaries

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)</td></tr>
<tr><td colspan="3"></td><td>Target users<br>5</td><td>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
<tr><td>Ecosystem services<br>provisioning regulating, cultural, supporting</td><td colspan="2">Social benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)</td><td colspan="2">Environmental benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.</td></tr>
</table>

**Figure 16: Business model canvas for NBS (5)**

**Brief description:**

In this section, the municipality analyses the target users and beneficiaries of the NBS implementation. These are the people whose needs the value proposition attempts to fulfil, but also those individuals who are not the direct users of the service but who also benefit from it indirectly.

**Steps to follow:**

1. Identify the main target users of the NBS by using the table below:

| | |
|---|---|
| City government | Tourists |
| City agencies | Utility companies |
| NGOs | Other companies |
| Citizens | Other target users (please specify…) |
| Commuters | |

2. Identify the beneficiaries of the NBS implemented among the following: City government, City agencies, NGOs, Citizens, Commuters, Tourists, Utility companies, Other companies, Other target users

**How to proceed:**

The local authorities have to **identify those actors that benefit from the project** intervention. These include: tourists, city agencies, utility companies, NGOs, citizens, commuters, and other companies. Local governments need to remember that benefits of NBS have also non-financial spill over effects on the society and the environment. This will enlarge the spectrum of the beneficiaries to groups who are not necessarily the main target of the intervention. Therefore, the municipality will have to account for both direct and indirect beneficiaries.

A good starting point is the **list of the stakeholders** detected in the previous section. Indeed, it is often the case where the people contributing to the project are also the ones who benefit from it, and It is not surprising if at times the two lists overlap.

**Examples:**

The project analysed in the deliverable 7.4 on page 52 (“Victoria business improvement district”) attempts to increase green cover in the Victoria district in London, which will mainly benefit businesses in the area. However, the increase in property value and in the attractiveness of the area is likely to attract tourists to the city. Increased tourism will bring about higher revenues for the city, thus making the city government itself a beneficiary of the project. The project analysed on page 59 (“Million trees NYC”) will affect the whole community (citizens, businesses but also tourists) thanks to the services provided by trees which improve climate, air and water quality.

## 6. Definition of the resources

| NBS | Activities | Value proposition | Stakeholders engaged | Resources |
|---|---|---|---|---|
| *project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)* | *description of the key activities necessary to deliver your valule proposition* | *description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.* | *list of the stakeholder involved in the project activitiesand their role* | *description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)* 6 |
| | | | Target users | Risks |
| | | | | |

| Financial instrument | Cost structure | Revenue stream |
|---|---|---|
| *on-budget/off budget innovative/traditional (see the attachement)* | *capital expenses (€), and maintenance costs Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible* | *identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)* |

| Ecosystem services | Social benefits | Environmental benefits |
|---|---|---|
| *provisioning regulating, cultural, supporting* | *non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)* | *non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.* |

**Figure 17: Business model canvas for NBS (6)**

**Brief description:**

In this section, the resources necessary to deliver the project value proposition and to maintain it (time, expertise, working hours, etc.) are described. Key resources define the kind of materials needed, the equipment required, but also the people to employ.

**How to proceed:**

There are four types of resources: physical, intellectual, human and financial. Usually, projects make use of all these types of resources in order realize their value proposition, although sometimes one is more predominant than the others. Understanding **which resources are essential** and which are not is fundamental in order not to waste any resource and work towards the value proposition in the most efficient way. The **quality of the resources** is another factor that needs to be considered in order to create high-quality goods or services and avoid early maintenance expenses.

**Examples:**

The project analysed in the deliverable 7.4 on page 59 (“Million trees NYC”) is all about planting one million trees by 2017. In this case, the municipality needed physical resources, that is trees, and human resources to plant them. The project analysed on page 71 (“Ghent climate change adaptation through urban greening”) consists in the creation of a crowdfunding platform where citizens can put out ideas on how to make the city more resilient to climate change and then support financially the ones they deem more apt. In this case, the project required human resources in the form of expertise, and financial resources from the citizens themselves.

## 7. Identification of the risks

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td>Target users</td><td>Risks<br>7</td></tr>
<tr><td colspan="2">Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td>Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
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</table>

**Figure 18: Business model canvas for NBS (7)**

**Brief description:**

In this section, the risks associated with the implementation of the NBS and the risks that can be encountered during the implementation process are analysed.

