European Commission

Guidelines for Co-Creation and Co-Governance of Nature-based Solutions

Insights from EU-funded projects

Independent Expert Report

Research and Innovation

Guidelines for Co-Creation and Co-Governance of Nature-based Solutions – Insights from EU-funded Projects

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Guidelines for Co-Creation and Co-Governance of Nature-based Solutions

Insights from EU-funded Projects

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Preface

Nature-based Solutions (NBS) are essential instruments in our toolkit to tackle major societal challenges, such as climate change, biodiversity loss and pollution. But they also have the potential to contribute to and accelerate the transformative change that will bring about a climate-neutral, sustainable, and equitable future as imagined by the European Green Deal.

However, the success of NBS interventions lies in their ability to consider local culture and conditions, to respond to the needs of the community where they are embedded and to distribute benefits fairly across population segments. It also depends on the buy-in of that community. That is why the design, implementation, maintenance, and monitoring of NBS need to involve and empower that community, ensure ownership and stewardship, which in turn translate into long-term environmental, economic and social viability of the intervention.

In this context, *co-creation,* and *co-governance* — the two cornerstones of this publication — become central to the effective deployment of NBS in different settings. Evidence suggests that co-creation is a key catalyst for social change, which also underscores the relevance of NBS processes and interventions in changing our relationship with nature while bringing it back into our lives. The European Commission has also made the role of co-creation essential in its guidelines and toolkit for Urban Greening Plans[1] to which some of the authors of this report contributed as well.

This report offers practitioners, decision makers, researchers and other experts' guidelines and approaches to co-designing, co-developing, co-implementing and co-monitoring NBS for environmentally, economically, and socially sustainable NBS.

The guidelines added value lies in proposing co-creation and co-governance pathways built on the experience of tailoring them to different contexts, spatial scales and timelines in several EU-funded research and innovation projects. The document gives valuable insights in specific cases and success stories, for instance, how some cities have overcome, with co-governance, the most challenging aspects of governance silos and ensured extensive citizen engagement.

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[1] As part of the EU Biodiversity Strategy 2030 - in order to bring nature back to cities and reward community action - the Commission called on European towns and cities of at least 20,000 inhabitants to *"...develop ambitious Urban Greening Plans"* including *"measures to create biodiverse and accessible urban forests, parks and gardens; urban farms; green roofs and walls; treelined streets; urban meadows; and urban hedges."* https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

Executive Summary

Co-creation and co-governance are core processes for sustaining the deployment of locally meaningful Nature-Based Solutions (NBS). The two processes are aimed at contributing not only to a more balanced ecological approach to urban regeneration, but also (in what concerns NBS) to generate processes anchored in a transdisciplinary dialogue between citizens and local communities, experts and urban planners, political representatives, and public officers, researchers, and private investors. The two concepts could be summarised as follows:

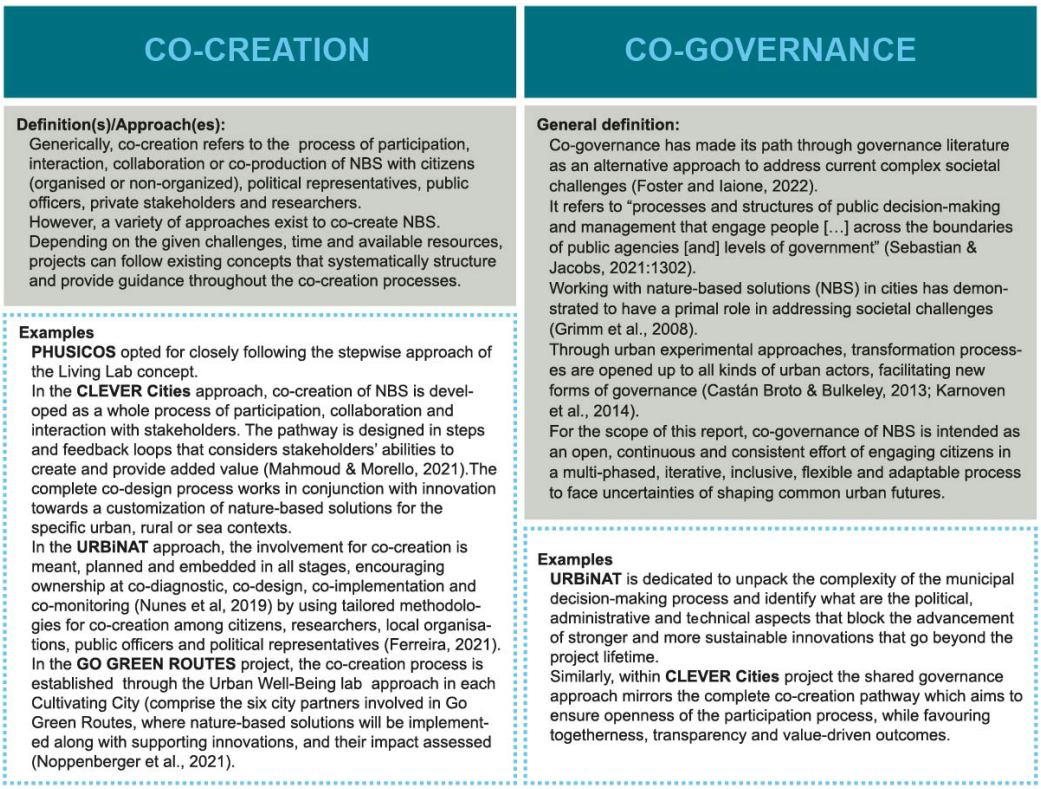

Figure 1 Key concepts of CO-CREATION and CO-GOVERNANCE throughout EU-funded projects

Graph ideated by Isabel Ferreira and Nathalie Nunes, input from Gerd Lupp, Israa Mahmoud, Maria-Carmen Garcia-Mateo

Aspects related to co-governance are present in all stages of the co-creation process, though assuming different levels of intensity, the opportunities for cooperation, collaboration and co-production that exist distinguish it from other forms of governance in what concerns the creation of NBS. There are fundamentally five stages in the co-creation cycle of NBS, transversally complemented by six key approaches to co-governance, summarised as follows:

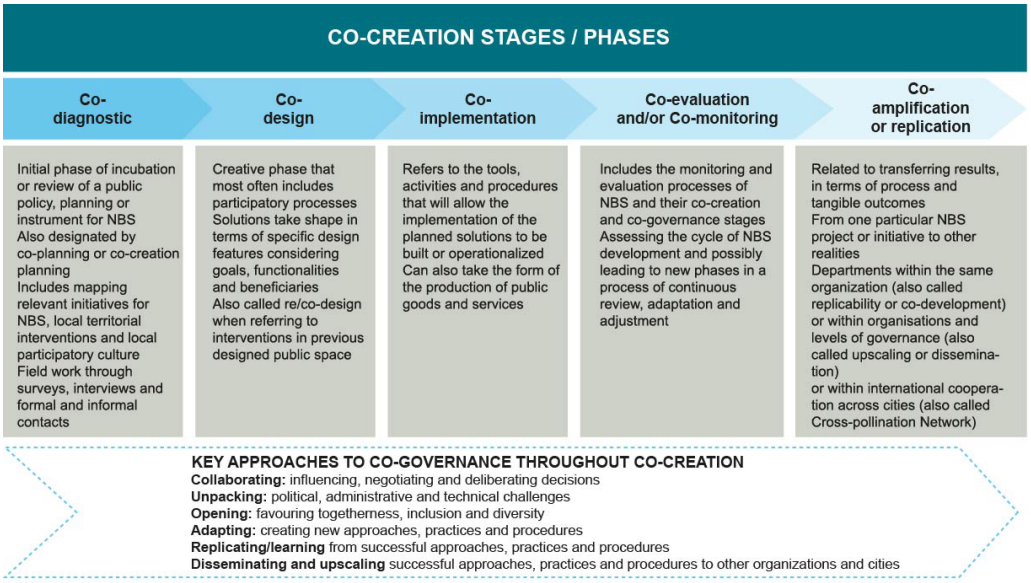

Figure 2 Co-creation stages/phases & Co-governance approaches

Graph ideated by Isabel Ferreira & Nathalie Nunes, input from Gerd Lupp, Israa Mahmoud, Alessandro Arlati & Maria-Carmen Garcia-Mateo

The current report analyses co-creation and co-governance for Nature-based Solutions (NBS) based on many European projects. Each project represents different approaches to co-designing, co-developing, co-implementing and co-monitoring NBS projects being deployed in diverse European political, geographical, ecological, governance, socioeconomic, cultural and participatory contexts. The analysis is the basis for the presentation of best practices regarding the co-creation of NBS at its different stages, phases and scales.

