D5.3 Governance, business, and finance models

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Contents

List of Tables

List of Figures

List of Abbreviations

Business Model Canvas - BMC

CLEVER Action Laboratories – CAL

Fellow Cities – FE Cities

Frontrunner Cities – FR Cities

Greater London Authority – GLA

Nature-based Solutions – NBS

Sustainable Business Model – SBM

Urban Innovation Partnership – UIP

1. Executive Summary

A growing number of cities are employing nature-based solutions (NBS) alongside or in place of traditional grey infrastructure solutions to societal, economic, and environmental challenges[1]. This has been driven by the need for cost-effective and holistic ways of addressing these challenges, as well as the recognition of the multiple sources of value which are generated by NBS.

However, despite the recognition of value and increased use, NBS are yet to become mainstream due to a number of challenges faced by municipalities in the realisation of nature-based urban development projects. These challenges include complex value sources, low willingness to pay, and often traditional organisational procedures. Coupled with a lack of resources to overcome these challenges, NBS projects are often employed as 'experiments' as cities lack a clear framework for the planning, implementation, and monitoring of such projects.

This report has been produced as a part of the CLEVER Cities project within Work Package 5, looking at CLEVER solutions to bring NBS from innovation to market. It is divided into three sections: Governance Models for NBS, Business Models for NBS and Financing Models for NBS. Together, these sections make up deliverable 5.3 which connects CLEVER solutions with business and financing opportunities. All three sections of this deliverable tie together to support the creators of NBS projects to implement sustainable NBS projects with long-term value for all stakeholders.

This report has been developed to support cities and organisations who are setting up an NBS project, however in each section a range of options have been examined and as such there may be resources and information that other organisations or stakeholders will find useful throughout the NBS lifecycle.

The governance section of this report examines the governance models and more significantly the overarching elements of these models in the implementation of NBS. It first distils existing models from NBS sister projects, examining these in the context of CLEVER. Following is the methodology behind and the identification of the fundamentals of CLEVER governance which can be used as a mapping tool across all stages of the application of NBS. This section also addresses the challenges and drivers related to governance in NBS and addresses how the five fundamentals established in the report have been employed in the CLEVER leading cities as a show of best practice.

[1] Perrin, M (2018). Impact-driven financing and investment strategies for urban regeneration. Factsheet 3, CLEVER Cities, H2020 grant no. 776604.

The business model section of this report has been created in order to address the gap between the significant value of NBS and the market uptake. This section frames value not as financial income for profit but identifies the diverse range of value sources in areas such as social, health and environment benefits. Business models in this report are used as a framework for describing the connections between stakeholders and illustrating how NBS can be used to create, deliver, and capture value.

While the majority of NBS are funded through public budgets, alternative funding solutions have increased[2]. Upfront and ongoing funding sources for NBS have grown in diversity, reflecting the innovation in the solutions themselves which has taken place over the last few decades. **The financing section** of this report examines the funding sources and financing solutions available for NBS projects of various scales and types. Using case studies to illustrate proven past and current financing solutions, the report also provides examples of innovative financing solutions which can be implemented in future NBS projects.

This section is focused around 6 steps in order to provide a methodical approach for cities to determine the optimal solution in each case before discussing how these steps can be used to create one financial solution. These steps are: Selecting the NBS, Understanding the benefits of NBS, Identifying funders, Identifying funding types, Identifying financing mechanisms, and Building a financial model. While this report has been written for public authorities, other stakeholders in the funding of NBS (such as investors, businesses, and foundations) may also find it useful.

[2] https://connectingnature.eu/financing-and-business-models

2. Governance models

2.1. Introduction

This part of the deliverable focuses on governance models we found to be employed in the CLEVER Frontrunner Cities (following FR Cities) Hamburg, London and Milan when co-creating Nature-based Solutions (following NBS). However, after scanning existing literature and topical outputs from other Horizon 2020 NBS sister projects, we decided that the added value is not to identify and describe the governance models used per se which would have put the focus more on contextual issues. Instead, we aim to flesh out the underlying features and processes, the interesting elements that we found in the CLEVER Cities which enable and constitute collaborative governance and multi-stakeholder collaboration. We termed them fundamentals of CLEVER governance.

In chapter 2.1 we review existing literature from other NBS sister projects to filter the collaborative governance types that were deemed conducive for NBS. Their different forms and arrangements will be explored in a bit more detail in chapter 2.1.1. We will zoom in on the UnaLAB's approach to identify and map barriers and enablers with indications on how to overcome the barriers as well as on the governance types and models as defined by the NATURVATION and Nature4Cities projects for NBS. Then we will set the scene by carving out how CLEVER understands governance and co-creation within the context of their CLEVER Action Laboratories (following CALs).

In chapter 2.2 we elaborate on the underlying methodology of identifying the CLEVER fundamentals, namely the 4PMGrid[3]. In CLEVER Cities, it is a core theoretical concept which we operationalized for identifying and structuring innovation processes that can emerge throughout the whole planning, design, management and monitoring of an NBS. When used as a mapping tool, it allows for capturing the cities' unique pathways for tackling co-design, co-planning, co-implementation and co-monitoring of the chosen NBS. These pathways – which are a combination of different elements - have specific underlying governance elements that make them work, such as specific stakeholder engagement formats, organisational structures, specific virtual and social platforms, or ICT tools to facilitate broad engagement. These can be systematically assessed through the grid cell structure of the 4PMGrid. Through targeted guiding questions we elicited those governance elements with the CLEVER FR cities, along with challenges and driver that hinder or facilitate the deployment of NBS. This provided the information base for formulating and structuring the fundamentals of CLEVER governance.

In chapter 2.3 we elaborate on these fundamentals of CLEVER governance which are the result of a clustering of the FR Cities' responses to the guiding questions into five overarching themes, namely:

- build institutional structures and arrangements for co-design (chapter 2.3.1);
- create a supportive policy framework (chapter 2.3.2);

[3] For a detailed outline of the methodology, consult the Deliverable: the 4PM-Grid as a mapping tool.

- foster citizen engagement (chapter 2.3.3.);
- foster experimentation and learning (chapter 2.3.4); and
- provide trainings and educational programmes (chapter 2.3.5).

We illustrate and outline how each city is employing these fundamentals individually in order to show possible applications of these fundamentals for other cities as well. We also provide recommendations for each fundamental with illustrative examples from the FR cities to help other cities in detailing their fundamentals according to their needs (based on the recommendations).

In chapter 2.4 we conclude with a pick-and-choose system/graph that cities can refer to for creating their tailored collaborative governance models by choosing the pathways through the fundamentals of CLEVER governance that suits their needs and context.

2.1.1. A recap of governance models for NBS

NBS are inspired and supported by nature, to address societal challenges. These challenges range from social, economic to environmental ones. Evidence suggests that NBS have the potential to tackle those challenges in an integrated manner by delivering a wide range of co-benefits from social to economic while providing sustainable solutions for climate adaptation (Raymond, 2017; Breukers & Jeuken, 2018). However, for these benefits to accrue and be acknowledged by the different stakeholders, NBS require a multi-stakeholder, multi-thematic and cross-sectoral approach and governance between government, experts and other professionals as well as civil society actors.

Thus, **'governing' in the context of NBS is understood as interaction between all participating parties in order to achieve a collective goal** (Somarakis et al. 2019).
Several outputs have been produced on governance for NBS in the NBS sister projects (i.e. Green SURGE, NATURVATION, ThinkNature, UnaLab or Nature4Cities, etc.). The approaches are diverse but can be categorized in attempts to:

- **identify and map barriers and enablers for the governance of NBS**
  (UnaLab D6.2 Municipal Governance Guidelines, ThinkNature Nature based solutions Handbook, Nature4Cities D5.2 Citizen and Stakeholder Engagement strategies and tools for NBS Implementation, Urban GreenUP, D6.1 Barriers and Boundaries Identification), with potential indications **how barriers can be overcome** (UnaLab D6.2 Municipal Governance Guidelines).
- **differentiate and identify different governance types or models**
  (NATURVATION, D1.3: Part VII: The Governance and Politics of Nature-based Solutions; NATURVATION International Comparison of Nature-based Solutions Project Report; N4C D1.2 NBS Implementation Models Typology)

Regarding the identification of barriers and enablers for the governance of NBS, UnaLab presents the most comprehensive approach. Whilst other deliverables elaborate extensively on NBS barriers and enablers (which we synthesized in a consolidated checklist, see chapter 2.4 and Annex 1.4), UnaLab links governance-related barriers to NBS uptake with action fields to help overcome these barriers (Hawxwell et al., 2018). This fits well with the intention of this document to go beyond barriers and enablers identification towards identifying those processes and features that are needed for collaborative governance. Six such action fields were identified by UnaLab, four of which were considered particularly important for our approach:

1) Municipal strategy and planning

The challenge is to move beyond piloting and experimentation of NBS to mainstreaming NBS in urban development policies and practice. Important building blocks are the development of a collective vision; embedding NBS in existing plans and strategies, by linking in with Green/Blue Infrastructure, Climate Adaptation, Climate Mitigation, Biodiversity Strategies or Water Management; allowing for experimental areas not only to develop locally attuned interventions, but to let municipal staff, citizens and developers collaborate in a safe space.

2) Organisation and structure

Municipalities traditionally work in sectoral and departmental siloes. This makes the cross-sectoral concept of NBS and its necessity to get multiple actors on board to develop an effective partnership to design, plan and implement an NBS a challenge. Solutions for this challenge are: the setup of cross-departmental structures, such as ad-hoc teams, working groups with regular meetings and common work procedures or even the creation of new departments with a focus on cross-cutting issues; the setup of informal network to establish trust between actors offering the option of face-to-face contacts and exchange.

3) Policies (regulations and incentives)

As a cross-cutting concept, the design and implementation of NBS is impacted by and subject to a wide range of policies and instruments, such as those in urban planning, green spaces, infrastructure and development, water management, etc. The challenge is that existing policies and regulations often do not readily fit the multi-actor and collaborative requirements of NBS and may have to be revised; also, new regulations and standards need to be instated (i.e. building standards for green roofs, pre-feasibility studies); another solution is to create incentives and market-based instruments for fostering private sector engagement and encourage private parties to develop and invest more in NBS.

4) Finance and procurement

Public procurement can serve as a powerful demand-side policy tool. However, NBS often call for new procurement strategies that account for the full range of NBS benefits and accommodate co-creation of multiple stakeholders to serve the diverse needs of communities. Since the inclusion of private actors is paramount for a widespread uptake of NBS, Public-private partnerships (PPPs) are a viable option in

which public and private entities enter contractual agreements aimed at creating, operating and maintaining NBS.

In terms of governance models, the main contributions come from N4C and NATURVATION.

Nature4Cities (N4C) established an implementation typology based on an assessing a range of governance models for their collaborative potential and suitability towards the requirements of NBS. Findings of the N4C Governance analysis indicate that, especially on urban scale, collaborative, multi-sector, polycentric and adaptive governance models can be considered a more suitable approach for NBS, where single-focused, traditional top-down approaches reach their limits. Prioritised models (in terms of suitability for NBS) display the aptitude to adapt to dynamic local planning with flexibility, while leaving room for experimentation and joint learning[4],[5].

NATURVATION looks at governance types from the angle of the main actors initiating and promoting them - be it public authorities, private/for profit entities, civil society/non-for-profit organizations, academia or grassroots movements (Sekulova & Anguelovski, 2017). This approach is less restrictive in pinning down certain arrangements as distinct governance models and more flexible in accommodating different arrangements without labelling them. All governance types can be boiled down to the involvement of three key actors, namely government, market (private actors) and civil society (community) who hold different interests and shares of power in the different governance types (Breukers & Jeuken, 2018). The governance types discerned are: Public-/municipality-driven, NGO-/foundation-driven, privately-driven and community-driven.

Most importantly, there is no one-size-fits-all solution. Municipality-, community-driven partnerships as well as community-based initiatives have all been successfully applied for NBS (Bulkeley, 2019). Neither do they have clear boundaries or are definite or static since they are subject to change over the course of a project. For these reasons, and since governance types vary greatly across the different CALs, there is no added value for this deliverable to outline and describe the different governance types employed in the CLEVER Cities and their CALs. Instead, the focus is on capturing the most decisive underlying features of these governance types that enable co-creation and multi-stakeholder collaboration.

2.1.2. Co-creation in CLEVER Action Laboratories

Co-creation is broadly understood as an active engagement of stakeholders who hold different types of knowledge and resources with the aim to generate collaboratively outcomes (i.e. vision narratives, new understandings of problems and opportunities etc.) (Voorberg et al., 2015). Since co-creation is

[4] For more information on the N4C approach, refer to Annex 11.
[5] For a detailed discussion on the development, categorization and analysis of the Governance Models Cluster Nature4Cities Deliverable 1.2 'Implementation Models Typology' can be consulted

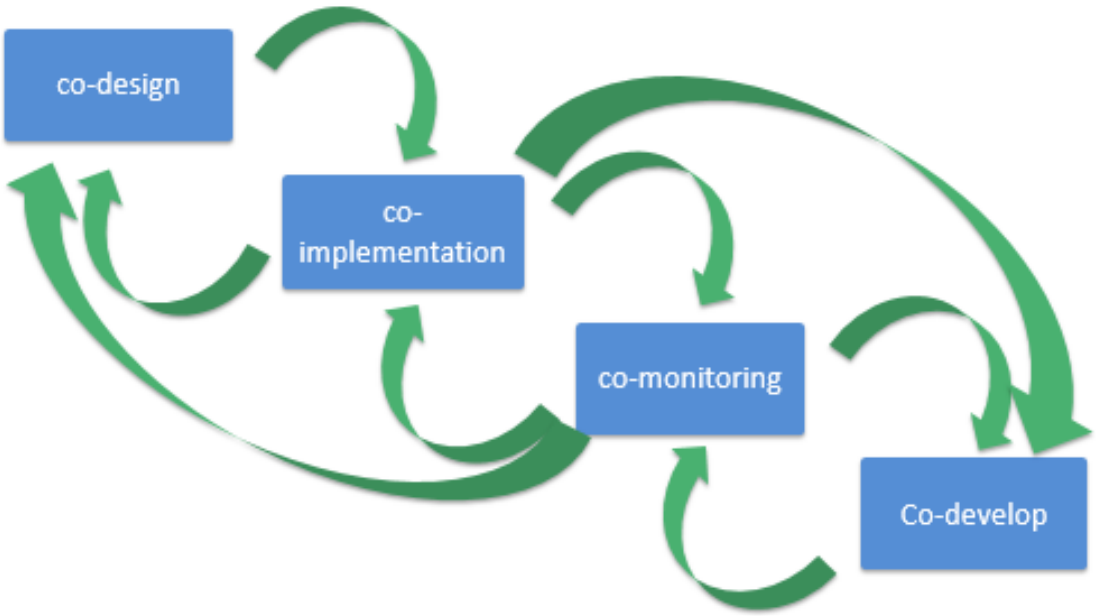
transversal across the different project phases of CLEVER, it spans across the following stages which are in turn interrelated to each other (see Fig.1):

i.) Co-design (involves the collaborative design of urban regeneration interventions – CLEVER Stimuli),

ii.) Co-implementation (working with PEOPLE and partners to put the solution into action),

iii.) Co-monitoring (essential to CLEVER Cities Project Monitor to evaluate the NBS implemented and monitor the durability and quality of the interventions.) and

iv.) Co-development (Co-development sets the scene to grow, test and develop the proposed solution



by looking at details, and the local context to create a viable intervention) (Davis et al., 2018).

Figure 1 - Stages of co-creation across project phases in CLEVER Cities.

CLEVER Action Labs (CAL) will co-design, co-implement and co-monitor NBS interventions in the deprived districts starting from specific place-based NBS technologies as impulses.

What differentiates co-creation from more traditional forms of stakeholder engagement is the intensity of involvement and the impact of societal actors in and on processes (Schaepke et al., 2018; Voorberg et al., 2015). Stakeholder engagement is crucial for design and implementation of NBS interventions in cities. The majority of NBS cluster projects emphasize the decisive roles that citizens and civil society groups play in designing, implementing and maintaining NBS (Somarakis et al., 2019; Bulkeley, 2019). Amongst others, key benefits of co-creative approaches are fostering the understanding of NBS and its benefits, empowering local communities, creating a sense of ownership, enhancing citizenship and belonging, reducing social exclusion and improving social cohesion (Hörschelmann et al., 2019).

However, these benefits are only fully exploited when citizens feel that their voices are heard and are taken into account by decision makers. The willingness to listen to public concerns, for instance by

organising a traditional consultation process is not good enough, approaches have to go beyond the good intentions to "involve citizens" (Somarakis et al., 2019). Local authorities can play an important role with regards to creating the right contexts for co-creation, by fostering supportive regulatory, policy and financial mechanisms, as well as decision-making instruments that allow for inclusive and early-on stakeholder engagement (Bulkeley, 2019).

The form of non-governmental actor participation in governance can range from consultation, involvement, collaboration, to empowerment according the study of Mattijssen et al. (2017) (see Table 1). These differ with regards to the extent of power and influence non-governmental stakeholders have on decision-making processes and on the development of the final solution. The further to the right, the more balanced the power distribution between stakeholders and public authorities becomes. Co-creation is ideally located further to the right in "collaborate" or "empower" with co-governance, co-management or bottom-up self-governance.

Government actor role	Leading ⟷ Enabling					None/ regulatory
Form of Non-government actor participation in governance	Information	Consultation	Involvement	Partnership	Empowerment	
Non-government actor role	Provide information and views about UGI plans and projects as part of decision making process		Some involvement in planning, management, care and maintenance of UGI	Shared roles and responsibilities around planning and management of UGI	Leasing or purchasing of public land	Management agreement, leasing or purchase of private land
Governance model	Government actor led Consultative Democratic processes		Co-management	Co-governance/ co-production Consensus oriented	Non-government actor led governance Self governance	

Table 1 - Spectrum of government and non-government roles in different governance arrangements developed in Green SURGE
(Source Template: Mattijssen, T., et al., The 'green' and 'self' in green self-governance – a study of 264 green space initiatives by citizens. *Journal of Environmental Policy & Planning*, 2017).

In CLEVER Cities, three Urban Living Labs, so-called CALs were created in each Frontrunner City to facilitate co-creation of NBS of urban regeneration interventions (the so-called CLEVER Stimuli) at the local level, with the aim of improving overall engagement of citizens in the process. The CALs are as follows:

Milan:

Figure 2 - CALs in CLEVER FR City Milan.

CALs	CAL 1 Green Roofs and Walls (GRW)	CAL 2 Giambellino 129	CAL 3 Tibaldi Train Stop and Noise Barrier
Description	focusses on the design and promotion of innovative solutions for experimental and multifunctional green roofs and walls.	CAL 2 "Giambellino 129" is an abandoned and polluted green lot located in the area of Lorenteggio-Giambellino regeneration Programme. A restoration programme has been foreseen, in order to create a community garden and a public green area.	CAL 3 Tibaldi Train Stop interventions are aimed to integrate NBS in Tibaldi station, located in the area of Municipio 5 of the south of Milan, and its close open spaces, and also to test on a short length tract of the railroad, mitigation of noise barrier with NBS integrated on their surfaces and along the rail banks aside of them.

Table 2 - Description of CALs in CLEVER FR City Milan.

London:

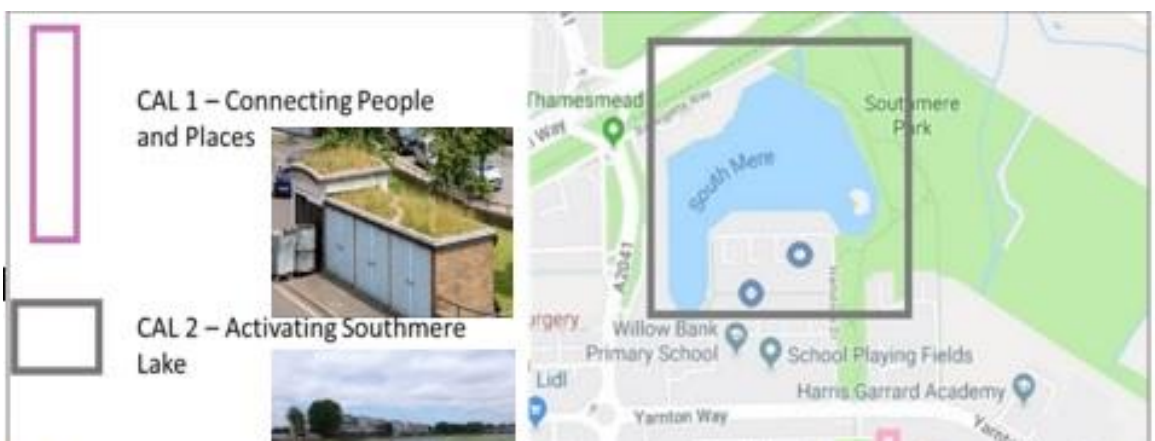


Figure 3 - CALs in CLEVER FR City London.

CALs	CAL 1 Parkview: Connecting People and Places	CAL 2 Southmere: Activating Southmere Lake	CAL 3 South Thamesmead: Greening Unusual Spaces
Description	CAL 1 will examine how nature-based solutions (NBS) can be used to make more attractive and liveable streets and public realm in Parkview. Currently, many of the open spaces do not encourage people to socialise, the neighbourhood feels grey, uninviting, empty and inactive.	The co-design, co-implement and co-monitor of the green-blue NBS of London's CAL 2 will address the poor water quality issues in the lake while engaging stakeholders at the new Lakeside Centre, local residents, and the Thamesmead Sport club. The lake can be an integral part of improving community cohesion, developing new skills for people in Thamesmead. CAL 2 will work with specialists and residents to develop a reedbed wetlands project to address the pollution in the lake.	CAL 3 will work with specialists and residents to test new approaches to greening unusual spaces: walls, balconies, roofs, walkways, and the incidental spaces that are often underutilised. The project will explore how to use smart and analogue systems to create new products and make greening the grey more effective and scalable in regeneration projects.

Table 3: Description of CALs in CLEVER FR City London.

Hamburg:

Figure 4 - CALs in CLEVER FR City Hamburg.

CALs	CAL 1 CLEVER Corridor	CAL 2 Green Roofs and Facades	CAL 3 School Yards
Description	The CLEVER corridor will connect the different NBS interventions implemented as part of CLEVER Cities. CAL 1 focuses on creating biodiverse spots and stepping stones as a connecting element between the nature reserves as well as the implementing a guiding system that will allow users to spent more time in nature, familiarize themselves with NBS	CAL 2 has two main pillars: First, creating and/or qualifying the green roofs & facades as a space for recreation by embedding them in an existing green network and connecting the existing quarters in Neugraben-Fischbek with the new residential quarters (Vogelkamp Neugraben, Fischbeker Heidbrook, Fischbeker Reethen). Second, developing an	CAL 3 focuses on the redesign of the school yards, starting from nature-based thinking. The pilot school in the process is the district school Fischbek-Falkenberg where different interventions are planned through CLEVER Cities (school garden, aquaponics). Further schools are in discussion for replication. Due to the planned restructuring of the school yards in the other two schools,

	and walk or cycle along the NBS interventions.	“areal drainage and heavy rainfall precaution concept” including risk assessment and prioritized pilot projects.	mobile school garden solutions are actively discussed. Besides the physical interventions, the CAL school yards will also focus on the topic of environmental and sustainability education.

Table 3 - Description of CALs in CLEVER FR City Hamburg.

2.2. Methodology

2.2.1. The 4PM-Grid

The 4PM-Grid is a core theoretical concept of CLEVER Cities which can also serve as an operational and procedural tool for identifying and structuring innovation processes that (can) emerge throughout the planning, design, management and monitoring of an NBS. The underlying idea is that innovation can emerge anywhere along these phases, both in terms of products and services, but also in the processes themselves. The 4PM-Grid allows for capturing the cities’ unique pathways for tackling co-design, co-planning, co-implementation and co-monitoring of the chosen NBS (see Fig. 5). A filled-in 4PM-Grid serves as the data collection base and helps the cities think in a structured way about where and in which way innovation emerges or will emerge in their processes, services or products[6]. It also provides insight into the elements of collaborative governance (considered as part of innovation) and its different forms adopted in cities.

Along its x axis, there are three Ps that reflect the spatial and territorial scales of the respective NBS:

- the very micro-level dimension of the CLEVER Action Lab, namely “Place” is in which the NBS is embedded, i.e. street, neighbourhood, district, etc.;
- the people-based dimension of “People” refers to the people involved as central driving forces in co-design, co-implementation and co-management of the NBS (i.e. UIPs) as well as the co-creation structures and methods designed around the CALs;
- “Platforms” refer to the scale dimension of the NBS and the territorial, social and virtual (interactive) platforms harnessed to support the co-design, co-implementation and co-management of the NBS.

[6] For knowing more about how to use the 4PMGrid as a mapping tool in cities, along with instructions and a template, please consult the Deliverable: The 4PM-Grid as a Mapping Tool.

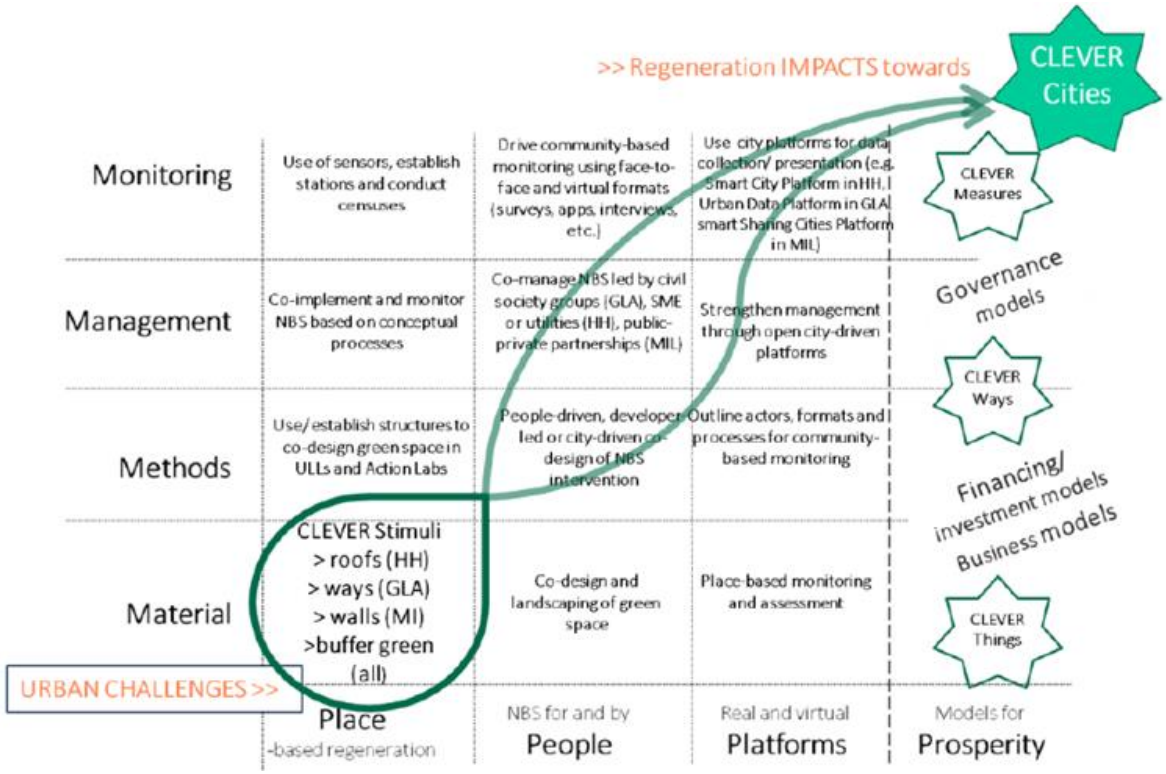


Figure 5 - The dimensions of the CLEVER 4PMGrid

Along its y axis, the 4 Ms represent the different phases of an NBS life cycle that the FR and Fellow Cities (following FE cities) are passing through in the course of the CLEVER Cities project and beyond.

- "Material" is about the specific type of physical NBS intervention (i.e. green roof, green corridors, urban farming), its technical and place-based aspects (challenges, needs, status quo)
- "Method" refers to the instruments, tools, methods and approaches employed for the co-design, co-implementation and co-monitoring of NBS, including stakeholder engagement formats, (ICT) support structures and tools, financing strategies, approaches for measuring multifunctionality / co-benefits of NBS, etc.
- "Management" refers to the overall governance of NBS, including how NBS are integrated and consolidated in existing governance, legislative, business and financing frameworks, formalized or non-formalized roles and responsibilities in place for NBS, procedures and protocols that regulate design, implementation and monitoring of NBS, co-management and co-maintenance arrangements in the long run (i.e. PPP), city plans and strategies;
- "Monitoring" implies the indicators, devices and local data collection and management tools used for co-monitoring and citizen-based NBS impact assessment, (open data) platforms employed to support co-monitoring, dissemination and presentation of results (i.e. linking up with SMART city platforms, sensoring, modelling, citizen science);

FR Cities have already passed through "Material" and "Method", and focus on "Management" and "Monitoring" during CLEVER. FE Cities, whose major task is to outline and detail roadmaps for their

planned future NBS implementation in the course of the project will focus on choosing the NBS, namely "Material" and defining the "Method" for doing so.

2.2.2. The 4PM-Grid as a mapping tool for collaborative governance elements

The cities' pathways – which are a combination of different elements - have specific underlying governance elements that make them work, such as specific stakeholder engagement formats, organisational structures, specific virtual and social platforms, or ICT tools to facilitate broad engagement. With its several grid cells referring to governance of NBS (see Fig. 6), the 4PMGrid lends itself to the identification and mapping of these governance elements and arrangements in each city, employed during co-design, co-implementation and co-monitoring of NBS.

For the purpose of eliciting and mapping underlying governance elements, we developed guiding questions for the cities which can be found in Annex 1.2. These support a targeted and structured data collection and provide a full and complete picture of the individual situation in each city and CAL.

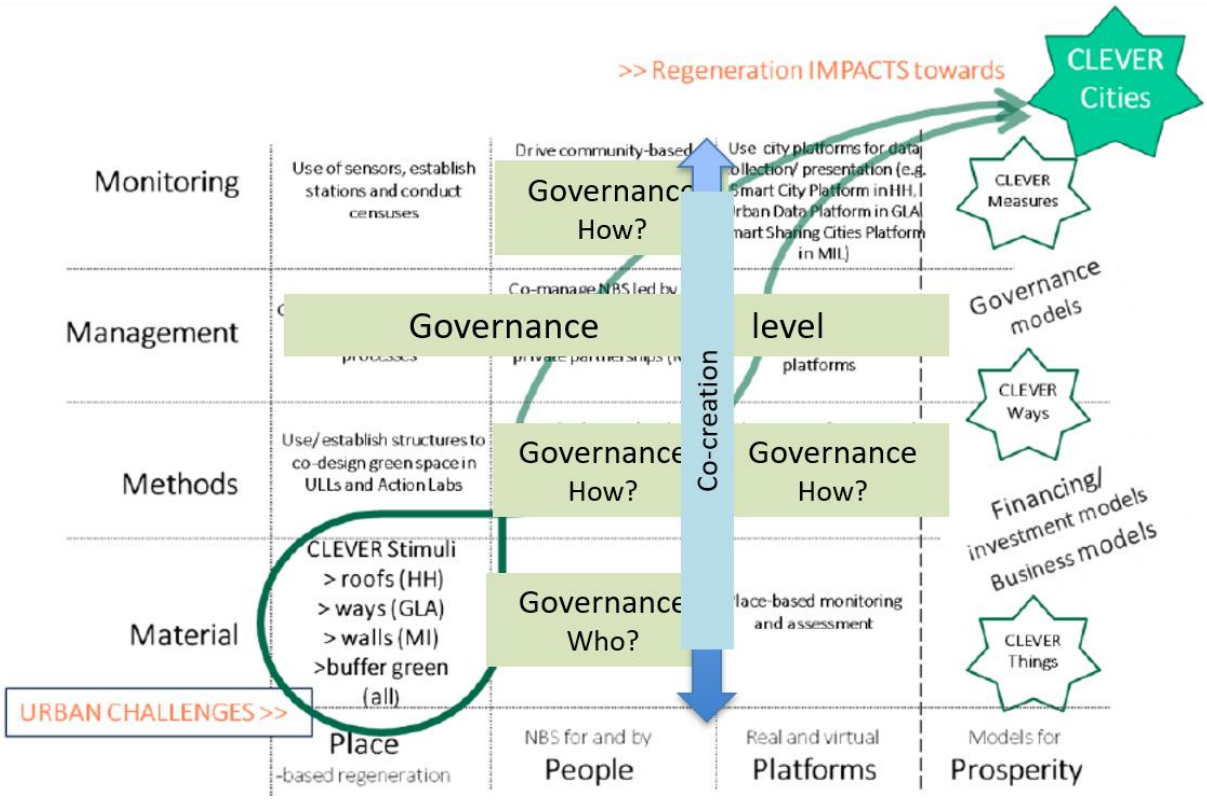


Figure 6 - Governance dimensions of the CLEVER 4PM-Grid

2.2.3. Identifying collaborative governance with innovation potential

Whilst the mapping of governance elements and processes in the cities is an important step to obtain the bigger picture, it does not allow us to discover their potential innovation.

One of the major objectives of CLEVER is to identify innovation pathways the cities are embarking on to design and implement their NBS. Thus, we set out to identify the innovation aspects of the mapped collaborative governance elements[7]. We first reviewed pertinent research and deliverables of other NBS-related Horizon 2020 projects (such as NATURVATION – 4 types of innovation; Nature4Cities – NBS implementation typologies and step-by-step stakeholder engagement guide; Connecting Nature – engaging the un-usual suspects; proGIreg forthcoming Co-design Guidelines) and individual definitions of innovation of the CLEVER Cities themselves.

We then synthesized innovation aspects and transformed them into user-friendly, innovation-related guiding questions. The initial set of guiding questions for collaborative governance elements formed the starting point for this exploration. These guiding questions were then tested with parts of the CLEVER Consortium and then refined based on their feedback (Annex 1.3). A two-part questionnaire containing all these revised questions as well as a section on challenges and drivers (see below) was sent out to the cities to provide data for chapter 2.3[8].

2.2.4. Identifying and mapping challenges and drivers

NBS have emerged as a novel response to the multiple challenges that cities face with the potential to remedy the issues while providing co-benefits as well. In that regard, with new solutions arise new (as well as established) challenges and drivers, which hinder or facilitate the deployment of NBS in cities.

Following our innovation questions, we wanted the FR cities to tell us about the challenges and drivers they were experiencing with regards to these innovative governance processes. To pinpoint their governance challenges and barriers, the cities were first asked what obstacles they face up or what catalysts crop up to respectively inhibit or support the process of NBS co-planning, co-design or co-implementation. This was a subjective part wherein the cities can freely decide to elaborate on one or as many of the challenges or drivers they came across in their NBS work. The questions were so framed that the cities feel welcomed to elicit not only which governance challenges and drivers they face with regards to the innovation aspects explored but also speak about ways in which those are being dealt with, for instance, how they have been overcome, negotiated and/or resolved if at all. This would help

[7] For a detailed outline of these innovation aspects refer to the Deliverable: the 4PM-Grid as a mapping tool.
[8] For a detailed outline of how we created these innovation-related questions, refer to the Deliverable: the 4PM-Grid as a mapping tool.

us showcase the individual and unique issues cities face when co-designing, co-planning or co-implementing NBS and how they attempted to remedy them.

Second, the cities were asked to tick the experienced challenges and drivers in a synthesized checklist which drew on challenges and drivers identified in various relevant deliverables produced by other NBS projects we had screened beforehand (UnaLab D6.2 Municipal Governance Guidelines, ThinkNature Nature based solutions Handbook, Nature4Cities D5.2 Citizen and Stakeholder Engagement strategies and tools for NBS Implementation, CLEVER Cities D1.1 Guiding Framework for CLEVER activities) (available in Annex 1.4).. This has been done to understand the common issues cities might be facing in a broader sense.

2.3. Fundamentals of CLEVER governance

The fundamentals of CLEVER Governance are based on the feedback received to the innovation questionnaire from respondents of the FR cities of London, Hamburg and Milan (see Annex 1.3), as well as on the follow-up phone interviews and information from the CLEVER Deliverables. In alignment with findings and outcomes from the other NBS sister projects, we clustered the questions and results in broader themes that we identified as fundamental to enabling and constituting collaborative governance and multi-stakeholder collaboration. They were thus termed “Fundamentals of CLEVER governance”.

The following chapters illustrate and outline how the three FR cities apply these fundamentals in their own ways and outline what common barriers and enablers were. They also provide recommendations for potential building blocks based on underlying features found FR cities which are illustrated throughout the chapter.

The information used in the following chapters is also based on CLEVER Del. 1.1: Guiding Framework for CLEVER Cities Activities, Del. 2.2: Co-Creation Plan & Co-Design of Solutions and Del. 2.3: CAL specific Co-implementation plan.

2.3.1. Institutional structures and arrangements for co-design

In the light of the “siloed” nature of municipalities, the concept of NBS often present a challenge for cities due to the necessity to get multiple actors on board to work effectively in partnership. Since every city establishes their institutional and organisation structures in their own way, there is no clear guideline for how to best approach it (Hawxwell et al., 2018). Instead we will work out some of the central principles that will help cities improve their organisational and institutional structure towards co-design.

CLEVER Cities has developed its own approach for setting up the organisational structure for co-design and co-implementation, the so-called Urban Innovation Partnerships (following UIP). They are city-wide or district-focused informal alliances of locally involved actors that are specifically interested and/or

relevant for implementing the NBS 'on site' (i.e. local and city authorities, community (groups), businesses, academics). They facilitate and drive the co-creation process of the NBS. While the CAL is the spatial dimension of the Action Laboratories, the UIP is the actor constellation, a mixing pot of all potential stakeholders in the local cluster for FR. These UIPs have different manifestations in the different cities with varying levels of institutionalisation.

2.3.1.1. Create a multi-stakeholder working structure

A first step towards creating a multi-stakeholder working structure is to identify the stakeholders. Depending on the type of NBS, different stakeholders might have to be considered. A green roof on the premises of a private housing company or a green wall on a train station require different types of leading stakeholders and target groups than urban gardening actions in schools. For instance, in Milan, citizens are the target group of the green roof (awareness raising) campaigns and public bid (CAL1 led by the SME Ambiente Italia), local residents in the co-creation of the new park and urban farming activities (CAL2, led by the NPO Eliante) and the public spaces to be created around the train station (CAL3, led by the railway company RFI & Italferr).