**Steps to follow:**

1. Identify the main barriers and enabling factors in influencing the success of the business model (e.g. SWOT analysis, that is, strengths, weaknesses, opportunities, threats).

**How to proceed:**

One of the main issues that can be encountered in a project concerns **financing**. Indeed, the funds that cities can allocate for the implementation of NBS projects are limited; hence, cities are forced to call for additional financing from private investors in order to develop the infrastructure or produce the service. The main issue concerns the lack of creditworthiness, that is, investors considering the city unable to repay its financial obligation. Related to this, it could also be that the project entails an investment risk which is too high and not sufficiently compensated by the revenue streams generated. Because of either the lack of creditworthiness or the high investment risks, private investors are not likely to partake in the project. Another factor that can keep investors away is the lack of co-financing by the municipality itself: if the financial burden weighs only on the investors, they will be reluctant to invest a large amount in the project. Possible solutions to these issues are listed in the table below. This deliverable only deals with risks related to the financial aspect of business models. However, there are other deliverables within the Urban GreenUP project which go deeper into the topic. Factors that enable or hinder the adoption of NBS are illustrated in the deliverable 1.5 “barriers and boundaries identification”.

The financial risks and possible solutions that municipalities need to consider before they move on to the financing of the project are summarized below.

| Barriers | Possible solutions |
|---|---|
| Creditworthiness (lack of correspondence between the investment risks and the revenues generated by the projects) | Define detailed information about the project in order to ensure transparency |
| Lack of co-financing by municipalities | Identify and plan a project portfolio that can be attractive for private investors |
| Lack of capacity building at local level | Ensure a certain municipal level of revenues (e.g. taxes and tariffs) |
| | Ensure an appropriate implementation and planning of the project in order to decrease risks and to ensure an adequate cash flow |

Besides the risks related to financing, other issues include the **high number of stakeholders** involved: this could lead to a long negotiation process between the parties, and even to a delay in the start of project.

**Examples:**

The project analysed in the deliverable 7.4 on page 47 (“Paris climate bond”) requires issuing an attractive green bond which is seen positively by investors. This requires a high degree of transparency and also the expertise of people who are knowledgeable of the green market and know what the investors are looking for. The issue of long negotiation processes was encountered in the project analysed on page 65 (“Valladolid green wall”) due to a high number of stakeholders involved. This escalated even further in the project analysed on page 55 (“Flood proof district in Bilbao”), resulting in a delay of the whole project.

## 8. Identification of the most suitable financial instruments

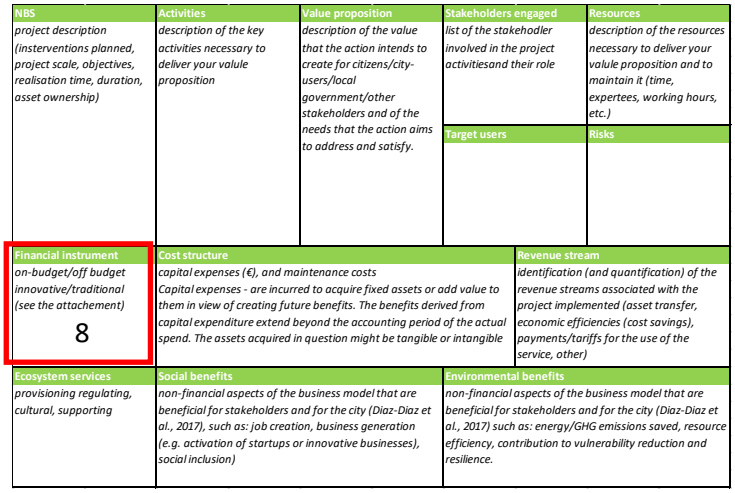


**Figure 19: Business model canvas for NBS (8)**

**Brief description:**

In this section, the financial instruments for NBS are taken into account. They can be classified into two different groups, namely on budget and off budget instruments: the former is directly included in the municipal budget, whereas the latter have no direct impact on it. Some of these financial instruments have been more adopted, such as national funding, project funding, and local taxation, but recently more innovative ones have appeared, such as green bonds, payments for ecosystem services, and crowdfunding.