The report provides guidelines to researchers, practitioners and other experts researching, implementing and/or evaluating territorial regeneration processes that prioritize and advocate for inclusive and nature-based approaches. Those interested or actively operating in the fields related to urban regeneration will find that this report is the result of a joint discussion and analysis of many European projects that pursue the mainstreaming of NBS co-creation and co-governance in strategic planning, urban governance, and urban design.

The report starts with an attempt to put together a diversity of features that emerge from the chapters of this publication, under the section *Setting the scene: building blocks of co-creation processes*. Instead of a list of oversimplified terminology, the section presents a building blocks approach which aims at translating a diversity of approaches, contexts, and knowledge production. The inherent diversity and complexity of the theme are further explored throughout the report, reflecting the discussions, perspectives, and outcomes from many EU-funded sibling projects, and providing insights, case studies and examples from four projects, namely CLEVER cities, Go-Green Routes, PHUSICOS and URBINAT.

Table 1. Brief description and link to the four main contributing projects

Project	Decription
CLEVER Cities	The CLEVER Cities project uses nature-based solutions to address urban challenges and promote social inclusion in cities across Europe, South America and China. CLEVER Cities develops solutions basket with innovative co-created and shared governance processes.
GOGREEN ROUTES	The multidisciplinary consortium is pairing participatory approaches and citizen science with Big Data analysis, digital innovation to co-create "Urban Well-being Labs" in six "Cultivating Cities", three "Seed Cities" and a "Cross Pollination Network".
PHUSICOS	The project demonstrates how nature-based solutions provide robust, sustainable and cost-effective measures for reducing the risk of extreme weather events in rural mountain landscapes.
URBINAT	The project focuses on inclusive urban regeneration through the co-creation of NBS to form Healthy Corridors which act as drivers in the transformation of social housing neighborhoods, and the wellbeing of residents.

The report is composed of the following five chapters:

Chapter 1 *Introduction to co-creation and co-governance of nature-based solutions: key policy trends* discuss the concepts of co-creation and co-governance of NBS, framing it under the context of the NBS policy agenda, including EU policies and global agendas supporting NBS, co-creation and co-governance. The value of co-creation of NBS for society and the planet is also explored, as much as how it can be enhanced through its various stages.

Chapter 2 *Understanding and mapping stakeholders* is focused on screening the relevant stakeholders to take part in the co-creation processes, from the perspective of who can/want/should participate in order to uphold valuable co-creation processes and activate living labs. Stakeholders are analysed from the perspective of diversity, participatory cultures, diversity of roles, inclusion challenges and engagement throughout co-creation stages.

Chapter 3 *Co-creation in action* elaborates on the key principles and guidelines of participatory design models and approaches. Conceptual and technical phases of the design processes are addressed in order to provide guidance on the fundamental components in which participatory design, building and implementation of NBS operates. The chapter also includes communication components related to the continuous process of informing, involving and empowering through the sharing of knowledge by using different dissemination channels.

Chapter 4 *Towards a Co-governance approach for NBS* starts by explaining the specificities of the concept of co-governance and discussing criteria to guide the transition from governance to co-governance. Drivers and barriers are also summarised and supported by examples. A set of governance network typologies and actors' constellations is presented, followed by a brief on multiple possible routes that led to a range of governance networks.

Chapter 5 *Monitoring and Evaluating the NBS co-creation process* focuses on the fundamentals and driving components of applying assessment to the process of NBS co-creation and also to include co-creation concept as part of the NBS design and implementation. An outline of methodologies and tools for participatory assessment are provided for the evaluation of NBS benefits. Moreover, guiding principles for the selection of indicators in participatory assessment of NBS are presented, followed by assessment approaches developed by NBS EU-funded projects.

Finally, the report presents 2 annexes:

Annex 1 provides a detailed overview of building blocks for a successful co-creation process.

Annex 2 lists and briefly describes a range of methods and methodological approaches on co-monitoring and co-evaluation.

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Setting the scene: Building blocks of Co-Creation processes

Coordination and main authors: *Nathalie Nunes and Gerd Lupp*
Internal review: *Israa Mahmoud, Isabel Ferreira and Alessandro Arlati*

The NBS community has been expanding with multi-agents partnerships that bring together different perspectives, expertise, and experiences from academic, technical, and political fields. These partnerships are also characterised by collective and participatory routes towards knowledge production, namely those related to co-creation processes. This preliminary section consists of a presentation of the building blocks needed for a successful implementation of co-creation processes, which are based on the experience and research developed within the frameworks of different EU-funded initiatives.

By “building blocks of a successful co-creation process”, we mean to say that co-creation of tailored NBSs depends on a sound, solid foundation of sufficient building blocks. Some blocks are essential and form the core of such processes (see also Nunes et al., 2021), while others are specifically rooted in each context as a means to serve the different needs of the different projects. As shown in the Figure 3 below, we organise the building blocks around four main entries or dimensions to design and implement a co-creation process:

i) ***Guiding principles*** blocks lay the foundations for the co-creation process;
ii) ***Stakeholder engagement*** blocks that ensure a wide outreach that goes beyond the usual suspect, therefore including and giving an active voice to those who are often neglected or ;
iii) ***Context specific*** building blocks are essential to successfully engage stakeholders;
iv) ***Inclusive approaches*** strive to encourage stakeholders to bring their skills and create added value and multiple benefits by the designed NBS.

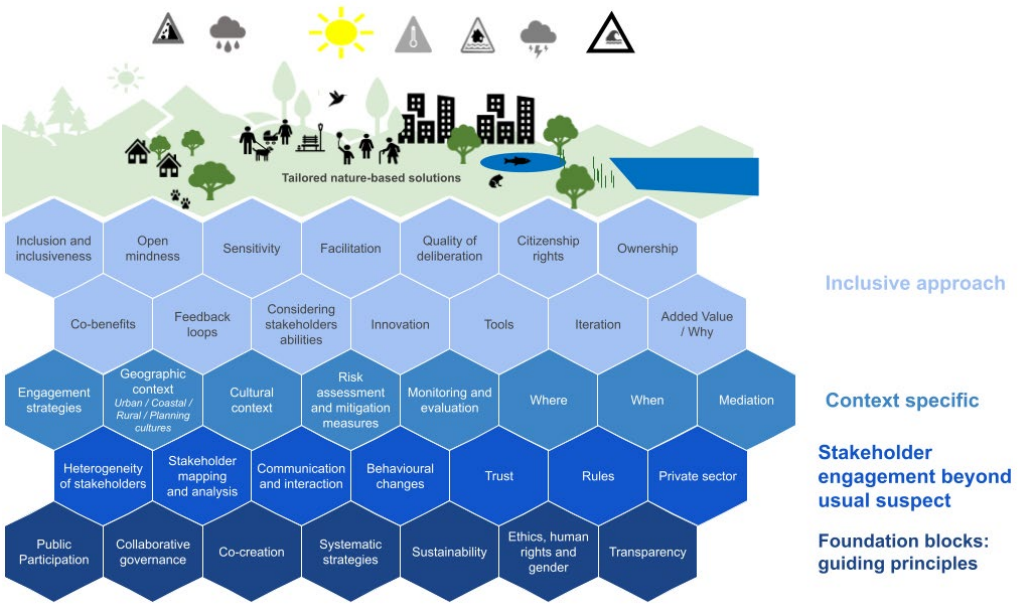

Figure 3: Devising a co-creation process based on a building blocks approach

Graph Ideated by Gerd Lupp, Gonçalo Canto Moniz, Nathalie Nunes. input from Israa Mahmoud