In Hamburg, different spots are planned to be qualified with greenery along the corridor with diverse stakeholders (depending on the intervention) that will be spread spatially within the corridor. For example, the first area will be co-designed with refugees and neighbours of the refugee accommodations. The talented locals via the cultural workshop" made in Suderelbe" will be involved in the co-designing certain elements, i.e. the guiding system for Neugraben Fischbek. Based on the two pillars in CAL 2 (green roof / façade and rainwater management), diverse actor groups both from the private and public sector are involved in the process (real estate company, Hamburg Wasser, Ministry of Environment and Energy, different departments of the district council, etc.). In CAL 3, the school building management company as well as the school administration are actively involved, together dedicated teacher and interested pupils.

Identify the stakeholders that should be involved based on required capacities and resources

It can help to organize actors in actor categories that allow for a differentiation according to capacities and resources that these actors bring to the process. The CLEVER Cities provide different examples of such actor categories (see Fig. 7 and Fig. 8):

The **first section "citizens"** involves local level actors with non-professional background in terms of implementing NBS. It constitutes the main target group or user group with responsibilities to maintain projects after CLEVER Cities project duration. Depending on the context, it includes residents, community organisations, religious organisations, schools, teachers, pupils, refugees, etc.

The **second section "expertise"** includes the group with a professional background in design, implementation or maintenance of green infrastructure, such as service providers (app developers, communication designers), researchers, landscape architects, gardeners or specialized SMEs.

The **third section "authorities, associated partners"** consists of (district or municipal) institutions and departments already involved in urban planning (construction, management of open spaces, etc.) or strategic partners, such as real estate companies, land owners or schools, bringing in mostly political and relational resources.

The **fourth section "Partners"** includes actors, which are mainly responsible or involved in the CAL activities and form part of the CLEVER core team.

Figure 7 - Illustrative example categories actor constellation UIP London, CAL 2 which Hamburg followed as well.

Slightly different categories were used in Milan to categorize actors (see Fig. 8).

The **first category is the "mediator"** which refers the bottom-up character of the CALs and brings up an important point for citizen engagement: the collaboration with various citizen representatives that are used as intermediaries to reach different citizen groups, to better understand the local needs of the future users, avoid potential conflicts.

The **second category of "expertise"** is the same as above.

The **third category is that of "promoter"**. It contains professional, institutional entities, such as the specialized associations and orders (i.e. association of builders and constructors, architects, engineers' associations) which the CALs directly work with. "Promoters" provide all kinds of resources and services, for instance training courses or guided tours, facilities for trainings, communication efforts through their channels or monitoring.

The **fourth category of "ally"**, similar to the category "partners" above includes various associations and organisations which help to increase visibility of the initiatives, grow the network and raise public awareness. They help to disseminate and advocate activities as part of awareness-raising campaigns and provide resources (i.e. co-facilitate training course, guided visits).

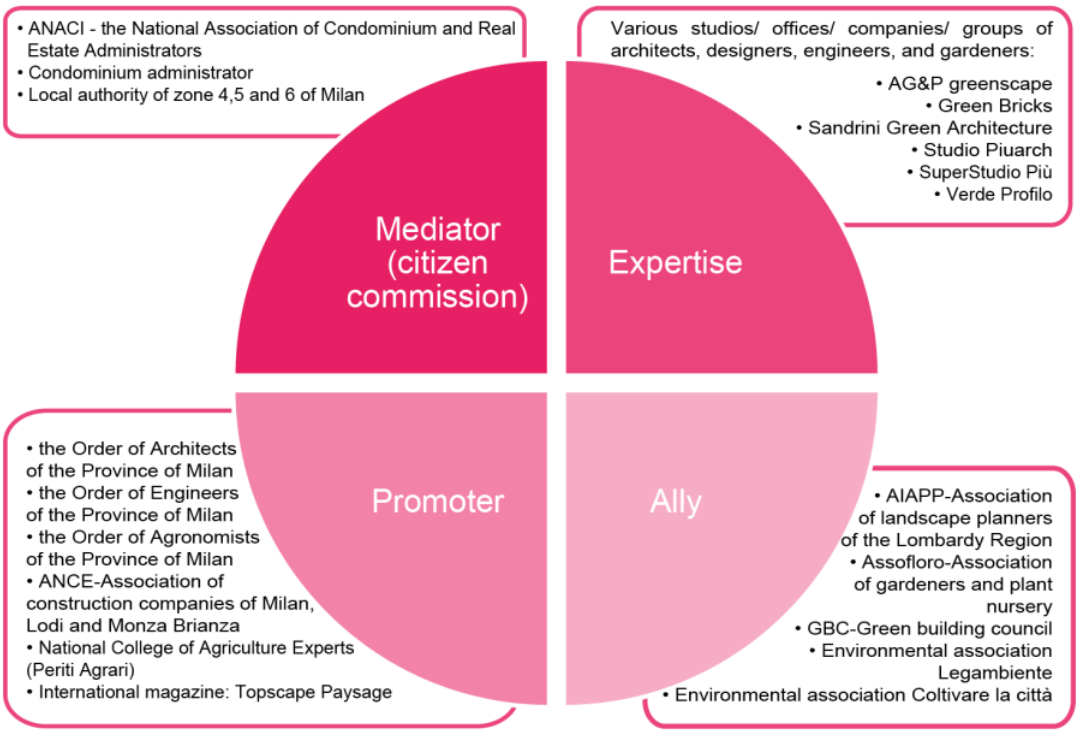


Figure 8 - Illustrative example categories actor constellation UIP Milan, CAL 1

2.3.1.2. Create a core team with balanced management roles and responsibilities

CLEVER Cities have created cross-sectoral core teams that include all relevant actors responsible or involved in the CAL activities. In the FR cities, 3-4 actors form these core teams to cover all relevant resources and expertise required for NBS design, planning, implementation and monitoring. Accordingly, roles and responsibilities are distributed across these different actors. As Table 5 illustrates these core teams (on strategic level) stay constant, while the CAL-level multi-stakeholder constellations, roles and responsibilities might differ for each CAL.

These core teams consist of:

- A municipal actor with a coordinating role. This includes overseeing all activities in the CALs, making sure that there is a joined up approach, developing the budget plan and managing distribution of financial resources, risk management and mitigation and accountability for timely meeting the project's objectives; the municipal partner is an important link to other specialized municipal departments who are consulted and drawn into processes if necessary;
- A public or private organisation/company leading the community engagement, co-design and co-implementation of the planned activities. This partner usually has long-term experience with participation processes with the local residents, young people or vulnerable groups. Their role includes the facilitation of the co-design process, creating design ideas and projects goals together with the stakeholders, steering co-implementation with local residents, refugees, students, teachers and interested parties; this partner frequently has an advisory and liaison role with local associations;
- A partner responsible for monitoring and social, environmental and economic impact assessment of the implemented NBS, which varies based on the type of NBS (i.e. green roof, urban garden, etc.). It can be a partner from academia, a specialized SME (for green roofs), an environment-focussed ministry or a service provider/operator on whose premises the NBS is implemented;

City / CAL	Core team & responsibilities	Organizational scheme for CAL	Stakeholders involved
London CAL 1 – Connecting People and Places	**Greater London Authority** (GLA): coordinating role as part; oversees activities in the CALs, ensures a joined up approach including all partners, ensures that goals are met, reports progress; risk management;	Same as the core team and responsibilities due to overlapping activities in all 3 CALs	To date stakeholder involvement has been mainly professionals from the social housing association, the GLA and the NGO plus a number of services provided by
London CAL 2 – Activating Southmere Lake			

London CAL 3 –Greening Unusual Spaces	**Social housing association**: landowner/ landlord accountable for delivery of most works which it is also leading (i.e. lake clean-up, construction of wetlands, monitoring of water quality changes, etc.); as majority budget holder also responsible for meeting capital delivery objectives in the CLEVER Cities Grant Agreement and subsequent delivery plans. Learning from CLEVER Cities how to make design and implementation processes more co-creative. **NGO**: leads community engagement, co-design and local communications with the support of the other two parties (i.e. mobilize stakeholders to curate design ideas, co-facilitate the Nature Forum (see below) and co-create key interventions), advisor for the procured design teams on community engagement.		(landscape) architects and engineers. Planned for community co-design: engaging with residents, community groups, not-for profit organisations, local institutions (i.e. Thames Water, Environment Agency), schools, nurseries, children centres, local businesses, service providers (i.e. health centres, police, places of worship).
Hamburg CAL 1 – CLEVER Corridor	**District council of Hamburg-Harburg**: overall coordination of corridor interventions and Hamburg level activities (i.e. budget plan, designating financial resources, timely completion of tasks); overall CLEVER Cities project coordination lies with the Senate Chancellery. **District council of Hamburg-Harburg, supported by management company for urban development and regeneration**: co-design and co-implementation of activities (i.e. facilitating the co-design process, creating design ideas and project goals, steering co-implementation with refugees, students, teachers, interested parties); liaison role for developing durable NBS models in a co-creative manner; closely follows the	**Coordination** by CLEVER Cities project lead – coordinator in Harburg; **Co-creation** processes coordinated by district council of Hamburg-Harburg, supported by management company for urban development and regeneration; **Cooperation with several local district administrators** and colleagues from other municipal departments (Department for Management of Open Spaces for concept development of Nature Experience, Planning Department for developing Zoning Map); **Monitoring and urban data platform** by Hamburg State Agency for Geoinformation and Surveying; **Additional expertise** by universities and Ministry for Environment and Energy.	Local residents, organisations and local businesses participate in co-creation activities
Hamburg CAL 2 – Greening roofs and facades		**Coordination** by district administration and project coordinator;	Planners, residents, users of the building and thematic experts participate in co-creation activities

	process to capture lessons learnt for future replication **University partners**: lead in monitoring and impact assessment (i.e. measuring changes in behavior, systems, processes) with support of several consulted actors; provision of expertise to all CALs, together with the Ministry for Environment and Energy and the Hamburg State Agency for Geoinformation and Surveying. **Landscape architects**: landscape design and constructions together with gardeners	**Co-creation** processes by transdisciplinary municipal company for urban planning; **Sub-contracting** for implementation by real estate owners (landscape architects together with the gardeners), financial and thematic support by CLEVER Cities Hamburg team; **Monitoring and urban data platform** by Technical University of Hamburg with Hamburg State Agency for Geoinformation and Surveying as lead partners and the rest of the Hamburg Team for local monitoring; **Additional expertise** by universities and Ministry for Environment and Energy.	
Hamburg CAL 3 - Schools		**Coordination** by CLEVER Cities project lead – coordinator in Harburg; **Co-creation** coordinated by district council of Hamburg-Harburg, supported by management company for urban development and regeneration; **Implementation responsibility** with school directors and teachers, with the support of professional support, if required; **Monitoring and urban data platform** by Hamburg State Agency for Geoinformation and Surveying; **Additional expertise** by universities and Ministry for Environment and Energy.	School building company, school administration, pupils, teachers (staff), parents, neighbours, landscape architects to participate (CAL-specific UIP with selected participants)
Milan CAL 1 - Public bid on green walls and facades	No identifiable core group due to variety of different actors in different CAL activities	**Coordination / Lead** in overall management by SME Ambiente Italia, together with the Municipality of Milan; **Communication**: by Municipality of Milan, supported by Ambiente Italia and WWF to identify dissemination needs and operate contact database is set up for newsletter subscriptions and participation in events; **Monitoring** by SME Ambiente Italia, together with Milan's Agency for Mobility Environment and Territory (AMAT).	Awareness-raising campaign: several municipal divisions (i.e. resilience, communication, green and territory), green services and environmental associations; professional associations; apartment block administrators Intervention: Associations of businesses and companies, building owners and building managers associations; environmental NGOS and citizens associations

Milan CAL 2 – Giambellino Community gardens		**Coordination / Lead** by Municipality of Milan; **Co-design and stakeholder engagement** by Municipality of Milan; partner Eliante (also provides technical support for specific NBS, such as the creation of wildlife habitats or the green wall); **Communication** by Municipality of Milan, supported by WWF; **Monitoring** by Municipality of Milan, supported by the Milan's Agency for Mobility Environment and Territory (AMAT).	Professional associations in gardening and NBS; environmental NGOS and Citizens' Associations (social and cultural associations); municipal technical offices involved in Lorenteggio rehabilitation plan
Milan CAL 3 – Station and Noise Barriers		**Coordination/lead** by railway company Italy, supported by the Municipality of Milan; **Communication** by railway network Italy, supported by WWF; **Implementation** by Railway network Italy is supported by green and landscape architects and planners; **Monitoring** by railway network Italy and Milan's Agency for Mobility Environment and Territory (AMAT).	Environmental NGOs and citizens, professional associations, travellers and residents

Table 4 - Core team and organisational schemes for CLEVER Cities CALS in London, Hamburg and Milan.

2.3.1.3. Develop institutional arrangements that suit your needs

There is no one-size-fits-all solution to developing the institutional arrangements since they depend on the context and the distinct multi-stakeholder constellation. With regards to CLEVER Cities, a differentiation needs to be made between the strategic level, i.e. the collaboration in the core group (see Table 5), and the local UIPs which include a wider set of additional stakeholders including citizens. Different ways were found by the CLEVER Cities for establishing and maintaining a collaboration in the core group and breaking silos.

Set up working groups with regular meetings and common work procedures

Where different working modes and procedures are often experienced a barrier in the beginning, a thing as simple as regular face-to-face meetings helped establish trust between the different parties, common work procedures and a share objective/outcome to work towards.

In London, CLEVER Cities made three entities collaborate in a cooperative network that were not used to working in partnerships so far: a social housing company, the partner in stakeholder engagement and the GLA. Getting buy-in in this actor constellation took some time due to the unknown outcome of the processes. The Theory of Change workshop helped to reveal envisaged impacts and opportunities and clarify outcomes. Bringing together a diverse team on a regular basis, trial and error and information sharing helped to establish a feasible partnership.

Between different departments, inter-departmental routine work meetings at district council level have intensified collaboration, such as was the case for Hamburg. This format also worked out for establishing a collaboration with the local partners, such as a real estate company implementing the green façade.

With regards to the UIPs, institutional arrangements in the CLEVER Cities are more varied, depending on the target groups. In light of established structures and arrangements not accommodating the needs and requirements of co-design or co-implementation, some CLEVER Cities have created new arrangements to better fit their purpose.

For instance, London has a strong community focus in its UIP. The city recognized the lack of citizen participation often linked to traditional top down planning processes as a shortcoming that counteracts public acceptance. In response, Peabody is aiming to develop a new governance model that attempts to include the community at all stages of decision making to create designs that really respond to local needs, a so-called community-public-charity model. The focus areas are the emphasis on co-designing solutions and using an open dialogue as a new experience in the local authorities' strategic planning work and municipal management.

Formalize citizen participation in institutions to ensure participation in decision-making and transparency

One building block is the Thamesmead Nature Forum that forms the core of the UIP with which the city plans to consolidate an organisational structure which expands management roles and decision-making power to citizens. The Thamesmead Nature Forum is co-chaired by Peabody and Groundwork. It is a community forum with event character that includes pop-up events and informal chats with the objective to make connections between existing community groups, forums, initiatives and actions underway in Thamesmead as a whole, and make a wide range of stakeholders heard. Following an open call publicised through different local channels, the group currently entails local people with an interest in nature and the community. In the future, it is envisaged to become a more strategic group for testing different ideas and a community-based advisory group for outdoor space and green-blue infrastructure at Thamesmead. It shall play a prominent role in the co-design process. The priorities and decision-making powers and structure are currently being decided by the members of the forum. The forum is envisaged to act as key stakeholder who will be needed to sign-off on key decisions such as grant

funding, co-creation activities or space design. With the setup of such a key stakeholder entity, the city of London hopes to achieve a stronger governance structure that will continue after termination of CLEVER (D2.3).

A second building block of this new governance model is to include citizens and local residents into the client team that advises the design team of the public realm work in the future. This will let them participate in decision-making and ensure transparency. There are discussions about how to formalize citizen participation in that governance structure to create a community empowerment legacy of CLEVER Cities. Groundwork is working extensively with Peabody's own resident engagement team to build trust and ensure that there is a good representation of voices in the design of solutions.

The city of Milan puts a strong emphasis on a collaborative approach **with private actors**, both companies as well as citizens. This fostered a timely cooperation between various stakeholders, such as private companies working in the green building sector and professional associations, in drafting a public bid to support and subsidize the construction of green roofs and walls targeting public and private parties (businesses and citizens) in CAL 1. This helped to identify major barriers to the implementation of green roofs and walls early on: additional costs (in contrast to grey solutions) and access to technical expertise. Taking these into account, an innovative procedure was developed, including the co-financing of 10 pilot projects (35 percent non-repayable fund of total costs), a preliminary feasibility check regarding statics of the roof and funded technical support (valuing up to €7,000) for co-design and co-implementation of the green roof or wall. What is more, the ten to be selected applicants will sign an agreement where they commit to: follow a co-design process involving at least people living and/or working in the building, create a maintenance plan for the next 10 years and support monitoring activities.

The model used by Hamburg to finance the provision of green infrastructure on a refugee accommodation site is akin to a conditional grant agreement. The site is leased and operated by a private operator, and the city is granting money to this operator with specific performance conditions, aimed at ensuring the project translates into positive environmental and social impacts for people who live in the facilities. This model is expected to work well because the private operator has a strong incentive to cooperate because of their vested interest in the delivery of the green infrastructure (e.g. by making the facilities more pleasant and improving quality of life for the refugees, it makes the site easier for them to manage).

2.3.1.4. Find allies that support future maintenance and management of NBS

Securing long-term management and maintenance of NBS (after termination of pilot projects) is a challenge for a lot of cities in light of scarce municipal financial resources and capacity. On the one hand, NBS require additional, specialised and trained personnel for maintaining them. On the other

hand, long-term responsibilities for the management and maintenance of the NBS are often not specified in the design and development phase of an NBS and are thus difficult to enforce later on. Distributing responsibilities to citizens or other stakeholders, such as private housing companies or school administrations is an increasingly attractive model. There are several ways to implement this model:

Build a sense of ownership for the co-implemented solutions on behalf of the engaged local residents and end-users

This is Milan's strategy towards safeguarding long-term maintenance and management beyond the project's lifetime. In CAL2 which aims to reclaim an abandoned green area in District Giambellino Lorenteggio and turn it into a community garden with self-farming facilities, the co-design process confirmed interest of citizen and local associations in the management of the area, at the end of the implementation process. To prepare them for this task, trainings for citizens, schools students and local associations are envisaged for the co-management of the bird gardening area, the orchard, the kitchen's garden, the wild flower meadow for pollinators, as well as of the green wall. Whilst Milan is putting their hope for long-term management and maintenance of the urban farming initiative in citizens, they are only about to establish a co-maintenance plan with the citizens. It is difficult to say at that stage how this is going to play out.

Link in with existing priorities and interests of stakeholders

In CAL 3, the city of Hamburg collaborates with a school administration that had a strong interest in the school garden in the first place, based on sustainability already being a priority, which can be seen by having a dedicated teacher for the school garden project. The school administration had put out a job advert for a dedicated teacher to initiate and lead a green programme for their school which they made a leading topic with green and sustainability elements being integrated into the curriculum. The brand of a green and sustainable school is considered a competitive advantage. It is in their own interest to gather funding for such initiatives for them to be maintained into the future. Thus, the school administration is willing to commit personnel and financial resources to the implementation and maintenance of the planned NBS (i.e. raised bed garden and aquaponics system).

Formalize co-maintenance responsibilities in agreements

At Tibaldi train station (CAL 3), Milan is also looking into ways to share responsibilities for the maintenance of NBS with the community since it would require too many capacities and financial

resources from the railway workers to take on these responsibilities on their own. Thus, the train station operator, together with the City of Milan is considering to formalise co-maintenance responsibilities in agreements with neighbourhood committees, local not-for-profit associations or local companies for parts of the NBS. Also, community members identified during the co-design phase will play an important role here and will be taught pertinent expertise in workshops.

Financial investments for the maintenance of NBS over time are also experienced a challenge for the uptake of green roofs and facades in Hamburg amongst private and public parties. Despite a subsidy strategy for green roofs put in place by the ministry and awareness raising campaigns about their multiple benefits, their uptake is very limited. The relatively large investment required for maintenance of the green roofs is one major reason, along with **diverging interests, priorities and goals**. For instance, the housing company supposed to implement the green façade had already made experiences with woodpeckers drilling into the thermo-isolated building surface and was thus not keen on installing any construction directly on the walls. Also, they did not perceive the green façade as increasing the value of the property and thus, elevating rents. It took several rounds of negotiation and convincing to eventually arrive at a compromise structure for the green facade with some distance between the wall. Also, the partners in the Ministry of Environment and Energy provided some advice and expertise. Eventually, a convincing compromise was found and the costs for maintenance of the green façade are carried by the private housing company. A green space manager is contracted by them to maintain the green façade.

Establish a new professional role with pertinent responsibilities to maintain NBS

In London, a new, non-traditional role of a community Gardener in Residence has been created to undertake extensive outreach work with the local community, to foster a sense of excitement about gardening and food growing. This role is a key innovation in the delivery of the programme since it works as a catalyst for making on-the-ground connections between residents as well as with other programme partners. Apart from traditional “green-keeping” the gardener works directly with residents to create opportunities for them to get involved in horticulture, including gardening, growing, composting, and protecting habitats. The gardener in residence provides hands-on experiences through workshops, gardening drop-in sessions for residents of all ages which are advertised by social media, posters, and their website. This helps spread the word about CLEVER but also safeguards future maintenance by creating “gardening champions” who like to give a hand.

2.3.2. Supportive policy landscape

Policy instruments can be powerful tools, not only for creating an enabling environment for the sustained uptake of NBS, but also for collaborative governance arrangements underlying them. Cities possess manifold policy instruments that range from soft tools (i.e. information and voluntary schemes, such as market incentives) to coercive tools (i.e. regulation, etc.). Not only should the selection of instruments be tailored to the local context, but also the right mix of instruments considered (i.e. policies, incentive schemes, building regulations, etc.) to favour and steer integrated planning processes (Hawxwell et al. 2018).

Review current policies and policy instruments for their suitability towards NBS

Whilst sectoral policies and plans can have a major impact on NBS uptake in an enabling and inhibiting way, NBS are often not explicitly represented in local policies, strategies or plans. A targeted review and evaluation of the existing policies can help to achieve this. The review and drafting stage of urban policies and plans serves a window of opportunity to integrate and promote NBS (Hawxwell et al. 2018).

In Milan, CLEVER Cities has worked as an important catalyst for promoting the uptake of NBS, namely green roofs and green walls in the city plan. With a solid climate adaptation strategy anchored in the resilience and green infrastructure strategy, the SECAP, land-use plan and building codes, Milan already had a conducive policy framework and planning instruments for NBS at the start of CLEVER Cities (similar to London where GI is embedded in the core city planning policy, the London Plan and the London Environment Strategy). When reviewing and drafting urban regulations, the municipality of Milan is always seeking for ways to mainstream NBS. Thus, a new article was added to the city plan that promotes the implementation of green roofs and walls. Through the use of a new index, the so-called Climate Impact Reduction Index that measures the environmental quality and climate adaptation capacity of each building, good practices and technologies for green roofs and walls were integrated in urban planning regulations.

In Hamburg, CLEVER Cities has triggered a review of traditional governance tools for rainwater management in Hamburg. Different discussion rounds and workshop formats (e.g. Cibix) have yielded the understanding that existing governance tools and documents might not be suited to address all the rainwater related problems in the project area. Existing guidelines operate on a small-scale level. CLEVER Cities however makes it possible to analyse aspects of rainwater management on a larger scale. This has sparked the new public-private governance arrangement to develop a new concept for rainwater management tailored to Neugraben-Fischbeck with the analysis of current situation, an analysis of the hazards of the designated locations, action priorities and catalogue of measures.

Assess piggybacking with urban redevelopment as window of opportunity to bring NBS int your city

Piggybacking with ongoing or forthcoming (re)development is considered an important and pragmatic vehicle to integrate measures with initially differing objectives. It is frequently mentioned with regards to creating and using windows of opportunities to bring NBS into cities (Bulkeley, 2019).

London faced two options with regards to docking NBS into ongoing urban regeneration projects and planning. Option 1 was to focus on small NBS interventions and implement them between the “red lines” of ongoing regeneration projects in Thamesmead with not entirely matching goals. This would have led to some co-designed along traditional non-co-designed initiatives. Option 2, which was chosen as the way to go forward, was to truly align objectives of NBS with one entire phase of planned public realm works in the area. As a result of CLEVER Cities, this second phase of public realm works will be entirely co-designed with residents. Given the scale of the project, circa £5 million, this is an ambitious approach to co-design. This case shows that piggybacking might be an entry point but has to be questioned with regards to accommodating options of real co-creation of NBS. The same applied to the city of Milan which indicated the limitations of the co-design of the railway station due to timing of the procurement process.

Integrate a co-creation requirement in public bids

Public bids and similar procurement procedures lend themselves to the integration of co-creation as a criterion for the implementation of NBS.

As part of its aspiration of embedding co-creation as an integrative element to the municipal governance process, the city of Milan integrated co-creation as a criterion in a public bid for the implementation of green roofs and facades, together with stakeholders (i.e. municipality, professionals, citizens). For reasons of integrating co-design as a prerequisite, the procurement process has been split into two phases: the first one deals with implementing the hard infrastructure, the needed construction structures for the green wall and roofs, the second one includes co-design features that will be taking effect at a later stage as a way to facilitate co-creating these NBS in public spaces.

In Hamburg, the German Federal Building Code requires stakeholder participation for implementing any construction activity. This requirement is reflected in the tendering processes for the CLEVER NBS. By incorporating a criterion/precondition of co-design and co-implementation by engaging local residents and stakeholders into tender requirements, contracted landscape architects are required to comply.

2.3.3. Citizen engagement in NBS deployment

For the NBS co-planning, co-design as well as co-implementation to be successful, there is a need to focus on the citizen engagement, right from the initial stages. Co-creation activities and processes needed to be put into practice to garner involvement of citizens. This ensures that the NBS being planned, designed or implemented match the expectations of the citizens also such that the NBS can fulfil their promises of co-benefits and deliver multifunctionality. While there will be contradicting values and perceptions amongst the involved citizens, it is nevertheless essential to give voices to all, also that a feeling of ownership is instilled among citizens, which is necessary for the maintenance and management of the NBS upon implementation. Additionally, the more invested all parties are, the more likely it is that the solution rolled out be successful (van Ham & Klimmek, 2017).

A truly participatory approach has the ability to enable the development of new relationships which can lead to more innovative ways of working, creative solutions and potentially deeper systems-level change, e.g. changes in organisational culture, policies and procedures. (Breukers & Jeuken, 2018). It is well understood that citizens act as the main beneficiaries and users of the NBS and through their experiences in using it/them, they actively create value for NBS, "either symbolic (the meaning of the NBS) or social (the value NBS brings to the social and individual well-being). Therefore, giving agency to citizens in the development and implementation of NBS with participatory processes will increase the value of NBS for the citizens in turn." (Breukers & Jeuken, 2018)

Be aware of challenges in citizen engagement processes

- All cities face various challenges when it comes to engaging citizens for **higher level of participation** in a **timely manner**.
- London highlights that it is **difficult to find citizens who would be willing to take part in the decision making process** as well as have the ability to commit to the time required. There's also the question of what reward mechanism should be applied for citizens who engage.
- Another major challenge is **overcoming language, literacy and caring commitments as obstacles to engagement**.
- The **representation of various voices** in the local community is also important to consider when planning for citizen engagement.
- Milan also faces some challenges such as **awareness raising amongst citizens** about the importance of NBS and similar to London, involving citizens into project procedures while also developing a co-maintenance plan where citizens take the ownership of the management and maintenance of an NBS, also after the project ends.

- **Unclear stakeholder relationships and a lack of clarity in responsibilities** within the arrangements is quite a common challenge as well. It is not enough to engage stakeholders without knowing and focussing on who has the power as well as the interest to take the project forward.
- Another one of the many challenges is the **different and/or competing perceptions** which can not easily be solved and perhaps competing perceptions are even necessary to understand how the co-implementation process will be impacted as well as how the utilisation of the implemented NBS will be.

Prepare for prejudices but still aim for wider representation

Preparing for prejudices and differences of opinions right from the start can help manage expectation. Moreover, constant engagement of citizens in early stages of the NBS deployment ensures that the different voices are heard and that their needs and expectations are catered to, to the extent feasible. Additionally, engagement of unusual suspects ensures a wider representation which is necessary to allow for a real co-creation process within the project's scope.

Implementing engagement activities that are varied and essentially stand alone as social or cultural events are a creative approach to overcoming consultation fatigue and the lack of interest of a community.

The who, when and how questions with regards to citizen engagement lend themselves to identify the innovation aspects, for instance involving unusual suspects, engaging citizens at the right moment, preferably from the start and using different engagement formats which lead to higher participation levels are the identified innovation elements. These are discussed in detail in the sections below.

WHO – Unusual suspects

Employ experienced partner(s) to facilitate citizen engagement

For an engagement to be fruitful, there is a need for an experienced project partner to facilitate the participation processes and include different sectors of the society. An effective approach is for the public agencies to develop a clear and **comprehensive social inclusion strategy** instead of focussing only on the activities and events to take place. Therefore, who should be involved is an essential question that the authorities need to ask themselves and also to find out with an understanding of the socio-economic and demographic attributes of the area in question.

For instance, in Hamburg a transdisciplinary municipal company for urban planning has this role wherein it works not only with the usual suspects but also with young people/pupils as well as vulnerable groups. In Hamburg's context the inclusion of the refugee settlement from the CLEVER project area is an important focus point. The refugees have been asked by the municipal company what they wanted to see in the area which resulted in the development of chill and entertainment area with healthy lifestyle elements. Raised beds have also been included which are cared for and maintained by the refugees living there. Meanwhile, they also include other unusual suspects such as property developers and housing companies. This engagement is done via exchanges on bilateral basis, monthly routine meetings with Hamburg local cluster partners, planned engagement of residents of housing companies in finding mutual interests via exchange. For instance, the property developer and academia representatives share a common interest in monitoring the results as well.

In Milan, within the realm of the CLEVER Cities project there is an **active involvement of private actors** such as companies which is done with the support of public funds. Participation is guaranteed through workshops and round tables organised ad-hoc. This notion of socially inclusive participation in all the phases of co-design, co-planning and co-implementation is facilitated by Eliante and POLIMI that design questionnaires for social monitoring and inclusivity during the lifetime of the CLEVER project (baseline/pre-greening and planned post-greening).

A unique approach will be followed for the co-design of pilot projects in Milan, due to the need of specific technical expertise. A public selection of a list of professionals and companies having specific skills in the design of green roofs and walls (following a public tender) will be done. These experts, properly coordinated and trained by the project's partners, will support the owners of the buildings in the co-design and the co-implementation of green roofs and walls. The involvement of technical experts will allow to propose to the building owners the use of the most innovative technical solutions available on the market, regarding the materials used in the construction phase, but also the tools and procedures for maintenance and monitoring. This co-design approach that enables the communication between the technical expert, the owner and the user of a building would provide an enhanced multifunctionality of green roofs and walls.

Build trust and create local identity

The London communities (within the scope of the CLEVER project) had a low level of participation due to consultation fatigue. Groundwork is working together closely with Peabody's own resident engagement team to build trust and to ensure that they have good representation of voices when they come to designing solutions. Together with wayfinding techniques and interventions to help create local identity, it is hoped that the creation of greened and nature-friendly public spaces will help Thamesmead's residents in London to relate better to each other and to gradually become more cohesive local communities. The CAL 1 programme is working to co-create and to evidence how the

use of social spaces combined with natural processes, can support healthier and happier residents. Walkabouts are conducted in Thamesmead, where in the community engages in discussions on the NBS in the area and the residents share their perspective about living in the area.

WHEN – Timely engagement

Early participation is usually not formally required nor institutionalised as a procedure. Nevertheless, it is essential to acknowledge and value timely participation, especially in early planning and implementation of NBS (Breukers & Jeuken, 2018).

Check what the appropriate stage to engage citizens is

An early on engagement ensures that the citizens feel part of the process and take ownership of it right from the start for the co-creation of the NBS. There is also a potential of higher commitment and stronger will to continue engaging in the process of NBS deployment, in the case where citizens come in the picture right from the beginning. While at some stages one-way communication merely informing citizens may be suitable. More interactive communication is more suitable at a later stage when the needs of citizens and stakeholders need to be taken into account. There are several stages of a project at which engagement could/should take place, namely:

a. Appraisal
b. Visioning
c. Planning
d. Designing
e. Implementing
f. Maintaining
g. Evaluation

London aims to pool in the citizens for the visioning exercise, leaving them out from the appraisal stage, while Hamburg would include citizens in the appraisal stage as well. On the other hand, London aims to involve citizens in all the subsequent processes while in Hamburg citizens the engagement of citizens in planning and evaluation of the NBS depends on the intervention itself and varies (i.e. citizens are engaged in the planning of the nature experience place; for the green facade, an information letter and an information meeting is planned).Meanwhile in Milan, citizens, community members, local groups and other stakeholders come into the picture at the designing stage only followed by their inclusion in implementing, maintaining and evaluating stages.

Seeking collaborative innovation in the public sector, during the process of drafting the public, various stakeholders, private companies working in the green building chain, professional orders and associations were involved in the innovation cycle from the earliest stage onwards. This collaborative process has allowed to identify the main existing barriers to the development of innovative green roofs and walls, which are related to the added costs (real and perceived) and the availability and accessibility of technical skills.

Create different engagement strands depending upon the requirement

The CLEVER approach to green space development is slowly taking shape in London. This approach not only includes early stage participation, where co-design is gradually put into the hands of residents, but it also demonstrates innovation potential by the diversity of the engagement methods utilised, the attention paid to motivational aspects of engagement, and the fact that community involvement will go beyond design into implementation and evaluation. The CLEVER Cities engagement process in Thamesmead has created several different engagement strands that focus on different stakeholders and/or emphasise different motivational factors. A schools' programme is a key strand to involving the wider school community in the co-creation process. A green skills programme with a focus on youth brings people into the engagement process by helping them attain qualifications or via direct payment for services. The Making Things Happen strand understands how people find it easier to join a process that is already happening and often focuses on creating activity nodes (or utilising existing ones) to capture interested people and bring them into the co-creation process.

HOW - Engagement formats that aim for higher levels of engagement

Using different and innovative types of engagement formats can support higher and better level of engagement needed for the project to be a success. Prior to delving into these engagement formats, it is also essential to understand the different levels of engagement. Often, we talk about stakeholder involvement but we do not specify how they should or might like to be engaged and to what extent: as users? as co-designers? as maintainers? As multipliers that spread the word? The participation planner (developed by POLIMI) helps to structure and capture the nature of participation processes, by letting one differentiate between the different relevant stakeholder groups and identify their level of engagement (Table 7). The types of engagement "Collaborate" and "Empower" not only lead to higher participation and engagement but also ensures the co-ownership of the project procedures and outcomes along the way.

Type of engagement	Inform	Consult	Involve	Collaborate	"Empower"
Description	Provide stakeholders with balanced, objective information about NBS projects and plans, support them in understanding the problem /solutions; no active citizen engagement.	Stakeholders are consulted and can provide feedback on analysis, alternatives and decisions as part of decision-making; however, inputs do not have to be taken into account.	Working directly with stakeholders to ensure that their concerns are understood and considered throughout the processes.	True partnering between public authorities and stakeholders in each step of the decision-making as much as possible; shared roles & responsibilities around planning & management of NBS.	Place the final decision in the hands of the public/stakeholders, implement what they decide (e.g. management agreements, leasing or purchasing of public and private land).
Method of engagement	i.e. Newsletter, Social Media, info campaigns	i.e. citizen interviews	i.e. citizen workshop, thematic events,	i.e. active roles in design and implementation (food forest)	Lead in design & planning of NBS (determine location, select plants, etc.)

Table 5 - Different levels and methods of engagement[9]

This engagement matrix is a powerful tool for any city to allocate the different actors involved in one or many stages of NBS deployment in the respective grids to be able to visualise the complete picture of who's involved, to what extent and how. Hamburg's example has been taken to illustrate how this tool can be used.

Type of Engagement	Inform	Consult	Involve	Collaborate	"Empower"
Private site owner/landlord (real estate, etc.)			Participation in the ToC Workshop	Monthly routine meeting in the project area office	Co-developing the design of solutions (determine solution, support with own landscaper)
Local community groups (e.g. Refugee Settlement, Old village centre locals)		Informal picnic to share awareness about the CLEVER goals and potential intervention ideas that have been collected via the online participation tools & first UIP event.	Workshop to define the need, potential usage ideas; Participation Workshop including the planning firm for the nature experience place	Collaborate with Loki Schmidt Foundation and their participation in the workshop (talks about the potential future collaborations when the nature experience place is implemented in terms of e.g. tours.	

[9] https://clevercitiesguidance.wordpress.com/

				Collaboration with local multipliers on developing the high beds as well as supervising and assisting the planting action	
Local population in the project area	CLEVER participation in the district festival through festival plan; Press release through official Hamburg web-page for green roof and façade financing through CLEVER Announcement of the CLEVER representation on different events through official Hamburg web-page.		Local population involvement in the process of e.g. Nature Experience Park concept development. Goal to is consider and include their thoughts, concerns, wishes in the further planning to ensure the satisfaction of end users.		
Educational institutions (schools, etc.)	When coining certain solution ideas, the school institutions were informed about them, their benefits, application examples (e.g. aquaponics) via presentation during the meetings			For redesigning the schoolyards in the project area, the school administration and district council collaborate on a very close level. The meetings (UIP) are regular and decisions over every important planning step is mutually made (site, place, time, process). This includes division of tasks and responsibilities (school ensuring dedicated teacher, maintenance	

				costs over the project timeline etc.)	
Students			Involve in organizing workshops that have to lead the ideation of the school yard design with NBS in the project area	Co-designing the CLEVER Mobil concept	

Table 6 - Illustrative example – Hamburg: Levels and types of engagement.

Try out both physical and virtual communication forms

As mentioned by Münster et al. (2017), participatory planning activities (tools and methods) can be delivered through physical or virtual communication channels, or a combination of both.