**Steps to follow:**

1. Select the financial instrument(s) to be adopted by using the table below:

| | **ON-Budget** | **OFF-Budget** |
|---|---|---|
| **Traditional** | ☐ EU grants<br>☐ National grants<br>☐ Regional grants<br>☐ Local taxation<br>☐ Local tariffs for public services<br>☐ Loans<br>☐ Bonds<br>☐ Construction rights<br>☐ Environmental compensation<br>☐ Others | ☐ Project financing<br>☐ Business improvement districts<br>☐ Payments for ecosystem services<br>☐ Others |

| | ON-Budget | OFF-Budget |
|---|---|---|
| **Innovative** | ☐ Green bonds<br>☐ Impact bonds (environmental, social,)<br>☐ Resilience bonds<br>☐ User charges/ Purpose taxes<br>☐ Others | ☐ Third party financing<br>☐ Revolving funds<br>☐ Endowment funds<br>☐ Sponsorships and concessions to use public spaces and resources<br>☐ Crowdfunding<br>☐ Others |

2. List the financial resources for investment provided by categories of funders (in euros)

| | |
|---|---|
| European institutions | |
| National government | |
| Regional government | |
| City government | |
| Real estate operators | |
| Financing and insurance institutions | |
| Utilities | |
| Citizens | |
| Other companies | |
| Other (please specify…) | |

**How to proceed:**

The local authorities need to decide which **actors they want to involve in the financing** of the project – whether to rely on their own resources or to look for external resources -, and select the type of financial instruments – whether to use a standard one or a more innovative one. which is appropriate to the business model.

It is usually the case for NBS projects that **on-budget financial instruments are chosen** over off-budget ones. That is because NBS do not ensure consistent revenue streams for long periods, given that most of their benefits concern non-financial social and environmental benefits. Hence, obtaining external financial resource is often an issue for projects on NBS.

**Examples:**

The project analysed in the deliverable 7.4 on page 65 (“Valladolid green wall”) decided to make use of both on-budget (EU grants) and off-budget financial instruments (project financing and third-party financing), including both traditional (EU grants and project financing) and innovative (third-party financing) financial instruments.

## 9. Definition of the cost structure

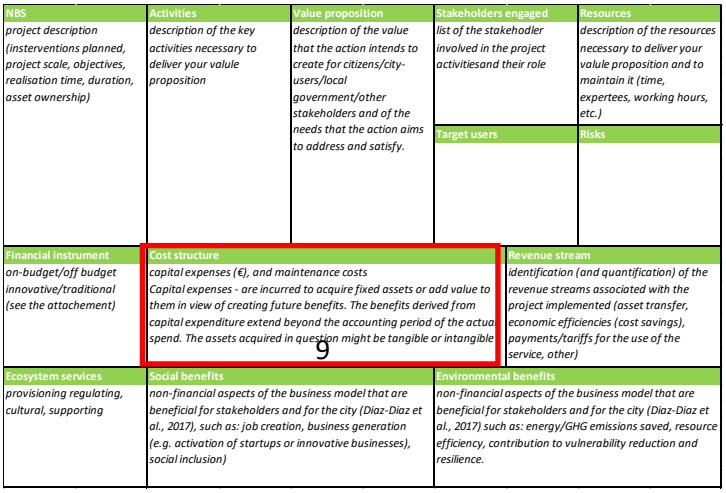


**Figure 20: Business model canvas for NBS (9)**

**Brief description:**

The capital cost of the project, along with the operational and maintenance costs, are part of the cost structure. The cost structure describes the costs that will be incurred during the project. Capital expenses are incurred on the purchase of land, buildings, construction and equipment to be used in the production of goods or in the rendering of services, while maintenance costs are the costs associated with keeping a good in optimal condition by regularly checking it and repairing it when necessary.

**Steps to follow:**

1. Define the cost structure by using the table below:

| | |
|---|---|
| Capital costs (euro) | |
| Average operational and maintenance cost (euro/year) | |

**How to proceed:**

It is very important to **estimate the expected expenses** – both fixed and variable costs – and compare them to the expected revenues before choosing how to raise finances. After the financial instrument(s) are selected, the **actors which will provide financial resources** necessary for the investment have to be chosen. This includes European institutions, national, regional or local governments, financing institutions, utilities, citizens, firms, NGOs, and universities.

**Examples:**

For the project analysed in the deliverable 7.4 on page 65 (“Valladolid green wall”), financial resources were raised through the adoption of several financial instruments by the following actors: European institutions, the city government, and firms. Instead, the project analysed on page 50 (“Milan adopt a green spot”) was financed by citizens, firms, NGOs and universities.