The four main entries or dimensions are composed of different blocks and briefly overviewed below in Table 2. They are addressed in further detail in the table of Annex 1providing in-depth insights of the different building blocks, including more extended definitions and references. Each of these blocks corresponds to factors that both support and impact the co-creation process. They need to be considered when developing a co-creation process, however, their combination may differ when applied to each (real case) specific context. Thereby, it offers insights on building co-creation processes based on an ecology of knowledges (Santos, 2018). It assumes that all of them, including scientific knowledge and the knowledge of other practitioners and agents, can be enriched through dialogue, sharing and learning. In the table below, the combination of these knowledges is also made explicit when linking each building block to the content addressed in specific chapters and sections of the present publication (i.e. [Chapter 1.3]).

Table 2. Brief overview of building blocks for a successful co-creation process

FOUNDATION BLOCKS: GUIDING PRINCIPLES
• *Public participation*: strategies related to the culture of participation, enabling regular interaction with citizens, and transversally increasing the culture of participation in all departments of the municipality [Chapters 1.3, 2.1] • *Collaborative governance*: strategies related to governance, thought in terms of balancing interactions among citizens, city staff, politicians, and other agents, i.e., focus on power relations and beyond the institutional division of municipal departments. [Chapters 4.1 and 4.2] • *Co-creation*: stimulating and improving the co-production of public services, participatory processes, and product development, by involving citizens in the implementation and delivery phases, as well as through an open process include a wide range of key actors, namely end-users. [Chapter 1.4] • *Systematic strategies*: setting different approaches and levels of participation depending on the goals and real conditions for participation. [Chapters 2.2 and 2.3] • *Sustainability*: increase the local community's overall sustainability in environmental, social and economic matters, and establish partnerships beyond the duration of NBS co-creation projects. [Chapter 1.1) • *Ethics, human rights and gender*: lenses contributing to the unveiling of deep-seated inequalities that need to be overcome. [Chapter 1.1 and cross-cutting dimensions and guiding principles for all chapters] • *Transparency*: being clear about purposes, rules and having strategies to communicate and provide information. [Chapters 1.4, 2.2, 3.2,3.4, 4.2, 5.2 and 5.5]
STAKEHOLDER ENGAGEMENT BEYOND USUAL SUSPECT
• *Heterogeneity of stakeholders*: diversity of groups in terms of age, gender, background, disciplines, whose broad engagement can be supported by systematic stakeholder mapping and dedicated strategies. [Chapter 2.2] • *Stakeholder mapping and analysis*: systematic methods to identify and characterise relevant stakeholders, as well as addressing their values, interests, knowledge and power relations. [Chapter 2.3] • *Communication and interaction*: communication strategies, materials and channels, multichannel interaction, codes of ethics, and support from organisations working with specificities (e.g., childhood, gender, older adults, race and ethnicity, functional diversity, citizenship status, religious diversity). [Chapter 3.2] • *Behavioural changes*: challenging traditional models of governance, expert advice, and implementation, as well as instigating adjustments of attitudes, mindsets, and behaviours in support of participation and collaboration. [Chapters 2.4, 3.1 and 3.3]

- *Trust*: improving or creating relationships of trust between citizens, and between citizens and city staff, politicians, and other agents. [Chapters 3.1, 3.4, 4.2 and 5.6]
- *Rules*: setting the frame and regulations to ensure equal rights in the expression of visions and priorities [Chapters 2.1, 3.4 and 4.2]
- *Private sector*: mapping who has links and can facilitate contacts with private actors, as well as their potential roles in the co-creation of NBS. [Chapter 2.2]

CONTEXT SPECIFIC

- *Engagement strategies*: starting points to identify relevant persons to engage could be the use of stakeholder mapping techniques, complemented by a variety of engagement strategy tools that exist, namely as a result of EU-funded projects. [Chapters 3.4 and 5.5]
- *Geographic context - urban, coastal, rural, planning cultures*: considering the different NBS types that might be more dominant, and the specific benefits more important or decisive for stakeholders. [Chapters 2.1, 2.2 and 2.4]
- *Cultural context*: articulating and making visible the multilayered cultural assets, aspects and meanings of a place. [Chapters 2.1, 2.2, 2.4, 3.2, 4.3, 4.5 and 5.6]
- *Risk assessment and mitigation measures*: identifying the factors influencing co-creation processes, as well as those leading to the failure of co-creation and co-production, drawing upon lessons learned [Chapter 4.2 and 4.3]
- *Monitoring and evaluation*: relevant for information and follow-up, as well as for the ownership of the co-creation process and its results. [Chapter 5]
- *Where*: having guidelines for the spaces in which the participatory events are held would address the place/setting, as well as its form and quality. [Chapters 3.1, 3.3, 3.4, 4,3, 4.4 and 4.5]
- *When*: identifying the best moment for the participatory events, including time/day, date, and phase. [Chapters 3.1, 3.3, 3.4, 4,3, 4.4 and 4.5]
- *Mediation*: the resolution of conflicts, and the use of dialogue to foster collaboration between people. [Chapters 3.2, 3.3, 3.4, 4.4 and 4.5]

INCLUSIVE APPROACH

- *Co-benefits*: the provision of economic, environmental and socio-cultural benefits. [Chapters 1.4, 2.2, 3.3 and 4.3]
- *Feedback loops*: to provide a culture of continuous response to what a person has perceived or understood. [Chapters 3.1, 3.2 and 4.3]
- *Considering stakeholder abilities*: to create a multiple-genre perspective and the interplay between capabilities possessed by the various stakeholders involved in co-creation activities. [Chapters 2.3 and 5.5]
- *Innovation*: process of creating value by applying novel solutions to meaningful challenges. [Chapters 1.1, 1.4, 2.2, 4.3 and 4.4]
- *Tools*: specific methodologies and guidelines to support mobilisation and inclusivity. [Chapter 3]
- *Iteration*: promoting and ensuring a culture of feedback, evaluation and continuous improvement of collaborative processes. [Chapters 3.1, 3.2 and 4.3]
- *Added Value/Why*: being clear as to why we need to engage citizens and support participatory processes. [Chapters 1.4, 2,2 and 5.5]
- *Inclusion and inclusiveness*: capacity and tools to address and welcome diversity, as well as going beyond the term of the project and looking at deep-seated inequalities. [Chapters 1.2, 2.2, 3.3, 4.1, 5.1, 5.2, 5,4 and 5.5]
- *Open mindedness*: re-orientate organisational values, norms and/or behaviours, by fostering a context that paves the way for the emergence of new habits, patterns and ways of doing and interpreting things. [Chapters 3.1-3.5, 4.3 and 5.6]