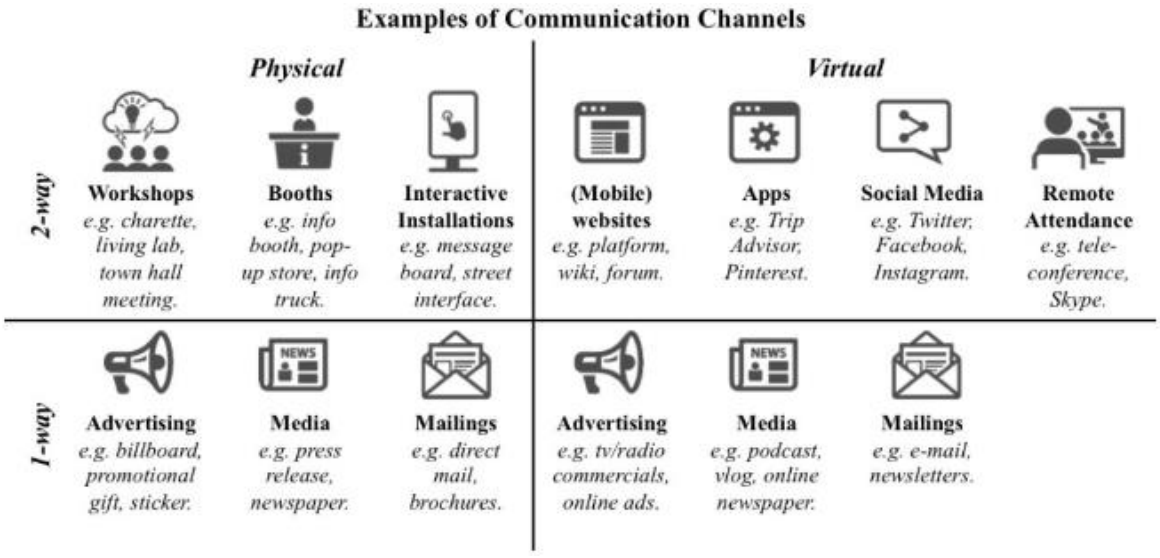


Figure 9 - Overview of communication channels: physical, virtual, 1-way and 2-ways, (Munster et al., 2017)

Digital participation cannot completely substitute physical interaction or more traditional ways of participation and involvement. Face-to-face participation allows people to interact directly, develop communities and sense of belonging, share opinions, ideas and point of view and build collective new projects and sometimes facilitates consensus (Breukers & Jeuken, 2018). There is innovation potential in the use of apps like Urban Mind, which is a location-based, well-being evaluation service for mobile

devices that offers its users the possibility to evaluate their sense of well-being with respect to their immediate environment at a given moment.

There are several modes of engagement as seen fit in different contexts in the cities of Hamburg, London and Milan. In Hamburg, the online participation tools (DIPAS), large scale CLEVER awareness raising events, participation in local events (LTSN, District fest) and representation of CLEVER on political forums are some formats used. An additional instrument of co-creation and participation of stakeholders in Hamburg will be the CLEVERmobil, which will be used for “Pop-Up-Participation” on the spot in a dynamic way, which is re-designed with the help of students from HCU and young people from the neighbourhood.

While in London, various techniques have been used to identify local people who would be interested in the CLEVER project such as via, One off events like BBQs on site, nature themed events for a wide range of established groups, Gardening sessions at strategic locations etc. Depending on the scale of collaboration i.e. neighbourhood, district and/or city level, bimonthly meetings, pop up events such as candle making, foraging and BBQ are hosted by London. There are also emails circulated as well as engagement via social media is conducted.

With a multileveled approach to co-creation activities, there is a focus on Maran Way (CAL1, London) as a model space with the most active community engagement for this CAL. Ongoing engagement activities have been varied in order to test methods and innovate. Consultations have been typically accompanied by cultural activities to reach larger numbers of residents and to keep motivation levels up. Regular working meetings and larger events continue as the design procurement process is studied and improved. Engagement undertaken so far includes six community participation events, notably the Maran Way community BBQ and co-design day, the creation of the Nature Forum, the development of the Key Performance Indicators and the initial application of some baseline variables (D2.3. CAL Specific Co-implementation plan, CLEVER Cities). Aside from these activities, for CAL 2 a site walkabout was organised and will continue to be organised in the coming times. The strategic idea behind it is to engage with already interested group of citizens to have an informal conversation in terms of pointing out how pathways were made from the lake to increase bird habitats, kind of planting needed, connecting green corridors – vision on these; habitat focused etc.

Focus on exchange instead of dissemination only

In Milan, continuous engagement through the awareness raising campaign and targeting capacity building for experts and professionals has been done, such as the involvement of the syndicate of architects and engineers in the co-design, co-implementation and co-monitoring through sectoral associations in CAL1. The awareness raising campaigns not only focus on knowledge dissemination via conferences and exhibitions but also knowledge exchange through guided tours and training

courses. Moreover, another activity which will directly engage citizens is the mapping of green roofs and walls in Milan, which will be prepared online in a shared platform giving the citizens an opportunity to learn more about the importance of these green building practices and, at the same time, contributing to the follow up of the green roofs mapping. All these actions aim to enhance shared knowledge, to raise awareness and to have a positive impact on the environmental issues. In CAL2 of Milan, collaborating for a common vision and mission with local association and municipality departments helps to ensure breaking silos between public administration, citizens and NGOs etc.

Milan intends to increase sense of belonging and overcome technical language and dissemination issues related to public knowledge of NBS within the public and citizens domain using different media. Other than that, the formats used to collaborate at the neighbourhood and district level are workshops while at the city level, Milan utilises the existing events to promote engagement, holds thematic workshops, training courses and guided tours etc. Electronic means such as InformaMi a newsletter by the Comune di Milano as well as information on the website are some other means of sharing information.

Employ ICT Tools to reach out for engagement

Hamburg has used DIPAS tools during the first UIP event which gave the attendees a possibility to visually follow the discussions while also making room for further online discussions to happen on the online platform. 50 entries have been made via the online platform and some ideas have been taken on board. The coordination and implementation of the project along the corridor is supported by Sensafety app which provides a location based service giving the users the possibility to evaluate the immediate environment in terms of perceived safety.

The Green Infrastructure Focus Map[10] is a tool to help London's decision-makers identify where green infrastructure improvements and investments might be best targeted, and what kind of interventions might be most useful for the needs of green deficiency areas. Geographic Information Systems layers support decision (i.e. amount of green space, where it is lacking, health data, data around flooding, air quality) by identifying where there is a deficiency and what issue a green space could address. Additionally, in the wake of Corona Virus pandemic, the city is also looking at various alternatives to engagement in the form of online connections. One example is as an open source tool called D-CENT. This tool provides a platform for discussion and dialogue on the topic of collaborative policy making and can be adapted to other needs as well.

[10] *Green Infrastructure Focus Map* is available at: **https://maps.london.gov.uk/green-infrastructure/**

2.3.4. Experimentation and Learning

Living Labs are spaces for experimentation. Ideally, they provide safe learning environments that allow participating stakeholders to create and test new technologies, services and/or governance arrangements in real-life contexts. Such testing in real world conditions has the potential to foster radical social and technical changes (Castán Broto & Bulkeley, 2013; Voytenko et al, 2016).

Ensure safe spaces for learning that allow for trial and error and accepting unfinished products

Iterative learning and reflectivity form an integral part of experimentation processes and the consolidation of outputs. This is especially important in the rather new area of NBS where we hardly have any precedence and a lot of new knowledge is created through learning-by-doing. Knowledge is created by collecting experience, reflecting on it and formulating conclusions. A continuous feedback cycle of evaluating results and adjusting actions and objectives helps to improve results (Parodi et al., 2018; Schaepke et al., 2018; Wittmayer et al., 2018).

In Hamburg, where learning is very much process-oriented, it focusses on the options of accommodating co-creation in (traditional) planning, construction processes as well as technical, health and safety requirements. Similar to what we can see in NBS sister projects, such as proGIreg, co-design and co-implementation of several NBS, such as green roofs or aquaponics, do not comply with either prescribed land-use (i.e. different land use than the one required for implementing the NBS), technical standards (i.e. green roof cannot be supported by building), or health and safety requirements (i.e. people are not allowed to access the roof; sanitary requirements for keeping fish in the tank of an aquaponics system in a school yard). As a result, product design and processes have to be assessed if they meet the requirements (health, safety, durability, etc.), ideally early on since they might limit co-creation activities. According to Hamburg, finding suppliers that are willing to engage in guided and supervised co-creation processes is a challenge since they do not want to be liable for any violation.

Ensure that lessons learnt trickle up from local to municipal/policy level

It is imperative to create structures that allow for the lessons learnt at the operational level which include citizens and other stakeholders to trickle up from the local UIP level to the more strategic municipal level where they can inform municipal planning and policy.

In CLEVER Cities, a good connection between the two decision-making levels is safeguarded by the two-fold structure of the UIPs. There is a core group level where decisions are taken by the municipality and the project partners, and a local micro level where decisions are directly taken by citizens engaged in the campaign, co-design activities and public events. Anything relevant emerging from the consultation with citizens, business, and experts is taken into consideration at municipal/cluster level and used as input to improve inclusive decision-making at this level, and ultimately at policy level. This includes conclusions drawn from the co-design processes, through survey results and the dialogue started with the citizens, in order to improve the process and make respective changes. One example for a lesson learnt in Milan relates to a low number of applications and thus interest in the public bid for green roofs and facades despite previous awareness raising campaigns. Initiatives need to be communicated in a better way, through accessible channels by using concise language.

2.3.5. Training and educational programmes

Lack of knowledge and awareness is a frequently stated barrier to NBS update in cities. This is not surprising given that NBS are a rather new and interdisciplinary concept. Lack of knowledge was identified for different actors: Municipal officials that have not yet been exposed much to NBS-related planning and implementation; Local businesses and citizens: for an effective implementation of NBS, that adequately addresses local needs, the engagement of the private sector as well as citizens is imperative; we have outlined in chapter 2.3.3 the importance of achieving higher levels of engagement to create ownership of solutions and safeguard their long-term maintenance and monitoring (Hawxwell et al. 2018);

The provision of trainings and educational programmes can build knowledge and capacity amongst municipal (and outsourced) employees, citizens and local businesses. Especially for citizens, it is an important vehicle for empowerment and commitment to NBS.

Focus efforts on the future generation to empower them to lead on implementing NBS

Targeting youth and students with green skills programmes or learning-by-doing workshops not only helps them attain qualifications in NBS design, implementation and monitoring which enables them to operate their own small-scale NBS independently, but also has an important spill-over effect to their parents. Thus, improving students' and parents' green skills can inspire them to support nature in their own backyard and thus, create wider behavioural change.

All three CLEVER Cities have recognized this potential. London operates a green skills programme as part of the schools' programme targeting nine-year-old pupils, led by Groundwork, consisting of a 13-week session which is already operating in four schools. Hamburg directly involves school children in gardening activities. On the one hand in CAL 3 under the guidance of designated teachers and additionally through their participation in the planting actions under supervision of a professional gardener. Through learning by doing they build up knowledge about how to select plants and the planting process. The Urban Nature programme hosted by WWF in the city of Milan is a competition and capacity-building activity targeting teachers and pupils of all educational levels. Each participating school proposes the implementation of a particular NBS. The winning school will be provided with the expertise (through teacher and students' trainings) to implement the project and learn-by-doing how to manage it.

Build capacities for future co-maintenance and co-monitoring of NBS among public and private actors

Relying on collaborative arrangements with citizens and real estate companies for the future maintenance and monitoring of the NBS requires capacity-building on different fronts:

- Up-skilling programs for the municipal unit for green space management or respective ground maintenance teams since green infrastructure requires different, additional skills for managing, maintaining and monitoring NBS (i.e. green roofs, walls, SuDs, etc.).

  In Thamesmead for instance, the social housing associations is undertaking a skills audit of their ground maintenance team (an in-house service) to develop a skills programme (the local CLEVER partners will take that as an opportunity to observe and capture that training journey).

- Training courses for citizens, professionals and other interested parties to empower them to implement NBS in their own private spaces, such as terraces or balconies, and to enable them to co-maintain and co-monitor implemented NBS.

  For instance, Milan is organising face-to-face and online training courses in cooperation with the association of architects of the province of Milan. These trainings include a guided tour of existing green walls and green roofs, exchange on good practices, nature observation visits focusing on urban biodiversity and identifying native species, lectures on the different types of management of NBS in the CALs, and DIY workshops (i.e. how to build nesting boxes, composter, etc.). Due to the current Covid19 emergency, the training activities onsite are postponed and will be conducted online only.

Train community researchers for monitoring

Another model is citizen science by recruiting and training community researchers directly. London is involved in a community peer to peer research programme. The social housing association has a special department, the social innovation partnership for interested members of the community, and they were commissioned to deliver a community research programme in another part of London – research with peers. Through this programme, they will train people to perform baseline monitoring and there is the option to pick people from Thamesmead and train them virtually to become a community researcher (for monitoring) and perform telephone interviews for instance. That way they could support monitoring by gathering qualitative data.

2.4. Conclusion

This part of the deliverable focused on the governance models we found to be employed in the CLEVER FR Cities Hamburg, London and Milan when co-creating NBS.

Whilst scanning and reviewing existing literature on NBS governance models from other Horizon 2020 sister projects with an eye for innovative and collaborative features, a decision was made not to identify the governance models used in the FR Cities which would have put the focus on contextual issues, following a prescriptive approach. Instead, we aimed to flesh out the underlying features and processes that we found in the CLEVER Cities which enable and constitute collaborative governance and multi-stakeholder collaboration. We termed them fundamentals of CLEVER governance.

To gather data from the CLEVER FR Cities, we used the methodology developed in the CLEVER Deliverable: the 4PM-Grid as a mapping tool, to map collaborative governance elements with the potential for innovation. The 4PM-Grid is a core theoretical concept of CLEVER Cities which we operationalized for identifying and structuring innovation processes that can emerge throughout the whole planning, design, management and monitoring of an NBS. As part of describing a cities' unique pathway for tackling co-design, co-implementation, co-monitoring and co-development, the 4PM-Grid's matrix structure can be used for mapping cities' underlying collaborative governance elements, such as specific stakeholder engagement formats or institutional structures.

Based on guiding questions, we first mapped these collaborative governance elements in the CLEVER FR Cities using available CLEVER Cities deliverables. In a second step, we delved deeper into the innovation aspects of these collaborative governance elements. We sent out a questionnaire with guiding questions to the cities and conducted follow-up interviews. The fundamentals of CLEVER Governance are based on the responses and feedback of the FR Cities. In alignment with findings and outcomes from the other NBS sister projects, we clustered the questions and results in broader themes that we identified as fundamental to enabling and constituting collaborative governance and multi-stakeholder collaboration - the fundamentals of CLEVER governance:

- build institutional structures and arrangements for co-design (chapter 2.3.1);
- create a supportive policy framework (chapter 2.3.2);
- foster citizen engagement (chapter 2.3.3.);
- foster experimentation and learning (chapter 2.3.4); and
- provide trainings and educational programmes (chapter 2.3.5).

Based on these fundamentals, we have delineated some recommendations (spread across chapter 2.3) which can support other cities in identifying their individual pathways through these fundamentals. The idea was to build a system of pick and choose wherein each city, depending on their needs, can focus on the recommendations of their choice for each fundamental, to constitute a collaborative governance model tailored to its needs and context (see Fig. 10). The fundamentals are seen as essential components of a collaborative governance model, however the recommendations are only suggestive and there to support the cities in their planning on setting up a collaborative model of governance in the city.

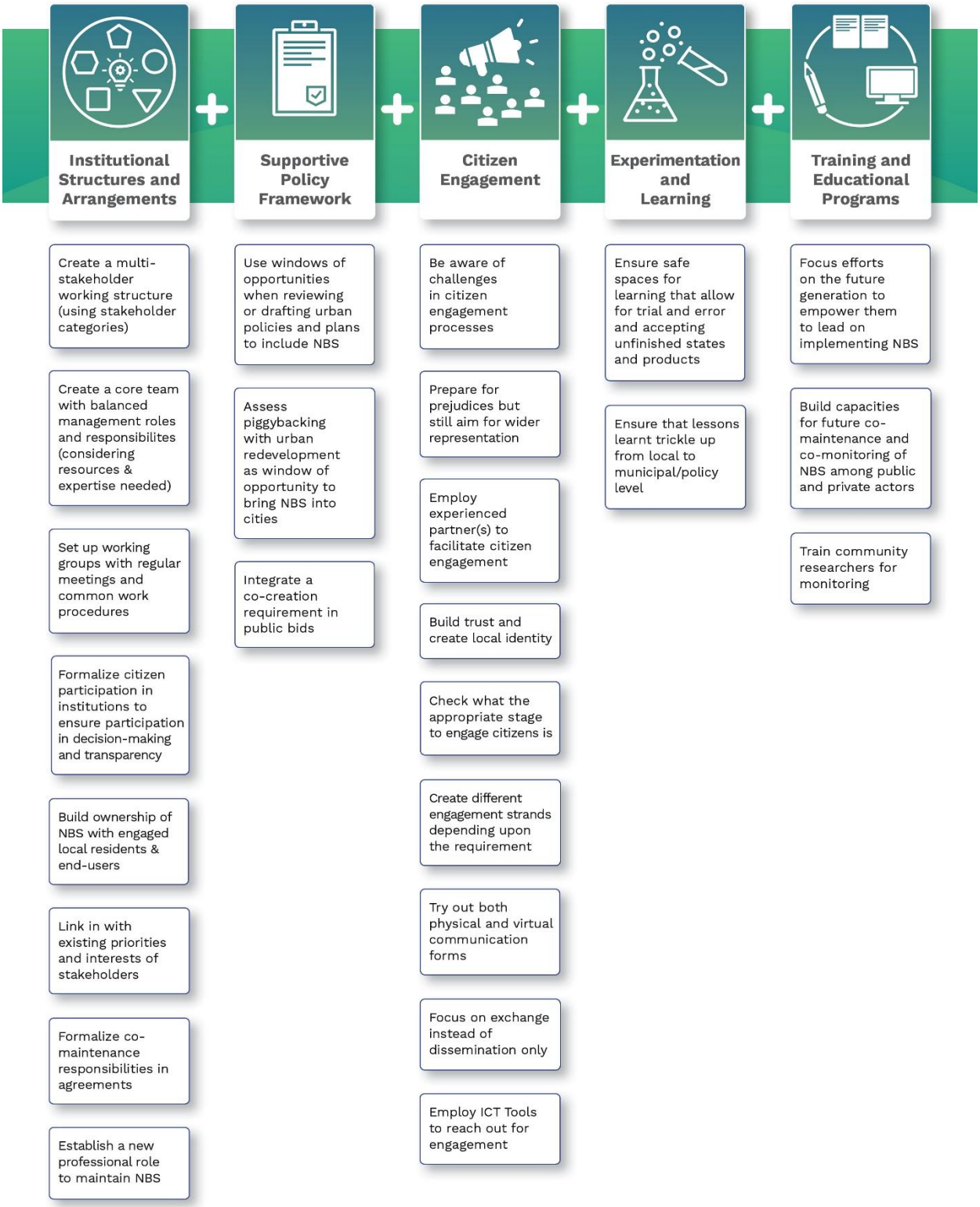


Figure 10 CLEVER Governance fundamentals and recommendations.

3. Business Models for NBS

3.1. Introduction

In the context of rising global sustainability pressure, Nature-Based Solutions (NBS) are a key factor that requires a close connection between governments, cities authorities, companies, financiers, citizens and other key stakeholders (Bocken et al., 2014). At the same time, the societal, economic and environmental benefits of implementing NBS in urban areas are receiving increasing attention in the scientific community, and slowly within planning and decision-making processes. Nevertheless, there remains a gap between the potential for implementing NBS, its benefits and its current uptake. Even though a number of urban planners are aware of the benefits that urban green areas provide, some investors, policy makers and/or residents and additional key stakeholders may not be as aware or might even have the perception that green installations are harmful, creating additional perception hurdles (Perrin, 2018).

However, we can consider business models as a key element to the overall business success recognition. Indeed, in our case the business models can offer arguments that can address the gap between the importance of NBS and its market uptake. Consequently, we consider that it is important to focus more on the understanding of key elements that constitute successful implementation of NBS in the cites. For this purpose, in this report we will map the value that NBS can generate, as well as indicate how the value is generated and how the actors contribute to its creation.

In general terms, in the case of a city, the value is no longer created only by authorities or companies acting autonomously but rather by a group of stakeholders, creating alliances and collaboration opportunities. The latter can be regrouped in larger ecosystems or, as in the case of Clever Cities, in Urban Innovation Partnerships (UIPs), focusing on developing urban-innovative projects (Clever Action Labs, CALs) integrating NBS. The collaborative ties between these stakeholders, as shown in the governance report, are crucial for building the essential elements of a business model as well as for the long-term sustainability of each urban project.

In this context the business model may be viewed as a unit of analysis of NBS, describing the connections between different cities' stakeholders and showing how they can create, deliver, and capture value (Osterwalder et al., 2014). The exercise of creating a business model can be useful in a myriad of ways from just capturing how an NBS project works and creating better strategic conversations and planning at city level, all the way to communicating about city actions to decision makers and building new growth engines for NBS by identifying and attracting additional founders.

It is worth highlighting that this report is not about assimilating or confounding the cities authorities to regular companies in search of profit. Indeed, when speaking about business models here, we wish to highlight the diversity of "sources of value" that are potentially mobilizable when creating, delivering, and capturing the value. In effect, when describing the value of an NBS project we will include, besides the economic benefits, the social and environmental dimensions provide positive impact for the entire ecosystem involved in a project. In chapter 3.2 we will present the methodology for developing business models for cities. Subchapters 3.2.1 and 3.2.2 will help to understand the theoretical concepts of Business Model Canvas (BMC) and Sustainable Business Models archetypes (SBM). In this report we consider the BMC and SBM as complementary tools for cities in developing business models for their NBS. Chapter 3.3 analyses the FR Solutions with regards to these concepts.

3.2. **Methodology**

The concept of business models has become influential in management sciences in recent years and it is used traditionally to a large extent by companies looking to work on their business processes, strategies and understanding better their drivers, facilitators and sustained competitive advantage.
In this section the framework of business models will allow us to step back from the logic where we would focus only on financing aspects or on selling one NBS solution or another. This report will allow us to include the city action in a broader questioning of the urban service offered to the community and the evolution of the contributors/ stakeholders involved. The business model will highlight the diversity of possible added values originated by the sustainable and collaborative business model driven by the NBS project or CLEVER solution.

In order to develop business models for NBS, we will use a methodology based on two strands.

I. The first strand is **gathering external information,** providing tools to generate and identify a business model. These tools will allow structuring the framework of NBS business models by providing different inputs:

    1. Input from the matrix of the Business Model Canvas (BMC) created by Alex Osterwalder & Yves Pigneur[11]. We will use this tool to showcase the NBS business models for each city as well as to understand components related to value creation, value delivery and value capture. The BMC was adjusted to CLEVER Cities context by following recommendations developed in similar NBS EU funded projects such as Connecting Nature[12].

[11] Osterwalder, A., Y. Pigneur and C. Tucci (2010). Business Model Generation: A Handbook For Visionaries, Game Changers, and Challengers
[12] The European Union's current research and innovation framework program, Horizon 2020 is currently funding a portfolio of NBS projects. This portfolio includes large-scale demonstration projects of NBS for resilience to the impacts of climate change and water resources in cities (UNALAB, Connecting Nature, GROW GREEN and URBAN

2. Input from Sustainable Business Model archetypes - SBM (Bocken et al., 2014) with the aim of identifying elements that may contribute to building up the business model for sustainability

II. The second strand is using already existing information from FR cities as well as internal materials and content from CLEVER Cities partners, especially information produced in the **Co-implementation plan** (Deliverable 2.3)[13] This overall content supported us in the development of business models for different FR cities and their respective CALs.

This methodology is an example that can be replicated by other cities. Next steps in developing a business model would then be to:

i) choose a Business model tool (in our case the Business Model Canvas and later the Sustainable Business Model),
ii) understand the tool and its core elements
iii) put the tool into practice by combining it with the cities' NBS project information. Here the cities can involve their key partners, share ideas, start sketching and discussing business model elements with post-it notes or board markers

We will start with the first step by explaining further the elements constituting the Business Model Canvas (3.2.1) and how this model can be integrated in a Sustainable Business Model archetype (3.2.1)

3.2.1 Understand the Business Model Canvas for NBS

In their book "Business Model New Generation[14]", Osterwalder and Pigneur, offer the following definition that we are going to use in the framework of this study: "***A business model describes the principles through which an organization creates, delivers and captures value***". This definition emphasizes several notions:

- ***Organization*** - a business model is developed by / from the point of view of an **economic actor**. The same economic activity can present several economic models depending on the point of view adopted. In the case of our different FR cities and their activities, we will apply this notion by structuring the business models by each of their bundles of activities (CALs) rather than the city itself.

GREEN UP) and at the landscape scale (OPERANDUM, PHUSICOS and RECONECT), as well that projects **specifically dedicated to the development of business models, governance and financing** of **NBS** (NATURVATION, Nature4Cities and NAIAD).

[13] Konjaria-Christian,S., et al. (2019) CAL specific co-implementation plan, Deliverable 2.3, CLEVER Cities, H2020 grant no. 77604

[14] Osterwalder, Alexander; Pigneur, Yves; Clark, Tim (2010). Business Model Generation: A Handbook For Visionaries, Game Changers, and Challengers

- ***Action*** - developing a business model requires a proactive attitude reflected in this definition by using three strong verbs: **create, deliver, capture**. The design and implementation of a business model entail effort and sustained action. These action verbs establish a **chronological sequence**: creation, delivery then capture. This sequence is accomplished by capturing part of the value for the benefit of the organization. Applied to public authorities, this **capture can be directed to preserving the general interest**. That implies that the business model of a public authority will often be different, in type or scope to those of private actors, whose primary objective is to ensure the profitability of their activity. This is the reason why most of the financing sources are public when we are going to illustrate how the value is captured within CLEVER's projects (how different CALs are being financed).

- ***Value*** - the value captured is the goal of the organization implementing the business model. Throughout the business model, we can follow its development step by step and the way it is captured. **This value is economic - but it is not necessarily monetized** - as it can, for example, be exchanged for another sustainable NBS benefit (long term health and well-being of citizens, environmental benefits rather than economic profit maximisation). Consequently, when speaking about value and profit[15] in this report we refer to social and environmental benefits rather than traditional economic profit maximisation. In the context of cities the public authority is "embodying" the common interest and ensuring the role of the whole urban functioning, having a capacity to develop services, in particular by taxes, which are often externalities for conventional economic players (security, health, local economic development, etc.).

Based on this definition we propose an **analysis matrix -** the Business Model Canvas (BMC) - which we have adapted[16] in order to describe business models for our three FR cities and their specific activities related to implementing NBS in CLEVER Cities.

In the BMC we are mapping, the main beneficiaries of a given NBS while stating which is the value proposition, which are the actions put in place and the different resources contributing to the implementation of an NBS. This exercise is useful for the cities, helping them visualise quickly, on one page, how their business model is structured. It has also a practical and simple user interface that can be used to clarify complex ideas and better communicate NBS projects to decision makers. In city departments working together on a project, the BMC can serve as common language and as a co-

[15] Generally calculated by subtracting the total of all costs in the cost structure from the total of all revenue streams
[16] The adapted matrix is based on the model of Osterwalder et al., 2010; Hanshaw & Osterwalder, 2010 while taking into account the recommendations from Connecting Nature (McQuaid, S., 2019)

creation and alignment tool, showing more concretely, to every stakeholder involved in the process, how you the city is going to implement actions and strategy for NBS

It is also important to note that the cities can use the BMC in different phases of their NBS project implementation. The BMC can be used to design, test, and build new NBS business models or to document, discuss, and manage existing ones. Indeed, while we strongly recommend employing it at an early stage - for cities developing their NBS activities, the BMC can also be used to revamp an existing NBS business model, giving it a strategic reorientation by further working on it.

The BMC is a visual chart composed of eight essential building blocks that describe how a business creates, delivers and captures value. The combination of the eight blocks allows the definition of a business model and emphasizes the systemic nature of CALs for each FR city. When they are developing their own business model, we recommend working in order on identifying the following elements:

1. **Beneficiaries -** are the groups of people, organizations or stakeholders, to whom you are aiming to reach and create value by proposing a dedicated value proposition. Your NBS business model must be carefully designed around a strong understanding of specific beneficiary needs. Indeed, you are required to know your final beneficiary first, to identify its problems and needs in order to propose adequate solutions. An organization can serve one or several beneficiaries with common needs and that require and justify a distinct offer. In our examples, beneficiaries can be diverse: citizens or residents of a city but also more broadly schools or neighbourhoods where the CALs and NBS are implemented.

2. **Value Proposition-** consists of a selected bundle of products and/or services that caters to the requirements of a specific beneficiary. In this sense, the value proposition is an aggregation, or bundle, of benefits that an organization offers to its beneficiaries. It is a crucial element of the business model as it seeks to solve beneficiary's problems and satisfy beneficiary's needs. In the CALs that we will analyse in chapter 3.3, we will observe examples of environmental, social and economic values that FR cities are proposing. Some of the value proposition that we will describe relate to services using fewer resources, NBS that create value form waste, products and services ensuring long-term health and well-being and producing scaling and sustainable solutions.

3. **Revenue streams –** it is how an organization captures value. The revenue streams result from value propositions successfully offered to beneficiaries. In our examples we are going to mention how different CALs are financed in CLEVER Cities. The majority of CALs are grant funded, by both Horizon 2020 and the cities themselves. In case you wish to analyse different possible funding types, options for financing mechanisms and to build a financial model we invite you to read the last part of this report on *Developing Financing and Investment Models for NBS in Cities*

4. **Key resources -** are the most important assets required to offer and deliver the previously described elements. Key resources can be *physical* (physical assets such as manufacturing facilities, buildings), *financial* (such as cash, lines of credit*), intellectual* (proprietary knowledge, patents and copyrights, partnerships) or *human*.

5. **Key activities -** are the most important activities an organization needs to perform well in order to implement its NBS business model.

6. **Key partners –** this building block describes the network of suppliers and partners that make the business model work. They bring in external resources and activities necessary to implement an NBS. By creating alliances your organization can optimize its business models, reduce risk, or acquire new resources. In CLEVER Cities the key partners were organized in actor categories that allow for a differentiation according to capacities and resources that these actors bring to the process. The main categories in CLEVER are: “citizens”, “expertise”, “authorities, associated partners” and “partners” responsible for CAL activities.

7. **Governance –** this building block focuses on the interaction between all the key partners in delivering the value proposition and performing the key activities. In this report we focus on the governance put in place in different CALs. However, this topic has been extensively developed in the previous section on Governance models.

8. **Cost structure -** describes the costs incurred to operate a business model.

This global approach can structure the NBS concept for each city to a framework of a business model, making the NBS intuitively understandable, while not oversimplifying the complexities of how the cities function.

On the next page we can observe in more detail how the BMC is organized by including the above elements. For example, when speaking about **value creation** we refer to elements or building blocks such as value proposition and governance mechanisms put in place in order to serve the final beneficiaries. When we analyse the **value delivery** we focus on the key partners, key activities and key resources needed to achieve the value proposition. Lastly the **value capture** is related to both the costs activities as well to financing through different revenue streams.

Even though we present a numeric version of the BMC in this report, it is important that cities can also print out the model (Table 8, below) on a large surface so groups of people from can jointly start sketching and discussing business model elements with Post-it notes or board markers.
Following the BMC matrix (table 8) we give examples of how the matrix can be filled by focusing on two case studies of cities that already implemented NBS (Tables 9 and 10).

Business Model Canvas Matrix for NBS. Focus on Creation, Delivery and Capturing Value

<table>
<tr>
<td>6)Key Partners
 
Who are the Key Partners? Who are the Key suppliers? Which Key Resources are acquired from partners? Which Key Activities do partners perform</td>
<td>5)Key Activities
 
What Key Activities do the Value Propositions require? What are the Distribution Channels? Beneficiary Relationships?
4)Key Resources
 
What Key Resources do our Value Propositions require(Physical, financial, intellectual human ressources)? Revenue Streams?</td>
<td>2)Value Propositions
 
What value is delivered to the beneficiaries? Which one of the beneficiary’s problems are helped to be solved? What bundles of products and services are offered to each beneficiary? Which beneficiary needs are we satisfying?</td>
<td>7)Governance
 
Who is involved in our governance process and public participation related to NBS? How do we engage stakeholders in the co-design, co-implementation and co-monitoring processes of NBS?</td>
<td>1)Beneficiaries
 
For whom is the value created ? Who are the most important beneficiaries?</td>
</tr>
<tr>
<td colspan="2">Value Delivery</td>
<td></td>
<td>Value Creation</td>
<td></td>
</tr>
<tr>
<td colspan="2">8)Cost Structure
 
What are the most important costs inherent in the business model?</td>
<td colspan="3">3)Revenue Streams/ Financial Model
 
For what value and benefits are our beneficiaries really willing to pay and which are the revenue streams ? Which is the Financial Model ?</td>
</tr>
<tr>
<td colspan="5">Value Capture</td>
</tr>
</table>

Table 7 - The Business Model Canvas - Matrix and focus on Value Delivery, Value Creation and Value Capture .[17]

[17] Model Adapted from Connecting Nature project (https://connectingnature.eu/financing-and-business-models) and with guidance from Osterwalder, Alexander; Pigneur, Yves; Clark, Tim (2010). Business Model Generation: A Handbook For Visionaries, Game Changers, and Challengers

Business Model Canvas NBS Case Study City of Gothenburg: Green Bonds[9]

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Governance</th><th>Beneficiaries</th></tr>
<tr>
<td>Who are the Key Partners? Who are the Key suppliers? Which Key Resources are acquired from partners? Which Key Activities do partners perform
1. Municipality – selects actions to receive financing
2. Investors – provide financing
3. Actors – provide NBS action

MOTIVATIONS FOR PARTNERSHIPS: Optimization of funding and economic prosperity</td>
<td>What Key Activities do the Value Propositions require? What are the Distribution Channels? Beneficiaty Relationships?

Identification and evaluation of projects/activities.
Monitoring of activities.

CATEGORIES:
Problem Solving, Platform/Network

Key Resources
What Key Resources do our Value Propositions require? Revenue Streams?

TYPES OF RESOURCES: Human (for selection process), Intellectual (for action), and Financial.</td>
<td>What value is delivered to the beneficiaries? Which one of the beneficiary’s problems are helped to be solved? What bundles of products and services are offered to each beneficiary? Which beneficiary needs are we satisfying?
Investors gain status/improve reputation and/or follow company objectives (E.g. CSR).
Actors receive financing to implement/continue their action.
Municipality gains the most indirect value through cost reduction.</td>
<td>Who is involved in our governance process and public participation related to NBS? How do we engage stakeholders in the co-design, co-implementation and co-monitoring processes of NBS?
The City of Gothenburg manages the programme. There is constant collaboration and dialogue with administrations and municipal companies, within the city, for projects selection.
Constant exchanges with investors and annual investor letters, showing preliminary allocation to each project for the coming year.</td>
<td>For whom is the value created ? Who are the most important beneficiaries?

Direct value is created for building owners and municipalities.
A large indirect value is created for municipality and citizens. For example:
Improved health, flood reduction, reputation for sustainability, improved biodiversity, and more.

Customer base is multi-sided due to investor-city-actor system.</td>
</tr>
<tr><th colspan="3">Cost Structure</th><th colspan="2">Revenue Streams/ Financial Model</th></tr>
<tr>
<td colspan="3">What are the most important costs inherent in the business model?
Key costs are unclear from the source available.
The Business is cost and value driven. There is an indirect value (e.g. improved air quality leading to better health of citizens and improved productivity as a result) is factored alongside cost.</td>
<td colspan="2">For what value and benefits are our beneficiaries really willing to pay and which are the revenue streams ? Which is the Financial Model ?Bonds range widely[18]. TYPES: Lending FIXED PRICING: Product feature dependent, DYNAMIC PRICING: Yield Management</td>
</tr>
</table>

Table 8: Business Model Canvas NBS Case Study City of Gothenburg: Green Bonds

[18] City of Gothenburg (2010) Green Bond Impact Report 2018. <https://finans.goteborg.se/wpui/wp-content/uploads/2019/06/Green-Bond-Impact-Report-2018-City-of-Gothenburg.pdf>

Business Model Canvas Case Study – City of London: Living Roofs and Walls (Implemented 2008)

Key Partners

Who are the Key Partners?
Who are the Key suppliers?
Which Key Resources are acquired from partners?
Which Key Activities do partners perform

Municipality (Council) – sourcing and strategizing Green Roof/solution
Specialists – consultation and implementation

MOTIVATIONS FOR PARTNERSHIPS:
Optimization of space and economic prosperity, reduction of risk, acquisition of particular resources and knowledge.

Key Activities

What Key Activities do the Value Propositions require?
What are the Distribution Channels? Beneficiaty Relationships?
Production and problem solving

- Locate potential buildings and areas suitable for green roofs
- Definition of stakeholders and activities
- Identification of most effective plants and placement
- Realization of green roofs and walls
- Training courses
- Co-mapping

Key Resources

What Key Resources do our Value Propositions require?
Revenue Streams?
Requires relationship with property developers and owners
TYPES OF RESOURCES:
Intellectual resource - Gardener company
Human resource – residents/ inhabitants' cooperation; project partners

Value Propositions

What value is delivered to the beneficiaries? Which one of the beneficiary's problems are helped to be solved?
Customer receive green roof/wall, drivers for this outlined in the report include:

- BREEAM Rating
- Building regulations
- Prolonged roof lifespan and reduced maintenance
- Improve aesthetic
- Exploit space/location
- Reputation and Corporate Social Responsibility
- Attain company targets
- Sustainability ethos
- Biodiversity
- Wish for outdoor amenity

Value of this is cost and risk reduction due to improved insulation and drainage of their building. Also gain new and unique customisable feature, improving the image of the building. Municipality drivers: cost and risk reduction due to less pressure on storm drainage and the benefits of reduced heat-island effect.

Governance

Who is involved in our governance process and public participation related to NBS?
How do we engage stakeholders in the co-design, co-implementation and co-monitoring processes of NBS?
The city of London assured the overall process of definition of stakeholders, identification of placements etc. Its actions were guided by different policy documents (Sustainable development and climate change, Open spaces and recreation, Flood risk)

Beneficiaries

For whom is the value created ?
Who are the most important beneficiaries?
Niche market of developers/owners who see biggest benefit – "green roof's contribution towards the BREEAM rating can make the development more marketable Buildings with sustainability measures in place can compete within the speculative city office development market."[19]
Additional benefit is seen by stakeholders: Improved biodiversity Improved air quality; Better storm attenuation; Additional health and satisfaction rates from tenants.