## 10. Identification of the possible revenue streams

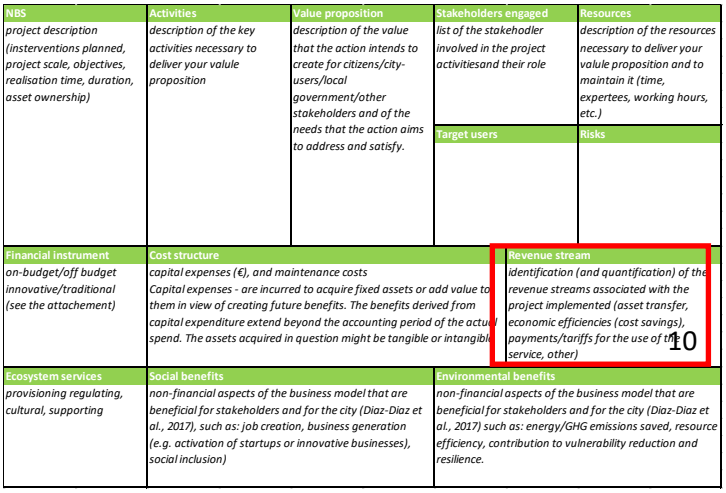


**Figure 21: Business model canvas for NBS (10)**

**Brief description:**

Along with the analysis of the costs, the local authority has to identify the revenue streams associated with the project. Revenue streams can originate from several sources, among which asset transfer, cost savings, and payments/tariffs for the use of service. However, given that the projects involve the implementation the NBS, for which no asset transfer nor payments for their use occur, most revenue streams concern economic efficiencies. For example, most NBS provide regulating services including urban temperature regulation (see step 11. "Analysis of the ecosystem services provided"), which allows households or companies residing nearby to reduce their energy consumption. This eventually leads to savings in energy bills.

**Steps to follow:**

1. Define the revenue streams of the NBS implemented by using the table below:

| Revenue streams | Average annual amount (in €) |
|---|---|
| asset transfer | |
| cost savings (please specify the sector) | |
| payments/tariffs for the use of service | |
| other (please specify) | |

**How to proceed:**

Besides listing the sources of possible revenues, it is important to **quantify them in monetary terms** in order to compute in the most accurate way the revenue streams. Future benefits need to be discounted and brought back to their present value. Indeed, by comparing the expected revenues with the costs and seeing which one is larger, the municipality will assess the feasibility of the project. It is often the case where the costs are larger than revenues, but that does not mean that the project is not worth undertaking. It is paramount to take into account secondary benefits – social and environmental ones – linked to the NBS, which are highly regarded by public administrations. Such benefits are further discussed in steps 12

"identification of the social benefits related to the NBS implementation" and 13 "identification of the environmental benefits related to the NBS implementation".

A starting point for understanding the sources of revenues is to **define the value capture**, that is, considering how to earn revenues from the provision of good, services or information to users and customers. Then, after identifying the key sources, the municipality can proceed to estimate them.

**Examples:**

The project analysed in the deliverable 7.4 on page 62 ("DC's stormwater credit market") will generate cost savings in terms of reduced water run-off. Another form of revenue arising from this intervention is an increase in property value. Cost savings are also expected for the project analysed on page 50 ("Milan adopt a green spot"), where the municipality will save on flower beds maintenance given that other stakeholders will now take care of it.

## 11. Analysis of the ecosystem services provided

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role<br>Target users</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)<br>Risks</td></tr>
<tr><td>Financial instrument<br>on-budget/off budget innovative/traditional (see the attachement)</td><td colspan="2">Cost structure<br>capital expenses (€), and maintenance costs<br>Capital expenses - are incurred to acquire fixed assets or add value to them in view of creating future benefits. The benefits derived from capital expenditure extend beyond the accounting period of the actual spend. The assets acquired in question might be tangible or intangible</td><td colspan="2">Revenue stream<br>identification (and quantification) of the revenue streams associated with the project implemented (asset transfer, economic efficiencies (cost savings), payments/tariffs for the use of the service, other)</td></tr>
<tr><td>Ecosystem services<br>provisioning regulating, cultural, supporting<br>11</td><td colspan="2">Social benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017), such as: job creation, business generation (e.g. activation of startups or innovative businesses), social inclusion)</td><td colspan="2">Environmental benefits<br>non-financial aspects of the business model that are beneficial for stakeholders and for the city (Diaz-Diaz et al., 2017) such as: energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.</td></tr>
</table>

**Figure 22: Business model canvas for NBS (11)**

**Brief description:**

In this section, the ecosystem services generated by the NBS are analysed. A crucial aspect of ecosystem services concerns their economic valuation. Indeed, most ecosystem services resemble public goods, thus making it impossible for the market to value them. Nonetheless, there are now plenty of valuation methodologies that are able to capture the economic value of ecosystem services. The choice of the correct methodology is fundamental to properly carry out the economic valuation.