- *Sensitivity*: respecting the local context in which co-creation is embedded, including relevant local policy, governance and socio-cultural factors. [Chapters 2.1, 2.2, 2.4, 3.1-3.5, 4.2, 4.3 and 4.4]
- *Facilitation*: specific guidelines to address facilitation that include other participatory guidelines, aiming at the training of local facilitators and the elaboration of supporting materials. [Chapters 3.3, 3.4, 4.2, 4.3, 4.4, 5.4, 5.5 and 5.6]
- *Quality of deliberation*: setting a meaningful deliberation process, through authentic deliberation, a clear decision-making process, and ensuring equal rights of expression. [Chapters 3.2, 3.4 and 4.3]
- *Citizenship rights*: broadening the meaning of the appropriation of social, urban, political, and cultural rights, both internally relating to collective imagination, and externally in what concerns rejuvenation of relationships with local authorities. [Chapters 2.2, 3.1, 3.3 and 3.4]
- *Ownership*: citizens having ownership of both problems and solutions depends on the assumption that practitioners can only bring knowledge if people own the process. [Chapters 1.4, 2.2, 3.2, 3.3 and 4.4]

Therefore, the proposed building blocks approach also aims at making room for the co-creation of the process itself, in the sense that it engages different actors, with different knowledge, and experiences in the design and implementation of co-creation processes. In fact, citizens and other stakeholders can further inform and inspire tools and ways to trigger engagement, based on their direct knowledge of the local participatory cultures, and at the same time they can reveal strengths, weaknesses, and gaps in interaction as means to guide the design of sustainable co-creation processes.

The building blocks approach is useful in the sense that it enables one to reflect upon and plan the co-creation processes before initiating them. Given that it highlights important dimensions to be taken into consideration. It also offers insights on how to address specific needs for a real case application. In fact, the building blocks approach can support the identification of complementarities and contradictions, common grounds and alternative visions of the different agents engaged in the co-creation process, given that it is based on sharing and learning from each perspective in relation to the different building blocks that are being combined in devising and implementing the process.

While a building block approach offers an overview of co-creation dimensions, the following chapters of the present publication are aimed at providing guidelines for the different stages of the co-creation process of NBS.

1. Introduction to Co-Creation and Co-Governance of Nature-based Solutions: Key Policy Trends

Coordination and main authors: *Maria-Carmen Garcia-Mateo and Ingrid Andersson*
Internal review*: Isabel Ferreira, Israa Mahmoud, Piret Noukas and Paola Lepori*

This chapter provides an overview to co-creation and co-governance in the context of nature-based solutions (NBS)[2], its policy and societal relevance in order to drive systemic change towards mainstreaming NBS. Moreover, it emphasizes NBS importance in strategic and enabling EU and global policy frameworks. The first section draws attention to the variety of strands that underpin the concepts of co-creation and co-governance. Likewise, it highlights how the concepts of co-creation and co-governance are intrinsically interrelated. This is followed by a section that discusses the added value of co-creation and co-governance in NBS planning. The third section gives a snapshot of relevant EU and global frameworks for NBS, while the fourth section underlines the essential role of co-creation and governance in NBS strategic planning and policymaking including urban and territorial regeneration.

1.1. The importance of co-creation and co-governance for NBS

Nature is increasingly recognized as a source of inspiration in addressing problems caused by the deteriorating environment, social and economic issues and to mitigate as well as to reduce the impact of climate change. Nature-based solutions (NBS) are a popular means for regions, cities, municipalities, and communities to counter these challenges (Albert et al., 2021) providing a multitude of wide-ranging, long-lasting, and highly complex co-benefits. While the synergies between climate, nature and society are evident, unveiling and capturing the benefits of NBS are far from given (Wickenberg et al, 2021; European Commission, 2015). Flaws in the planning, implementation, and maintenance of NBS can lead to unwanted side effects and negative impacts, including increasing inequity.

In a broad sense, the context of NBS co-creation refers to the process of participation, interaction, collaboration, or co-production with citizens (organised or unorganised), political representatives, public officers, private stakeholders, and researchers. The term or concept of **co-creation** such as "*collective creativity of collaboration"* is not new and can be outlined in the field of architecture or collaborative design (Sanders & Stappers, 2008). In principle, **co-creation** may be conceived as a **collaborative act** where two or more people contribute **creatively**. Moreover, this collaboration is meant to tackle a challenge and design and implement a preferred solution (Bryson et al, 2017).

Co-creation processes are meant to engage **multiple actors** (Raymond et al., 2017), with different knowledge and backgrounds, in **a reflective way to strengthen** and **support** the design and implementation process of NBS (Kabisch et al., 2016). Municipalities and other stakeholders join forces to facilitate the uptake of sustainable development practices (Mahmoud et al., 2021a, McCormick, 2020). For instance, special consideration is required for **social innovation** and **diversity** (Frantzeskaki et al., 2019). Moreover, **connectivity is interwoven** with **multifunctionality** and supports co-creation processes by shaping green

[2] Recently, the European Commission endorsed the NBS definition by the *United Nation Environment Assembly* (UNEA-5), *fifth session* (UNEP, 2022), defined as: 'actions to protect, conserve, restore, sustainably use and manage natural or modified *terrestrial, freshwater, coastal* and *marine* ecosystems, which address *social, economic and environmental challenges* effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.

networks, contributing to nature regeneration. When co-creation is embedded in the process from its beginning, innovation can be enhanced (Kiss, et al, 2019).

NBS processes contain certain features and principles that tend to be intrinsic to a successful pathway of co-creation: (i) **iterative process** (Noppenberger et al, 2021); (ii) a **learning by doing** process (Bulkeley et al, 2016); (iii) good and **open communication,** formal and informal (DeLosRios-White et al., 2020); (iv) **locally adapted participatory process**; (v) a **creative** and **collaborative effort** (Wickenberg et al., 2021; Sanders & Stappers, 2008) of a variety of disciplines; (vi) **thinking across boundaries**; (vii) **transdisciplinary** (Kabisch et al., 2016; European Commission, 2016) and **interdisciplinary** participation approaches (Nesshöver et al., 2017).

The effectiveness and outcomes of successful co-creation further depend on the degree to which it is accompanied by adequate multi-stakeholder engagement in terms of a common understanding of the challenges, aligning various, often different interests and agendas, while adjusting NBS to the local context at the same time (Wickenberg et al., 2021). Concerns regarding outcomes and conflicts, their capacity to deliver expected benefits, especially in terms of equity and justice, demonstrate the complexity and challenges to be met taking such pathways (Anguelowski et al, 2023). Furthermore, **collective decision-making** or **collaborative governance** help facilitate the empowerment of stakeholders in decision-making processes (Ansell & Gash, 2008). Likewise, aspects such as knowledge, decision-making processes, behavioural aspects, social, economic and consideration of nature can lead to success and a more integrated approach (Lemos & Agrawal, 2005). Society is impelled to solve complex environmental problems as a means to reach more sustainable solutions. To this extent, collaborative governance underlines benefit for societal problems from local to global while dealing with environmental challenges.

Co-creation is **interrelated** with **co-governance**, as the direction and outcome of the former is much dependent on the scope, depth and direction of the latter. The two are staged to evolve together, they are inherently related to policymaking and the wider societal fabric. Whether a systemic approach can be worked out, entailing a pathway for the mutual implementation, integration and mainstreaming of NBS, is vital in addressing the needs and aspirations of citizens, thus achieving more well-being and quality of life.