Cost Structure

What are the most important costs inherent in the business model?
Biggest cost from this report[10] appears to be in the preparation of existing roofs for the installation of the green roof. Costs outlined range widely from £50/m^2 to £237/ m^2 depending on roof preparation. This is a value driven model, property owners see reduced costs (maintenance, heating, taxes) and increased property value and appeal (appearance and sustainability rating)
SAMPLE CHARACTERISTICS: Fixed Costs (salaries, rents, utilities), variable costs, economies of scale, economies of scope

Revenue Streams/ Financial Model

For what value and benefits are our beneficiaries really willing to pay and which are the revenue streams ? Which is the Financial Model ?
Pay for planning and installation (asset sale). Revenue for municipality and property owners is seen in reduced overheads and in increased property value (therefore higher rent and taxes)
Pricing is product feature and volume dependent
TYPES: Asset sale
FIXED PRICING: Product feature dependent, Volume dependent
DYNAMIC PRICING: Unclear how the roof is priced

Table 9: Business Model Canvas NBS Case Study – City of London: Living Roofs and Walls

[19] City of London (2011) *Green Roof Case Studies* <https://www.cityoflondon.gov.uk/services/environment-and-planning/planning/heritage-and-design/Documents/Green-roof-case-studies-28Nov11.pdf>

In the previous tables we have observed examples on how the BMC can be applied to NBS. This exercise will be extended in chapter 3.3 allowing us to describe the business models for several FR cities' CALs. On another side our interest is focused on how we can embed the elements from different CALs in sustainable business models archetypes (point 3.1.2 below) focusing more on how we can represent the value generated in the cities.

3.2.2 Understand the Sustainable Business Model archetypes

In the process of developing a business model we consider that the BMC is the first tool that a city should use. In a second phase, following the BMC and after having identified all the value chains and the stakeholders involved, we recommend further working on the NBS value notion. The later can be easily identified by working with the second tool Sustainable Business Model archetypes (SBM) and by having all the elements clarified in the first phase of the analysis (BMC). Structuring SBM below will also give the opportunity to show how the NBS are delivering greater social and environmental sustainability for local communities and founders/

This section describes business models with similar characteristics, similar arrangements of business model building blocks, or similar behaviours. We call these similarities business model archetypes.
In their study about developing Sustainable Business Model archetypes (SBM), Bocken et al. (2014), propose unifying themes for business models related to NBS. Following their work, we describe patterns and attributes that can facilitate a categorisation of business models for NBS below. We are going to use their findings in order to develop a common language for different types of business models that a city can develop.

The patterns described in the following pages should help cities understand business model dynamics related to NBS and serve as a source of inspiration for own work with business models. In figure 11 and in table 11 below, we sketch out eight pre-existing business model archetypes built on concepts from the NBS business literature. A single business model as described previously in the BMC above can incorporate several of these archetypes as we will showcase in the next chapter of this report.

SBM 1 - *Maximise material and energy efficiency*	SBM 2 - *Create value from 'waste'*	SBM 3 - *Substitute with renewables and natural processes*	*SBM 4 - Deliver functionality rather than ownership*
Services using fewer resources	Creating value form waste	Addressing resource constraints with renewable resources	Reversing the product to service delivery
SBM 5 - Adopt a stewardship role	SBM 6 - Encourage sufficiency	SBM 7 - Re-purpose the business for society/ environment	SBM 8 - Develop scale-up solutions
Products and services ensuring long-term health and well-being	Products and services seeking to reduce demand-side consumption and production	Focus on delivering social and environmental benefits	Producing scaling and sustainable solutions

Figure 11 Sustainable Business Models Archetypes for NBS. Source: Bocken et al., 2014

1) **Maximise material and energy efficiency**: services in the cities using fewer resources, generating less waste and creating less pollution)
2) **Create value from 'waste'**: the concept of 'waste' is eliminated by turning existing waste streams into useful and valuable input to other production
3) **Substitute with renewables and natural processes:** reduce environmental impacts and increase business resilience by addressing resource constraints with renewable resources and man-made artificial production systems
4) **Deliver functionality rather than ownership:** provide services that satisfy beneficiary needs without beneficiaries having to own physical products. Business focus shifts from manufacturing 'stuff' to maximising beneficiary use of products, so reducing production throughput of materials, and better aligning manufacturers' and beneficiaries' interests.
5) **Adopt a stewardship role:** manufacture and provision of products and services intended to genuinely and proactively engage with stakeholders to ensure their long-term health and well-being. Broader benefits to stakeholders often become an important aspect of the value proposition
6) **Encourage sufficiency:** products and service solutions that seek to reduce demand-side consumption and reduce production (durable, modular, education about reduced consumption). The focus of such innovation is on the beneficiary relationship and influencing the behaviour of the beneficiary
7) **Re-purpose the business for society/ environment:** prioritising delivery of social and environmental benefits rather than economic profit maximisation, through close integration between the firm and local communities
8) **Develop scale-up solutions:** scaling sustainability solutions to maximise benefits

From the elements above we can already get a sense of the focus of the eight SBM. In the table 11, below we provide more information on how different elements related to value can be interpreted in the context of SBM.

Business model archetype	Value proposition	Value creation and delivery	Value Capture
1) Maximise material and energy efficiency 	Services in the cities using fewer resources, generating less waste and creating less pollution.	Activities aimed at using fewer resources and generating little waste, emissions and pollution. Focus on manufacturing as an innovative process. New partnerships and network reconfigurations to improve efficiencies.	Costs are reduced through the optimised use of materials and reducing waste, and compliance leading to increased profits. Positive contribution to society and environment through a minimised environmental footprint.
2) Create value from 'waste' 	The concept of 'waste' is eliminated by turning existing waste streams into useful and valuable input to other production.	Activities and partnerships to eliminate life cycle waste, close material loops and make best use of under-utilised capacity. Connection to new partners (e.g. recycling firms) to capture and transfer waste streams.	Economic and environmental costs are reduced through reusing material and turning waste into value. Positive contribution to society and environment through reduced footprint, reduced waste and reduced virgin materials use.
3) Substitute with renewables and natural processes 	Reduce environmental impacts and increase business resilience by addressing resource constraints with renewable resources and man-made artificial production systems.	Innovation in products and production process design by introducing renewable resources and energy and conceiving new solutions by mimicking natural systems. New value networks based on renewable resource supply and energy systems. New partnerships to deliver holistic NBS.	Revenue associated with new products and services. Value for the environment is captured through reducing use of non-renewable resources, reducing emissions associated with burning fossil fuels, reducing synthetic waste to land-fill.
4) Deliver functionality rather than ownership 	Provide services that satisfy beneficiary needs without beneficiaries having to own physical products. Business focus shifts from manufacturing 'stuff' to maximising beneficiary use of products, so reducing production throughput of materials, and better aligning manufacturers' and beneficiaries' interests.	Delivery through product/ service offerings requires significant changes within the structure producing the business in order to deliver this and may incentivise redesign for durability, reparability and upgradability. Potentially, more direct contact with beneficiary education to shift away from ownership.	Beneficiaries 'pay' for the use of the service, not for ownership of the products.
5) Adopt a stewardship role 	Manufacture and provision of products and services intended to genuinely and proactively engage with stakeholders to ensure their long-term health and well-being. Broader benefits to stakeholders often become an important aspect of the value	Ensuring activities and partners are focused on delivering stakeholder health and well-being. Production systems and suppliers selected to deliver environmental and social benefits. Network reconfiguration may require alternative suppliers.	Stewardship strategies can generate brand value and potential for premium pricing. Stakeholder well-being and health generate long-term business benefits. Healthy beneficiaries are good for the business and society. Healthy happy beneficiaries can be more productive and secure suppliers ensure more resilience.

	proposition by better engaging the beneficiary.		
6) Encourage sufficiency 	Products and service solutions that seek to reduce demand-side consumption and reduce production (durable, modular, education about reduced consumption). The focus of such innovation is on the beneficiary relationship and influencing the behaviour of the beneficiary.	Ensuring activities, partners and beneficiary relations are focused on consuming less, wasting less and using products longer. This may involve product redesign for durability. It will require fundamental incentive systems to discourage 'over-selling'/ obsolescence.	Profitability, beneficiary loyalty and increased market share realised from provisions of better products (longer lasting, durable/ not subject to short fashion – cycles). Societal and environmental benefits captured: educated society, using less product, reuse across generations.
7) Re-purpose the business for society/ environment 	Prioritising delivery of social and environmental benefits rather than economic profit maximisation, through close integration between the firm and local communities and other stakeholders.	Creating societal benefits (e.g. secure livelihood) and environmental benefits (e.g. regenerating flora and fauna) through activities, channels and partners. Integrating business with stakeholders through participatory business approaches, which may include non-traditional business partnerships (e.g. NGOs).	A meaningful enterprise which delivers nutrition, health, and education at a low environmental cost, while being embedded in community and employment rich.
8) Develop scale-up solutions 	Scaling sustainability solutions to maximise benefits for society and the environment.	Ensuring a sustainable business model solution can achieve scale by employing the right channels and partnering with others. New and potential unusual partners and business relationships are required to scale the business.	Ensuring a variable (e.g. franchising, licensing) or fixed (mergers and acquisitions) fee is paid for scaling up a solution and that other mutual benefits between partners are achieved through scaling up (e.g. market penetration).

Table 10: Sustainable Business Models Archetypes. Source: Bocken et al., 2014

3.3. Business Model Canvas and Sustainable Business Model Tools. Focus on FR cities CALs

In the following chapter we are going to work on the exercise of describing how we can represent Business models for the CALs that FR cities develop within the CLEVER Cities project. For this purpose, we are going to use the tools described previously namely the Business Model Canvas (BMC) and the Sustainable Business Model archetypes (SBM).

We consider that BMC and SBM are complementary. In effect the BMC can be used by the cities in the first phase of the business model development, to design, test and build new NBS projects. The SBM can be applied in a second phase to deepen the understanding of the NBS project and facilitate the identification and explanation of sustainable NBS features. Both BMC and SBM help cities to build new growth engines for NBS by better communicating NBS projects to decision makers and facilitate the involvement of additional founders and stakeholders.

In the following, this chapter will exemplary analyse these CALs:

- Hamburg: CAL 3 Schools
- London: Cal 2 Activating Southmere Lake
- Milan: Cal 1 Green Roofs & Walls

For each one of the three CALs we are showing how the BMC and SBM can be employed. We are also applying the two models on the remaining 6 CALs in Annex 2.2

Business Model NBS Hamburg CAL 3 – Schools

Key Partners	Key Activities	Value Propositions	Governance	Beneficiaries
• Citizens: Parents, pupils, Teachers/ Heads of schools, Neighbours, Caretaker • Authorities, Asscіated Partners: Pilot School - Stadtteilschule Fischbek-Falkenberg, Grundschule Ohrnsweg and Grundschule Neugraben Schools • Hamburg Partners: Steg, BEZ, HWWI, UKE, TUHH, GMH, LIG, HCU, BSB • Expertise: Gardeners, Landscapers, Architects, Associated local experts - Handcraft businesses& citizens, Potential suppliers (start-up)	• Setting up school gardening activities in 3 schools in the project area. -. Nature-based teaching offers for outdoor activities for the students • Urban gardening activities – modernising of school • Designing and installing the aquaponics model in one school **Key Resources** • Physical: School facilities • Human: from CLEVER and RISE programmes • Intellectual: HCU students for the Grundschule Neugraben; suppliers (start-up), Local crafts businesses	• Building environmental stewardship • Preventing child obesity by teaching on the nutritional value and importance of fruits and vegetables in one's diet • Building knowledge on food security and community work • Developing work ethic, planning skills, sense of ownership and responsibility; • Fostering physical activity and hence a healthy lif estyle, etc.	• Setting up UIP which consists of School Building Management (GMH), school administration, district council, steg, dedicated teacher, other teachers and pupils as well as parents (based on needs) • Existing scale-up plan to link other two primary schools in the larger UIP so that the learned experienced are shared and prepared for further upscale. • During the Corona virus, partners are facilitating possibilities of continuing the co-processes via online tools such as Trello.	• Pupils, Teachers • Local schools • Residents • Neighbourhoods

Cost Structure	Revenue Streams/ Financial Model
Build of Permaculture Garden and Aquaponics needing several NBS: • Fruit trees • Berry bushes • Raised Bed - Soil, Compost, Wood chips • Housing for Aquaponics • Aquaponics system Utility costs (water, electricity), material costs (tools, seeds, construction – school administration • Aquaponics, Mobile garden elements, Plants	CLEVER Cities funding through grant award procedure (Zuwendungsverfahren) (model still in discussion) While initial material costs will be covered by CLEVER, on-going costs will be covered by the schools where NBS are to be installed. The potential for citizen funding for on-going costs is planned to be checked, in the form of donations from parents.

Table 11: Business Model Canvas CAL 3 Hamburg Schools

Sustainable Business Model	Value proposition	Value creation and delivery	Value Capture
Adopt a stewardship role 	Developing school playgrounds and gardening - a practice-orientated way to reconnect citizens to nature, the young generation.	School playgrounds will be redesigned using nature-based solutions to improve the rainwater retention and the health of local school children. Later, in the project, urban school gardens will also be developed. Schoolteachers are leading the activities by a ''doing yourself'' approach. This is beneficial for school students as well as for uptake of solutions. Moreover, a teacher position was advertised, specifically to have a dedicated person being able manage and drive forward the green school programme. The fact that the school administration already empowered the green school programme marks a competitive advantage towards other schools.	Interventions are co-financed by different public local programmes and actors combined with school funds. The school is also able to take over the costs for management and maintenance.
Encourage sufficiency 	Support environmental education and allow young, urban citizens to engage with food and nature	School pupils are empowered by trainings on healthy eating and food, sport and physical activities. The activities provide them a better education, allowing the conditions to make better decisions about their future and endowing green upskilling for future employment	This model delivers nutrition, health and education at a low environmental cost while being embedded in the community schools. Social benefits are also involved as the model aims at preventing child obesity by teaching on the nutritional value and importance of fruits and vegetables in one's diet. The health, food, and well-being were put in the forefront of the educational agenda.
Develop scale-up solutions 	Developing school playgrounds and gardening	Upscaling the pilot solutions developed in the first phase to further Hamburg Schools. From the realised project, "dos" and "don'ts" will be taken and give advises on how other schools can transform their schoolyards into recreational spaces for pupil and nature.	Benefits can be captured at the level of the cooperation that will be developed in the upscaling phase, promoting the exchanges and the cohesion of the different schools.

Table 12: Sustainable Business Model archetype Hamburg CAL 3 – Schools

Business Model NBS London CAL 2 – Activating Southmere Lake

Key Partners	Key Activities	Value Propositions	Governance	Beneficiaries
• Citizens: Residents, Nature Forum, Bow Arts/ Lakeside Centre & other local artists; The Link Youth and Community Centre; Southmere Lake Fishing Syndicate; Sporting Cub Thamesmead, Heads of schools, teachers, pupils, parents • Authorities, Associated Partners: London Borough of Bexley, YMCA Thames Gateway • Expertise: Gardeners, Landscape architects • London Partner: Peabody Trust; GLA; Groundwork London, The Young Foundation, Land and Water contractors	• Silt transfer, edge shaping treatment and shoring up, island and habitat formation • Filtration wetlands • Natural play zone • Green corridor- planting of new trees and including signage, natural art, and outdoor classroom stops • Gardening and growing spaces, educational programmes **Key Resources** • Human: partners from CLEVER Cities and London municipality • Intellectual: Political, economic, cognitive (knowledge on silt transfer, edge shaping, filtration wetlands) relational stakeholders;	• Use NBS to improve the water quality, habitat and biodiversity of the lake • Address the pollution in Southmere Lake • Make Southmere Lake a destination for new and old Thamesmead residents, and London as a whole • Foster a love of nature and the great outdoors and encourage more healthy lifestyles at an early age. • Increase house prices per m2	• The part on lake specific work is delivered by Land and Water contractors and overseen by Peabody Trust • The part concerning the activating lakeside involves the client team and is made up of Peabody, Groundwork and local residents. ○ Design team will coordinate all the technical and community design work ○ Steering group will be led by senior team in Peabody and representatives from local community and GLA	• Thamesmead's and London Residents • Thamesmead's property owners (properties adjacent to Southmere Lake) • Local Schools, Teachers, pupils, parents • Employees of local businesses.

Cost Structure	Revenue Streams/ Financial Model
• Silt clearance and reuse, creation of reedbed, lakeside planting, installation of fishing platforms, and new trees • Site clearance for woodland walk, creation of paths, removal of fencing • Installation of dipping platform • Natural Play and additional planting Co-Design and Co-Build • Co-designed signage and information boards • Small community co-designed NBS • Outdoor classroom and nature trail materials	• Most of the budget for is to be met from Peabody's Phase 1 Southmere Lake Improvement works. The complementary budget is to be met from CLEVER Cities. • There have been significant costs savings in the reuse of silt within the site. • Additional budget has been secured from Greener City Fund, a Mayor of London initiative to help make London Greener.

Table 13: Business Model Canvas NBS London CAL 2 – Activating Southmere Lake

Sustainable Business Model	Value proposition	Value creation and delivery	Value Capture
Create value from 'waste' 	Using NBS to improve the water quality, habitat and biodiversity of a lake. Managing and re-using excavated silt will save millions of pounds and avoidable waste.	More than 4,500 tons of silt is going to be removed to make the lake deeper and prevent the build-up of harmful algae. The silt will then be re-used to establish a wetlands area on the east side of the lake to attract new bird and wildlife.	There have been significant costs savings in the reuse of silt within the site. At the beginning of this project the treatment of the contaminated silt was £350/m3 with a total cost potentially rising to £4,200,000. However, silt testing came back and deemed the materials suitable for reuse onsite.
Adopt a stewardship role 	Breathe new life into the lake by attracting local people and visitors and help the area reach its full potential.	The area of the lake will include new fishing platforms and a fish free channel to encourage biodiversity and allow other aquatic life, such as frogs and newts to flourish. Moreover, a 'learning in the landscape' outdoor classroom will be developed in order to bring learning outside, foster a love of nature and the great outdoors, and encourage more healthy lifestyles at an early age. An outdoor learning trail and spots will be used by local teachers for outdoor activities linked to a larger school programme and connected to school curricula. Students and other visitors can encounter various natural and cultural learning points on a single walk.	Enhanced public realm - residents and housing developers. The overall work around Southmere Lake and its environment will allow conditions for an increased housing price per m2
Re-purpose the business for society/ environment 	Foster a love of nature and the great outdoors and encourage more healthy lifestyles at an early age.	Following the phase of cleaning the lake, the second phase of the transformation will get under way and see even more enhancements of the lake as well as the surrounding area for residents and visitors. This second phase will promote health and well-being, creating thriving community facilities that can be used by as many residents, schools and youth groups as possible. Tree planting will also serve as the initial steps in making ecosystem connections for bird and small animal habitat. Green corridor with interpretive spots initiated in conjunction with the planting of new trees and including signage, natural art, and outdoor classroom stops.	This CAL delivers health, and education at a low environmental cost, while being embedded in the local community

Table 14: Sustainable Business Model archetype London CAL 2 – Activating Southmere Lake

Business Model NBS Milan CAL 1 – Green Roofs & Walls

Key Partners	Key Activities	Value Propositions	Governance	Beneficiaries
• Mediator (citizen commission): National Association of Condominium, Condominium administrators, Local authorities • Expertise: Companies, architects, engineers, gardeners • Promoter: The Orders of Architects, Engineers, Agronomists of the Province of Milan,National College of Agricultural Experts, International magazine: Topscape Paysage • Ally: Associations of landscape planners, of gardeners and plant nursery, Green building council, Environmental associations: Legambiente, Coltivare la città	• Definition of stakeholders and activities • Locate potential buildings and areas suitable for green roofs in Milan • Co-design green roofs and walls to be constructed • Construction of green roofs and walls • Guided tours of green roofs and walls • Conferences • Travelling exhibition • Training courses • Co-mapping of green roofs and walls in Milan **Key Resources** • Human: CLEVER and Municipality, • Intellectual: private sector and citizens, technical experts • Physical: roofs and walls for experimentation	• Improving local microclimate and better managing the stormwater runoff; contribution to reduce air pollution • Environmental benefits: air pollutant removal carbon sequestration, stormwater management, mitigation of the heat island effect • Economic benefits: energy savings, increased efficiency of the photovoltaic panels, increase of property values • Social: redevelopment of unused spaces for social activities, opportunities& relationship between people.	• Collaboration with the stakeholders in awareness raising activities, including their involvement in training courses, site visits and co-mapping of green roofs and walls • Open and transparent process of selection and involvement of technical experts supporting the co-design of green roof and walls • Citizen engagement through online mapping of green roofs and walls in Milan and various awareness-raising activities • Management of a public bid, co-financing the design and the construction of green roofs and walls	• Resident and people living and working in the “greened” building • Neighbourhood • a “public” added value regarding the contribution to improve the local microclimate, reduce CO_2 emissions, improve the air quality and to better manage the stormwater runoff.

Cost Structure	Revenue Streams/ Financial Model
• Co-funding of the realization of green roofs and walls • Support to the design of CLEVER pilot green roofs/walls • Devices supporting the environmental monitoring • Organization of public events and conferences • Organization of training courses and site visits	• Most of the budget is to be provided by Milan municipality. • The complementary budget will come from CLEVER Cities, both in term of working staff and financial resources for technical external assistance in the design of green roofs and walls as well as the installation of monitoring devices.

Table 15: Business Model Canvas NBS Milan CAL 1 – Green Roofs & Walls

Sustainable Business Model	Value proposition	Value creation and delivery	Value Capture
Maximise material and energy efficiency 	By using green spaces and walls air pollution is decreased, local microclimate is improved and water runoff is better managed	In Milan green roofs and walls will bring more nature into the city. The NBS solutions can act as a space alternative showing that the nature does not stop on the ground. A roof garden or a courtyard can provide vegetables, fruits and aromatic herbs or can even welcome paddy fields for cultivating different types of rice.	Green spaces and roofs can be incentivised by the city through its financing lines as in the case of Milan. The city offers financial support by facilitating the access to Credit Lines, Tax Deductions and Green Bonuses. Milan also allows for the involvement of private individuals in co-financing and sponsorships of this kind of solutions.
Develop scale-up solutions 	By using green roofs innovations Milan proves the benefits to its potential users. Milan influences the beneficiary relationship and its behaviour in further adopting the green roofs and walls installations.	Involving real estate, building associations and private citizens in order to upscale the initial pilot to 10 different project areas. To facilitate the scale-up the city of Milan also developed environmental certification schemes regarding the role of green roofs and walls. Moreover, an activity of co-mapping the existing green walls and roofs is ongoing. This action will be giving visibility to the existing realizations (but also to the new designed ones).	In this model we can speak about an increase of the property values or about capturing social benefits, be them increased opportunities of socialization, well-being and quality of life. The co-mapping of green roofs and walls could also represent an opportunity to involve private sponsorships awarding the most interesting projects and enhancing the replication of CLEVER roofs and walls all over the city and the metropolitan area.

Table 16 Sustainable Business Model archetype Milan CAL 1 – Green Roofs & Walls

3.4 Conclusion

In this report we have used the Business Model Canvas and the Sustainable Business Model archetypes to show how the cities can work on developing their own business models. We have argued that these tools can support cities to capture the “big picture” of an NBS and create value that can attract further founders and external stakeholders. We consider the two models as being complementary tools at the service of cities, searching for ways to better communicate about their NBS to decision makers while attracting additional founders and stakeholders.

Complementarity of BMC and SBM	
Business Model Canvas (BMC)	**Sustainable Business Model (SBM)**
Used in the first phase of business model development (design, test, and build new NBS business model)	***Used in a second phase of business model development***
✓ Identifies the value chain - stakeholders involved and actions required to implement a NBS ✓ Provides a visual - one page on what is the business ✓ Offers simple interface for complex ideas ✓ Serves as common language for co-creation and alignment tool in cities	✓ Deepens the understanding of the NBS project ✓ Focuses on different types of NBS value (v. proposition, v. creation & delivery and v. capture) ✓ Facilitates the identification and explanation of sustainable NBS features (value from waste, energy efficiency, renewables, long-term health and well-being)
✓ Help to better communicate NBS projects to decision makers ✓ Build new growth engines for NBS by identifying and attracting additional founders and stakeholders ✓ Create additional value for NBS beneficiaries and for the city more effectively ✓ Document, discuss, and manage existing NBS focusing on sustainability aspects of business models	

Table 17 Complementarity BMC and SBM

The two models also show how cities’ NBS are delivering greater social and environmental sustainability for local communities and founders.

By and large the BMC and the SBM are appropriate tools for cities to assess and communicate the value created by urban NBS. As stated before, it is advisable to implement the two tools in different phases of the implementation of a NBS. Taking account this aspect, both models support cities in mapping and outlining key business model structures and benefits of NBS.

4. Financing Natured Based Solutions (NBS)

4.1. Introduction

This section of the report has been developed to support cities and organisations who are setting up a Nature Based Solution (NBS) project, when identifying a financing solution. According to the World Conservation Congress, NBS are “actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.” As this report has been prepared as part of the CLEVER Cities project, it has been developed from the perspective of a city or municipality. However, the report covers a wide range of funding options, and may be useful for other organisations such as foundations, businesses and investors, in planning, structuring and securing NBS funding. Therefore, we use a wide range of financing examples for NBS and other sustainable solutions in a range of settings that could be built upon and adapted for NBS in cities.

According to the Naturvation Urban Nature Atlas, around 75% of NBS are funded directly through public budgets.[20] However, there are a diverse and growing range of financing solutions that can provide upfront and ongoing funding sources for NBS projects. This variety in funding mechanisms has been a response to the diversity of NBS projects that have appeared over the last few decades; these include small projects such as park improvements and green roofs on buildings, to much larger scale projects such as coastline adaptations and the planting of sustainable timber forests. Likewise, the financing solutions that have evolved to meet the funding needs have involved a range of funders and used a spectrum of types of finance.

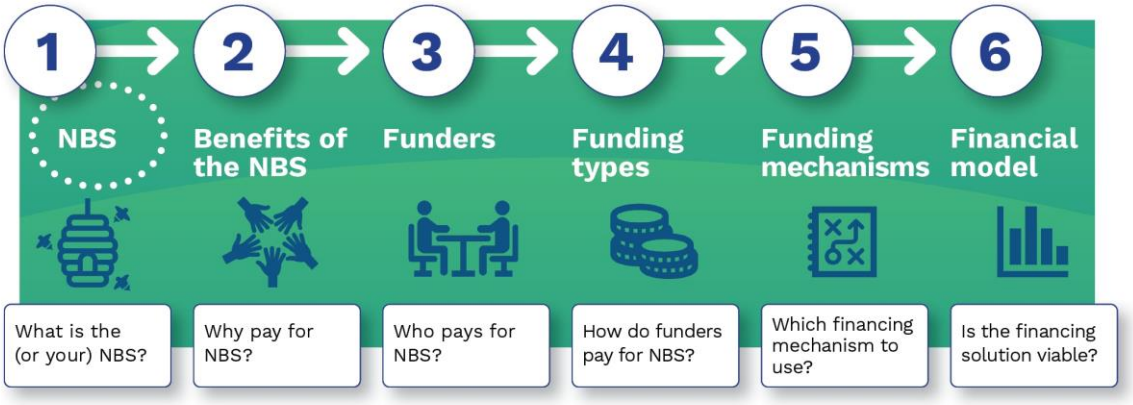
In this report we will look at NBS financing solutions across many types and scales of NBS. Throughout the report we will use case studies to demonstrate past and current financing solutions that have been used for NBS. We will also highlight innovative financing solutions that can be applied to future NBS projects. We focus primarily on financing solutions outside of the Clever Cities project, but we include a summary of how Hamburg, London and Milan are currently financing their CALs. This is to illustrate the full breadth of funding possibilities available.

We will focus the discussion around the steps needed to determine the optimal solution in each case: the benefits of NBS that lead to funding, who funds NBS, possible funding types, options for financing mechanisms and building a financial model. Finally, we will discuss how these components can be tied together into one financing solution.

[20] https://connectingnature.eu/financing-and-business-models

The report will follow steps 2-6 of the below flowchart:

Chart 1: Steps for creating an NBS financing solution



1. NBS: The first step in developing a financing solution is selecting an NBS to install. This step is not covered in this section, as we are assuming this as a starting base.

2. Benefits of the NBS: In **Section 4.2** we explore why funders pay for NBS. In particular, we explore the value and benefits generated by NBS projects including environmental, social, cultural and financial benefits and which funders are most interested in these benefits.

3. Funders: In **Section 4.3** we explore the range of funders paying for NBS: local government, central government, philanthropy and charity, commercial investors, social investors, citizens, and other groups (including private companies).

4. Funding types: In **Section 4.4** we explore how funders fund NBS, by exploring the most common types of funding, including repayable and non-repayable sources.

5. Financing mechanisms: In **Section 4.5** we explore a diverse range of financing mechanisms being used to fund NBS.

6: Financial model: In **Section 4.6** we explore how to build a financial model to validate the financing solution, tying together the various elements including funders, funding types and financing mechanisms.

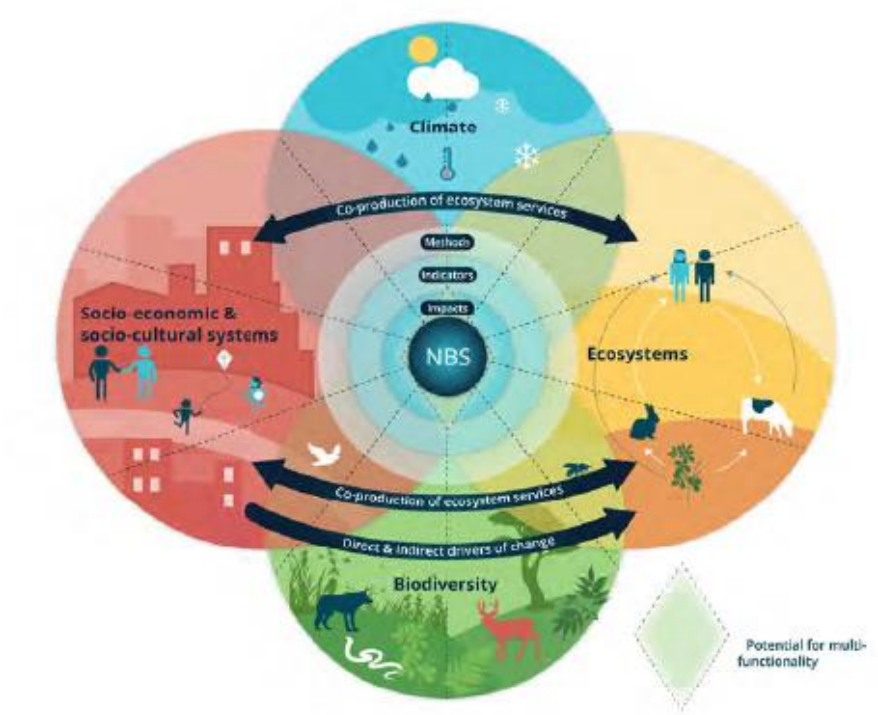
7. Building a financing solution: In **Section 4.7** we summarise the prior material to provide step by step guidance on creating a financing solution. We provide worked examples to illustrate the process.

4.2. Benefits of NBS: Why pay for NBS?

4.2.1. Recognising added value of NBS

The starting point of an NBS financing solution is to understand the underlying value of the NBS: these benefits form the incentive for a funder to finance an NBS project. NBS projects bring unique benefits to society, spanning diverse issue areas such as climate, biodiversity, public health, the economy and social cohesion. The below graphic from Eklipse, a Horizon 2020 project, illustrates the types of benefits of NBS and how they can be interlinked and overlapping.

Image 1: Framework of relationships among elements of NBS (Eklipse, 2017)



Source: "An impact evaluation framework to support planning and evaluation of nature-based solutions projects," Eklipse Expert Working Group, 2017.

Eklipse identified 10 key areas that can be translated into the top benefits of NBS. Therefore, in this report we have used these as a framework for identifying added value of NBS. These are summarised as follows:

1. **Climate mitigation and adaptation**: the capacity to react and respond to climate change, through actions such as reducing greenhouse gas emissions or sequestering carbon
2. **Water management**: the sustainable management of water resources
3. **Coastal resilience**: maintaining or restoring the key ecosystem services provided by coastal areas and protecting communities from things like storms and water erosion

4. **Green space management** (including enhancing/conserving urban biodiversity): the management of green and blue spaces (areas based on natural elements) improving the current status of a parameter or driver through active or passive behaviour, in this case through reducing greenhouse gas emissions or sequestering carbon
5. **Air/ambient quality**: air quality, particularly in respect to pollutants
6. **Urban regeneration**: Urban regeneration aims at improvements in the economic, physical, social and environmental conditions of an area that has been subject to negative change and is considered vulnerable
7. **Participatory planning and governance**: Planning approaches and governance architectures that support accessibility to green spaces
8. **Social justice and social cohesion**: recognising the diverse requirements, rights and duties of a diverse set of social groups; this may span environmental, distributional (equality of distribution), procedural (inclusiveness, fairness), and recognition-based (e.g. excluded groups like disabled, migrants) justice
9. **Public health and well-being**: physical and mental health and wellbeing of individuals
10. **Potential for new economic opportunities and green jobs**: co-benefits of green areas on urban environment, e.g. increased real estate values, improved water management, recreational services, positive health effects

4.2.2. Benefits and funder types

To understand the relationship between funders and the types of benefits, we performed a survey – this survey was circulated to individuals from a range of sectors in roles related to NBS. Due to the small sample size (n=20), which was largely restricted to European participants, the results of the survey are indicative (information on survey participants is included in the appendix[21]). However, they provide a useful industry perspective on how survey participants interpret the relationship between funders and NBS benefits. This survey was distributed to an informed and diverse range of stakeholders in the space, including academics, local government and research organisations. Additional information about the survey is available in Annex 3.1. Our survey focused on the ten NBS benefits identified in the Eklipse framework, with two additions: urban biodiversity and enhancement of natural capital. We classified seven types of funders within the survey; additional information on these funders can be found in the following section. Based on the perspectives of the survey respondents, we identified six key findings.

[21] Respondents were from a range of sectors in roles related to NBS: academia (2), central government (2), local government (4), non-profit (1), private: landscape / urban planning (4), professional association (3), public research institution (1), regional development agency (1).

It should be highlighted that these findings reflect the perspectives of survey respondents – working in a range of roles across the NBS industry. While they are indicatively interesting and they highlight areas for further exploration, more work is needed to verify these findings.

- **Key Finding 1.** Local government, central government and citizens value NBS benefits highly
- **Key Finding 2**. The top five NBS benefits that funders value the most are public health and well-being, green space management, air/ambient quality, urban regeneration and climate mitigation and adaptation
- **Key Finding 3.** Different stakeholders value different NBS benefits
- **Key Finding 4.** Government is the most willing to pay for NBS benefits, and citizens and investors are the least
- **Key Finding 5.** The top five NBS benefits that funders would pay for are potential for new economic opportunities and green jobs, urban regeneration, public health and well-being, green space management and climate mitigation and adaptation
- **Key Finding 6.** NBS value does not always translate to a stakeholder's willingness to pay

The detailed results of the survey can be found in Annex 3.1. Here, we expand on these key findings.

Key Finding 1. Local government, central government and citizens value NBS benefits highly.

Survey respondents believed that these three groups (local government, central government, citizens) value NBS benefits more highly than other groups such as philanthropy and charity, commercial investors and social investors (see Table 26 in Annex 3.1).

Key Finding 2. The top five NBS benefits that funders value the most are public health and well-being, green space management, air/ambient quality, urban regeneration and climate mitigation and adaptation

Survey respondents identified specific benefits as more likely to be valued by stakeholders than others: public health and well-being, green space management, air/ambient quality, urban regeneration and climate mitigation and adaptation. Coastal resilience and/or soil protection was ranked lowest (see Table 26 in Annex 3.1).

Key Finding 3. Different stakeholders value different NBS benefits.

There is divergence in how the stakeholders value these benefits. For example, survey respondents believe local government values green space management (75% of respondents believe that local government values this benefit), water management (70%) and public health and well-being (65%) most highly. Survey respondents believe central government values air/ambient quality (60%) and climate mitigation and adaptation (60%) most highly. On the other end of the spectrum, survey respondents

believe commercial investors value potential for new economic opportunities and green jobs (45%) and urban regeneration (40%) most highly (see Table 26 in Annex 3.1).

These divergences reflect that each benefit holds different value and relevance for each stakeholder, or that biases might be present. For example, it is sensible that central government would value most both air quality and climate mitigation, as it is the primary actor responsible for directing a national response to these issue areas.

The benefits valued by local government and citizens are the most similar. The benefits valued by social investors track closely that of citizens, however at a lower threshold. Philanthropy (social/community focus) and commercial investors (economic focus) are outliers compared to the other stakeholders, in terms of the benefits they value.

Key Finding 4. Government is the most willing to pay for NBS benefits; citizens and investors are the least.

Respondents believed local and central government were the most willing to pay for (or subsidize) benefits. They believed citizens and social investors were the least likely to pay for benefits. Respondents believed that philanthropy and charity and commercial investors were willing to pay for a few NBS benefits (Philanthropy and charity: green space management, urban biodiversity, public health and wellbeing. Commercial investors: enhancement of natural capital). but generally unwilling to pay for other benefits.

Key Finding 5. The top five NBS benefits that funders would pay for are potential for new economic opportunities and green jobs, urban regeneration, public health and wellbeing, green space management and climate mitigation and adaptation.

Survey respondents identified specific benefits as more likely to be paid for by stakeholders than others: potential for new economic opportunities and green jobs, urban regeneration, public health and wellbeing, green space management and climate mitigation and adaptation. Coastal resilience / soil protection was ranked lowest. (See Table 27 in Annex 3.1)

Key Finding 6. NBS value does not always translate to willingness to pay.

The survey indicated that funders were generally more likely to value an NBS than be willing to pay for it. For example, while 70% of survey respondents believe that local government values the NBS benefits of water management, just 40% believed local government is willing to pay for this. Similarly, 70% of survey respondents believe that citizens value NBS health and well-being benefits, yet just 15% believe citizens are willing to pay for this.

The survey also indicated that the NBS benefits most valued by funders, were not the same ones that funders were most willing to pay for. There is a misalignment between value and willingness to pay. For example, in the following table on NBS Funding only one of the top three NBS benefits valued most highly by funders (public health and well-being) is a top three NBS benefit funders are willing to pay for.

This is important to note in the context of financing – a stakeholders' value of a benefit does not translate to their willingness to pay. There is a clear role for some stakeholders to pay for benefits rather than others, which may encompass ownership, responsibility and externalities of different projects.

Table 18 Ranking of % survey respondents who agree with the statement: funders would value / pay for this benefit

NBS Benefit	Rank: Funders value this benefit	Rank: Funders will pay for this benefit
Public health and well-being	1	3
Green space management	2	4
Air/ambient quality	3	6
Urban regeneration (inc. transport)	4	2
Climate mitigation and adaptation	5	5
Social justice and cohesion	6	9
Water management	7	8
Potential for new economic opportunities and green jobs	8	1
Community participatory planning and governance	9	7
Urban biodiversity	10	11
Enhancement of natural capital	11	10
Coastal resilience and/or soil protection	12	12

Source: "Survey on nature-based solutions," CLEVER Cities 2020, n=20. Note: "Rank" calculated as comparative index to measure value – total %/120 (possible votes)*100.