**Steps to follow:**

1. Identify the ecosystem services provided by the NBS by using the table below:

| *REGULATING* | *CULTURAL* | *PROVISIONING* | *SUPPORTING* |
|---|---|---|---|
| ☐ Water flow regulation and runoff mitigation<br>☐ Flood risk reduction<br>☐ Urban temperature regulation<br>☐ Noise reduction<br>☐ Air purification<br>☐ Carbon sequestration | ☐ Recreation and health<br>☐ Cognitive development<br>☐ Knowledge preservation<br>☐ Aesthetic | ☐ Food supply<br>☐ Freshwater supply | ☐ Creation of habitat for species<br>☐ Biodiversity improvement |

**How to proceed:**

In order to select the proper valuation methodology, the local authority needs to understand first **which ecosystem services are involved** in their project. Ecosystem services can be classified in four different categories: supporting (habitat for species), provisioning (food, fresh water, raw materials), regulating (climate regulation, flood regulation, air quality regulation, water purification), and cultural (aesthetic appreciation, recreation, sense of place). Depending on the category and also on the specific ecosystem service, a different **valuation methodology has to be adopted**: for regulating services, damage avoided cost and replacement cost is often used; direct market valuation methods are preferred for provisioning services; revealed preference approaches are used to gauge cultural services; finally, stated preferences can be used for a wide array of services. It is often recommended to combine different methodologies in order to have more accurate results.

The ecosystem services analysed in the case studies mainly belong to the regulating category - water flow regulation and runoff mitigation, urban temperature regulation, air purification, noise reduction and carbon sequestration. Recreation and health and aesthetic appreciation, the most common cultural services in cities, are also taken into account, as well as the creation of habitat for species and biodiversity improvement from the supporting category.

Given the large spectrum of ecosystem services provided by a single NBS, it is important for projects implementing NBS at the urban level to **properly value the benefits** (i.e. the ecosystem services) stemming from such NBS. Indeed, only by fully capturing their economic value, stakeholders will realize the social, environmental, and economic contributions provided by NBS. This will be particularly important with respect to the next two sections, that is the identification of social and environmental benefits related to the NBS implementation.

**Examples:**

The project analysed in the deliverable 7.4 on page 74 (“City of Melbourne urban forest fund”) generates 9 ecosystem services: water flow regulation and run-off mitigation, flood risk reduction, carbon sequestration, air purification, temperature regulation, recreation and health, aesthetic appreciation, biodiversity improvement, and creation of habitat for species.

Five of them belong to the regulating category, two to the cultural one and two are supporting services.

## 12. Identification of the social benefits related to the NBS implementation

<table>
<tr><td>NBS<br>project description (insterventions planned, project scale, objectives, realisation time, duration, asset ownership)</td><td>Activities<br>description of the key activities necessary to deliver your valule proposition</td><td>Value proposition<br>description of the value that the action intends to create for citizens/city-users/local government/other stakeholders and of the needs that the action aims to address and satisfy.</td><td>Stakeholders engaged<br>list of the stakeholder involved in the project activitiesand their role<br>Target users</td><td>Resources<br>description of the resources necessary to deliver your valule proposition and to maintain it (time, expertees, working hours, etc.)<br>Risks</td></tr>
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</table>

**Figure 23: Business model canvas for NBS (12)**

**Brief description:**

The implementation of NBS also entails the creation of non-financial benefits that affect the society. These aspects are not any less important than their economic counterparts, and municipalities need to consider them when valuing the project feasibility. Hence, the social impacts of the project need to be addressed as well.