1.2. The added value of co-creation and co-governance for NBS

NBS Governance frameworks are an important factor in understanding the positive or negative results related to the implementation of NBS. Many challenges influence the deployment of NBS, such as insufficient governance structures or capacity building of citizens involvement (Schmalzbauer, 2018). A number of studies point out the importance of several factors, namely active participation of citizens along with associated determinants such as attitudes, mindsets, and cultural conditions, in shaping favourable frameworks for co-creating and implementing just NBS (Noppenberger et al, 2021; DeLosRios-White et al., 2020). Toxopeus et al. (2020) highlight the importance of bottom-up approaches in the governance process and co-governance is appearing as an important process of innovation that derives co-benefits for stakeholders involved in the process.

The impact of co-creation and co-governance in the present context is a reflection of the value-creating process associated with NBS. Extending from the richness of ecosystem services, NBS potentially result in a range of **co-benefits**, **spanning the environment, society, and the economy** (IUCN, 2020). The **value** of NBS, however, is multifaceted, difficult to capture, and far from being taken for granted. While some outputs are short-term, local, and direct, others might be long-term, dissipate widely and materialise only indirectly following synergies with other factors (Kabisch et al, 2022). The value generation connects

majorly to social parameters including social cohesion, well-being and health (Bockarjova, et al, 2022). Additionally, environmental benefits arise from NBS supporting biodiversity and natural ecosystems. Yet others are linked to enhance the quality of air, water, soil, etc (Ghafourian et al, 2021). Different stakeholder categories represent specific needs and contributions (Bulkeley, 2020a). Given the constructive process of co-creation, a sense of ownership is created and becomes part of the solution, instead of being outsiders – bystanders – part of the problem. This is likely to increase their openness and interest in the services generated by these NBS, thereby raising the demand for, and the value of the outputs (URBiNAT, 2020).

The quality and level of integration of NBS in communities is directly connected to the attitudes, decisions, and agendas of **policymakers, experts, researchers, citizens, entrepreneurs, companies, policymakers**, **NGOs,** etc. (Iniesta-Arandia et al., 2014). How they engage with NBS, in which way engagement is enacted in the light of their daily lives and the issues confronting them, the time and effort they devote, and with what role they enter a **collaborative process** with other local stakeholders, all have a major bearing on what role particular NBS will play, and for what purpose (Kabisch et al., 2016).

The extent to which **different stakeholders, with diverse knowledge and experiences,** can take part in designing and implementing NBS, influences notably the scope for further value-creation through innovation (Prahalad & Ramaswamy, 2004). This enhances the willingness of the different stakeholder categories to use the co-benefits offered by the NBS (McQuaid et al., 2021; Hofstad, et al. 2021). Participants in the co-creative process assume **co-ownership** of the solutions implemented, increasing long-term commitments and trust. These co-benefits appeal to co-governance arrangements that stimulate and sustain co-creation processes in the planning and stewardship of NBS, while recognising the challenges and realising the collaboration required to overcome them. Additionally, s**pecific expertise** might support the management of new skill sets that are key for **successful** engagement of actors (Elelman and Feldman, 2018), including adequate preparation and mediation to pave the way for mutual learning and training among those engaged in co-creation.

1.3. Global agendas, programs and EU policies enabling NBS

Major global agendas, notably the Convention on Biological Diversity (**CBD**)[3] and the United Nations Framework Convention on Climate Change (**UNFCCC**), encourage use of nature-based solutions that are co-created through participatory approaches. Recently, the **Kunming-Montreal Global Biodiversity Framework** outlined participatory approaches and inclusive spatial planning in Target 1, emphasising the need to respect the rights of indigenous peoples and local communities. Moreover, these participatory approaches are recommended as fundamental to progress towards other targets, namely in the implementation of NBS for social, economic and environmental co-benefits (Target 8), for supporting the regulation of the ecosystem functions and services (Target 11) and to carry the adoption of biodiversity-inclusive urban planning, towards human well-being and the conservation of biodiversity (Target 12). Also, the CBD Aichi Biodiversity Targets (Strategic Goal E) prescribe that implementation of biodiversity measures must be enhanced *"through participatory planning, knowledge management and capacity-building"* and specifies this in the underlying targets (UNEP/CBD, 2010). Moreover, **SDG11** of the **United Nations Sustainable Development Goals** highlights the need to *"make cities and human settlements*

[3] https://www.cbd.int/article/cop15-cbd-press-release-final-19dec2022

inclusive, safe, resilient, and sustainable" while target 11.3 urges for inclusive and sustainable urbanisation, fostering the participatory and integrated approach in planning and management of cities and human settlements (United Nations, 2015).
At the EU policy level, the **EU Green Deal** sets a strategic roadmap to reaching climate neutrality by 2050, enhancing human and ecological well-being and health, safeguarding natural ecosystems, and encouraging active public participation to tackle environmental and climate related challenges (European Commission, 2019). Nature-based solutions, co-creation and co-governance are fundamental to achieve the aims of the European Green Deal to restore natural ecosystems, protect and restore biodiversity, enhance climate adaptation, well-being and health, facilitate the process of the transformative change in society, economy and in all policy levers to reach sustainability, resilience and climate neutrality.

NBS came to the attention of the European Commission as an area for R&I investment in the 2010s; in 2015, elaborating on an agenda for nature-based solutions & re-naturing cities, an expert report recommended the involvement of local communities and all stakeholders in the multi-level management of NBS (European Commission, 2015). With the start of the current policy cycle (Von Der Leyen Commission, 2019-2024) and the launch of the European Green Deal, NBS have been progressively incorporated into EU strategies, policies and legislation. Thus, the **EU Biodiversity Strategy for 2030**, while aiming at accelerating the restoration of ecosystem and biodiversity, contains concrete actions and commitments where NBS, co-creation and co-governance have the potential to play a key role (European Commission, 2020). Another key strategy, the **EU Climate Adaptation Strategy**[4], mentions NBS for adaptation as one of the three cross-cutting priorities for more systemic adaptation, and nature-based solutions feature prominently in the Guidelines on Member States' adaptation strategies and plans by the European Commission, published in 2023[5]. Both documents explicitly refer to the importance of inclusive co-governance and stakeholder and citizen engagement.

The 8th **Environment Action Programme**[6] defines the long-term priority objective that by 2050, "people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced. A healthy environment underpins the well-being of all people and is an environment in which biodiversity is conserved, ecosystems thrive, and nature is protected and restored, leading to increased resilience to climate change, weather- and climate-related disasters, and other environmental risks." The EAP further defines **6 priority objectives for 2030**, related to (i) climate neutrality, (ii) adaptive capacity, (iii) regenerative growth, (iv) zero pollution, (v) biodiversity protection and restoration, and (vi) reducing environmental and climate pressures, that are coherent with the deployment of NBS. It is worth highlighting that the enabling framework of the EAP (article 3) stresses the importance of co-creation and co-governance at different levels (see (aa) to (ae)).

Mention should be given to the **Urban Greening Plans**[7] in which towns and cities with more than 20000 inhabitants are impelled to *"develop ambitious Urban Greening Plans" including "measures to create biodiverse and accessible urban forests, parks and gardens; urban*

[4] https://climate.ec.europa.eu/eu-action/adaptation-climate-change/eu-adaptation-strategy_en#more-systemic-adaptation
[5] https://climate.ec.europa.eu/system/files/2023-07/Guidelines%20on%20MS%20adaptation%20strategies%20and%20plans.pdf

[6] https://environment.ec.europa.eu/strategy/environment-action-programme-2030_en

[7] https://environment.ec.europa.eu/topics/urban-environment/urban-greening-platform_en

farms; green roofs and walls; tree-lined streets; urban meadows; and urban hedges." Their guidance puts co-creation at the very core of urban greening plans.