4.2.3. Financial and commercial incentives

The above benefits, focused on the non-financial benefits generated by NBS, are predominantly related to environmental, community and social benefits. However, there may be financial benefits to funding NBS. For example, NBS may have profitable and revenue-generating benefits (see Case study 2: Green Living Concept). Other NBS may provide cost savings for funders (see Case study 1: DC Water Impact Bond). When there is a commercial benefit to funding NBS, financially motivated funders such as commercial investors, social investors, real estate developers, utility companies, and even governments may see this as an additional motivation to fund an NBS project. **Therefore, commercial incentives may unlock additional funders and financing solutions for NBS projects, where they are present.** While commercial benefits complement the added-value benefits as described in the Eklipse framework, they may also be sufficient to attract funding in the absence of other added-value benefits.

4.2.4. Case studies of funders paying for NBS benefits

The below case studies provide examples of NBS projects in which funders have paid for the benefits highlighted in the Eklipse framework. These diverse examples illustrate different settings and ways in which funders might pay for benefits.

For example, in the case study of DC Water's Impact Bond, investors (commercial and social) and Washington DC's municipal water authority came together to fund NBS for water management benefits. The funders paid to decrease storm water runoff by installing green infrastructure to absorb the rainwater. The water authority in this case also had a financial benefit to fund the project: cost savings from reduced sewer overflows. The investors had a financial benefit to fund the project also: potential gains of $3.3 million in interest from the loan.

Case study 1: DC Water Impact Bond[22]	
Description	**DC Water Environmental Impact Bond** Washington DC, USA 2016 – present  Green spaces in Washington DC, Jacob Creswick
Financing mechanism	**Environmental Impact Bond (Blended Finance)** $25 million USD of 30 year tax-exempt junior municipal bond with initial 3.43% coupon
Funder	Outcomes payer: DC Water, Upfront investors: Goldman Sachs, Calvert Foundation
How it works	This Environmental Impact Bond was a partnership between Washington DC's water authority and investors. $25 million in investment was raised from Goldman Sachs and Calvert Foundation, and the funds raised were used to construct green infrastructure to absorb and slow stormwater during periods of heavy rainfall in Washington DC. The objective was to reduce the incidence and volume of combined sewer overflows, that pollute the waterways in the municipality. The investment was made in the form of a bond with an interest rate of 3.4%. An additional investment return could be generated based on the percentage reduction in stormwater runoff achieved: DC Water makes a payment of $3.3 million to the investors if runoff is reduced significantly (threshold set to 41% reduction). If the reduction is lower (less than 18% reduction), investors will make a risk share payment to DC water of $3.3 million. A reduction between 18% and 41% results in no contingent payments. This Environmental Impact Bond structure allows the water authority to share the underperformance risk of its green infrastructure investment with an investor, as well as providing upfront capital. Investors stand to receive an enhancement to returns if

[22] Goldman Sachs, "FACT SHEET: DC Water Environmental Impact Bond", undated, https://www.goldmansachs.com/media-relations/press-releases/current/dc-water-environmental-impact-bond-fact-sheet.pdf.

	outcomes are very good but will pay a penalty (and thus reduce their interest returns) if outcomes are very poor, despite the substantial investment made.

In the case study of the Green Living Concept, the Serbian construction company Erker Inženjering demonstrated a willingness to invest in the NBS benefits of air quality, and public health and wellbeing for the residents of one of their buildings. There is assumed to be a commercial benefit for the company: by increasing the air quality and wellbeing benefits of the building they will likely generate higher customer satisfaction and lower vacancy rates in their building, resulting in higher net revenue.

Case study 2: Green Living Concept in Novi Sad[23]	
Description	**Green Living Concept – Green Buildings** Novi Sad, Serbia 2019
Financing mechanism	**Direct Funding** (May be considered Instrument Generating Revenue due to possibility of green investment increasing revenue from residential building) Funding amount unknown
Funder	Erker Inženjering (construction company)
How it works	The Serbian construction company Erker Inženjering developed the Green Living concept on its Vojvode Šupljikca Street residential building. The Green Living Concept includes the addition of green roofs, community gardens, green walls and an eco-booth for waste sorting to the residential building. The green roofs provide thermal insulation, lowering heating costs by 20% and purify the air to ensure a higher quality microclimate. The green walls operate through a hydroponic system and also help to clean the air. The construction company plans to apply this concept to future buildings.

4.3. Funders – Who funds NBS?

4.3.1. Funders of NBS

While NBS in cities have traditionally been funded by the local and central governments of the cities themselves, as NBS become more widespread and awareness grows, other funders have begun to participate in the NBS funding landscape. We have classified seven key types of funders to be considered when implementing NBS: local government, central government, philanthropy and charity, commercial investors, social investors, citizens, and other groups (including private companies).

[23] "Green Living Concept transforming residential construction," Balkan Green Energy New, Jan 28 2019, https://balkangreenenergynews.com/green-living-concept-transforming-residential-construction/.

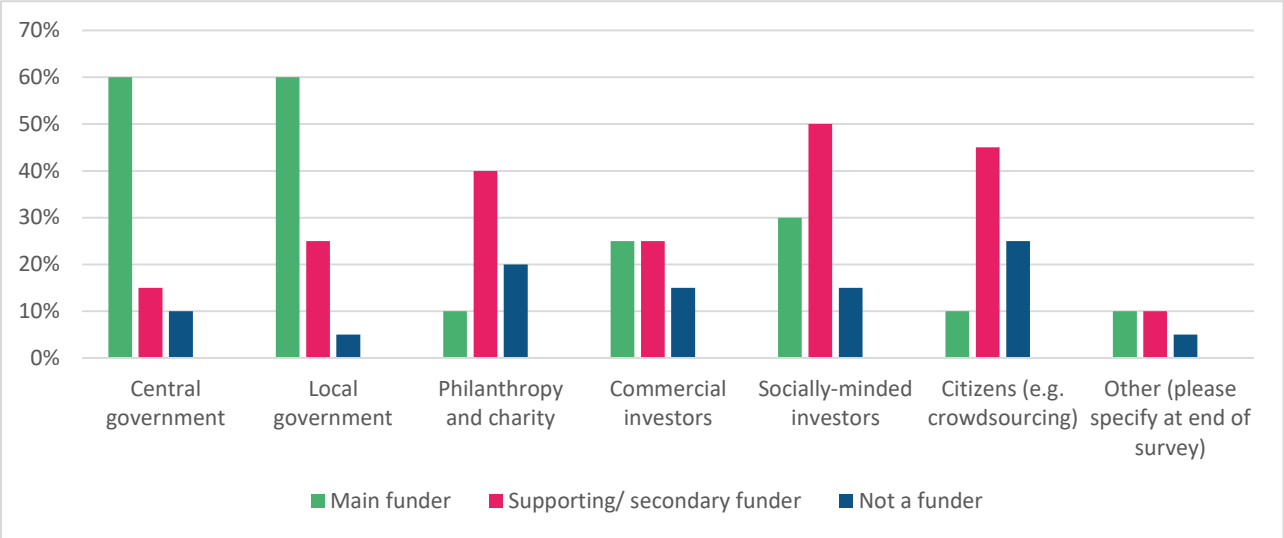
Table 19 : Funders of NBS

Funder	Description	Example
Local government	Local/municipal government funding NBS, usually through grants or direct provision	On the Queen Caroline Estate in London, local government funding from the borough and Greater London Authority (alongside EU LIFE programme funding) was used to implement nature-based sustainable urban drainage systems. The total project cost £266,000.
Central government	Central (national or international) government funding NBS, usually through grants or direct provision	Austria's Smart Cities initiative uses funding from the Austrian government's Climate and Energy Fund to invest in various projects to transition to an energy-efficient and climate friendly way of life. This has included various NBS projects, including the greening of streets in Vienna.
Philanthropy and charity	Philanthropic and charitable trusts and foundations funding NBS, usually through grants	The Non-Conventional Water Resources programme in the Mediterranean (NCWR) is funded by the Coca Cola Foundation. It aims to advance the use of NCWR technology to help with climate change adaptation in insular and urban communities. Projects include rainwater harvesting.
Commercial investors	Commercial investors investing in the implementation of NBS in expectation of a positive financial return	The DC Water Environmental Impact Bond included investment from Goldman Sachs (as well as the Calvert Foundation, and outcomes payments from the DC Water and Sewer Authority) to fund the construction of green infrastructure to manage stormwater runoff. The total bond was $25 million USD.
Social investors	Social investors investing in the implementation of NBS in expectation of a positive financial (usually below commercial rate) return and social return (external benefits)	Climate Trust Capital is an investment manager that funds projects to reduce greenhouse gas emissions, including in forestry and grassland conservation. It generates revenue on its investments by selling carbon offset credits on the carbon market, through California's cap and trade programme.
Citizens	Citizens investing in NBS in their local areas e.g. through crowdfunding. Usually grants, but can be repayable	MyParkScotland is a charity that raises funds for Scotland's public parks, including a crowdfunding platform where donors can support various park projects.
Other	For example, private companies installing NBS on new developments	The K11 Musea shopping centre in Hong Kong is clad in 4,600 square metres of green walls and a green roof featuring urban farms. It is a privately funded commercial development.

In the aforementioned survey we undertook on the current landscape of financing of NBS, 60% of respondents said that central or local government were usually the main funders of NBS. The next most common primary funders were social investors (30%) and commercial investors (25%).

The results also demonstrated the role in government funding leveraging other sources: philanthropy and charity (40%), social investors (50%) and citizens (45%) were all noted as supporting or secondary funders.

Chart 2: Which funders are financing NBS in your experience?



Source: "Survey on nature-based solutions," CLEVER Cities 2020, n=20

4.3.2. Who is funding the CALS in CLEVER Cities?

The CLEVER Cities project, part of the EU's Horizon 2020 innovation action plan, is using NBS to address urban challenges and promote social inclusion in cities. Within the CLEVER project's framework, the three FR cities Hamburg, London and Milan are running a series of NBS demonstration projects (CALs). These cities are mainly reliant on government and grant funding, but are leveraging funds from a variety of different funders.

4.3.2.1. Hamburg

Hamburg's CALs are being funded through three mechanisms, all of which disburse funds from the CLEVER Cities grant (European government funds) and additional local government funds through local government: grant, public law contracts and public procurement. To date, only the grant award procedure of CLEVER funds has been used so far.

For CAL 3 (schoolyard gardens), while initial material costs for the CAL will be covered by CLEVER, on-going costs will be covered by the schools where NBS are to be installed. There is also an expectation for citizen funding for on-going costs in the form of donations from parents.

4.3.2.2. London

In London, the majority of the CAL budget is to be met from the housing association Peabody's improvements budget ("Phase 1 Southmere Lake Improvement Works"), with the rest met from CLEVER Cities project funding. Additional funding has also been secured from the Greener City Fund, a Mayor of London grant funding initiative to help make London greener.

An investment by Peabody into this CAL and the local area of Thamesmead's green infrastructure demonstrates that the benefits, both economic and social, are valued by the owner of the land. In terms of social outcomes, Peabody is investing in green infrastructure in order to increase quality of life, wellbeing, health and community cohesion in the area. Economically, the business case of increasing the rentable value and lower vacancy rates of commercial property has also been made. In Section 4.4 on Funding Types, we explore in more detail how valuing the benefits of NBS is key to secure sustainable and diverse funding.

4.3.2.3. Milan

The majority of the budget for Milan's CALs is to be met by the Milan municipality and CLEVER Cities project. This funding will then be used in an innovative way, through a grant procedure to encourage private implementation of green roofs through co-financing. Applicants for green roof co-financing can be public or private owners of a building, and in this way the scheme will be using public funds to leverage both more public funds and private investment into green infrastructure. This will result in a demonstration on how t to use public funds effectively and efficiently in building a market for NBS, and other municipalities will be able to learn from the successes of the grant scheme, as well as identify potential improvements for future schemes. This scheme is particularly interesting as it demonstrates how multiple and diverse funders of NBS (in this case private and public building owners: citizens, businesses, etc.) come together to co-fund the creation of green walls and roofs.

4.3.3. Funders by business model

A useful way to consider which funders will fund an NBS is to determine the business model. This step is a shortcut to understanding which funders are likely to fund the project.

The previous section of the report highlights a range of possible NBS business models. Below, we present additional business models to consider, using the NBS business model catalogue developed by Naturvation, a Horizon 2020 project[24]. We use these business models to show which funders might fund the business model.

Table 20 Key funders by business model

Business model	Description and example	Key funders/*Secondary funders*

[24] https://naturvation.eu/sites/default/files/results/content/files/business_model_catalogue.pdf

Risk reduction	• Upfront investments into urban NBS are made to lower future costs from extreme weather events such as droughts and floods • For example, wetlands for flood prevention and mitigation	• **Central and local government** The long-term nature of the benefit and the positive externality (risk reduction) means that governments are more likely fund this model, as their incentives are longer-term and societally focused • **Other: insurers** *Insurers are incentivised to reduce extreme weather events that are costly to them in terms of claims and pay-outs* • ***Philanthropy/charity and social investors*** *Philanthropy and socially minded investors are also more likely to fund positive externalities. There is the possibility for financial return through e.g. the reduction in flood costs that could attract social investors (see DC Water Environment Impact Bond for this in practice)*
Green densification model	• Integration of NBS into (often large scale) urban real estate development. The costs of creating and maintain NBS become embedded in the larger business case of sustainable urban living, captured through real estate value and economic growth • For example, the green densification of Thamesmead by Peabody	• **Local government and other (e.g. housing associations, real estate developers)** Key funders of new housing developments are the most likely parties to fund this model. The incentives for them included increased value of real estate, potential reduced maintenance/running costs (e.g. reduced heating/cooling costs from green roofs) and positive public image • **Commercial investors** Similarly, if there is a positive financial return to be made (through, e.g. increased house prices, or long-term secure rental revenue), there is a business case for commercial investors to invest in green densification
Urban net gain or offsetting model	• A 'no net loss approach' incentivises or requires offset investment into urban NBS that are lost because of real estate and infrastructure development within the city • For example in the UK, Community Infrastructure Levies are planning charges that can be earmarked for NBS	• **Commercial investors and other businesses** This business model is often designed and/or enforced by planning authorities, usually local governments, in order to maintain and grow green infrastructure within an urban area. As a result, the payer tends to be real estate developers, who are likely to be backed by commercial investors.
Vacant spaces model	• The government steps back and provides space for local initiatives and entrepreneurship in (sometimes temporary) unused urban public space	• **Local government, philanthropy/charity and citizens** This business model is also often designed by planning authorities and local governments to encourage both economic

	• For example, outdoor recreation projects on frozen lakes or disused land	activity and NBS. Crowdfunding from citizens is likely to be used in conjunction with other funding, from for example local government and social investors. • **Commercial and social investors** If the NBS I combined with entrepreneurial activity or there is an income stream that would allow for repayment of capital, commercial and social investors may also be incentivised to invest.
Local stewardship model	• Local NBS plots and trees are valued by citizens and businesses who are willing to protect and support nature in their neighbourhoods based on the direct value they from it • For example, community food growing or urban orchard projects, such as the UK's Orchard Project[25]	• **Local government, philanthropy/charity and citizens** As with the vacant spaces model, this is a localised business model that is likely to be funded by organisations with a local connection: local government, charities and citizens (through crowdfunding). However, there is unlikely to be an income stream for value capture and so social or commercial investors are not likely to fund this business model.
Green health model	• The therapeutic, health and wellbeing value of NBS is recognised and used as a driver to finance urban NBS • For example, Liverpool's Primary Care Trust funding a variety of NBS projects to promote well-being	• **Central and local government** Funders who are responsible for health spending in general, and are incentivised to improve population health and well-being, as well as reducing future health care spending are most likely to fund NBS for health outcomes. These tend to be central and local government health departments, including public health. • ***Philanthropy/charity and social investors*** *Charities and social investors whose mission is aligned to improving health and wellbeing will also value health benefits and so fund health-focused NBS. For social investors, there will need to be a income stream or cashable saving (e.g. for government) that will provide income to repay any capital invested.*
Green education model	• Urban NBS are set up and managed to support environmental education and allow young citizens to engage with issues relating to climate, food and nature • For example, school rain gardens or community gardens	• **Central government and local government** Similar to the green health model, funders who are responsible for education spending in general are most likely to fund NBS for education outcomes. These tend to be central and local government education departments, who also value the training and apprenticeship opportunities that arise from this model.

25 https://www.theorchardproject.org.uk/

		• ***Citizens, philanthropy/charity and social investors*** *Similarly, charities and social investors (where there is a route to repayment) whose mission is aligned to education citizens on food and nature could fund these NBS* *Citizens such as parents may also be incentivised to pay for these outcomes through this business model*
Green heritage model	• Builds on cultural values and a sense of identity to sustain and develop NBS. The green spaces that support/are cultural heritage can lead to different types of value creation, ranging from tourism to education to cultural healing • For example, community gardens and food markets	• **Central government, local government and philanthropy/charity** The funders who are likely to value cultural heritage benefits, as well as the training and apprenticeship opportunities, are the most likely funders for this business model • ***Commercial investors, social investors and other (businesses)*** *Additionally, if there are other types of value creation such as tourism that might bring a financial return (e.g. entrance fees), investors and businesses may also fund this model*

Source for business models and descriptions: Naturvation Business Model Catalogue, 2019

The key themes we have identified for which funders fund NBS under various business models are:

- When value is hard to capture, grant funding (from governments or philanthropic funders) tends to pay for positive externalities or longer-term benefits that are difficult to monetise, such as improvements in education
- When there is a local connection to the project, citizens can be valuable funders on top of mainstream funders
- When benefits can be monetised and there is an identifiable cashflow/financial return, commercial and social investors and enterprises can invest in NBS. For social investors, this financial return can be lower than the commercially accepted level, if other positive impacts can be demonstrated

These findings align with the findings from our survey: while many stakeholders value the benefits of NBS, this does not always translate into a willingness to pay, and governments remain the most likely funders of NBS. However, the range of business models and positive (and sometimes monetizable) benefits available to NBS also demonstrates the value in investigating this full range to identify innovative financing mechanisms that could be used to attract different funders. See the financing mechanism section for more detail.

4.4. Funding types – How is NBS funded?

4.4.1. Funding types for NBS

Funders can pay for NBS using different funding types. These funding types may be repayable (for example, investment such as debt or equity) and support upfront NBS costs, or they may be non-repayable sources (for example, grants or earned income). **It is important to note that when a repayable funding type is used, there must be revenue generated by the business model including non-repayable sources of funding, so that the repayable funds can be returned to the investor.**

We have classified three main categories of funding below. These three funding types are used independently and in combination to create NBS Financing mechanisms, for example loans, crowdfunding, grant funds, earned income models and public private partnerships (more information on these in the following section on Financing mechanisms).

Table 21 : Funding types for NBS

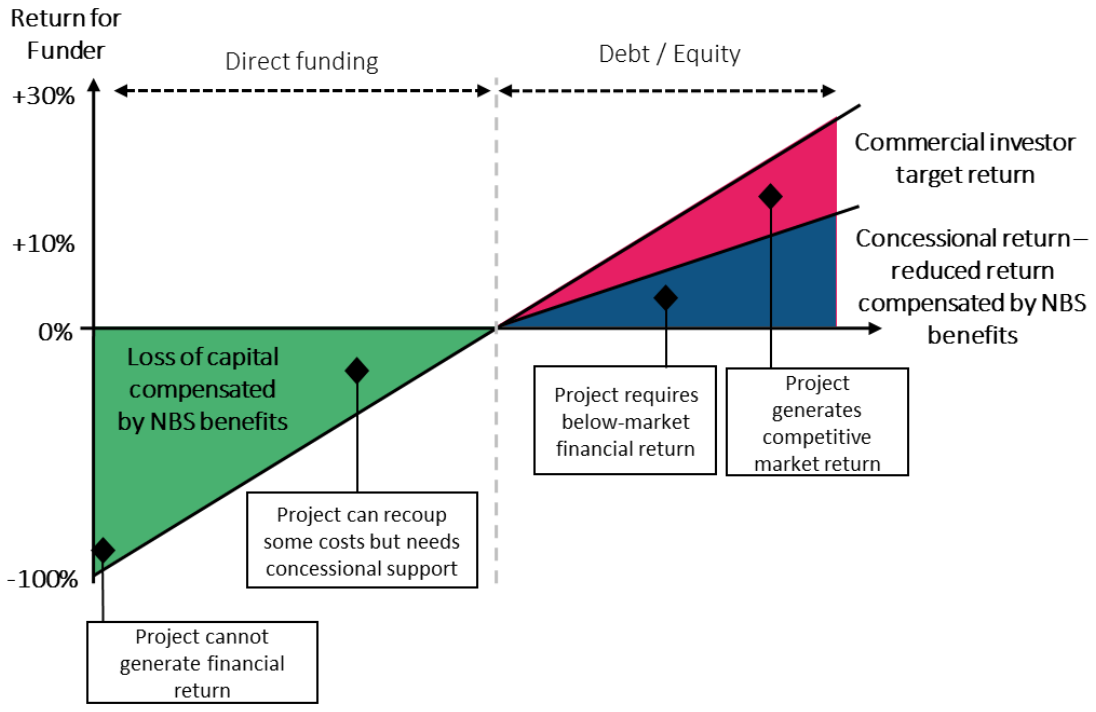
Funding type	Repayable?	Description	Example
Direct funding / grant	No	Funder pays directly for the NBS, or disburses a non-repayable block of money (grant) to a recipient to pay directly for the NBS This funding type includes public subsidies, which is public funding to support the costs of. a project, by reducing the price of something to lower than it would be otherwise	The water utility Anglian Water paid for the development of wetlands near its wastewater treatment sites, to provide natural cleaning to the water as an alternative to additional chemical treatments.
Debt	Yes	Funder lends the working capital (upfront funds) to pay for NBS; the recipient repays the funds over time with additional interest charges	The Toronto Atmospheric Fund makes loans (debt) to local projects tackling climate change and air pollution. For example, they made a loan to land developer Tridel to fund the upfront costs of making their properties greener.
Equity	Yes	Funder invests funds into an NBS and takes a percentage of ownership, repayment to the funder depends on the value of the NBS	Lyme Timber Company is a timber investment management company – they make equity investments into sustainable forestry plantations which have benefits such as promoting carbon sequestration and land restoration

These three funding types sit along the commercial – concessional spectrum. This spectrum expands on the binary distinction of repayable / non-repayable funding to show that funding can exist across a range of expected return. **Commercial funding** generally expects a market rate financial return, which generally increases based on level of risk for the funder. Debt and equity are the main types of commercial funding. **Concessional funding** generally expects a lower than market rate financial return or exceptionally nil financial return. Direct funding / grants are concessional funding. Debt can also be offered as concessional funding, at concessional rates – e.g. a social investment loan for climate adaptation where the interest rate offered is discounted due to the positive NBS benefits expected. 'Blended finance' describes a mix of funding types.

Commercial funding generally expects a market rate financial return, which generally increases based on level of risk for the funder. Debt and equity are the main types of commercial funding.

Concessional funding generally expects a lower than market rate financial return or exceptionally nil financial return.

Chart 3: Spectrum of funding for NBS



Source: Social Finance, 2020

As shown in the above chart, projects may require different types of funding depending on their financial profile. Projects that cannot generate a financial return will require non-repayable funding. Projects that generate some return, but not enough to cover costs will need concessional support. This could be for

example, a blended approach such as a loan (debt) plus grant funding. Projects with high social impact that provide some financial return but may not be able to provide market rate returns on debt or equity, might seek social investors or repayable government investment to fund their project. Finally, projects which generate commercial investment return can access mainstream market investors or look for social investors or government investors as funders.

As above, there are a variety of funders who might be willing to fund NBS using one or more of direct funding / grant, debt or equity funding. To simplify this, we have indicated below which funders might pay for an NBS using which funding types. The form in which a funder's monies are disbursed varies based not only on financial return, but also on the funder's objectives and responsibilities. For example, social investors may be able to offer concessionary rates but will need to generate a monetary return on the funds they use for NBS and so they will require revenue-generating funding types such as debt or equity. Citizens, in contrast, are likely to pay for NBS at a small scale in a manner that generates personal benefit and are likely to pay for NBS directly through earned income (e.g. paying for tickets to enjoy a wetland space).

Table 22 NBS Funders by Funding Type

Funding type	Local govt	Central govt	Philanthropy /Charity	Commercial investors	Social investors	Citizens	Other (e.g. business)
Direct funding/grant							
Debt							
Equity							

Table key:

Funder likely to use funding type	Funder could consider using funding type

4.4.2. Case studies of funding types for NBS

The below case studies provide examples of funders using the above funding types to pay for NBS. The examples involve a range of funders and in many cases, multiple funders collaborating.

In the case study of Melbourne Urban Forest Fund, a variety of funders were brought together to fund a successful NBS financing solution. The Urban Forest Fund provides financing for greening projects in Melbourne. The financing solution developed for the Urban Forest Fund relied on direct funding from local government and a private company (which made donations to offset the negative effects of its land development activity). The funding from local government and private donations was used to provide subsidies to individual greening projects: each funding grant delivered by the Urban Forest Fund required the local project provide "match-funding" – to pay for certain costs themselves to demonstrate a willingness to co-invest in the solution.

Case study 3: Melbourne Urban Forest Fund[26]	
Description	**Melbourne Urban Forest Fund** Melbourne, Australia Ongoing  Vertical garden, Daniel Funes Fuentes
Financing mechanism	**Direct funding (Innovative use of public budgets)** Size unknown
Funder	VicRoads, Municipality of Melbourne, Local groups/citizens
How it works	The Melbourne Urban Forest Fund was set up to provide financial support to greening projects, including green spaces, tree planting, biodiversity projects, improvements to soil conditions, vertical gardens, and green roofs. The Financing mechanism is a unique example of how multiple financing sources can be blended successfully: while the municipality of Melbourne contributed initial direct funding, it is collecting donations to increase the fund size. For example, it successfully requested VicRoads, a local road infrastructure developer, to contribute £215,000 in direct funding to offset the negative environmental impacts of their development activities. It is also collecting private donations. The Melbourne Urban Forest Fund match-funds green developments between AUD 50,000 – 500,000; they require the project to put up funds also (match-funding). An example of a funded project is the Melbourne Skyfarm: the fund granted this project AUD 300,000 to build an urban farm atop a carpark in Melbourne's Docklands.

Another interesting example is the case study of the Anglian Water Green Bond. In this example, the private water utility company Anglian Water was able to raise funding from commercial investors to pay for green infrastructure. Anglian Water issued a green bond, which is a form of repayable debt with a fixed annual interest rate. Anglian Water will repay the debt using income generated from its normal

[26] "TAKING ACTION FOR URBAN NATURE: Business Model Catalogue for Urban Nature-Based Solutions," Naturvation; "Melbourne's Urban Forest Fund," City of Melbourne, https://www.melbourne.vic.gov.au/community/greening-the-city/urban-forest-fund/Pages/urban-forest-fund.aspx; "Urban Forest Fund," Bulletpoint, https://www.bulletpoint.com.au/urban-forest-fund/; "Urban 'skyfarm' to be built atop Melbourne carpark," Architecture AU, 8/5/2019, https://architectureau.com/articles/urban-skyfarm-to-be-built-atop-melbourne-carpark/.

activities as a water utility. In this model, debt is the primary (repayable) funding source for the green infrastructure. Ongoing earned income is the funding source that supports the repayment of the debt (green bond), through direct income.

Case study 4: Anglian Water Green Bond[27]	
Description	**Anglian Water Green Bond** United Kingdom 2017 – 2025
Financing mechanism	**Green Bond (Green finance)** £250 million
Funder	Commercial investors
How it works	In 2017, Anglian Water became the first public utility to launch a green bond. Anglian Water is a UK provider that supplies water and water recycling services to more than 6 million customers. They have pledged to become carbon neutral by 2050 and through issuing this bond, raised the capital to help them toward this goal. Anglian Water's £250 million bond was issued across c. 80 investors for an eight year period, and priced at an annual yield of 1.625 per cent. The proceeds of the bond will be used to help Anglian water refinance sustainable water management project with a reduced climate footprint; reducing either energy or water use. They also plan to use proceeds for climate-adaptation projects to reduce flood risk.

In New Forest's Tropical Asia Forest Fund (TAFF), the funding type used is equity. The TAFF makes equity investments in sustainable timber plantations throughout Southeast Asia. The funders of the TAFF are commercial investors and social investors. While these investors provide upfront repayable funding in the form of equity, earned income through the sales of timber and rubber latex provide the TAFF with a non-repayable source of direct funding revenue.

[27] "Green Bonds," Anglian Water Group, https://www.awg.com/sustainability/green-bonds/; "ANGLIAN WATER PAVES THE WAY FOR UK GREEN BONDS," London Stock Exchange Group, 14/8/2017, https://www.lseg.com/markets-products-and-services/our-markets/london-stock-exchange/fixed-income-markets/anglian-water-paves-way-uk-green-bonds.

Case study 5: New Forests Tropical Asia Forest Fund[28]	
Description	**New Forests Tropical Asia Forest Fund** Sydney Australia Ongoing  Logging activity, Tobias Freeman
Financing mechanism	**Equity investment** 3.6 billion USD
Funder	Commercial investors, social investors
How it works	The Tropical Asia Forest Fund (TAFF) makes equity investments in sustainable plantation-based timber in Southeast Asia. The TAFF targets commercial rate returns on its investment through timber sales, rubber latex sales and capital appreciation of its timber investments. However, the TAFF also generates positive environmental, social and economic outcomes. Among these outcomes are sustainable forest management, reduction of CO2 emissions, land restoration, and rural job creation (at the end of 2017 the TAFF portfolio companies provided 2,000 jobs in rural areas of Southeast Asia). The TAFF manages investments across Malaysia, Laos and Indonesia.

4.5. Financing mechanisms for NBS

4.5.1. Direct implementation or promotion of implementation of NBS?

The previous section defined three primary types of funding: direct funding, debt and equity. These basic funding types can be implemented in many ways. We call these methods of implementation the **financing mechanisms for** NBS. These mechanisms are tools and structures for using the three funding types in practice.

In this section, we will highlight a variety of innovative financing mechanisms to fund NBS. While this section is not a comprehensive list of all the possible ways to fund an NBS, it should provide an overview of what options are available. This section focuses on the point of view of cities implementing NBS, although it should be relevant for many types of stakeholders, including businesses, charities, and investors.

[28] https://thegiin.org/assets/GIIN_Scaling%20Impact%20Investment%20in%20Forestry_webfile.pdf

From the point of view of cities implementing NBS, the EU funded Horizon 2020 project Grow Green (2019) found two main options for funding the development of NBS. Within each category we have outlined financing mechanisms that are being used for NBS. The first option, **Direct Implementation**, describes mechanisms for a government or city to implement a NBS themselves, while the second option, **Promote Implementation**, describes mechanisms for a government or city to induce or incentivises implementation by other actors through the creation of appropriate funds, financing mechanisms and financial incentives.

1. Direct implementation and maintenance of NBS projects through the planning parties' budget

Using different sources of financing for NBS includes exploring innovative ways to acquire access to financial resources that will allow cities to implement NBS themselves. These include:

- **Innovative use of public budgets**: such as pooling funding from different government departments or making use of previously untapped sources such as the public health budget.
- **'Green debt'**: loans accruing interest, which can be from public or private financial institutions, individuals, government, or commercial investors and can be through mechanisms such as green bonds, crowdfunding, and the Natural Capital Financing Facility (NCFF).
- **'Green equity'**: equity-based instruments, including equity investments and equity-based crowdfunding.
- **Grant funding and donations**: including EU funding; grants from regional and national public bodies; philanthropic contributions; and crowdfunding.
- **Instruments generating revenue:** (including value-capture mechanisms), such as revenues from land sales or leases; taxes (aimed at cost-recovery); ecological fiscal transfer (EFT), user fees; developer contributions or charges; betterment levies; voluntary contributions from beneficiaries; sale of development rights and leases; funds linked to offsetting or compensation requirements; and other voluntary schemes that generate revenues.

2. Promote the implementation of NBS or maintenance of existing NBS to other actors for their contribution.

- **Market-based instruments:** user charges; taxes (as incentives rather than a cost-recovery mechanism); subsidies; tax rebates; credit-trading systems; offsets for residual impacts on biodiversity/GI; and payments for ecosystem services (PES).
- **Revolving funds**: Investment funds where proceeds from prior investments provide a revolving flow of capital to top up the fund and finance further projects.
- **Creating Public-Private Partnerships:** PPPs are characterised by long term commitment by private parties, to provide a public asset or service.
- **Environmental or Social Impact Bonds:** EIB and SIB refer to the same scheme of an outcome-based contract. Private investment is put in upfront to fund the NBS and is then repaid by public bodies on achievement of pre-specified outcomes.
- **Developing 'Business Improvement Districts' (BID):** Corporations of a defined area join forces to set up their own management body to decide on financing improvements and generate income through diverse instruments.

4.5.2. Key financing mechanisms and instruments for NBS

We now summarise these mechanisms and instruments, with more detailed descriptions and examples of a few of the mechanisms below. Examples for each mechanism can be found in Annex 3.3.

Table 23 Key financing mechanisms and instruments for NBS

Innovative pooling of different government budgets	
Local government often carries the costs for creating, improving and maintaining NBS. While environmental budgets for nature and green spaces may not be sufficient, channelling funding from different government departments can be an innovative solution. Those may include: • Public health budgets • Public security/police budgets • Education budgets As benefits from nature to physical and mental health are studied and understood better, funding from the public health budget can be generated. Additionally, a growing evidence base shows the influence of well-designed and maintained green infrastructure on crime reduction. Therefore, funding from the public security/police budgets can be acquired. Interventions for a specific place or group, like schools and pupils have a high chance to receive funding from the education budgets. Different sectors can be examined for potential direct or indirect benefits from NBS, and financial resources can be provided in different forms.	
Green debt	
Loans	Loans from private or public financial institutions, or governmental funding, with a focus on sustainable project and finances.
Concessional financing (soft loans)[29]	A loan with an interest rate below the market rate can serve as incentive for including an NBS project, either within an existing project (infrastructure, water engineering works) or as a standalone project.
Green bonds	An instrument to raise capital through the debt capital market, similar to a loan, with the exclusive commitment to environmental beneficial projects. A fixed amount of capital is lent from investors (creditors) to the bond issuer (debtor). When the maturity, in a defined time period, of the bond is reached, the capital (principal) is repaid. A beforehand agreed amount of interest (coupons) is additionally paid to the creditors.

[29] https://www.oekb.at/en/export-services/covering-and-financing-exports/concessional-financing-soft-loan.html

	Green bonds are usually issued for significant amounts of funding, and therefore the NBS is likely to be part of a larger package of investment. Green bond investors tend to be commercial investors and social investors.
Crowdfunding	Crowdfunding can be used to raise debt with a set level of financial return. This could be at or below market rates.
Natural Capital Financing Facility (NCFF)	Financing facility set up by European Commission and the European Investment Bank to fund natural capital projects.
Green equity	
Equity finance	Equity raised to finance NBS. This could be public or private finance, including crowdfunding raised from individuals.
Grant funding and donations	
European Structural and Investment Funds (ESIF)	Grant funding for NBS. The Cohesion Fund and the European Regional Development Fund are suited for urban natural infrastructure.
Program for the Environment and Climate Action (LIFE)	Co-Funding for environmental projects, climate change adaptation and mitigation.
Horizon 2020	The EU Framework Program for Research and Innovation, supports NBS projects that involve said components, including CLEVER Cities, Naturvation and Nature4Cities.
Regional & national government grants	Like the Heritage Lottery Fund and the Big Lottery Fund, which are public bodies in the UK. They are distributing funds from the National Lottery. Funded projects include nature projects, as they focus on public benefits.
Philanthropic contributions	Charity, private or public foundations, citizens, private sector donors etc. are an unpredictable yet valuable source of funding for NBS projects. Donations are usually location specific.
Crowdfunding	A large number of individual participants donate or invest an amount of money selected by themselves. Usually used for small-scale projects, which hold public interests and are not necessarily suitable for other financing instruments. As crowdfunding is an unpredictable source for long-term funding, projects may require additional funding sources.

	Crowdfunding can be divided into the segments of reward-based crowdfunding and equity-based crowdfunding (also: crowdinvesting)[30]
Revenue-generating instruments	
Diverse mechanism referring to the generation of revenue from an NBS. Land sales/leases, taxes, developer charges or 'value capture' mechanisms, which seek a contribution from the benefiting parties, can be revenue-generating and secure long-term financing opportunities to maintain, improve or develop an NBS. Because there are many options for creating a revenue-generating instrument, proper adjustment for each individual project needs to be made. Planning parties, e.g. local authorities or businesses can identify a suitable mechanism according to their specific venture. Where upfront funding is required, the NBS project can secure funding through a debt-based instrument, e.g. green bonds at the beginning of the project.	
Land sales/leases	Capital can be generated from land sales and leases by government-owned land to provide upfront capital to develop and maintain NBS projects.
Taxes	Taxes under municipal authority or redistributed taxes from other levels can be seen as municipal income (Droste et al. 2017) and invested in NBS. As land-value capture strategy, a tax code can be developed to access the value of acclaimed land [31].
Ecological Fiscal Transfers (EFT)	The redistribution of tax revenue through government levels, for ecological indicators (like protected areas) (Kettunen and Illes 2017).
User fee	For example, introducing a nominal park entrance fee, user fees for sport pitches /other green space facilities or hiring out parks for private events can raise revenues for the maintenance of the park.
Developer contributions/charges	A strategy which involves one-off charges for property developers in order to receive development approval (Infrastructure Victoria 2016).
Betterment levies	One-off or recurrent payments by landowners or beneficiaries to capture the land value gain from a public project (Infrastructure Victoria 2016).