**Steps to follow:**

1. Identify the social benefits generated by the NBS by using the table below:

| | No or negative contribution | Low contribution | Moderate contribution | Relevant contribution | Very relevant contribution |
|---|---|---|---|---|---|
| job creation | | | | | |
| business generation (e.g. activation of start-ups or innovative businesses) | | | | | |
| social inclusion | | | | | |
| access to new services | | | | | |
| creation of education/training opportunities | | | | | |

| | No or negative contribution | Low contribution | Moderate contribution | Relevant contribution | Very relevant contribution |
|---|---|---|---|---|---|
| increase of wellbeing | | | | | |
| increase of environmental awareness | | | | | |
| increase of road/personal safety | | | | | |
| increased efficiency in public services | | | | | |
| traffic/road congestion reduction | | | | | |
| better use of existing public spaces | | | | | |
| other social/environmental benefits (please specify…) | | | | | |

**How to proceed:**

Among the benefits generated by NBS, cultural services seldom produce financial benefits. Whereas provision services such as food are tangible goods that can be sold, cultural services provide social benefits that cannot be monetized. However, these services do exist, especially in urban contexts and need to be accounted for. For example, local authorities should **investigate the cultural services provided** by the NBS they plan on implementing and then include the social benefits produced in their analysis. Note that social benefits are not limited to those related to cultural ecosystem services but go beyond their scope.

**Examples:**

Benefits of the project analysed in the deliverable 7.4 on page 47 (“Paris climate bond”) include social inclusion, access to new services, creation of education/training opportunities, and increase of wellbeing, some of which are related to cultural services. The project analysed on page 55 (“Flood proof district in Bilbao”) also contributes to job creation and business generation (e.g., activation of start-ups or innovative businesses), along with other social benefits.

## 13. Identification of the environmental benefits related to the NBS implementati

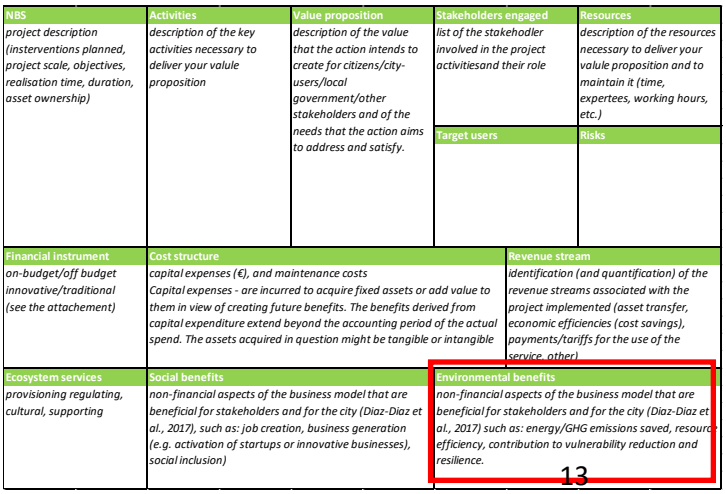


**Figure 24: Business model canvas for NBS (13)**

**Brief description:**

As stated in the previous section, the implementation of NBS has non-financial spill-over effects that are not accounted for in the revenue streams. Along with the social benefits discussed above, there exist also several environmental benefits, such as such as energy/GHG emissions saved, resource efficiency, contribution to vulnerability reduction and resilience.

**Steps to follow:**

1. Identify the environmental benefits generated by the NBS by using the table below:

| | No or negative contribution | Low contribution | Moderate contribution | Relevant contribution | Very relevant contribution |
|---|---|---|---|---|---|
| noise reduction | | | | | |
| reduction of energy consumption/ | | | | | |
| GHG emissions reduction | | | | | |
| reduction of local air pollutants emissions | | | | | |
| increased water use efficiency | | | | | |
| contribution to vulnerability reduction and resilience | | | | | |
| other social/environmental benefits (please specify…) | | | | | |

**How to proceed:**

Whereas for social benefits municipalities needed to pay attention mostly to the cultural services provided by the NBS, in the case of environmental benefits, **regulating services have to be analysed** carefully, although environmental benefits are not only associated to this category of ecosystem services. Indeed, climate regulation and air quality regulation contribute to reducing energy consumption and the emissions of air pollutants, respectively, and altogether contribute to increasing the overall resilience of the city. Noise reduction is commonly provided for by urban green, another regulating service that improves the quality of life of citizens.

This section and the previous one really highlights the importance of valuing the benefits generated by the NBS involved in the project correctly. Municipalities need to **assess the overall value of ecosystem services** in order to capture their social and environmental benefits.

**Examples:**

The project analysed in the deliverable 7.4 on page 50 (“Milan adopt a green spot”), apart from saving money for maintenance costs, reduces noise and curbs GHG and local air pollutant emissions. The project analysed on page 55 (“Flood proof district in Bilbao”), instead, with the creation of the flood-proof district, contributes to creating a resilient environment and generates energy savings.