Moreover, the proposed **EU Nature Restoration Law**[8] sets the first ever ambitious legally binding restoration targets law. It attributes responsibilities to Member States in delivering it with their **National Restoration Plans** (European Commission, 2022). Relevant role of NBS is highlighted under the proposal to help restore ecosystems, while at the same time, provide key ecosystem services. Specifically, actions such as **embedding NBS into urban planning** and **NBS design are encouraged.** Likewise, the collaboration of various stakeholders and inclusion of local communities (ibid). However, the ambition of the Law has not reached expectations on the NBS approaches and biodiversity restoration target set, which needs to be complemented by enablers of NBS co-governance and co-creation. In other words, more action is needed to enhance biodiversity and support the delivery of ecosystem services through the engagement of all actors, politicians, policymakers, practitioners, researchers, and citizens.

Furthermore, **EU R&I funding programmes,** Horizon 2020 (2014-2020) and Horizon Europe (2021-2027), have provided increasing funding for projects tackling various aspects of nature-based solutions and encouraging particular consideration to encompass stakeholder participation (Faivre et al., 2017). The results of the European Union NBS R&I projects have provided valuable results that have contributed to build a solid evidence-based thinking on the benefits and opportunities provided by NBS in tackling global and societal challenges (Bulkeley, 2020a). Cities, regions, and communities, as well as society at large, benefit from a fundamental window of opportunity open by NBS umbrella concepts such as co-production of knowledge, co-design, co-governance, and co-management. Through the EU NBS Research and Innovation agenda and funded projects, the EC takes a leading role in enabling and promoting intensive experimentation on how NBS could be set forward (*see more* El Harrak M. & Lemaitre F., 2023).

1.4. Mainstreaming NBS in strategic planning processes

Mainstreaming NBS in strategic planning and policies, including strategic land use planning, has been identified as helpful for managing associated societal demands. Moreover, novel means of adaptation are required to manage divergent needs and challenges coming to the forefront at the city or regional level. For instance, the IPBES report sets the scene for monitoring biodiversity global assessment framework for the communities and city or regional level to help with mainstreaming established by Governments in 2012. IPBES provides policymakers with objective scientific assessments about the state of knowledge regarding the planet's biodiversity, ecosystems and the contributions they make to people, as well as options and actions to protect and sustainably use these vital natural assets, see (IPBES, 2019).

The **New Leipzig Charter** plays an important role in framing policy at the EU Ministerial level in terms of agreements concerning the urban scale, in order to strengthen the quality of life of people (European Union, 2020). The aim is to enhance sustainable and resilient urban development and integrate social, ecological, economic and environmental transformation needed, particularly to accomplish SDG 11 (European Union, 2020). Overall, three dimensions of cities are highlighted to help with the transformative integration: (i) The **just city,** provisioning equal opportunities to all; (ii) the **green city**, encouraging the **use of NBS**

[8] European Commission. Proposal for a regulation of the European Parliament and of the Council on nature restoration. Brussels, COM/2022/304 final https://eur-lex.europa.eu/resource.html?uri=cellar:f5586441-f5e1-11ec-b976-01aa75ed71a1.0001.02/DOC_1&format=PDF

to **improve biodiversity and adapt to climate change;** (iii) the **productive city,** fostering an innovative atmosphere, enhancing skilled and **knowledge-based society** (European Union, 2020).
EU Regional Policy supports the uptake of NBS. The new **EU Cohesion Policy**[9] **2021-2027** Joint Action Plan, that set five main priorities covering **greener**, **social** and **inclusive** growth, by fostering sustainable and integrated development of cities and regions. A variety of planning frameworks set the scene in different European countries for this sustainable development uptake (Nadin et al., 2018). NBS benefit from covering novel and endorsed strategic planning pathways (Wickenberg et al., 2021). Collaborative systemic change has been viewed as important in this developing context (Senge et al, 2007), with long-term strategies and visions that are helpful in establishing a roadmap to jointly elaborate **key principles for action.** Some of the most problematic challenges may require mediation of opposing interests, however, facing up to the need of a compromise, and building support for taking consensual decisions (Shipley & Utz, 2012; URBiNAT, 2020).

For this reason, one must acknowledge that socio-ecological transformations are inherent to the governance of NBS urban planning approach and specifically social engagement and that financing mechanisms are needed for its execution (Egusquiza et al 2019). Furthermore, the integration of key aspects, namely, equity, diversity and democracy, in an NBS budget would help to properly value many social, economic, cultural and environmental factors.

Strategic planning guidelines usually benefit from being shaped, governed, and co-created in cross-sector collaboration therefore, building communities for joint learning, according to the specific target group, culture, economy, technology and history (Senge et al, 2007). Moreover, it is important to consider the following criteria in the governance process to support the development of consensus: (i) incorporate delegate of all matters;(ii) be motivated by a task share interest; (iii) captivating actors as they can collaborate; (iv) challenge the status quo; v) include outstanding facts; (vi) search for an agreement (Connick & Innes 2001).

To conclude, key fundamental takeaways to enhance co-governance and co-creation processes for NBS implementation and mainstreaming are:

1. Planning the action; a well-established co-creation and co-governance protocol is useful for the implementation action.
2. Budgetary allocation: a study on the financial resources to be executed should be planned in advance.
3. Knowledge broker expertise for NBS is needed for the foundation of the planning procedure.
4. Engagement mechanisms and recognition of contributions from diverse stakeholder participation.
5. Follow up mechanisms, set-up for evaluation and monitoring processes.
6. Intermediation methods for co-creation intervention and short term NBS interventions to facilitate the raising of awareness and ownership.
7. Capacity building; break silos from within local authorities and decision-makers.
8. Embedding co-creation into urban planning and urban regeneration.

[9] The five policy objectives of the new EU Cohesion fund are: https://ec.europa.eu/regional_policy/policy/how/priorities_en

9. Encourage cities, communities and regions to adopt strategic planning frameworks for NBS, supporting regeneration for inclusivity and community social cohesion;
10. Remove possible obstacles for co-creation integration, knowledge gaps and research gaps in regulatory frameworks and policies;
11. Create partnerships between government, knowledge brokers, private sector, universities and civil society to build creative frameworks for collaboration;

Summary

This chapter outlines the importance of **co-creation and co-governance** and how it is reflected in **policies and agendas ranging from international downscaling to local levels**. Despite recent research emphasising the fundamental benefit of co-creation in such complex urban regeneration processes even if not widely practiced, it is believed that through better co-governance, more social equity and societal challenges can be addressed. Section 1.1 describes and discusses the relevance as well as the importance of co-creation and co-governance and how they are interlinked. Section 1.2 explains their added value resulting in better NBS and unveiling co-benefits for diverse stakeholders. Section 1.3 looks at policies and agendas on NBS, co-creation and co-governance setting the frame for the actual planning processes and approaches, while section 1.4 links the given frames to strategic planning and proposes key takeaways for enhancing co-governance and co-creation processes.

2. Understanding and Mapping Stakeholders

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2.1. Introduction to understanding & mapping stakeholders

Co-creation of nature-based solutions aims at developing inclusive processes of participation for innovative spatial planning in urban and rural contexts. In this sense, the main question is who is interested or needs to be involved in the co-creation process by taking specific roles according to their capacities, availability and representativity of target groups.