[30] Description on Statista.com for the 'Alternative Financing report 2019'

[31] https://www.goldmansachs.com/insights/pages/infographics/taking-the-heat/index.html

Voluntary beneficiary contributions	Private parties which benefit from public development pay negotiated settlement in order to cover some project costs (Infrastructure Victoria 2016).
Sale of ownership/development rights and leases	As a land-value capture strategy, delivered commercial opportunities by a project can be integrated (Infrastructure Victoria 2016). This can be the right to build near a new train station for example, or leases to vendors in a new park.
Funds linked to offsetting/compensation requirements	Compensation payments are required when developments imply negative impacts to nature. Improvement of nature projects will be financed from the pooling of those payments.
Other voluntary schemes	For example, Bologna, Italy, introduced a carbon footprint compensation scheme to pay for tree planting.
Market-based instruments MBI are tools for achieving a stated goal by providing incentives for private parties through altering economic signals.	
Reduction of user charges	User charges for 'grey' infrastructure (sewage charge) is reduced when green infrastructure is implemented (Sustainable Drainage Systems). Property owners are encouraged to install NBS in order to reduce their charges.
Taxes	Tax relief can work as an incentive to install NBS to reduce pressure for infrastructure or as a replacement for 'grey' solutions
Subsidies	Governments can provide a subsidy to cover (part of) the costs of installing NBS on private property. This can leverage the private benefits to landowners from NBS assets, to stimulate additional investments and increase public benefits.
Tax rebates	Similar to a subsidy, tax rebates have been suggested as a means of incentivising the management of green space by private individuals or landowners
Credit trading system (e.g. carbon credit, stormwater retention credit)	Credits in the form of permits are given out by regulating authorities, according to a set target. Companies can sell and buy these from another, according to their output. Used widely in the realm of air pollution/carbon, and now starting to appear in the realm of stormwater management.

Offset	Regulations can require a voluntary or mandatory compensation for developments detrimental to nature. The demanded offset can be the implementation or improvement of natural infrastructure, or a financial contribution.
Payments for Ecosystem services (PES)	A financing scheme where payments are made by the beneficiaries of the ecosystem services to the land manager, who will provide the flow of them. The generally voluntary payments can be output- or input-based, depending on the intended action or state of the natural infrastructure.
Revolving loan funds	
Investment funds where proceeds from prior investments provide a revolving flow of capital to top up the fund and finance further projects. They can be held on diverse administrative levels to serve as gap financing program, to foster development, and can be multi-geography or specific to a distinct area / municipality.[32]	
Public-private partnership	
PPPs are characterised by long term commitment by private parties, to provide a public asset or service. The private party does hold management and risk responsibility. Operations and maintenance contracts, leases, concessions etc. can be forms of contracts in public-private-partnerships. Public-private-partnerships can be adapted into different stages and scales throughout a project, given the availability of suitable partners.	
Environmental or social impact bonds	
EIB and SIB refer to the same scheme of an outcome-based contract. Private investment is put in upfront to fund the NBS and is then repaid by public bodies on achievement of pre-specified outcomes. The performance risk is therefore distributed between private actors (investors) and the public body, and the rate of return is not fixed; local and central government only pay for success.	
Business improvement district	
BIDs serve to improve commercial or industrial environments. Business improvement districts originate from Ontario and became popular in Europe and the US. Corporations of a defined area join forces to set up their own management body to decide on financing improvements and generate income through diverse instruments.[33]	

[32] https://www.cdfa.net/cdfa/cdfaweb.nsf/pages/revolving-loan-funds.html

[33] Sandfort 2018 in ThinkNature D7.1 p 28

4.5.3. Innovative financing mechanisms: examples from case studies

Often, a shift of financial responsibility from a governmental authority towards private funding needs to be made in order to meet the financing demands of NBS. Leveraging private funding through innovative financing mechanisms, fiscal instruments or other mechanisms can help to address this situation, including involving the newest socio-economic and technological developments, such as digitalisation (Coles et al. 2019). Here, we look in detail at three key innovative financing mechanisms to consider: subsidies, impact bonds and crowdfunding.

4.5.3.1. Milan's green roof subsidy

The municipality of Milan set up a subsidy scheme for green roofs and walls. This funding scheme is innovative for NBS funding – which is traditionally grant-funded by government. It used a subsidy to attract co-investment by businesses and citizens to pay for the distributed benefits of NBS.

In June 2019 Milan began an awareness raising and promotion campaign. In an open call, the public bid 'BE2 – Building Energy Efficiency' was launched, with municipal co-funding of €1.1 million, which opened for applications from November to December 2019. During the grant procedure, applicants (public or private) need to describe the design of the green roof/wall and foreseen expenses.

After a feasibility check based on a preliminary control of the static characteristics of the roof, Milan's municipality will take the decision as to which submissions will become one of 10 CLEVER Cities pilot projects. These face a more exhaustive set of criteria, but receive a higher 35% subsidy plus funding towards technical support, while funding of 25% subsidy and a more limited set of criteria is implemented for the other projects.

The municipality will share a list of experts from a public tender for green roof construction to the selected applicants. The green roof experts, who will receive active support from CLEVER partners, will guide co-planning and co-implementation.

The first green roofs are expected to be built in August 2020. The monitoring and evaluation for the 10 CLEVER pilot projects will contain technical monitoring for environmental benefits as well as surveys and interviews for social and economic benefits.

This subsidy is an example of government funds being used as a market-based instrument in order to leverage private funds to finance NBS at scale. By offering subsidies to reduce the cost of implementation below market rates, the government funding can be used to achieve greater scale of NBS implementation within Milan. The monitoring should hopefully demonstrate the financial, environmental and social benefits of the green roofs compared to grey roofs, reducing long-term costs and increasing demand for green roofs in the future.

Case study 6: Milan Green Roofs/Walls[34]

[34] CLEVER Cities, "CAL-specific co-implementation plan," 2019.

Description	**Milan Green Roofs/Walls – Building Energy Efficiency** Milan, Italy 2019 – present  Urban green roof, chuttersnap.
Financing mechanism	**Grant funding, Direct funding (Blended Finance)** € 1.1 million
Funder	Municipality of Milan, private funding, EU funding
How it works	Milan is co-funding €1.1 million to realize green roofs and walls through its public bid "BE2 – Building Energy Efficiency." In this grant procedure, the municipality of Milan will subsidize building owners (private or public) 25-35% of the costs of building green roofs/walls. Milan will provide experts in technical assistance and monitoring devices through the budget from EU programme CLEVER cities. For 10 CLEVER pilot schemes, €7,000 will be available for this technical support. The subsidy is part of the city's funds for energy efficiency, which is part of an overall strategy to increase urban nature in the city in order to improve air quality, decrease run off and enhance citizen well-being.

We have not included examples for other CALs from CLEVER Cities in this section as the majority of these are grant funded, by both Horizon 2020 and the cities themselves. It is important to note that financing does not have to be innovative in and of itself: cities should look for the simplest financing mechanisms possible to achieve their aims. Grant funding can allow for greater innovation in the NBS themselves due to less financial pressure.

However, when there are a variety of stakeholders involved and valuing the NBS, innovative financing can be a useful tool to implement and scale NBS when direct funding is not available or appropriate. Cities should take the time to evaluate their individual circumstances, and the step-by-step guide in section 4.7 is intended to help cities to do this.

4.5.3.2. Environmental and Social Impact Bonds

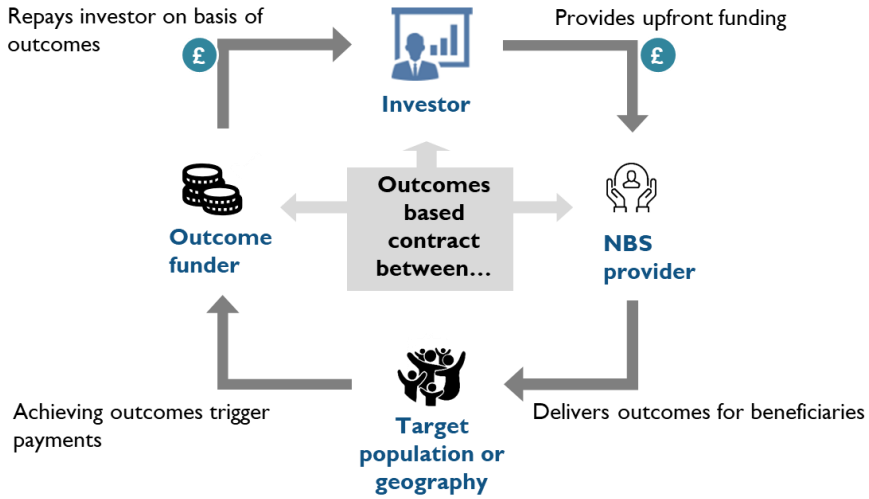
Environmental and social impact bonds are innovative financial instruments to leverage private investment for high-impact environmental programs. They are a type of payment by results contract, where investors pay for the up-front costs of a project, programme or service, and are repaid (with

interest) by a commissioner (i.e. local or central government) if and only if pre-defined environmental or social outcomes are achieved. This transfers performance and financial risks from the providers and the commissioners to private investors, as seen in Image 2 below.

Impact bonds are an innovative way to leverage private investment in NBS, as well as encouraging municipalities and other government bodies to invest in NBS by reducing the risk. They are most likely to be applicable when there are clear, measurable outcomes that the commissioner values and is willing to pay for, and the likelihood of success is great enough to bring private investors on board.

For these reasons, environmental impact bonds are most commonly seen in NBS that reduce tangible costs (such as stormwater treatment or flooding) and can be addressed through measurable changes (such as the reduction in stormwater runoff). Social impact bonds measure social outcomes, such as an increase in public health and well-being. These can be harder to directly attribute to an NBS. However, if this can be done, then this could be an effective financing mechanism for NBS.

Image 2: Impact bond structure



Source: Social Finance, "What is a Social Impact bond," 2020, PPT Deck

Case study 7: Buffalo Sewer Authority Environmental Impact Bond[35]	
Description	**Buffalo Sewer Authority Environmental Impact Bond** Buffalo, NY, USA Launched February 2020

[35] https://buffalosewer.org/app/uploads/2020/02/Environmental-Impact-Bond-PR.pdf

Financing mechanism	**Environmental Impact Bond** $30 million
Funder	The City of Buffalo (outcomes payer) Ralph C. Wilson Jr. Foundation and the Community Foundation of Greater Buffalo (upfront costs of NBS)
How it works	The EIB targets the deployment of green infrastructure on private properties with large amounts of impervious surfaces, to reduce stormwater runoff and help eliminate the effects of combined sewer overflows on Buffalo's waterways. In order to incentivise private property owners to agree to install and maintain green infrastructure for this purpose, charitable foundations fund the building of these NBS. If the desired outcomes are achieved (reduced stormwater runoff), the City of Buffalo will pay an outcomes payment to the private property owners. This reduces the risk to the municipality, and also incentivises the property owners to take up the scheme and adequately maintain the NBS.

4.5.3.3. Crowdfunding

Crowdfunding and Crowdinvesting are alternative financing instruments, where financial resources are generated by a wide range of private or public investors without the involvement of a bank or other large financial institution, usually done via online platforms. The European Commission (undated) explained crowdfunding, its different types, risks and additional benefits[36] which will be briefly introduced in this subsection.

The interaction between fundraisers and the crowd is made through crowdfunding platforms, where financial pledges are made and collected. The platforms usually charge a fee if the fundraising campaign is successful, for providing a secure and easy to use service. The 'all-or-nothing' model is a common funding model that platforms operate on. This concept follows the idea that only if the fundraiser reaches their target, money flows, otherwise invested money will be returned to the investors.

Whereas the most common types of crowdfunding are peer-to-peer, equity and rewards crowdfunding amongst profit-making SMEs (small and medium enterprises) and start-ups, there are many more, including the use of crowdfunding for community projects supported by municipalities.

Types of crowdfunding:

- Peer-to-Peer Lending: Similar to traditional loan, but money is borrowed from many individual lenders, and will be repaid with interest. This form of crowdfunding is unlikely to be relevant for financing NBS, although we do include a case study below where it is used to financing a digital tool to help inform the installation of NBS (Case Study 10: GREENPASS)

[36] European Commission (undated) Guide on crowdfunding. Available at: https://ec.europa.eu/growth/tools-databases/crowdfunding-guide_en (13.04.2020)

- Reward-based Crowdfunding: Donations for a project or business, where in a later stage a non-financial return such as a product or service is expected. For example, Coca-Cola launched in 2018 a fundraising campaign to test interest in the bottled water brand Valser, where donators received the product according to the donated amount[37].
- Donation-based Crowdfunding: Donations for a specific charitable project are made by many individuals to reach the campaign goal, without the expectation of financial return. In some cases, the donations may be for the building of a community asset (e.g. a community garden) which may have some non-financial value for the individuals.
- Debt-Securities Crowdfunding: Companies or projects issue debt security instrument, such as a bond, where many individuals can invest for a fixed rate of return.
- Equity Crowdfunding: Similar to a stock exchange, a stake in a business is given in return for investment. This can start from a very small amount, and so can be useful in community projects, for example, or for revenue-generating companies to raise smaller amounts of funding (see Case study 9: Stadtfarm Crowdfunding)

There are several benefits of crowdfunding beside it being an innovative way to finance a project or business. For one, it is a **powerful marketing tool,** helpful in raising awareness of your NBS. It can also give a **validation** to a project or concept, as the will of investors to contribute serves as a test of the strength of the idea. For example, if a community supports a crowdfunding campaign for a local NBS strongly, local government may be persuaded to increase their contribution. In a fundraising campaign, many individuals are addressed, some of which may be in a position to help with **expertise and insight without additional costs**. Crowdfunding allows interaction and gaining valuable feedback from the accessed crowd. Additionally, a successful fundraiser can be a proof of your concept, which can be useful when trying to **attract additional financing** from other financiers.

Below are some examples of how crowdfunding can be used to finance NBS.

Case study 8: Crowdfund London[38]	
Description	**Crowdfund London on Spacehive** London, UK Annual scheme
Financing mechanism	**Crowdfunding and match funding** £4.4m to date
Funder	Members of the public, match funded by the Mayor of London

[37] https://olddognewtricks.com/coca-cola-tests-crowdfunding-innovation/ and https://www.indiegogo.com/projects/valser-coca-cola-co-s-secret-from-the-swiss-alps#/updates/all

[38] https://www.spacehive.com/movement/mayoroflondon

How it works	Crowdfund London is an annual scheme run by the Mayor of London on Spacehive, a crowdfunding platform. It was the world's first city-wide civic crowdfunding programme and has funded a total of £4.4m of community projects to date. Local groups pitch ideas on Spacehive in order to meet their funding targets. The Mayor pledges up to £50k to selected projects, based on the quality of the idea, its potential impact and the strength of local support. City Hall's regeneration team are also on hand to advise projects on delivery and make useful connections. The backing of the Mayor increases support and success rates of projects. In future, City Hall is looking to bring in more foundations, councils and corporates to boost crowdfunding. While the platform is not exclusively for NBS projects, it has been used to fund NBS projects such as the Camden Highline, the rewilding and transformation of a disused railway into a sustainable green space and transport link[39].

Case study 9: Stadtfarm Crowdfunding[40]	
Description	**Stadtfarm Crowdfunding** Berlin, Germany 2020  Aquaponic system, Shawn Ang
Financing mechanism	**Equity Crowdfunding** €350,000
Funder	Citizens, social investors
How it works	StadtFarm is a company that uses aquaponics systems to sustainably produce fish and vegetables in a closed water cycle. Their systems aquaponics system save water, land and reduce greenhouse gas emissions compared to conventional agricultural and can be built within urban settings. They generate revenue from selling fish and vegetables to restaurants and citizens. StadtFarm ran a crowdfunding campaign to raise €350,000 for a 7% equity stake in their company. This funding is to build a second aquaponic system in Berlin. Over 367

39 https://www.camdenhighline.com/
40 https://www.seedrs.com/stadtfarm

	individuals invested in their campaign, investing on average €1,000 each to support StaftFarm's project and possibly generate profit on their investment.

Case study 10: GREENPASS[41]	
Description	**GREENPASS Crowdfunding** Vienna, Austria 2018-2019  Parking lot garden, danist07
Financing mechanism	**Crowdfunding (Peer-to-Peer lending)** €300,000
Funder	Private individuals and cooperate investors
How it works	GREENPASS is an easy to apply software, which enables efficient and resilient city planning and architecture. It aims to visualise and quantify the effects of blue and green infrastructure, to make it comparable to standard building solutions. After successful appliance in Austrian project, GREENPASS stepped up to expand on an international level. In 2018, a fundraiser was launched, which offered a subordinated loan with 6% of fixed interest (additional +0.5 % for investment higher than €5000) with a timeframe of 5 years and 3 months. Based on the revenue, an annual profit-share is part of the crowdfunding scheme. 241 Investors supported the crowdfunding campaign until its end in April 2019. While not an NBS itself, GREENPASS is a tool to promote the uptake of NBS in cities.

Identifying the financing mechanism which will suit your project depends on a range of factors. It will depend on the scale of the project and its specific requirements, who the beneficiaries and other stakeholders are, and who will implement and maintain the project, as well as the potential for revenue streams. Knowing which services an implemented NBS will provide and to whom, and the associated costs and revenues is fundamental to identifying appropriate financing mechanisms. A way to work through this is to create a detailed financial model for your NBS.

[41] https://greenpass.io/

4.6. Financial model

After the components of the NBS financing solution are identified (NBS, benefits, funders, funding type, financing mechanism), a critical element of verifying feasibility is to build a financial model. A **financial model** is a simplified representation of a project's real financial situation. The model will be used to make projections, and answer questions such as: How much cash is needed for upfront costs?, What are the potential returns to investors?, How and when does the cash move into and out of the project? and How do costs and revenue change over time? The projections of a financial model will show if the financing solution for a project is viable.

The model will also allow testing of various potential results to help form judgements on low, medium and high success rates and the resulting consequences for project stakeholders, in terms of benefits realised and financial returns paid to funders.

Building a financial model for an NBS financing solution involves a few primary components that need to be analysed:

1. Inputs:

The creator of the financial model will collect key figures to make predictions about the finances of the NBS. These inputs will include assumptions on timings, costs and revenue.

Costs: this category includes costs such as development of the NBS solution, installation or building of the NBS, ongoing management costs, ongoing maintenance costs, external service fees (e.g. legal, accounting, insurance), and cost of capital such as a loan.

Revenue: this category includes any revenue to the NBS such as ongoing grants, direct funding, and earned income such as usage fees.

Timing: this category includes projections on when things occur, such as length of time to develop / build the NBS, timings of costs and revenue occurring, length of time in which the financial model will make projections, etc.

2. Financial statements:

The next step of building a financial model will be to use your inputs to map out operations which are summarised by three financial statements – income statement, balance sheet and cash flow statement. This step might require hiring specialist support or relying on financial and accounting professionals within the organisation. There are many publicly available resources that provide guidance and templates for this step.

3. Outputs:

The final step of the financial model involves using the financial statements to understand key outputs of the model. This includes projections on data points such as the amount of upfront funding or investment needed, the amount of ongoing revenue needed to cover ongoing costs, the possible rate of return on the investment (if there is one), taxes due, and amount of funds available in the project at all times. At the output stage, viability of the financing solution will become more clear, and adjustments

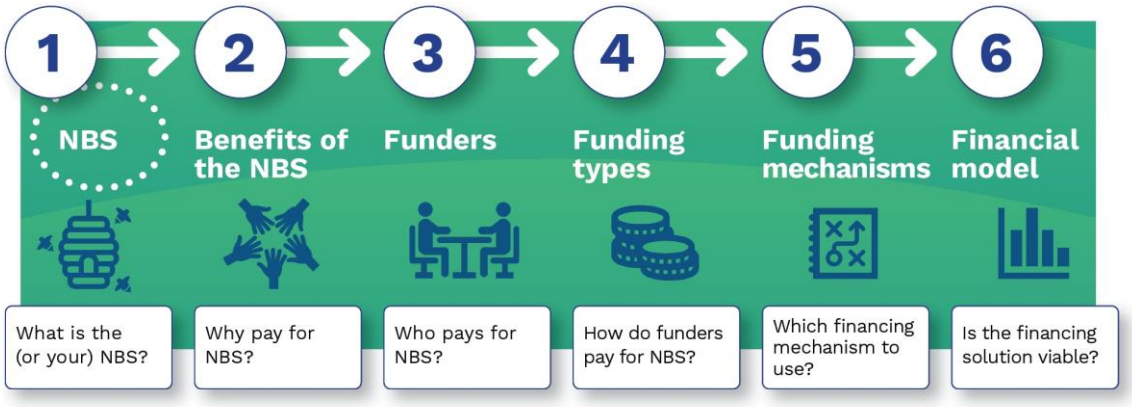
may be made to correct aspects of the solution that are non-viable (for example, a project may need higher upfront funding than expected).

4.7. Building a financing solution for NBS

4.7.1. Step-by-step guide for financing NBS

This step-by-step guide can be used by cities to guide them through the process of finding the right financing mechanism for their NBS. It is a structured way to define benefits, funders, business models and financing mechanisms, which can then lead to the creation of a viable and sustainable financial model. It is designed to be printed out and filled in by cities to help them think through their financing solutions for NBS.

This guide follows the steps of our Chart 1: Steps for creating an NBS financing solution.



Step 1: What is your NBS?

This could be:
A single NBS (e.g. a community garden, a green roof)
A local cluster of NBS
A borough/city/region-wide scaling of NBs

Step 2: What is value / benefit generated from your NBS?

Consider the key issue areas below and see where your NBS could provide benefits or add value – check as many as applicable, and then articulate exactly what these benefits are and how your NBS brings them (consider creating a theory of change):

- ❑ **Climate mitigation and adaptation**:
- ❑ **Water management**: the sustainable management of water resources
- ❑ **Coastal resilience**: maintaining or restoring the key ecosystem services provided by coastal areas and protection communities from things like storms and water erosion
- ❑ **Green space management**: (including enhancing/conserving urban biodiversity): the management of green and blue spaces (areas based on natural elements) improving the current status of a parameter or driver through active or passive behaviour, in this case through reducing greenhouse gas emissions or sequestering carbon
- ❑ **Air/ambient quality**: air quality, particularly in respect to pollutants
- ❑ **Urban regeneration**: Urban regeneration aims at improvements in the economic, physical, social and environmental conditions of an area that has been subject to negative change and is considered vulnerable
- ❑ **Participatory planning and governance**: Planning approaches and governance architectures that support accessibility to green spaces
- ❑ **Social justice and social cohesion**: recognising the diverse requirements, rights and duties of a diverse set of social groups; this may span environmental, distributional (equality of distribution), procedural (inclusiveness, fairness), and recognition-based (e.g. excluded groups like disabled, migrants) justice.
- ❑ **Public health and well-being**: physical and mental health and wellbeing of individuals
- ❑ **Potential for new economic opportunities and green jobs**: co-benefits of green areas on urban environment, e.g. increased real estate values, improved water management, recreational services, positive health effects
- ❑ **Urban biodiversity:** increase in the variety and variability of living organisms found in an urban environment
- ❑ **Enhancement of natural capital**: enhancing the quantity, quality, location and accessibility of natural capital

- ❑ **Commercial case:** your NBS may stack up on regular financial terms if e.g. there is a good revenue model, such as entrance fees

In creating your theory of change, you should also think through (i) how to measure the benefits (e.g. before and after measurements of flooding or jobs created), (i) how to evaluate these benefits and attribute them to your NBS. Different funders will have different levels of scrutiny in how they will want this done: consider your context.

Step 3: Which stakeholders value these benefits and could fund your NBS?

Consider which of these main types of funders would value and pay for your benefits. Tick as many as you can – you want to be flexible and attract as much funding as possible to your NBS:

- ❑ Central government
- ❑ Local government
- ❑ Philanthropy and charity
- ❑ Commercial investors
- ❑ Social investors
- ❑ Citizens (crowdfunding)
- ❑ Other

One way to determine who may fund your NBS is to map out your business model based on the theory of change for your NBS. This will help you work out how to capture the value of your benefits and find funders to pay for this value created

Naturvation business models:

- ❑ Risk reduction
- ❑ Green densification
- ❑ Urban offsetting
- ❑ Vacant spaces
- ❑ Local stewardship
- ❑ Green health
- ❑ Green education
- ❑ Green heritage

Step 4: How and when might these stakeholders fund your NBS?

Now see how this can align with different types of funding.

Funding options:
Non-repayable:
- ❑ Direct funding / grant

Repayable:
- ❑ Debt – commercial or subsidised rates
- ❑ Equity – commercial rates or subsidised rates

If your NBS will generate revenues in the future, you can consider repayable finance – the level of these revenues will determine whether this needs to be concessional or not.

Again, you should tick as many funding options as possible to start with, before narrowing down what is most likely through conversations and further refinement of your business and financial model
Some funders might be appropriate for set-up or early stage funding, while others may be more appropriate for maintenance or longer-term funding

Step 5: Which financing mechanisms are most appropriate for your NBS?

Given your NBS, are you looking to:

❑ Directly implement and maintain the project yourself; or
❑ Promote the implementation and maintenance by others

You also need to keep in mind the types of funders and funding that are appropriate for your NBS, as decided in steps 3 and 4

If you are looking to directly implement the NBS yourself, some innovative financing mechanisms to consider include:

❑ Innovative use of public budgets and pooling between departments ***(non-repayable)***
❑ Green debt ***(repayable)***
❑ Green equity ***(repayable)***
❑ Grant funding and donations ***(non-repayable)***
❑ Revenue-generating instruments such as revenues from land sales, taxes, developer chargers ***(non-repayable)***

If you are looking to promote others to implement your NBS, some innovative financing mechanisms to consider are:

❑ Market-based instruments such as subsidies, credit trading systems, offsets ***(non-repayable)***
❑ Revolving funds ***(repayable)***
❑ Public-private partnerships ***(repayable)***
❑ Business Improvement Districts with an NBS focus ***(non-repayable)***
❑ Impact bonds ***(repayable)***

These are just some examples of financing mechanisms that could be used to fund your NBS – there are many others out there. Given what you know about your funders and business models, you should explore all possible options to find the right one.

Step 6: Building your financial model

Bringing all of your financial information and projections together into a financial model is an important step in ensuring the viability and reliability of your financing solution. The model can be updated and added to as your plans develop. The key areas to think about are:

1. **Costs**
   - **a) Set up costs**
     - i. Staff costs (including taxes, pensions and benefits)
     - ii. Overheads (such as rent, recruitment, travel, IT equipment, legal costs, audit etc)
     - iii. Materials
     - iv. Tax
     - v. Contingency (e.g. 10%)
   - **b) On-going costs**
     - i. Staff costs (including taxes, pensions and benefits)
     - ii. Overheads (such as rent, recruitment, travel, IT equipment, legal costs, audit etc)
     - iii. Materials
     - iv. Financing costs (capital and interest payments)
     - v. Tax
     - vi. Contingency (e.g. 10%)

2. **Revenues**
   - **a) Funding revenue (e.g. grant income or loan income)**
   - **b) Earned revenue (e.g. entrance or user fees)**

For both costs and revenue, the **timing** of when they will occur as well as the **amount** is vital to ensure your chosen financing mechanism is right for you NBS.

For example, if you choose a form of repayable finance, but you don't think you'll start earning any revenue for the first 2 years, you will need to make sure you have **a repayment holiday** before starting to repay the loan.

We recommend making sure **your financial model is built over a sufficient time line** (e.g. 2-5 years) and on a monthly or annual basis

An example of a high level financial model of an NBS with positive and increasing revenues that could potentially take on repayable finance and break even after 5 years:

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	€0	€1,500	€5,000	€7,500	€10,000
Costs	€10,000	€5,000	€2,500	€2,500	€2,500
Net revenue	- €10,000	- €3,500	€2,500	€5,000	€7,500
Cumulative	- €10,000	- €13,500	- €11,000	- €6,000	€1,500

4.7.2. Worked example

To demonstrate how this guide might be used in practice we have worked through an example below:

Example 1: Woodland Restoration Project		
Example NBS project	A local government is planning to build a woodland forest on a large plot of land previously cleared for agricultural use. They are looking for a financing solution which will fund the upfront and ongoing costs of maintaining the woodlands.	 Woodland area, Lukasz Szmigiel
Example financing solution	Local government pays for the building of the woodland forest through cross-departmental funding from the national environmental budget and the local health budget. Additional grant funding to support forest biodiversity is obtained from a wildlife philanthropy. After the woodland forest is built, ongoing maintenance fees are supported through earned revenue through public use of the forest for hiking and camping.	

Step 1: NBS – What is the NBS?

The NBS selected in this project is a woodland forest.

Step 2: Benefits of the NBS

A woodland forest provides a number of benefits. The trees ability to capture and store carbon contributes to benefits for air quality and climate mitigation and adaptation. As the trees will be planted on unused land, the forest will provide a benefit for green space management by increasing positive utilisation of the space. If the woodland forest favours a variety of species, it will benefit biodiversity, and if is made accessible to local residents there may be additional benefits for public health and wellbeing. There can also be ongoing revenue (commercial benefits) generated by the forest. If it is made accessible to local residents, the local government expects that it can charge fees such as parking fees and overnight camping fees.

- ☑ Climate mitigation and adaptation
- ☐ Water management
- ☐ Coastal resilience
- ☑ Green space management
- ☑ Air / ambient quality
- ☐ Urban regeneration
- ☐ Participatory planning and governance
- ☐ Social justice and cohesion
- ☑ Public health and well-being

- ☐ Potential for new economic opportunities and green jobs
- ☑ Urban biodiversity
- ☐ Enhancement of natural capital
- ☑ Commercial case

Step 3: Funders

There are a number of stakeholders who might be interested in paying for the NBS benefits outlined above. Below are potential funders and the benefits they might be interested in paying for:

- ☑ Central government *(air quality, climate mitigation and adaptation, health and wellbeing)*
- ☑ Local government *(green space management, health and wellbeing)*
- ☑ Philanthropy and charity *(biodiversity, health and wellbeing, climate mitigation and adaptation)*
- ☑ Commercial investors *(commercial benefits)*
- ☑ Social investors *(commercial benefits)*
- ☑ Citizens *(health and wellbeing)*
- ☑ Other *(commercial benefits)*

The project might be able to utilise a number of the Naturvation business models: the urban offsetting model, the vacant spaces model, the green health model, and the green education model.

- ☐ Risk reduction
- ☐ Green densification
- ☑ **Urban offsetting: For example, if developers help to fund the woodland from the development of real estate within the city**
- ☑ **Vacant spaces: As the land has been cleared and is currently unused, and there is entrepreneurial potential for the woodland**
- ☐ Local stewardship
- ☑ **Green health: the health and wellbeing value of the woodland for recreational use can be recognised and used to finance the woodland**
- ☑ **Green education: For example, if the woodland and the resulting increase in biodiversity is used to create educational opportunities for local residents, such as through nature trails and outdoor activities**
- ☐ Green heritage

Step 4: Funding types

Based on the funders identified in the above step, there are many possible funding types available for this project.

- ☑ Direct funding / grant
- ☑ Debt
- ☑ Equity

It is clear at this step that there are multiple combinations of funding types and funders that might be interested in paying for this NBS project. In the next step we can explore some particular financing mechanisms that could apply to this woodland restoration project.

Step 5: Financing mechanisms – Which mechanism in this funding type fits best?

1. Innovative use of public budgets and pooling between departments – because this NBS project has benefits that span public health, environment, and air quality, it would be a sensible project to be funded through the financing mechanism of pooled budgets. For example, this project might draw on parks / green space budgets, health budgets, education budgets, or climate change budgets.
2. Revenue generating instrument – because this NBS has the ability to generate revenue from public use of the forest, for instance use of the space for hiking, camping, educational programmes, or other uses, there is option to plan a revenue generating financing mechanism for the project.

Step 6: Financial model

In this final step, a very simplified financial model for the project is outlined, as an example. The model summarises major revenue and costs, and their sources, as well as the key timings of inputs and outputs.

The restoration project expects the forest will cost 1,000,000 € for set-up costs, including development, land clearing and planting. The ongoing maintenance cost for the woodlands will be 80,000 € annually, and include the costs to maintain hiking trails and the costs of staff.

The project expects that it can raise the €1,000,000 in grants and direct funding in Year 1 and €200,000 in Year 2 from a combination of public environmental budgets, the local health budget, and a grant from a nature-focused philanthropic donation. The project expects it can earn income from services including parking and hiking fees, licensing, and educational and training events. It projects these income streams will scale up from €30,000 in Year 2 to €100,000 in Year 5. These values are shown below.

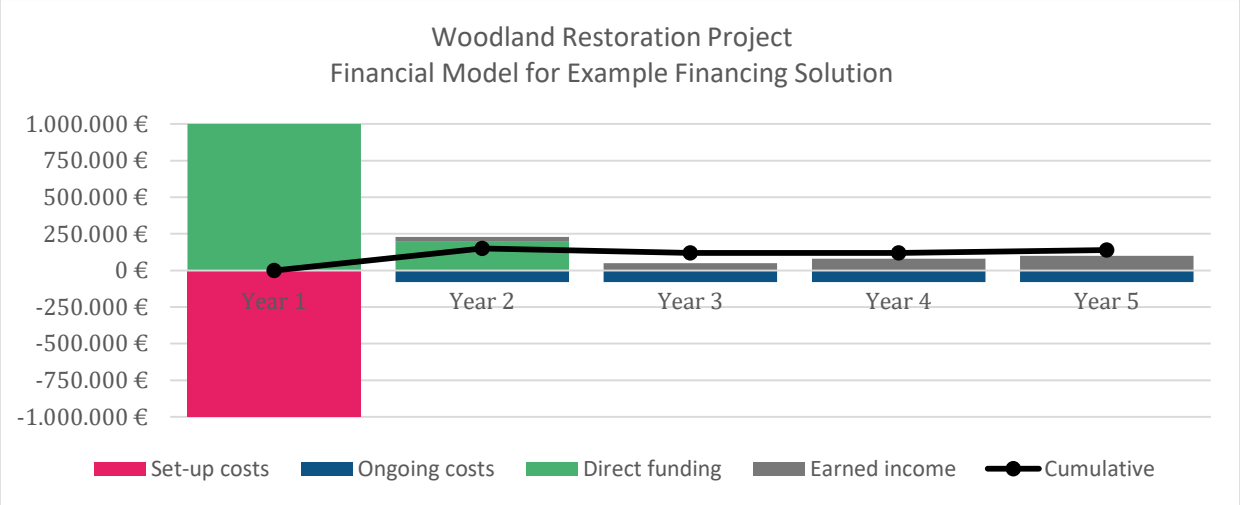
Table 24 Woodland Restoration Project Costs and Revenue by Year (€)

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue					
Direct funding	1,000,000	200,00	0	0	0
Earned income	0	30,000	50,000	80,000	100,000
Costs					
Set-up costs	-1,000,000	0	0	0	0

Ongoing costs	0	-80,000	-80,000	-80,000	-80,000
Net revenue	0	150,000	-30,000	0	20,000
Cumulative income	0	150,000	120,000	120,000	140,000

These projections are modelled with a financial model, and the project believes that if their projections are correct, they will need upfront grant investment and that by year 4 the annual earned income should cover ongoing costs. They project a positive net cash balance over the first five years of the project. A summary of the financial flows are shown below:

Chart 4: Woodland Restoration Project Costs and Revenue by Year (€)



The final financing solution for this project is as follows: Local government pays for the building of the woodland forest through cross-departmental funding from the national environmental budget and the local health budget. Additional grant funding to support forest biodiversity is obtained from a wildlife philanthropy. After the woodland forest is built, ongoing maintenance fees are supported through earned revenue through public use of the forest for hiking and camping.

4.8. Conclusion

Financing of NBS in cities can take many different forms, and various innovative mechanism for this have emerged in recent years. For any city looking to implement NBS, whether this is a one-off project or a scaling up of NBS across the city, it is important to look closely at your NBS and find the right financing solution.

We have outlined in this report a six-stage approach to take cities from the inception of their NBS to a detailed financial model, with supporting business model, that can be used to identify and engage the relevant stakeholders and to attract investment. Our approach can be summarised as follows:

1. Define your NBS
2. Define and quantify (if possible) the benefits attributable to your NBS
3. Analyse which stakeholders value your NBS and the attributable benefits, and determine which of these could be potential funders
4. Analyse which funding types could be used successfully, particularly by identifying a suitable business model
5. Determine which financing mechanism aligns best with the incentives of funders, to attract the right type and level of investment for your NBS
6. Create a detailed financial model to support the financing solution determined, and to guide conversations with potential funders to secure financing for your NBS

While in some cases this could be a straightforward process, if the NBS is small and created to fit into an existing grant funding call for example, in other cases this could be a complex process. Especially when the aim is to scale up the implementation of NBS, innovative financing mechanisms such as the ones we describe in section 4.5.5 can be useful and should be considered strongly.

Cities should expect to work with multidisciplinary teams to achieve this, bringing in expertise from the designers of the NBS themselves to those with financial and procurement expertise. It can be a long process, with multiple iterations and many conversations with stakeholders to secure the right funding for your project. Cities should build this time into their planning timelines. Using this time effectively to build lasting partnerships and knowledge can be beneficial for the long-run future of NBS within your city.

Finally, cities should continue to exchange information between themselves on successful processes and approaches for funding NBS. This knowledge exchange will help to build the expertise and innovation needed to scale NBS.

Conclusion

A. Conclusion Governance Models

Finding the right governance model for NBS depends to a great extent on the local context and needs and there is no one-size-fits-all solution. But what are the decisive features of collaborative modes of governance that enable co-creation and multi-stakeholder collaboration so urgently needed for design, implementation and maintenance of NBS?

In the governance models report we intended to outline these features in the five identified fundamentals of CLEVER governance. We looked at how the CLEVER FR Cities are employing these fundamentals to illustrate their applications. We also delineated recommendations to support other cities in identifying their individual pathways. Thus, we built a system of pick and choose wherein each city, depending on their needs, can focus on the recommendations of their choice for each fundamental, to constitute a collaborative governance model tailored to its needs and context (look at Fig. 12). The five fundamentals of governance are as follows:

1. Build institutional structures and arrangements for co-design;

Depending on the type of NBS, different stakeholders might have to be involved in institutional structures. A first step towards creating a **multi-stakeholder working structure** is to identify the stakeholders based on the capacities and resources required for the NBS at hand. Establishing stakeholders categories can help you do that in a systematic way (i.e. expertise, partners, mediators, promoters, ally). Consider creating a core team with balanced management roles and responsibilities to cover the most important resources and expertise needed for NBS design, planning, implementation and monitoring.

It is further important to develop **institutional arrangements that suit your needs** and context with a focus on establishing and maintaining long-lasting collaboration and breaking silos. Consider setting up working groups with regular meetings and common work procedures. Since citizen and private actor participation plays such a crucial role in NBS, transparency in decision-making is imperative for winning their trust and commitment. One way to ensure this is by formalizing their participation in institutions and decision-making.

Finally, **finding allies to secure long-term co-management and co-maintenance of NBS** is decisive in light of scarce municipal financial resources and capacity. We outlined three enablers for that: i.e. building ownership on behalf of residents and end users through trainings; find stakeholders where you can link in with their existing priorities and interests (i.e. green curricula of schools, etc.); formalize co-

maintenance responsibilities in agreements (for instance with the private sector, or citizens); or consider creating a new role with pertinent responsibilities (such as an in-residence community gardener).

2. Create a supportive policy framework;

Policy instruments can be powerful tools, not only for creating an enabling environment for the sustained uptake of NBS, but also for enabling collaborative governance arrangements underlying them. There are different ways to support a supportive policy framework or harness the current one: You can use windows of opportunities, such as the **drafting or review of urban policies and plans to integrate and promote NBS**. You should always consider and assess the feasibility of **piggybacking with ongoing or planned urban redevelopment (or related) projects to bring NBS into your city.** Don't forget **public bids** and similar procurement procedures which lend themselves to the **integration of co-creation as a criterion** for the implementation of NBS.

3. Foster citizen engagement;

For a successful NBS deployment, it is essential that you **engage citizens, especially unusual suspects, in a timely manner, using varied and suitable modes of engagement**. The engagement, meaning not just consultation but rather collaboration or empowerment ensures that there is a sense of co-ownership and high level of trust among citizens and public authorities. However, higher the engagement, more the chances of varied voices in the room with possibly conflicting viewpoints. Nevertheless, to make sure there is maintenance and management of the NBS beyond the project's lifetime and a sense of ownership during, it makes sense to **ensure wider representation** and that all voices are heard.

Furthermore, you should **employ an experienced partner to facilitate** the engagement process since a good level of engagement is a tricky process and if not dealt with delicately and in skilfully; it can be counterproductive to the NBS implementation. Another significant bit is that you ensure that the **citizens are engaged at the appropriate stage**, at best at the early stages of planning and decision making. However, at times it makes sense for you to develop some initial ideas, before presenting it to the relevant stakeholders and general public.

It is **not only about dissemination, advocacy and promotion but also knowledge exchange**. There is a lot of local knowledge which can go underutilized if the engagement process isn't adequate right from the start. However, you also need to think of a system of incentivising the engagement of local people and rewarding those that continuously work towards the common vision.

4. Foster experimentation and learning;

Iterative learning and reflectivity form an integral part of experimentation processes and the consolidation of outputs. A continuous feedback cycle of evaluating results and adjusting actions and objectives helps to improve results. This is especially important in the rather new area of NBS where we hardly have any precedence and a lot of new knowledge is created through learning-by-doing. **Ensuring safe spaces for learning that allow for trial and error and accepting unfinished states and products** is therefore of utmost importance.

Also, be aware of the importance of **learning to trickle up from local to municipal/policy level**. Consider creating structures that allow for the lessons learnt at the operational level which include citizens and other stakeholders to trickle up to the more strategic, municipal level where they can inform municipal planning and policy.

5. Provide trainings and educational programmes.

Relying on collaborative arrangements with citizens and real estate companies for the future maintenance and monitoring of the NBS requires capacity-building on different fronts. The provision of trainings and educational programmes can build knowledge and capacity amongst municipal (and outsourced) employees, citizens and local businesses. Especially for citizens, it is an important vehicle for empowerment and commitment to NBS.

Focus efforts on the future generation to empower them to lead on implementing NBS. Green skills programmes or learning-by-doing workshops not only help them attain qualifications in NBS design, implementation and monitoring, but also have an important spill-over effect to their parents. **Build capacities for future co-maintenance and co-monitoring of NBS among public and private actors,** for instance through up-skilling programs for municipal units or training programs for citizens and interested parties. Make use of citizen science by **recruiting and training community researchers for monitoring** or setting up your own community research programme.

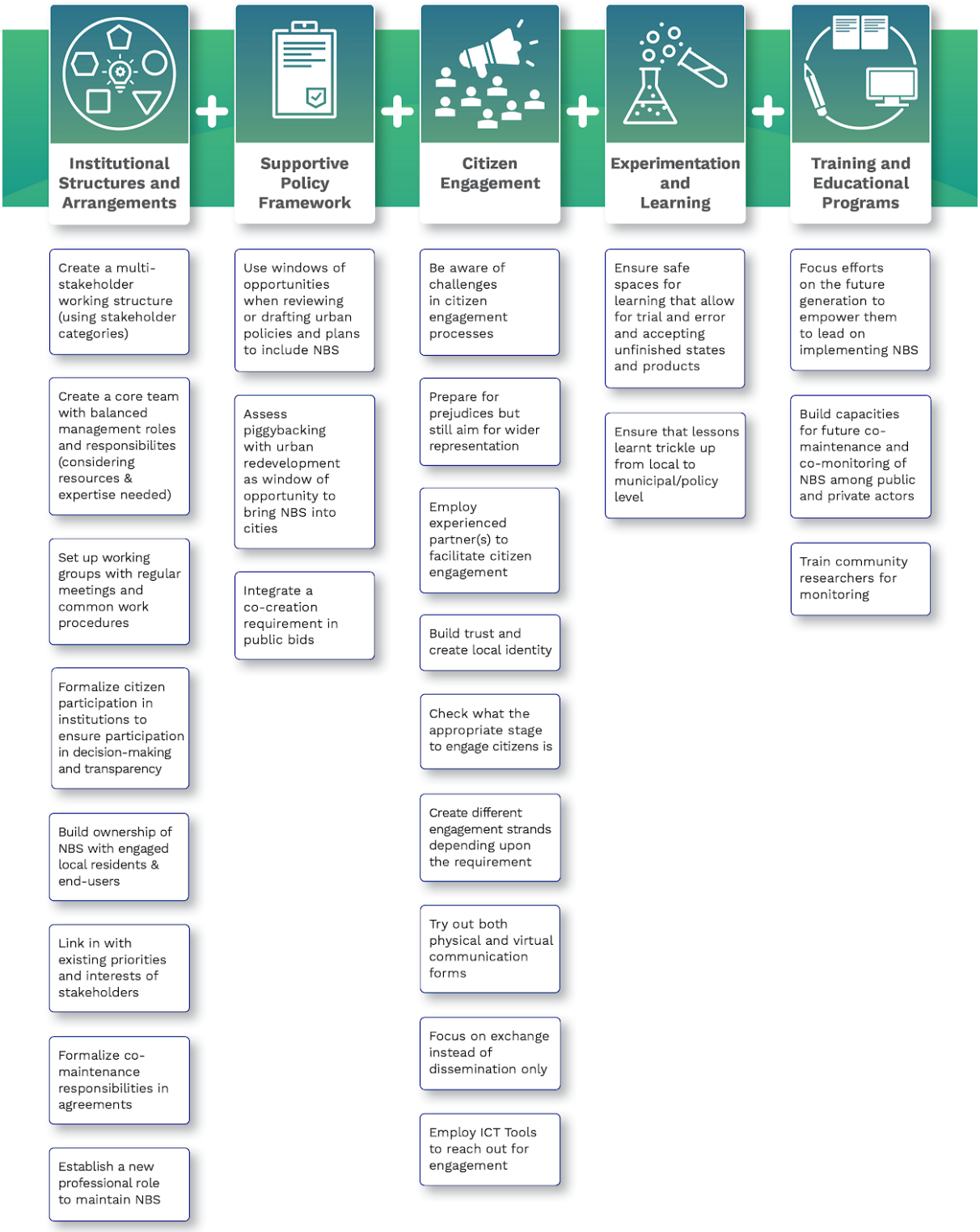


Figure 12 CLEVER Governance fundamentals and recommendations

B. Business Models for NBS

The exercise of creating a business model can be useful in a myriad of ways from just capturing how an NBS project works and creating better strategic conversations and planning at city level, all the way to communicating about city actions to decision makers and building new growth engines for NBS by identifying and attracting additional founders. In the process of developing a business model we consider that the Business Model Canvas (BMC) is the first tool that a city should use. The fig. 13 illustrates which are the main building blocks of an BMC as well as the main questions that must be addressed in order to start developing the model.

We consider that in the Business Model Canvas we are mapping the main beneficiaries of a given NBS while stating which is the value proposition, which are the actions put in place and the different resources contributing in the implementation of an NBS. This exercise is useful for the cities, helping them visualise quickly, on one page, what are the key elements of their business. It has also a practical and simple user interface that can be used to clarify complex ideas and better communicate NBS projects to decision makers. In city departments working together on a project, the BMC can serve as common language and as a co-creation and alignment tool, showing more concretely, to every stakeholder involved in the process, how the city is going to implement actions and strategies for NBS.

It is also important to note that the cities can use the BMC in different phases of their NBS project implementation. The BMC can be used to design, test, and build new NBS business models or to document, discuss, and manage existing ones. Indeed, while we strongly recommend employing it in an early stage - for cities developing their NBS activities, the BMC can also be used to revamp an existing NBS business model, giving it a strategic reorientation by further working on it. For cities searching to develop their own business model, we recommend working in order, on identifying the following elements:

1.Beneficiaries - are the groups of people, organizations or stakeholders, to whom cities are aiming to reach and create value by proposing a dedicated value proposition.

2.Value Proposition- consists of a selected bundle of products and/or services that caters to the requirements of a specific beneficiary.

3.Revenue streams – it is how an organization captures value. The revenue streams result from value propositions successfully offered to beneficiaries.

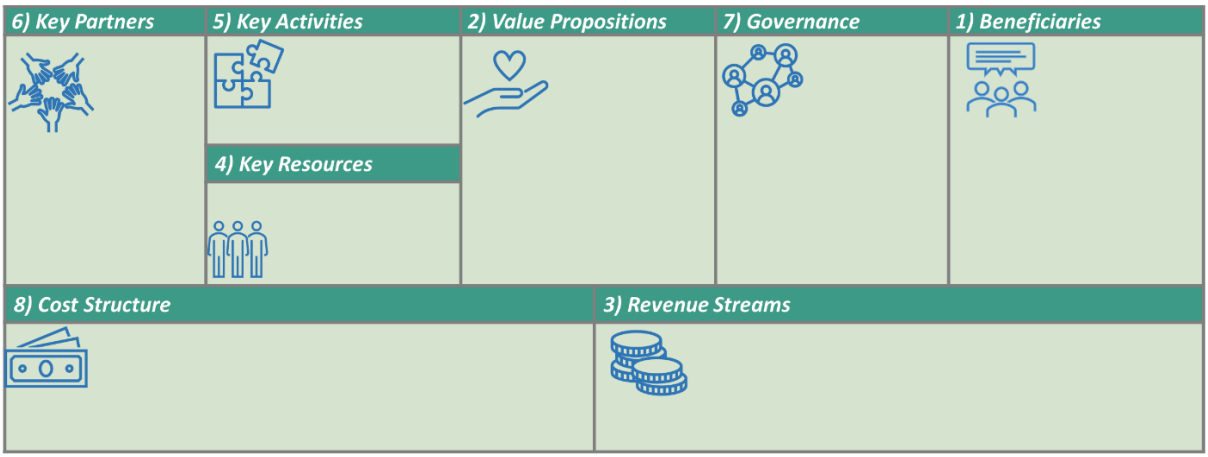
4.Key resources - are the most important assets required to offer and deliver the previously described elements.

5.Key activities - are the most important activities an organization needs to perform well in order to implement its NBS business model.

6.Key partners – this building block describes the network of suppliers and partners that make the business model work.

7.Governance – this building block focuses on the interaction between all the key partners in delivering the value proposition and performing the key activities.

8.Cost structure - describes the costs incurred to operate a business model



1) Who are your final beneficiaries ? For whom are you creating value ? What are their main challenges ?
2) What value is delivered to the beneficiaries (social, environmental, economic, health)? Which one of beneficiary's problems are helped to be solved within your NBS project ?
3) How is your organization capturing value? What are the revenue streams(public/ private) financing your NBS ?
4) What are your most important assets required in order to deliver the Value proposition & Key Activities ?
5) What are the Key Activities in order to deliver the Value proposition ?
6) Who are the Key Partners? Who are the Key suppliers? Which Key Resources are acquired from partners? Which Key Activities do partners perform ?
7) Who is involved in the governance process and public participation related to NBS? How do you engage stakeholders in the co-design, co-implementation and co-monitoring processes of NBS?
8) What are the most important costs inherent in the business model?

Figure 13 Business Model Canvas for cities developing an NBS project

C. Financing and investment models for NBS

Financing of NBS in cities can take many different forms, and various innovative mechanisms for this have emerged in recent years. For any city looking to implement NBS, whether this is a one-off project or a scaling up of NBS across the city, it is important to look closely at your NBS and find the right financing solution.

We have outlined in the financing and investment models report a six-stage approach to take cities from the inception of their NBS to a detailed financial model. This can be used to identify and engage relevant stakeholders and to attract investment. Our approach can be summarised in the following six steps:

1. **Define your NBS**

You will need to have one or more NBS selected before building the financing solution. This is because the NBS will determine which financing options are available. Once your NBS has been chosen, you can follow the following steps to help you evaluate and choose the right financing solution to implement it.

2. **Define and quantify (if possible) the benefits attributable to your NBS**

NBS can provide a variety of benefits beyond the environmental, including social, health and economic benefits. Understanding which benefits your NBS creates can help you to attract funding from those who value these benefits. We have provided a framework to help you define these benefits. We have also analysed the types of stakeholders who both value and will pay for different benefits, finding that these two things are often not aligned.

3. **Analyse which stakeholders value your NBS and the attributable benefits, and determine which of these could be potential funders**

A wide range of funders are interested in funding NBS, from local government to commercial investors. Exploring when and why different funders fund NBS can help you to start conversations with appropriate potential funders. We have outlined and described the main funders of NBS to help with this exploration. We also looked at how by analysing your NBS's business model and finding where your value creation

is, you can find potential funders for your NBS. This built upon the findings from the Business Models report.

4. **Analyse which funding types could be used successfully, particularly by identifying a suitable business model**

Funding exists on a spectrum from non-repayable (e.g. subsidies, grants) to repayable (e.g. loans, equity investment). Looking at this spectrum alongside your business model, you can assess which funding type would be appropriate for your NBS and unlock new funding streams. This is especially important if there are revenues associated with your NBS that allow you to take on repayable funding.

5. **Determine which financing mechanism aligns best with the incentives of funders, to attract the right type and level of investment for your NBS**

Funding can be implemented through many different financing mechanisms. These can be designed, for example, to stimulate demand for NBS or to attract new investors. We have explored some key financing mechanisms for NBS, analysed through the lens of a city either directly implementing NBS or promoting the implementation and scale up of NBS by other stakeholders. We then looked in detail at three particularly innovative financing mechanisms: the use of subsidies to stimulate scale-up by other actors, the use of environmental and social impact bonds to align incentives of cities, providers and investors and redistribute risk, and the use of crowdfunding to generate funding from a wide range of stakeholders.

6. **Create a detailed financial model to support the financing solution determined, and to guide conversations with potential funders to secure financing for your NBS**

Once these components of a financing solution have been identified, the feasibility of the NBS can be assessed by building a financial model: a simplified representation of the NBS's real financial situation over time. This can be used to have in-depth conversations with potential funders and investors. We have provided the key components to help you build a financial model.

While in some cases this could be a straightforward process, if the NBS is small and created to fit into an existing grant funding call for example, in other cases this could be a complex process. Especially when the aim is to scale up the implementation of NBS, innovative financing mechanisms such as the ones detailed in the report can be useful and should be considered strongly.

Cities should expect to work with multidisciplinary teams to achieve this, bringing in expertise from the designers of the NBS themselves to those with financial and procurement expertise. It can be a long process, with multiple iterations and many conversations with stakeholders to secure the right funding for your project. Cities should build this time into their planning timelines. Using this time effectively to build lasting partnerships and knowledge that can be beneficial for the long-run future of NBS within your city.

Finally, cities should continue to exchange information between themselves on successful processes and approaches for funding NBS. This knowledge exchange will help to build the expertise and innovation needed to scale NBS.

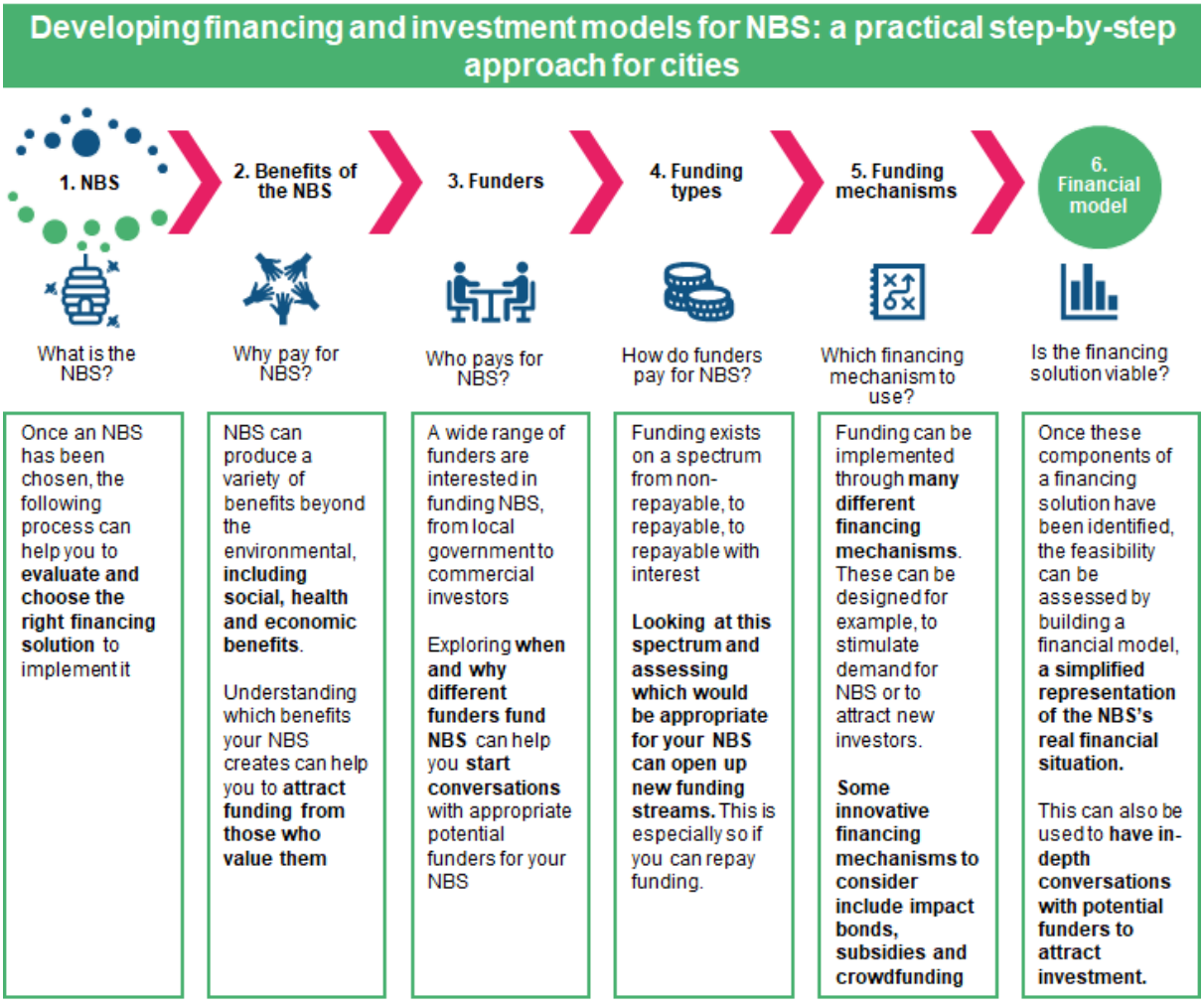


Figure 14 Developing financing and investment models for NBS: a practical step by step for cities

Connection between Governance, Business and Financing and Investment Models

Looking at the different business models developed in the FR cities it becomes evident that the successful implementation of NBS requires the co-creation and engagement of a large and diverse spectrum of stakeholders varying from citizens to different societal and financial actors. In order to function properly the cities, have to include governance mechanisms able to engage stakeholders in the co-design, co-implementation and co-monitoring processes of NBS.

We observe that the majority of Clever Cities CALs are funded from public sources and one of the key takeaways for this report would be that the cities can extend their research, aiming at identifying and securing different sources of investment (as described in the Financing and Investment Models part). Diverse groups of financiers both public and private will be welcomed in order to balance incentives and improve the ability to value different types of payoffs of NBS.

The elements involving value creation, delivery and capture are vital to structure the overall information of each CAL and to pitch the NBS in a clear and simple way to different founders. In the context of Clever Cities, the benefits to be presented to additional founders can be related not only with economic return but also and more importantly with environmental and social impact on local communities. However, the multifunctional nature of many NBS be an issue in this respect. Businesses operate or invest based on relatively linear logic models, whereas NBS can provide multiple benefits many of which are not of direct interest to the private sector investor.

It is also worthy to mention that the different CALs are still in the implementation phase and the lack of examples of proven success is obstructive for discussions with additional financiers. Additionally, special focus is needed in order to fill the gap between the potential for implementing NBS and their market uptake. This is in part due to the challenge of sustainably financing these solutions: while there is a growing interest in different forms of 'green' finance, there is still a limited evidence base about how these resources can be leveraged to support NBS. There is indeed the challenge of conveying the value of natural capital and ecosystem services in economic terms. Even in cases where attribution is possible, the value may go unassisted or unaccounted for in decision-making, particularly as NBS can be difficult to compare to alternative and traditional grey solutions.

All three parts of this report have in common the aspect of co-benefits delivered to different stakeholders by a particular type of NBS. In the governance models, the aspect of which benefits accrue to whom as a result of an implemented NBS determines which stakeholders should be involved and planned into institutional arrangements and multi-stakeholder actors' constellations. The question of which benefits accrue to which stakeholders could form a common starting point for all the models: it is the first step in the financing model to identify who would be prepared to pay for these benefits and it is one of the first questions to address when developing a business model (value capture and beneficiaries).

One important aspect to be considered in governance, business and financing models is that of long-term management and maintenance of NBS. Regarding governance, it is imperative to build ownership of residents and future users early on that often provide essential voluntary services for NBS maintenance. Also financing and business models should account for the maintenance of the NBS in the long run by considering respective arising costs in the life cycle of an NBS.

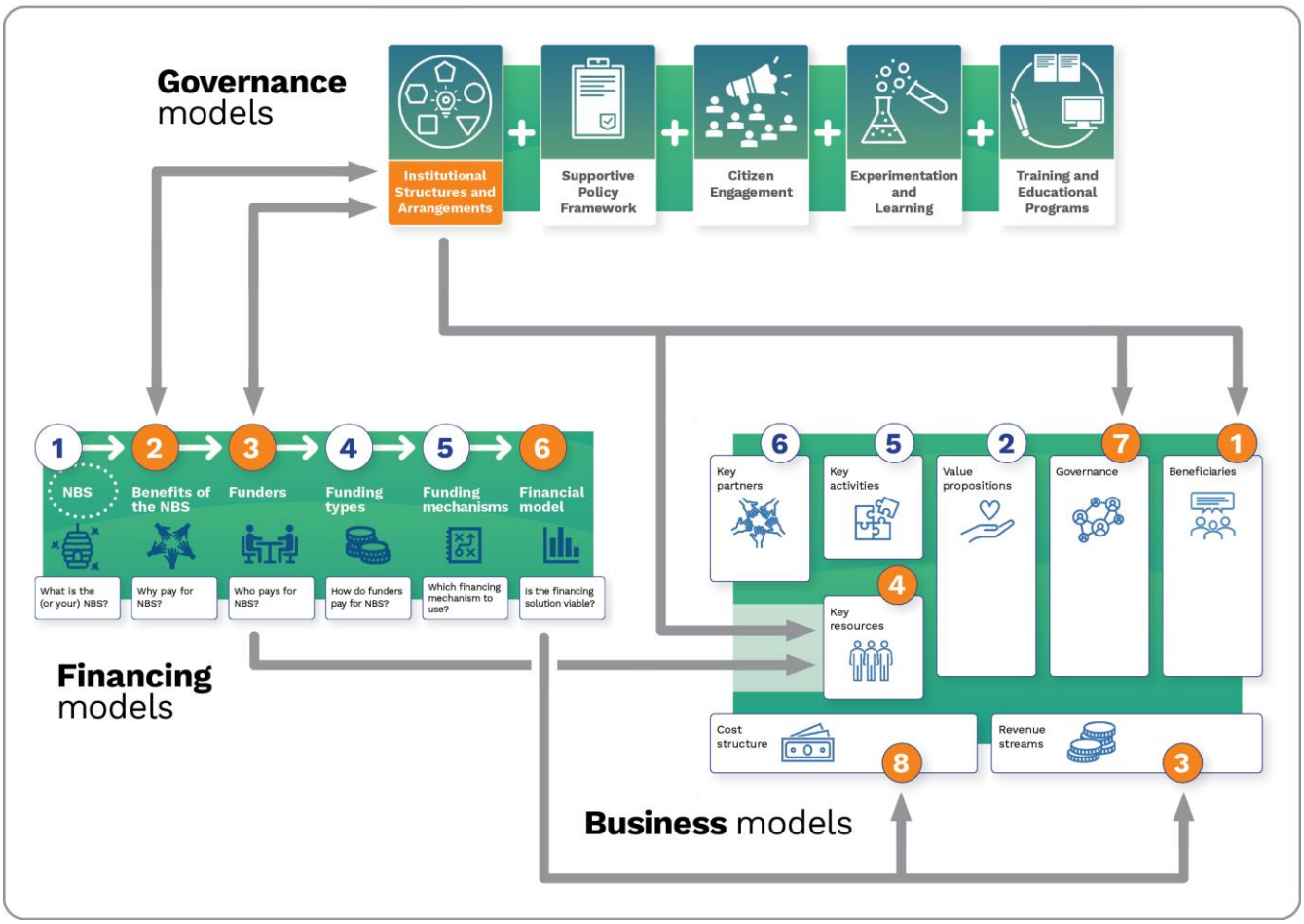


Figure 15 Connection between Governance, Business, Financing and Investment Models

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Annexes

Annex 1 – Governance Models

Annex 1.1: Nature4Cities governance clusters

The Horizon 2020 funded project Nature4Cities (N4C) assessed a range of governance models for their collaborative potential and suitability towards the requirements of NBS, resulting in the following 5 governance clusters:

7. CLUSTER 1: Traditional public administration (Suitability for NBS: low)
8. CLUSTER 2: New Public Management (Suitability for NBS: low to medium)
9. CLUSTER 3: Private-private partnerships (Suitability for NBS: medium to high)
10. CLUSTER 4: Societal Resilience (Suitability for NBS: high)
11. CLUSTER 5: Network Governance (Suitability for NBS: high)

Each cluster can be discerned into different governance practices, which show the range of possible arrangements. N4C evaluated the clusters with regards to the '*dynamics that should be present in any governance mode that aims to facilitate innovative and transformative processes*' (Egusquiza et al., 2017, p. 50). As various governance modes had been taken into account, not all of them show characteristics suited to NBS. To show the suitability for NBS, they ranked the clusters from high to low suitability. Approaches that facilitate the inclusion of co-creation are the cluster models 2-5, which are explained in more detail in Table 8.

Cluster	Governance model	Suitability for NBS
New Public Management	**Public-private Partnership (PPP)** Describes a vast spectrum of possible public-private co-operations with different degrees of private participation. Government involvement can range from high to low, guarantees public services. PPPs are very context based, but can be characterised as market oriented, competitive and top down.	**Low-Medium** Highly dependent on the scale. Private parties decide themselves about collaborations, where risk aversion might go against innovative solutions. When implemented right, cross-sectoral partnerships, risk sharing, and new business models can be encouraged.
	Business-led self-regulation In a fully business led market governance, corporate social responsibility leads to voluntary agreements, third-party certifications or eco-labelling. Corporations act as rule-maker and rule enforcer, working decentralized.	
Private-private partnerships	**Non State Market-driven governance (NSMD)** It is identified by the absence of a state authority, as it has a market-based authority which works with incentives,	**Medium-high** Complex systems as NSMD and SLEN have high requirements which are rarely

	disincentives/supply and demand. Stakeholders and a broader civil society can participate in adaptive policy making. Enforcement mechanisms and mandatory requirements are part of the model. **Business–NGO partnerships** Complex model which can range from a reactive partnership (Sponsorship, Short Term, Dyadic Problem Solving) through a transactional and integrative to a transformative partnership (Collaborative Governance, Base of Pyramid Strategy). It is a decentralized, non-hierarchical hybrid governance mode, with the potential for development within itself. **Sustainable Local Enterprise Networks (SLEN)** The key assets in this self organizing, complex adaptive system are the four capitals: Human, social, financial and ecological capital, which are not be traded off. NGOs, civil society members can take part and at least one for-profit company should participate in this mode, where the outcomes are reinvested to create a self-reinforcing cycle. Building its capacity is one main goal, but not all participants of the network have to agree on its primary purpose.	met. The political, economic and social system in which they are embedded need a significant change towards enterprise-based activities to provide a base for the development of these models.
Societal Resilience	**Co-management** Can be initiated through bottom-up or top-down processes and requires an open participation. This non-hierarchical model implements decentralized management as far as possible, as government is usually involved. Enables social learning. Individual schemes for projects are set up to divide tasks and responsibilities. **Civic ecology practices** The hands-on environmental stewardship emerges as a community-based response to urban decline. A small scale, local approach which reflects the local environment, being self-organized and decentralized as far as possible. Larger impact might be given when involving scientists or NGOs. **Self-governance/grassroots initiatives** Active society is joining decision-making about societal development. This bottom-up approach defined by institutional diversity and multi-scalarity organizes and manages itself in a polycentric way.	**High** This reflexive form of governance may enable the management of natural resource with a social-ecological component, making it highly applicable for transformative innovations such as NBS.
Network Governance	**Collaborative governance** Initiated by government, this model seeks to not only consult non-governmental stakeholders, but to involve them in the decision-making process. Consensus is a main goal, although not always possible. A focus on public	**High** Providing the flexibility for dealing with uncertain, complex dynamics in a

	management issues is given in this multi-level, polycentric model which is formally organized.	reflexive, adaptive model which is open for participation.
	Adaptive governance A system usually triggered by a crisis and emerging opportunities. Descend from environmental governance or bottom-up initiatives, processes are organized polycentric and decentralized as far as possible. Institutional structures connected through informal and formal social networks allow a wide range of stakeholders.	
	Adaptive co-management To achieve the flexibility needed for learning and adapting, this community-based model relies on a diverse set of stakeholders sharing management power and responsibility while guided by key players for building trust and linking actors. Social capital and trust are essential for this polycentric model.	

Table 25 Governance Models suited for NBS based on Egusquiza et al. (2017).

Annex 1.2: Guiding questions for collaborative governance

Monitoring / People	Which methods do you use to safeguard community-based (co-) monitoring activities and NBS effectiveness / impact assessments (i.e. citizen science)? Examples: citizen science, apps, interviews
Management / Platform	What plans, strategies and city objectives do you have in place related to your NBS? What protocols ensure employment of platforms for NBS management? Which open city-driven platforms do you use to strengthen the management of NBS?
Management / People	What governance arrangements to steer co-creation of the NBS? What protocols, roles and responsibilities have you put in place for long term maintenance and management of the NBS? What specific training and educational programmes (capacity building) do you have in place to foster NBS? How will you safeguard co-management and co-maintenance of the NBS in the long term, including public, private and other stakeholders? Examples: Public-private partnerships, public-NGO partnership, public-community alliances; citizen contracts for green spaces
Management / Place	Do you have roles, responsibilities and procedures (protocols) in place for NBS to work in that area? What protocols do you have in place?
Methods / Platform	How do you use spatial, virtual and social platforms for the purpose of co-design? Which formats and processes do you use for community-based monitoring? Examples: Awareness raising and empowerment-focussed platforms like the Environment Citizen Forum
Methods / People	Which approaches, methods and/or instruments do you use for stakeholder engagement for NBS? Which organisational and institutional structures have you established to co-design NBS? Examples: Examples: CALs, UIPs, Public bodies offering advice
Material / People	Who is affected by and/or interested in the interventions? Which people do you involve as central forces in driving the design, implementation and management of the NBS interventions? Who is involved in the governance of the NBS (design, implementation, management, monitoring, etc.) as well as in public participation processes? Examples: District, neighbourhood

Annex 1.3: Innovation-oriented guiding questions

1. **How do you co-design, co-implement and/or co-monitor NBS with unusual suspects? Examples: Inclusion of minority groups, insurance companies, property developers etc.**

2. **Who is involved in the governance process and public participation related to NBS? (tick box(es) several choices possible)**
    a. ☐municipality-driven
    b. ☐public-public partnership
    c. ☐public-private partnership
    d. ☐public-citizen partnership
    e. ☐public-NGO partnership
    f. ☐NGO/foundation-driven
    g. ☐ privately driven
    h. ☐community-driven

3. **How are experimenting and learning encouraged and failures allowed at different stages of NBS planning, design and/or implementation?**

4. **At what stage of NBS deployment are citizens/community members/local groups and other stakeholders involved? (tick box(es), several choices possible)**
    a. ☐Appraisal
    b. ☐Visioning
    c. ☐Planning
    d. ☐Designing
    e. ☐Implementing
    f. ☐maintaining
    g. ☐evaluating

5. **Which (organisational) structures / institutional arrangements have you established to co-design NBS?**

6. **How do you engage stakeholders in the a.)co-design, b.)co-implementation and c.)co-monitoring processes of NBS? What is the added value (in comparison to traditional methods)?**

7. **What formats do you use to collaborate with stakeholders at a.)Neighbourhood, b.)District and/or c.)City level? For instance pop up participation, co-design on spot etc.**

8. **Do you use ICT to facilitate co-design, co-implementation and co-monitoring of NBS design and planning? (i.e. apps, social media, serious gaming, hackathons, IT Citizen's platform, urban e-planning concepts (DIPAS) etc.) If so, please elaborate.**

9. **How do you make sure that activities are open, accessible and inclusive towards a diverse set of stakeholders?**

10. **a.) Has the NBS given rise to new or major changes in governance arrangements at municipal, district or national level? Which ones?**

10. b.) **Has the NBS given rise to new or major changes in public policy (frameworks) at municipal, district or national level? Which ones?**

11. **How are you employing new ways for managing/maintaining NBS or Green-blue infrastructure?**

12. a.) **What specific training and educational programmes (capacity building) do you have to inspire citizens to do NBS themselves?**

12. b.) **What specific training and educational programmes (capacity building) do you have to raise awareness towards NBS?**

12. c.) **What specific training and educational programmes (capacity building) do you have for monitoring techniques?**

12. d.) **What specific training and educational programmes (capacity building) do you have for citizens to lead on NBS design, implementation and maintenance?**

12. e.) **What is the target group for your specific training and educational programmes? (e.g. children, youth, adults or elderly)**

13. **What governance instruments do you have in place for NBS on local level? (e.g. public-community alliances; citizen contracts for green spaces)**

14. **How are you transparent with regards to the 'rules of the game', the aim of participation and how inputs provided will be used? Is that formalized (i.e. policy, law, etc.)**

15. **Are management roles and responsibilities distributed based on individual choice and willingness of actors? Is there room for negotiation and discussion?**

16. **How are the management roles, responsibilities and/or decision-making power distributed across different actors? (private-public partnership etc.)**

17. **How do you do community based monitoring? (e.g. shared GIS technology, apps, interviews with novel questions, augmented reality)**

18. **Have you defined the monitoring and evaluation goals, objectives and indicators together with citizens? (Citizen science)**

19. **Are you involving several municipal departments for NBS design, implementation, monitoring and maintenance?**

Annex 1.4: Challenges and Drivers for NBS governance

Checklist of Challenges faced in the city with regards to co-design, co-implementation and co-monitoring of NBS. Please check the boxes which apply to your case(s). Several choices possible.

☐**Short term actions and decision making cycles**: The usual short-term action and decision-making cycles within municipalities does not always match with long term requirements of the whole life cycle of NBS projects

☐**Establishment of long term responsibilities**: Responsibilities for maintenance of the project might not be specfied at the design and development phase of the NBS.

☐**Gentrification**: The willingness of improve life and urban quality with NBS projects in a short term could lead to risk of gentrification in a long term.

☐**Lack of coordination between city departments**: could lead knowledge to be trapped in `sectoral silos´.

☐**Lack of flexibility of decision making structure**: could impact the provision of multilevel, multiscale and multi-thematic projects as NBS.

☐**Bureaucracy and unsupportive legal frameworks**: This can lead to difficulty in getting a go ahead leading to delays.

☐**Goal misalignment**: Different goals of stakeholders within partnership arrangements could hinder collaboration.

☐**Apathy**: A high number of stakeholders could generate inertia and apathy

☐**Role ambiguity**: unclear stakeholder relationships and lack of clarity in responsibilities within the arrangements.

☐**Different and/or competing perceptions**: can hinder the decision making processes.

☐**Lack of participation**: Top down processes with no real citizen participation makes the NBS more difficult to be accepted by the citizens.

☐**Balancing of multiple benefits NBS can deliver**: it is difficult to take into account all benefits and co-benefits NBS promises to ensure a wider impact.

☐**Challenges for monitoring NBS**: Monitoring the impacts of NBS is difficult, in general especially related to societal benefits.

☐**Difficulties in upscaling NBS**: Drawing inspiration from one NBS and implementing similar ones in other areas (taking into account different governance structures and other contextual issues) can be a challenge.

☐**Lack of political support**

☐ **Lack of financial support**

Checklist of Drivers: Please check the boxes which apply to your case(s). Several choices possible.

☐**Collaboration among different sectors**: An important aspect to ensure well functioning implementation of NBS

☐**Well established coordination role(s)**: This would give a framework for better designing, planning and/or implementing of NBS

☐**Emerging partnerships**: Partnerships could encourage NBS uptake and upscale as well.

☐**Grassroots innovations and transition activities**: Play a significant role in promoting NBS in cities

☐**Adaptive governance**: allows the process of self-learning

☐**Involvement of urban government**: can facilitate collaborative arrangements

☐**Cross sectoral spaces and partnerships**: fosters knowledge sharing

☐**Co-production processes**: ensures different perceptions are catered to

☐**Tools to build a common vision**: supports reaching unanimity for a vision

☐**Creation of a wide toolkit of policy instruments**: aids the process of mainstreaming of NBS

☐**Inclusion of NBS in land use policies**: require NBS in city and master plans

☐**Synergies of policy making at various levels**: Include NBS in planning document of cities

☐**Awareness of policies that can support NBS implementation**

☐**Co-creation of norms**

☐**Concrete guidelines for multifunctional NBS**

☐**Harmonise terminology, avoid jargon**

☐**Involve residents and NGOS and communicate with local communities**

☐**Prepare for prejudices**

☐**Make use of existing knowledge platforms**

Annex 2 – Business Models

Annex 2.1 Business Model NBS Hamburg CAL 1 – Green corridor

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Governance</th><th>Beneficiaries</th></tr>
<tr>
<td>

- Citizens
- Communication designer
- Hamburg Partner: Steg, BEZ (FHH),HWWI, HCU, ICLEI
- Different plot owners and actors for single interventions along the corridor

</td>
<td>

- Creation of biodiverse spots and living spaces
- Creation of a corridor guiding system and communication content for different media (info board, flyer, QR Code)

Key Resources

Intellectual: citizens and plot owners and actors for single interventions along the corridor
Human: CLEVER and Hamburg municipality
Financial: private partners

</td>
<td>

- Linking two nature reserves separated by an urban settlement. Biodiverse spots support more physical activity and promote healthy lifestyle
- Connecting different neighbourhoods giving incentives to discover the urban and nature surroundings as well as spending more time outside / support physical activity

</td>
<td>

- Through setting up and enabling the functional UIP which will lead through the process of guiding system development for the corridor.
- For most individual intervention there are smaller UIPs/task force groups in place that are involved and defining the process.