This chapter focuses on understanding stakeholder participation and on mapping the different stakeholders that can, want or should participate in order to promote an effective and valuable co-creation process. An important aspect in this process is to include beyond the usual suspects as stakeholders, thus opening the participatory process to people who are usually not heard as a means to create an inclusive and just process. Taking these aspects into consideration, the chapter is organised in four sequential topics:

a. Initial understanding of system context to explore diverse participatory cultures
b. Co-creation stakeholders, their roles and their capacities to shape co-creation
c. Mapping stakeholders to include and leave no one behind
d. Urban analyses versus co-diagnostic of uses, needs and dreams to involve stakeholders from the beginning of co-creation processes

Examples and case studies from different projects in the following sections, will illustrate the different topics and showcase the different approaches to understand, involve, motivate, and engage stakeholders. It will also elucidate the variety involved in the characterization of the roles and importance of different groups to contribute to co-creation.

2.2. Understanding stakeholders and contexts

2.2.1. Co-Creation in different contexts and cultures

In-depth collaborative approaches and intense stakeholder involvement often stretch the limits of normative and regulating systems and can even go beyond them in order to test new ideas and stimulate innovation processes (Concilio, 2016). Therefore, they might be in conflict or question the usual planning practices.

For this purpose and to frame the co-creation process, it is important to understand socio-cultural factors such as awareness and understanding of NBS in the different region or country contexts as well as the goals to be achieved. It is vital to comprehend the respective planning traditions, hierarchical structures of institutions and stakeholder roles, self-understanding of stakeholders and worldviews to identify potential barriers as key steps to find ways to overcome them *(see section 4.4)*. As the challenges around NBS are quite similar all over the world and policies worldwide strive to achieve collaborative approaches, the regional land management planning and local knowledge are decisive factors that lead to a successful NBS co-creation and implementation process.

2.2.2. Spatial planning cultures in Europe

One key factor for the implementation of NBS is to understand the different planning processes or contexts in which they take place. In Europe, several different planning cultures exist. According to Knieling and Othengrafen (2009), Planning Cultures can be understood as institutional or planning practices of a society. This refers to the interpretation of planning tasks, recognizing and addressing problems. Depending on how the planning culture, rules and guidelines frame the processes, certain procedures need to be followed and certain tools have to be applied. Planning culture is an outflow of respective attitudes, values, general rules, standards and beliefs. It includes both traditions, habits and customs as well as constitutional and legal frameworks. Planning cultures reflect general political styles and administrative families.

In Europe, five different planning families can be identified (Newman & Thornley 1996), Scandinavian, Germanic, British, Napoleonic and Eastern European. These families are shaped by the political styles in the respective countries. While the Scandinavian style is characterised by de-centrality and flexibility, the Germanic family (e.g., Germany and Austria) shows low flexibility. Also, the Napoleonic family approach is less flexible and centrally oriented (e.g., Italy, France, some tendency towards de-centrality in Spain). This means that in the Scandinavian family, planning is more consensus oriented. Stimulated by this culture, countries in Northern and Northwestern Europe tendentially have a higher degree of openness to engagement of various non-government actors (Dryzek et al., 2002, van der Jagt et al., 2016). Mediterranean countries tend to have a more regulatory planning approach. However, the economic crisis after 2008 enabled the emergence of spaces and arenas for participatory approaches to create space for new ideas and opportunities (Moro & Puerari, 2015).

2.2.3. Local participatory culture

Another key factor is the mapping of local participatory cultures, focusing on the research of participatory initiatives – formal and informal – led by citizens and the public authorities, the identification of active organisations, and the analysis of participatory culture. It is applied by means of interviews and documentation revision (Ferreira, 2022) and inspired by cultural mapping, a field of interdisciplinary research and a methodological tool in participatory planning and community development. Cultural mapping consists of collecting, recording, analysing and synthesising information to describe the cultural resources, networks, links and patterns of usage of a given community or group (Stewart, 2007). There are different methodologies to track citizen engagement in spatial planning. In the following case study, the approach chosen by URBINAT is exemplified.

Box 1. Mapping participatory culture in URBINAT

URBiNAT followed a number of main steps (Ferreira, 2022; Nunes et al., 2019):

- Identifying participatory practices in the public sphere in general and in public policies and activities.
- Identifying networks of local organisations, champions, residents or neighbourhood associations and business actors or companies.
- Analysing previous participatory projects led by the public authorities and initiatives led by citizens.
- Interviewing citizens, organisations, informal groups, initiatives and public actors
- Understanding the nature of collective initiatives in terms of scope, leadership and networking capacity
- Understanding the specificities of the local decision-making culture and the corresponding roles of citizens, stakeholders, elected representatives, and public officers.

The fieldwork to map the participatory culture of the territory occurred through the application of a semi-structured interview questionnaire. In Porto, it was applied through meetings with stakeholders, including 5 with municipality departments, 5 with schools, local organisations, and associations, 2 meetings/workshops with the municipality at political level and with technicians and 3 workshops with local organisations and associations (URBiNAT, 2019a). As

a result, it was possible to identify the formal and informal community networks and understand the local participatory culture beyond institutionalised frameworks. This was the basis to design a locally meaningful strategy for involving different stakeholders, respecting their values, norms and practices of participation in the public realm and using these to measure its level of innovation, instead of any kind of theoretical milestone.

2.3. Co-creation stakeholders and their capacities

Stakeholders[10] for NBS refer to the individuals, communities, organizations, and government entities that participate (together) to collectively design, build, and manage NBS projects. This collaboration involves the sharing of skills, resources, and knowledge to develop more inclusive and sustainable solutions. Intense collaborative planning among different public and private actors and stakeholders, as well as citizens for the design and implementation of NBS from the initial stages are increasingly recognized as an efficient tool to solve complex problems and to find innovative designs. Recent studies underpin that such partnerships and collaborative approaches are crucial for successfully implementing NBS (Zingraff-Hamed et al., 2020a). Stakeholder involvement can help deal with potential conflicts, issues, and constraints that may arise (Zingraff-Hamed et al., 2020b). Especially understanding scepticism and motivation to act is important to orchestrate collaborative planning (Lupp et al., 2016). Despite critical voices about co-creation, especially in terms of lack of environmental awareness and pushing their personal interests (Wamsler et al. 2020), stakeholder involvement can help overcome bottlenecks when trying to implement NBS resulting from a lack of cooperation. Stakeholders themselves in almost all cases experience co-creation processes as being valuable and find better, more appropriate solutions (Buchecker et al., 2013, Lupp et al., 2023). To ensure such collaboration is effective, a diverse group of stakeholders must be actively engaged.

Categorising stakeholders for NBS helps to identify and prioritise the interests, needs, and expectations of different groups. This is important because co-creation of NBS involves multiple stakeholders who typically have different goals and perspectives. It helps to promote transparency, fairness and effectiveness in the design and implementation of NBS, since it allows for stakeholders to get to know each other better, build trust and reach mutually beneficial outcomes.

There are different models of categorising stakeholders in the co-creation process, Quadruple Helix being the most common one. This model involves the active participation of four key categories of stakeholders: government, industry, academia, and civil society (Carayannis & Campbell, 2012). In some cases, in the co-creation process for NBS, the fourth actor group are citizens who are involved from different standpoints, as end-user and/or voluntary organisations and volunteers. In order to avoid overlaps between stakeholder macro-categories, a more detailed classification of stakeholders is considered necessary, often depending on the purposes and additional needs of the project. It could include categorising the stakeholders based on their specific interests, capacities, and roles in co-creation process as well as on cultural background, geographical location, professional expertise or level of influence and impact on the issues at hand. By doing so, it becomes possible to engage with each stakeholder group in a targeted and meaningful way, leading to a more inclusive and effective co-creation process.

[10] For the purpose of common understanding of the terms, it is co-decided that in the following (sub) sections to use the word ‘stakeholders’ instead of ‘co-creation agents’ and ‘actors’. It provides consistency and clarity in the document, avoiding confusion or misinterpretation.