</td>
<td>Residents and citizens</td>
</tr>
<tr><th colspan="3">Cost Structure</th><th colspan="2">Revenue Streams/ Financial Model</th></tr>
<tr>
<td colspan="3">Communication designer
Enabling resident led production site ‘Made in Süderelbe’
Production of the Guiding system elements in the public realm
Flyers, info boards, printed media

Production of every single intervention as a different node along the corridor (Nature playground, cycle path drainage system, climate trees & root network system, gardening and entertainment areas in refugee settlement, qualification of green roofs with bees and nesting aids, planting raised beds and qualifying crossings with flower meadows etc.)</td>
<td colspan="2">CLEVER Cities funding for guiding system development
and/or private partner funds for the development of individual interventions along the corridor.</td>
</tr>
</table>

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Governance</th><th>Beneficiaries</th></tr>
<tr>
<td>• Citizens: Residents of buildings
• Expertise: Metal work company, Landscaper/ Gardener, Loki Schmidt Foundation, NABU
• Authorities, Associated partners: SAGA, BEZ (FHH) Construction department, Other buildings owners, Grocery Store
• Hamburg Partner: Steg, BUE (FHH), Hamburg Wasser, TUHH, IBA, Sprinkenhof, Green Deep Development</td>
<td>• Identification of the Green Façade area and risk areas
• Construction design model for the chosen building
• Meeting with residents of the building on the green façade topic
• Selection of the plant species by involvement of different actors
• Installing the trellis construction
• Planting action for green façade
Heavy Rainwater Drainage analysis concept[42]
Key Resources
• Intellectual: Gardener company; Expert knowledge and computation - heavy Rainwater drainage
• Human – residents/ inhabitants’ cooperation; project partners
• Financial: SAGA housing company, TUHH</td>
<td>• Green facade offers improvements in health and well-being of residents and neighborhood
• Innovative management of water resources enables flood risk reduction through implementing different NBS (green roofs, tree cover, sustainable drainage systems)
•</td>
<td>• Monthly UIP with the private housing company
• Different tools used to promote the possibility of green roof and façade financing: press release, district festival “Neugraben Erleben”, HCU student analysis on the reasons for little uptake.
• Informing on the benefits of Green Roofs and Facades through various formats: e.g. ToC format was where the discussions about the cooperation for green façade with the housing company initiated
• CiBiX laying ground for the identification of the needs for the rainwater drainage analysis concept
• UIP comprising of various public and private entities operate for the rainwater drainage analysis concept development</td>
<td>• Residents
• Inhabitants of the building
• Neighbourhood
• City of Hamburg</td>
</tr>
<tr><th colspan="3">Cost Structure</th><th colspan="2">Revenue Streams/ Financial Model</th></tr>
<tr>
<td colspan="3">• Plants
• Soil preparation
• Planting
• Initial maintenance from gardening firm
• Concept development</td>
<td colspan="2">• CLEVER Cities funding through grant award procedure (Zuwendungsverfahren) (this model is currently in discussion),
• SAGA housing company co-financing the façade greening
• TUHH co-financing the cycle path water drainage pilot project (material and installation)
• Beside this, voluntary installed Green roofs and facades are funded by BUE (FHH)</td>
</tr>
</table>

[42] UIP development, Commissioning, Concept development, Risk area identification, Measure development

<table>
<tr>
<td>Key Partners
Citizens: Residents, Nature forum, The Atrium, South Thamesmead Forum, Parents, Heads of schools, Pupils, Faith groups
Expertise: Landscape Architects, Gardeners Associated local expets (handcraft, businesses, citizens)
Authorities, Associated Partners: London Borough of Bexley
London Partner: Peabody Trust, GLA, Groundwork London, The Young Foundation, Social Finance</td>
<td>Key Activities
Street and Courtyards Regeneration
Parking study and consultation
Unused spaces viability study and consultation
Permeability materials and drainage systems research.
Green infrastructure audit / opportunity mapping
Co-design workshops
Observation
Movement analysis
Interviews and focus groups
Key Resources
Human: CLEVER, London Municipality
Intellectual: Political, economic, cognitive, relational stakeholders
Financial: Peabody</td>
<td>Value Propositions
Making a key street in South Thamesmead a safer, healthier and more attractive space for its users
Making spaces better connected for people to move by foot and bike
Reduced surface flooding
Reduced community tensions relating to anti-social parking
Improved lighting to make the space feel safer</td>
<td>Governance
Client team is made up of Peabody, Groundwork and local residents.
Design team will coordinate all the technical and community design work
Steering group will be led by senior team in Peabody and representatives from local community and GLA</td>
<td>Beneficiaries
Thamesmead’s residents
Thamesmead’s property owners
Local Schools, Teachers, pupils, parents
Local businesses.
Thames Water (potential of less surface flooding to manage)</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Courtyard improvements
Maran Way Public Realm
Staff Resources to support co-design</td>
<td colspan="3">Revenue Streams/ Financial Model
The budget is mostly to be met from Peabody’s multimillion-pound regeneration programme. Peabody is committed to a five-year plan to improve the day-to-day experience of living in Thamesmead.
As part of this Peabody is investing over £7 million in improving the public realm in South Thamesmead.</td>
</tr>
</table>

Annex 2.4 Business Model NBS London CAL 3 – Greening unusual places

Key Partners	Key Activities	Value Propositions	Governance	Beneficiaries
• Citizens: Residents, Nature forum, The Atrium, South Thamesmead Forum, Parents, Heads of schools, Pupils, Faith groups, The link youth and community centre • Expertise: Landscape Architects, Gardeners Associated local experts, Universities • Authorities, Associated Partners: Royal Borough of Greenwich, Parkway Primary School, St John Fisher School • London Partner: Peabody Trust, GLA, Groundwork London, The Young Foundation, Social Finance	• Development of the Atrium Community Centre Entrance and Mangold Way/ Parkview • Development of School Water Walls Space • Edible Courtyard • Micro-grant spaces • Collective grant spaces • Unused spaces viability study and consultation • Green infrastructure audit / opportunity mapping. • Smart irrigation demonstrator **Key Resources** • Human: CLEVER, London Municipality • Intellectual: Political, economic, cognitive, relational stakeholders • Financial: Peabody	• Offering opportunities to learn new horticulture and building skills through educational learning opportunities • Providing opportunities of access to nature and recreation spaces • Providing first processes and innovative approaches to irrigation& diverse planting habitats	• Being delivered as many small projects rather than one large project. • Each project will be overseen by GLA & Peabody with the inclusion of other experts or residents as required. • Grant and community growing programme is overseen by Groundwork, Peabody and GLA with support from local residents.	• Thamesmead's and London Residents • Thamesmead's property owners • Local Schools, Teachers, pupils, parents • Employees of local businesses.

Cost Structure	Revenue Streams/ Financial Model
• Experts • NBS opportunity mapping • Community grants • Flagship NBS • NBS Innovation • Materials and installation of NBS spots • Staff Resources	• The budget is mostly to be met from the CLEVER Cities programme – there will also be an overlap between each of the CALs and Peabody's public realm improvements

Annex 2.5 Business Model NBS Milan CAL 2 – Giambellino 129 Community Garden

<table>
<tr>
<td>Key Partners
Santo Curato D’Ars Church
Retake (Citizen Association)
Fate Largo (Giambellino Social Association Network)
Spazio Donna We World (Social Association)
Dinamoscopio (Cultural association)
Schools,Youth centre, LIPU (Environmental association)
Fauna Viva (Environmental association)
Bosco in città (Environmental association)
Legambiente (Environmental association)
Giardini in Transito (Community gardens network)Non riservato (Cultural association)
Comitato Ponti (Community garden near G129)</td>
<td>Key Activities
Bird watching & gardening and bat box
A wild meadow area with oasis for butterflies;
An area managed as a community garden and orchard;
A green wall co-managed with citizens, as a prototype to be reproduced on terraces and balconies;
Effective plants for the absorption of pollutants.
Key Resources
Intellectual: Schools or cultural associations
Finance: Investment resources from Municipality of Milan
Human: CLEVER and Municipality of Milan</td>
<td>Value Propositions
Providing high quality multifunctional green services in Giambellino 129 that can bring presidium, social cohesion and ecological improvements.
Increase the area attractiveness, to make it a living place, where people meet each other and make activities
Guarantee the daily use of the area, to improve the perception of safety
Increase awareness on benefits related to the connection between humans and nature</td>
<td>Governance
The area is a public property and the Municipality of Milan is responsible for soil remediation and new construction works.
Social and environmental associations and citizens will manage the area, including NBS and social activities.</td>
<td>Beneficiaries
Resident and people living and working in the “greened” building
Neighbourhood
Schools or cultural associations</td>
</tr>
<tr>
<td colspan="2">Cost Structure</td>
<td colspan="3">Revenue Streams/ Financial Model</td>
</tr>
<tr>
<td colspan="2">Specific placed-based NBS intervention- bat box, wilding the area, wall greening</td>
<td colspan="3">The budget for this action lab is mostly to be met from Lorenteggio Regeneration Programme which includes different interventions concerning public housing, mobility, green spaces and public services.
The investment for this Programme amounts about €100million. In particular, the construction’s costs of G129 are covered by the Municipality of Milan and Clever cities</td>
</tr>
</table>

Annex 2.6 Business Model NBS Milan CAL 3 – Tibaldi Station

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Governance</th><th>Beneficiaries</th></tr>
<tr>
<td rowspan="2">• City of Milan
• National Railway Company[43]
• Environment and Territory Mobility Agency
• WWF, Ambiente Italia
• Universities; 5th Town Hall – City of Milan
• Professional associations (AIAPP, ANACI); Professional orders (architects, agronomist, engineers)
• Green and landscape planner’s professional association (Assofloro)
• Association of the apartment block administrators (Assimpredil)
• Environment and territory associations
• Residents of viale Tibaldi</td>
<td>Implementing different types of NBS around the train station and along the rail tracks:
NBS on noise barriers
Green wall
Design for comfortable public space
Reinforced soil</td>
<td rowspan="2">• Improving the station performance (rainwater mismanagement, comfort and microclimate for the travellers) introducing ground-breaking green elements and others NBS;
• Allowing the continuity of the ecological corridor and the biodiversity:
• Introducing standards that could be repeated and based on NBS for what concerned noise mitigation.</td>
<td rowspan="2">• The area belongs to RFI and City of Milan.
• RFI is responsible for the new construction works.
• Social and Environmental Associations and citizens will participate in the co-management and co-maintenance of the area, including NBS and they will participate to social activities.</td>
<td rowspan="2">• City of Milan and citizens
• Travellers
• National Railway Company
• Residents of viale Tibaldi</td>
</tr>
<tr>
<td>Key Resources
• Intellectual: Engagement of the private sector and citizens, Technical experts
• Financial: private sponsors</td>
</tr>
<tr><th colspan="2">Cost Structure</th><th colspan="3">Revenue Streams/ Financial Model</th></tr>
<tr>
<td colspan="2">• Noise barriers
• Green wall
• Design for comfortable public space
• Reinforced soil</td>
<td colspan="3">• The funding allocated for the NBS at Tibaldi Station in 800K €.
• Some sponsors will be involved for the green maintenance</td>
</tr>
</table>

[43] Rete Ferroviaria Italiana; Polimi – Politecnico di Milano (Università) – Polytechnic of Milan (University; FPM – Fondazione Politecnico di Milano (Università) - Polytechnic of Milan Foundation (University)

Annex 2.7 - Sustainable Business Models

In this Annex we are covering all the pre-existing models of SBM, focusing on **some of the CALs implemented in CLEVER Cities**. The purpose is to provide practical information on how the SBM can be interpreted. Please note that this Annex does not include all the CALs and BMC described above as the objective is to only clarify the eight models and not to apply the BMC to SBM (as this was already done extensively in chapter 4.3)

Sustainable Business Models	*Value proposition*	*Value creation and delivery*	*Value Capture*
1) Maximise material and energy efficiency 	Milan CAL 1 By using green spaces and green walls we decrease air pollution, reduce noise, improve local microclimate and help to better manage the water runoff.	In Milan green roofs and walls will bring more nature into the city. The NBS solutions can act as a space alternative showing that the nature does not stop on the ground. A roof garden or a courtyard can provide vegetables, fruits and aromatic herbs or can even welcome paddy fields for cultivating different types of rice.	Green spaces and roofs can be incentivised by the city through its financing lines as in the case of Milan. The city offers financial support by facilitating the access to Credit Lines, Tax Deductions and Green Bonuses. Milan also allows for the involvement of private individuals in co-financing and sponsorships of this kind of solutions.
2) Create value from 'waste' 	London CAL 2 Using NBS to improve the water quality, habitat and biodiversity of a lake. Southmere Lake is set to be reborn by being cleaned up and introducing of new plant and wildlife. Managing and **re-using excavated silt** will save millions of pounds and avoidable waste.	More than 4,500 tons of silt is going to be removed to make the lake deeper and prevent the build-up of harmful algae. The silt will then be re-used to establish a wetlands area on the east side of the lake to attract new bird and wildlife. This will also include new fishing platforms and a fish free channel to encourage biodiversity and allow other aquatic life.	There have been significant costs savings in the reuse of silt within the site. At the beginning of this project the treatment of the contaminated silt was £350/m3 with a total cost potentially rising to £4,200,000. However, silt testing came back and deemed the materials suitable for reuse onsite.
3) Substitute with renewables and natural processes 	CAL 2 - Hamburg The improved management of water resources - reducing flood risk through different NBS (green roofs, tree cover, sustainable drainage systems).	The development of a "Areal drainage and heavy rainfall precaution Concept" is subject of experimentation in Hamburg. It involves implementing green roofs and monitoring the water retention capacity as well as the controlled release of the water. New partnerships and collaboration needed to set up sustainable drainage systems. It is worth mentioning that in CLEVER Cities, it is the first time that rainwater management and drainage can be implemented at such a scale which has not been possible before in the project.	Interventions are co-financed by different public local programmes and actors in Hamburg, however the option of including owners of building roofs in the project could appeal to the municipality.

		The drainage system enable water flowing along a winding route from one chamber to another. During heavy rainfall the chambers of the board are filled with water that passes from one chamber to the next causing better discharge of the excess water.	
4) Deliver functionality rather than ownership 	CAL 2 - Milan Providing high quality multifunctional **green services** in Giambellino 129 that can bring presidium, social cohesion and ecological improvements.	Co-design and construction of the green area of Giambellino 129, a green area of 27,000 square meters. NBS : bird watching, oasis for butterflies, community garden and orchard; green wall to be reproduced on terraces and balconies Great attention will be paid to the didactic aspect, to make G129 a place for citizens to discover, experiment, learn how it is possible to reproduce the green elements on the balconies, buildings, courtyards and empty spaces of the city. The final result is to empower citizens undertake and implement similar actions in the future.	This model creates values both for the environment as for its beneficiaries/citizens that can replicate the service provided by the city – in their private spaces, at home (balconies, terraces). This model makes it easyr for the citizens to contribute to the project.
5) Adopt a stewardship role 	CAL 3 - Hamburg Developing school playgrounds and gardening - a practice-orientated way to reconnect citizens to nature, in particular the young generation.	School playgrounds will be redesigned using nature-based solutions to improve the rainwater retention and the health of local school children. Later, in the project, urban school gardens will also be developed. Schoolteachers are leading the activities by a ‘’doing yourself’’ approach. This is beneficial for school students as well as for uptake of solutions. Moreover, a teacher position was advertised, specifically to have a dedicated person being able manage and drive forward the green school programme. The fact that the school administration already empowered the green school programme marks a competitive advantage towards other schools.	Interventions are co-financed by different public local programmes and actors combined with school funds.
	CAL 2 London Breathe new life into the lake by attracting local people and visitors and help the area reach its full potential.	The area of the lake will include new fishing platforms and a fish free channel to encourage biodiversity and allow other aquatic life, such as frogs and newts to flourish. Moreover, a ‘learning in the landscape’ outdoor classroom will be developed in order to bring learning outside, foster a love of nature and the great outdoors, and encourage more healthy lifestyles at an early age.	Enhanced public realm - local residents and housing developers. The overall work around Southmere Lake and its environment will allow conditions for an increased housing price per m2

		An outdoor learning trail and spots will be used by local teachers for outdoor activities linked to a larger school programme and connected to school curricula. Students and other visitors can encounter various natural and cultural learning points on a single walk.	
6) Encourage sufficiency 	CAL 1 Hamburg - Empowering local community	The action encourages residents to reflect to notions such as healthy lifestyles, durability as well as wasting less and consuming responsibly.	Social and environmental benefits are captured - more educated residents encouraging them to be more independent in their personal consumption.
	CAL 3 – Hamburg - support environmental education and allow young, urban citizens to engage with food and nature	School pupils are empowered by trainings on healthy eating and food, sport and physical activities. The activities provide them a better education, allowing the conditions to make better decisions about their future and endowing green upskilling for future employment	This model delivers nutrition, health and education at a low environmental cost while being embedded in the community schools. Social benefits are also involved as the model aims at preventing child obesity by teaching on the nutritional value and importance of fruits and vegetables in one's diet. The health, food, and well-being were put in the forefront of the educational agenda.
7) Re-purpose the business for society/ environment 	CAL 1 Hamburg Empowering local community and under-represented citizens (refugee accommodation) by developing joint urban gardening activities and planting actions.	Co-creation concept based on the wishes of residents on the uses of free space around their residences for purposes of gathering, exchanging, making conversation or entertaining. The residents of the area created the high beds for themselves as well as took part in the chill and communication area designing. The high beds in the project area have been implemented together with the residents.	This action is prioritizing delivery of social and environmental benefits rather than economic profit. The action produces societal benefits by involving the local refugees (there are about 1500 refugees that live in the project area) allowing them to have their say through volunteering. One of the outcomes of this action is related to strengthening of responsibility among fragile groups while allowing them a better local integration.
	CAL 2 London Foster a love of nature and the great outdoors and encourage more healthy lifestyles at an early age.	Following the phase of cleaning the lake, the second phase of the transformation will get under way and see even more enhancements of the lake as well as the surrounding area for residents and visitors. This second phase will promote health and well-being, creating thriving community facilities that can be used by as many residents, schools and youth groups as possible. Tree planting will also serve as the initial steps in making ecosystem connections for bird and small animal habitat.	

		Green corridor with interpretive spots initiated in conjunction with the planting of new trees and including signage, natural art, and outdoor classroom stops.	
8) Develop scale-up solutions 	CAL 3 Hamburg - Developing school playgrounds and gardening	Upscaling the pilot solutions developed in the first phase to further Hamburg Schools. From the realised project, “dos” and “don’ts” will be taken and give advises on how other schools can transform their schoolyards into recreational spaces for pupil and nature.	Benefits can be captured at the level of the cooperation that will be developed in the upscaling phase, promoting the exchanges and the cohesion of the different schools.
	CAL 1 Milan– Green roofs and walls	Involving real estate, building associations and private citizens in order to upscale the initial pilot to 10 different project areas. To facilitate the scale-up the city of Milan also developed environmental certification schemes regarding the role of green roofs and walls. Moreover, an activity of co-mapping the existing green walls and roofs is ongoing. This action will be giving visibility to the existing realizations (but also to the new designed ones).	In this model we can speak about an increase of the property values or about capturing social benefits, be them increased opportunities of socialization, well-being and quality of life. The co-mapping of green roofs and walls could also represent an opportunity to involve private sponsorships awarding the most interesting projects and enhancing the replication of CLEVER roofs and walls all over the city and the metropolitan area.

Annex 3 Financing Natured Based Solutions

Annex 3.1: Additional information on "Survey on Nature Based Solutions", 2019

"Survey on Nature Based Solutions" was delivered as part of the research for this report. Social Finance and Green 4 Cities delivered the survey over the period August – December 2019. Our primary distribution method was mailing lists for Clever Cities, other Horizon 2020 projects, and a mailing list for one nature-based solution conference. We received 20 responses from a range of different stakeholders working in the industry. Additional information on the survey is below:

Full list of survey questions:

1. Which of the following potential benefits of NBS are valued by stakeholders, in your experience? Please tick all that apply. (Benefits and stakeholders displayed in checklist)
2. Do you know of specific examples demonstrating that stakeholders value these outcomes? If yes, please provide details.
3. Which of the following potential benefits of NBS would funders pay for, in your experience? Please tick all that apply. (Benefits and stakeholders displayed in checklist)
4. Do you know of specific examples where funders paid for these potential benefits of NBS? If yes, please provide details.
5. Which funders are financing NBS, in your experience?
6. Which of the following ways to finance NBS have you seen in practice?
7. What funding incentives are you aware of to increase NBS and other sustainable initiatives?
8. Measuring impact is important for NBS. What interesting tools or mechanisms have you seen for measuring the value/impact of NBS?
9. Is there anything else you would like to tell us/any more examples you would like to share about the financing of NBS?

Additional information on survey respondents:

Respondent Type – Organisation	Count
Academia	2
Central Government	2
Local Government	4
Non-profit	1
Other	2
Private Sector: Landscape / Urban planning	4
Professional Association	3
Public Research Institution	1
Regional Development Agency	1

Table 26 NBS Benefits - % of survey respondents who agree this funder values this benefit. (Survey Question: "Which of the following potential benefits of NBS are valued by stakeholders, in your experience?")NBS Benefits - % of survey

respondents who agree this funder values this benefit. (Survey Question: "Which of the following potential benefits of NBS are valued by stakeholders, in your experience?")

NBS Benefit	Local gov	Central gov	Philanthropy and charity	Commercial investors	Social investors	Citizens	Rank
Air/ambient quality	55%	60%	30%	30%	20%	50%	3
Climate mitigation and adaptation	50%	60%	30%	35%	20%	40%	5
Coastal resilience and/or soil protection	20%	50%	10%	10%	10%	15%	12
Community participatory planning and governance	55%	25%	55%	5%	20%	40%	9
Enhancement of natural capital	50%	55%	30%	25%	10%	25%	11
Green space management	75%	45%	30%	20%	30%	55%	2
Potential for new economic opportunities and green jobs	40%	35%	25%	45%	25%	35%	8
Public health and well-being	65%	45%	45%	15%	35%	70%	1
Social justice and cohesion	60%	25%	60%	0%	30%	55%	6
Urban biodiversity	60%	35%	35%	5%	20%	45%	10
Urban regeneration (incl. transport)	60%	55%	15%	40%	20%	55%	4
Water management	70%	40%	20%	30%	10%	35%	7

Source: "Survey on nature-based solutions," CLEVER Cities 2020, n=20. Percent of respondents responding "Yes" to this question.
Note: Rank calculated as comparative index to measure value – total %/120 (possible votes)*100.

Table 27 NBS Funding - % of survey respondents who agree this funder would pay for this benefit (Survey Question: "Which of the following potential benefits of NBS are valued by stakeholders, in your experience?")

NBS Benefit	Local gov	Central gov	Philanthropy and charity	Commercial investors	Social investors	Citizens	Rank
Air/ambient quality	45%	50%	15%	10%	10%	20%	6
Climate mitigation and adaptation	40%	55%	20%	10%	10%	15%	5
Coastal resilience and/or soil protection	10%	55%	5%	10%	0%	5%	12
Community participatory planning and governance	45%	5%	30%	5%	30%	20%	7

Enhancement of natural capital	35%	45%	15%	5%	15%	10%	10
Green space management	70%	30%	10%	10%	5%	30%	4
Potential for new economic opportunities and green jobs	50%	40%	15%	45%	15%	5%	1
Public health and well-being	40%	50%	40%	0%	15%	15%	3
Social justice and cohesion	25%	15%	45%	0%	25%	15%	9
Urban biodiversity	40%	25%	15%	5%	0%	20%	11
Urban regeneration (incl. transport)	60%	55%	5%	25%	5%	15%	2
Water management	40%	55%	10%	10%	10%	5%	8

Source: "Survey on nature-based solutions," CLEVER Cities 2020, n=20. Percent of respondents responding "Yes" to this question.
Note: "Rank" calculated as comparative index to measure value – total %/120 (possible votes)*100.

Annex 3.2: Summary of funders

A summary of the seven primary funders discussed in this section of the report is below. This table summarises who the funders of NBS are, what are some incentives they have to fund NBS, what types of funding they use (how), and when they fund NBS.

Table 28 Summary of funders

WHO funds NBS	**WHY** [1] do they fund NBS?	**HOW** [2] do they fund NBS?	**WHEN** do they fund NBS?
Local government	- Green space management - Water management - Public health and wellbeing - Social justice and cohesion - Urban biodiversity	- Direct funding / grant - Debt - Equity*	- Risk reduction - Green densification - Vacant spaces - Local stewardship - Green health - Green education - Green heritage
Central government	- Air/ambient quality - Climate mitigation and adaptation - Urban regeneration - Enhancement of natural capital - Coastal resilience / soil protection	- Direct funding /grant - Debt - Equity*	- Risk reduction - Green health - Green education - Green heritage

Philanthropy and charity	- Social justice and cohesion - Community participatory planning and governance - Public health and wellbeing - Urban biodiversity	- Direct funding / grant - Debt* - Equity*	- Risk reduction - Vacant spaces - Local stewardship - Green health - Green education - Green heritage
Commercial investors	- Potential for urban economic opportunities and green jobs - Urban regeneration - Climate mitigation and adaptation - Commercial case**	- Debt - Equity	- Green densification - Urban offsetting - Vacant spaces - Green heritage
Social investors	- Public health and wellbeing - Commercial case **	- Debt - Equity	- Risk reduction - Vacant spaces - Green health - Green education - Green heritage
Citizens	- Public health and wellbeing - Green space management - Urban regeneration - Social justice and cohesion - Air / ambient quality	- Direct funding / grant*	- Vacant spaces - Local stewardship - Green education
Other (e.g. business)	- Situation specific - Commercial case **	- Direct funding / grant*	- Risk reduction - Green densification - Urban offsetting - Green heritage

[1] Illustrative – top 5 benefits valued from survey (note: benefits receiving scores <= 30% not included)
[2]* Potential funding type for funder to use. ** Commercial case is not an NBS specific benefit, but may be a factor to integrate into the financing solution.

Annex 3.3: Examples for different financing mechanisms

Table 29 Examples for different financing mechanisms

Innovative pooling of different government budgets
Hamburgs Clever Cities project CAL 3 School Yards involves financing from the local authority Freie Hansestadt Hamburg. RISE(the framework programme for integrated district development), and the schools' self-governing funds are also to be used to fund the project.
Green **debt** funded by public or private financial institutions, or individuals.

Loans	**SüdWestStrom**, Thübingens (Germany) network of public utility companies built a new office building, using green loans from KfW. KfW (Kreditanstalt für Wiederaufbau) is a public financial institute offering green loans (and more).
Concessional financing (soft loans)	**Sioux City sewer system** financed the stabilization of riverbeds in Ravine park for USD 1.4 million to obtain a low interest loan for their USD 14.4 million facility modernisation project.[44]
Green bonds	**The City of Gothenburg** is holding a green bond since 2013. It is supporting environmental projects which are selected by the City Office and the City Council. The Environment Administration must verify them to the City Executive Board before awarding the green bonds. The City Office is monitoring the project and communicates to investors. Between 2013 to 2016, the bond issuances raised around 4.5 billion SEK (equivalent to GBP 360 million).[45]
Crowdfunding	**GREEENPASS** is a software that enables efficient and resilient city planning by visualising and quantifying the effects of blue and green infrastructure and comparing this to grey infrastructure. In 2018, a fundraiser was launched, which offered a subordinated loan with 6 % of fixed interest (additional +0.5 % for investment higher than €5000) with a timeframe of 5 years and 3 months. 241 investors supported the campaign.
Natural Capital Financing Facility (NCFF)	**Athens Resilient City and Natural Capital** got a 5 million investment from NCFF for green and water-related infrastructure. The European Investment Bank provided a 55 million loan, to support the Municipality of Athens Resilience Strategy for 2030. The NCFF contribution will allow Athens to improve the investment plan, including more innovative natural solutions (EIB, 2018).
Green equity funded by public or private financial institutions, or individuals.	
Equity finance	**StadtFarm** is a company that uses aquaponics systems to sustainably produce fish and vegetables in a closed water cycle. StadtFarm ran a crowdfunding campaign to raise €350,000 for a 7% equity stake in their company. This funding is to build a second aquaponic system in Berlin. Over 367 individuals invested in their campaign, investing on average €1,000 each to support StadtFarm's project and possibly generate profit on their investment.
Grant funding and donations Various public or private bodies on diverse administrative level provide grants for creating NBS. Local authorities as well as businesses or individuals can apply for grant funding	
European Structural and Investment Funds (ESIF)	France: the '**Star Elite**: wastewater treatment system by bio-enhanced and augmented plant filters for the reuse of water' project was supported during their project duration from 2016-2019 with the European Regional Development Fund contributing €86,531. It enabled the development of a prototype for phytopurification technology, which is now commercially available (EC, 2020).

[44] https://waterfm.com/reduction-of-agricultural-nutrient-runoff-examining-new-payment-methods-to-address-source-water-pollution/
[45] https://finans.goteborg.se/en/greenbonds/projects/

Program for the Environment and Climate Action (LIFE)	In Lisbon, the LIFE project towards a more resilient city began in September 2019. **LIFE LUNGS** - UrbaN Green InfraStructure as an adaptation to climate change is a programme to tackle rising temperatures using urban green infrastructure and develop a zero-rainwater waste scheme[46].
Horizon 2020	The EU programme Horizon 2020 funds a wide range of projects, including NBS projects like CLEVER Cities, GrowGrreen and more[47].
Regional & national government grants	The Heritage Lottery Fund and the Big Lottery Fund are public bodies in the UK, redistributing funds raised by the National Lottery.
Philanthropic contributions	**SSE Renewables Community Investment Funds, UK** consisting of community funds like SSE Sustainable Development Fund, Local Funds and others. It was set up by SSE Renewables, a leading energy company. In 2018/2019 it donated a total of GBP 6.6 million, supporting project with a long-term impact on social, economic and/or environmental changes.[48]
Crowdfunding	In 2015 Ghent, Belgium introduced a **Ghent crowdfunding platform for climate adaptation**. Citizens share their ideas, and with the minimum donation of €5 on the platform raise funds from multiple individuals. Additional municipal funding can be requested, which will be granted when 50 % of fundings are generated through the crowdfunding platform[49].
Revenue-generating instruments	
Land sales/leases	**Lichtenrader Volkspark, Germany** is leasing its land from the Federal State Berlin. The private association 'Trägerverein Lichterader Volkspark e.V.' is developing and maintaining the public park from incoming donations. [50]
Taxes	The **renaturalization of the Wesser river's coast** in Germany had a budget of around €520,000. It was halfway funded from sewage taxes by the local Department of Environment, Construction and Transport and co-funded by the EU.[51]
Ecological Fiscal Transfers (EFT)	In 2007, **Portugal introduced Ecological Fiscal Transfers**. In 2008, this represented 2.2 % of the total fiscal transfers, supplying around €53 million.[52]
User fee	**The Botanic Gardens and Parks Authority** in Perth, Australia a revenue of AUD 2.200 was generated from user charges and fees, which makes about 10 % of their total revenues in 2017-2018.[53]
Developer contributions/charges	A **Development Cost Levy** for property developers is required as a prerequisite for getting a building permit in Vancouver, Canada. In 2018 a

[46] https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=7122
[47] Find more projects on https://ec.europa.eu/programmes/horizon2020/en/h2020-sections-projects
[48] Community Investment Review 2018/19, https://sse.com/media/629283/Community-Investment-Report-2019.pdf
[49] https://climate-adapt.eea.europa.eu/metadata/case-studies/ghent-crowdfunding-platform-realising-climate-change-adaptation-through-urban-greening
[50] Lichterader Volkspark (2008) https://www.lichtenrade-berlin.de/lichtenrader-vereine-lichtenrader-volkspark
[51] https://naturvation.eu/nbs/bremen/renaturalization-weser-rivers-coast
https://www.bauumwelt.bremen.de/sixcms/media.php/13/Hemelinger_See_Fuldahafen.pdf
https://www.landschaftsarchitektur-heute.de/projekte/details/2023
52 https://jeep.eu/uploads/articles/attachments/2fa8b43b-13cc-4878-a670-ced2e31b4caf/PT%20Ecological%20Fiscal%20Transfer%20final.pdf?v=63680923242
53 https://www.bgpa.wa.gov.au/images/pdf/about_us/ar_bgpa_2017_18.pdf

	total of CAD 98 million were generated from this collection, funding public facilities including parks. [54]
Betterment levies	The **Melbourne Metropolitan Parks Charge** is collected from a Victorian government owned retail water corporation on behalf of the Department of Environment, Land, Water and Planning since 1958. The development, management and maintenance of metropolitan parks, gardens, trails, waterways and zoos have been secured through this fund.[55]
Funds linked to offsetting/compensation requirements	For the **Ruhr river renaturation in Arnsberg**, Germany municipality is financing 20 % through an 'eco-account', which accumulates financial resources from compensation for construction projects. 2011 renaturation on 10 km was done for €12.2 million in total.[56]
Other voluntary schemes	As the outcome of a LIFE project, the 'Green areas inner-city agreement' was established 2015. It introduce a voluntary **carbon footprint compensation scheme to finance tree planting** in Bologna, Italy. Businesses calculate their caron footprint and donate towards tree planting, while the city agreed to plant and cover costs for maintaining for 3 years. 1,405 trees were planted, from voluntary contributions of €281,000.[57]
Market-based instruments	
Reduction of user charges	A **new pricing system on sewer charges** was introduced 2012 in Hamburg, which involves a calculation of stormwater management charges based on the amount of sealed area on the property. HAMBURG WASSER and the State Ministry of Environment and Energy conducted the Rain InfraStructureAdaption (RISA) project, with the new system as one output. [58]
Taxes	The Netherlands operate a **Green Fund Scheme**, where green projects are exempt form income tax. The schemes is aimed at investors, but only certified projects are granted the exemption (Illes & Ratliff, 2017).
Subsidies	**Bratislavas rainwater management subsidy**: the cities offers subsidies for covering 50% for small projects with a max. cost of €1000 for rainwater management installations such as rain gardens, rain water catchment tanks, unsealing surfaces or installing green roofs.
Tax rebates	A tax relief system was introduced in France to support **biodiversity conversation in Natura 2000 sites** on private land (Illes & Ratliff, 2017).
Credit trading system (e.g. carbon credit, stormwater retention credit)	**Stormwater Retention Credit Trading Program, Washington, DC** was created 2013, see Case Study 1.
Offset	In Melbourne, the government owned water company runs a stormwater offset scheme. If developers cannot treat stormwater on their location according to the standards, a fee has to be paid. From this budget,

54 https://vancouver.ca/files/cov/annual-report-development-cost-levies-2018.pdf
55 https://www.parks.vic.gov.au/about-us/parks-charge
56 https://www.flussgebiete.nrw.de/system/files/atoms/files/2012_04_19_symp_16_scheia-skript.pdf?fbclid=IwAR21xH_QE0sOrE5qKviv96i5tO9lZC3DY_qf2Oqczq8aSoDD5svKJGUjDUw
https://www.sauerlandkurier.de/hochsauerlandkreis/arnsberg/oekologischer-ausgleich-5760874.html?fbclid=IwAR0pDe3m9elk0bIlKlZrWAT1sehYPfTfUfkTcbY_Nvc2dlBzcPn-SOa0FGO
57 https://climate-adapt.eea.europa.eu/metadata/case-studies/gaia-green-area-inner-city-agreement-to-finance-tree-planting-in-bologna
58https://pdfs.semanticscholar.org/836e/175809b3b0675e42ff0c7c327616683c8fa7.pdf?_ga=2.112276167.297118859.1585838227-1682148416.1584465056

	Melbourne Water installs stormwater facilities at another location (Melbourne Water, 2019).
Payments for Ecosystem services (PES)	In 2008 private water company (South West Water) partnered with an NGO (Westcountry Rivers Trust) to set up the **'Upstream Thinking' catchment management scheme**. Famers located in areas important for water quality will be provided advice in form of a water management plan and grants for up to 50 % of their investments. This scheme aims to improve water quality, lowering water treatment costs for South West Water (South West Water, undated).
Revolving funds	
The **Clean Water State Revolving Fund** in the US supports NBS by providing low-interest loans for water quality improving projects. The Environment Protection Agency provides the capital, Repayments of the low-interest loans are recycled into the programmes to finance new projects. Over time, the funds revolve (US EPA, 2020). The **Urban Redevelopment Authority of Pittsburgh** holds several revolving loans, for example the Urban Development Fund or the Pollution Prevention Assistant loan to become more energy efficient. [59]	
Public-private partnership	
In Bilbao, Spain the **Zorrotzaurre** district is being **redeveloped into a flood-proof residential area**. The Management Commission of Zorrotzaurre was set up as a public-private partnership composed of actors owning the 65 % of the formerly industrial land. All redevelopment costs including ground level elevation and public green spaces are going to be paid by the partnership according to their share of the land, being 51 % public and 49 % privately owned (Climate-ADAPT, 2016).	
Environmental or social impact bonds	
In Buffalo, US the City of Buffalo and Buffalo Sewer Authority launches an $30 million Environmental Impact Bond. It is used capitalize on a green infrastructure incentive program, the Rain Check 2.0 Gran Program, which encourages private green infrastructure development (Buffalo Sewer Authority, 2020).	
Business improvement district	
Team London Bridge, UK - The London Bridge business community established a company in 2006 to deliver projects and services funded by the BID levy contributions. For 2019/20 the levy is 1.19 % of rateable value, being invested in project that the members have prioritised (e.g. environmental improvements), which is updated every 5 years (Team London Bridge, undated).	

[59] https://www.ura.org/media/W1siZiIsIjIwMiAvMDEvMilvOHluMzZmY2JuM19QUEFBX0ZseWVvXzFfMiJfMiAvMC5wZGYiXV0/PPAA%20Flyer%20-%201_22_2020.pdf

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