The table 3 below exemplary lists main groups of stakeholders and their main capacities. Capacities are what different groups bring to the co-creation process, their main interests/motivations and benefits they obtain from co-creation. Sometimes also the main challenges, difficulties and “barriers" must be considered from the very beginning of the process when engaging certain groups of stakeholders.

Table 3 Stakeholders capacities and roles
(based on Carayannis et al., 2012, Durham et al., 2014, Zingraff-Hamed et al., 2020b, Loureiro et al., 2020, Gerlak et al., 2023, Mitincu et al., 2023)

Stakeholder Group	Capacities and Roles
Policy Makers	Highly influential in the approval of innovations, in creating a legal and regulatory framework, allocating funding and resources, and promoting the use of NBS through local incentives. They are important in agenda-setting, communication, and the political arena for engagement processes. Their role is crucial in ensuring that NBS are being articulated with broader public policies, integrated into decision making processes and becoming a mainstream approach.
Public Officers Local authorities; Municipality officers; Commission officers	Responsible for implementing policies and regulations related to NBS, public officers can facilitate the collaboration between different stakeholders, to co-create NBS tailored to the specific needs and contexts. They can influence the adoption of NBS and raise public awareness about their potential. They can create synergies between several NBS projects from the same municipality.
Education, Accademia, and Researchers Teachers, staff, pupils; professors, alumni and students, community groups; both private and public institutions; Independent researchers	Accademia and researchers contribute to create new and innovative ideas for NBS through research. This includes proposing new methodologies for engagement of stakeholders, monitoring of NBS, as well as improving the existing ones and providing scientific evidence of the impact of NBS etc. Educational institutions as “less usual” subjects in the co-creation of NBS can incorporate NBS into existing curricula and serve as a hub where new NBS can be tested and refined, being a driving stakeholder in the process
Civil Society Non-governmental organisations [NGOs]; community groups; charitable organisations; professional associations; foundations; cooperative enterprises; etc.	One of the most active groups in raising awareness about the environmental and social benefits of NBS. They can be the advocates to ensure that the NBS are being implemented in a transparent and accountable manner, and that the rights and needs of local communities are protected.
Citizen Collectives Community organisations; neighbourhood associations; Building residents associations; Local initiatives	When as end-users, they are the direct voice to ensure that the NBS are designed and implemented to meet their needs, concerns, and ambitions. They are key actors to bring diverse knowledge, perspectives, and ideas into the different stages of NBS co-creation (see Foreword section) and introduce new ideas and community grounded insights towards more innovative solutions. They can also be an active partner in the implementation of NBS, for example by volunteering their time and resources, particularly in the maintenance of NBS.

Stakeholder Group	Capacities and Roles
Practitioners and Professionals Urban planners, geographers, sociologists, architects and landscape architects, engineers, agronomists, environmental scientists and ecologists, social scientists, and community organisers	Key in the development of new ideas, with their knowledge, skills and expertise, and by working with multidisciplinary approaches, they are able to translate such new ideas into technological and societal advancements. They are a fundamental piece for the permeability of participatory processes, acting as key drivers for putting in dialogue professional expertise, technical requirements, needs and ambitions as expressed by local communities and citizens' societal needs. They are essential regarding the effective design and implementation of NBS projects for the socio-ecological challenges communities are faced with.
Business, Entrepreneurs, and Investors NBS enterprises; insurers, asset managers, co-operatives …	Despite prioritising profit, they may bring innovative solutions, technical skills, distribution networks, communication capacity or even logistical and financial capacity based on the industry they function in. By showcasing the economic and social benefits, they can play a key role in promoting the adoption of NBS.
Press and media	They can contribute to raising awareness and knowledge thus contributing to stimulating public support for NBS. This supports spreading the word to motivate decision-makers in the adoption of NBS.

Box 2. CLEVER Cities - the three Frontrunner Cities (Hamburg, London, and Milan)

In the initial stages of CLEVER Cities project, an extensive exploration of diverse groups of stakeholders was conducted, paving the way for a subsequent comprehensive categorization. The determinants considered for this stakeholder categorization were multifaceted, encompassing key elements such as the primary goals driving each stakeholder's participation, the various decisional levels involved (local, federal, etc.), and a profound understanding of the set of resources they possess and can bring to the co-creation process (political, economic, legal, scientific/cognitive, and relational).

Building upon the initial stakeholder categorization, an additional layer of analysis was undertaken to delve into the intricacies of each stakeholder's responsibilities throughout the co-creation process. To achieve this, the RASCI[11] Model was employed, serving as a valuable framework that defined the roles of stakeholders in relation to various tasks and activities. This systematic approach allocated clear distinctions as to who was "Responsible" for executing specific activities, who was "Accountable" for the ultimate outcomes, who was "Supported" to ensure successful implementation, who needed to be "Consulted" to provide valuable insights, and who should be "Informed" to stay updated on the progress. After this analysis, some insights concerning the dynamics of stakeholders' relationships emerged, which were further analysed through the use of the power-interest tool within the stakeholder mapping phase (Konjaria-Christian et al., 2019)

2.4. Stakeholders mapping and Living Labs approaches

2.4.1. How to engage all stakeholders and not just the "usual suspects"?

Identifying and addressing stakeholder values, interests, and knowledge is a crucial step for in-depth participatory processes (Burgers and Farida, 2017). Often considered self-evident

[11] https://www.interfacing.com/what-is-rasci-raci

in literature (Reed et al., 2009), a lack of applying systematic approaches for identifying and involving stakeholders can lead to a very long initiating process and significant delays in implementation or quiet -but still- decisive groups can be overlooked even if affected. Systematic methods to identify relevant stakeholders therefore often are critical to enable higher planning efficiency, reduce bottlenecks and ultimately, gain time needed for planning, designing and implementing NBS (Zingraff-Hamed et al., 2020a).

While some theoretical approaches towards stakeholder engagement require only the contribution of certain stakeholders and their perspectives (Burgers and Farida, 2017), other approaches such as Living Labs strive to involve different groups in a continuous and equal manner during all phases (Steen and van Bueren, 2016). Innovative approaches to achieving co-creation, such as the quadruple helix innovation networks or Living Lab approaches (Leminen, 2013) provide methodologies for bringing together core stakeholder groups.

While often considered self-evident in literature, systematic Stakeholder Mapping can help to identify relevant stakeholders. Having these stakeholders on board in the co-creative process right from the beginning can contribute to ensuring a well-functioning co-design process and deal with potential conflicts, issues and constraints that may arise. Knowing and addressing stakeholder values, interests and knowledge is a crucial step in the NBS process (Cohen-Shacham et al., 2016) and mapping can help in gaining a better understanding of them.

Box 3. Stakeholder Mapping Approach used in PHUSICOS and RECONECT

This mapping approach maps and analyses stakeholder constellations as observed in the two H2020 projects PHUSICOS (www.phusicos.eu) and RECONECT (www.reconect.eu). Both projects have used a systematic strategy developed to identify and initiate collaborative planning to co-design NBS, sharing many similarities. Tailored to the different theoretical foundations, the RECONECT method emphasises the influence of actors perceived by the core stakeholders. In PHUSICOS, stakeholder involvement and collaborative planning is based on the Living Lab theories and its intention to form quadruple helix innovation networks. Striving to continuously engage stakeholders from the four groups Academia, Civil Society/End Users, the Private Sector and Public Sectors, stakeholder mapping therefore strongly focuses on continuous involvement of stakeholders from the four sectors.

In both projects, a reflection of who has the power to influence decisions for NBS, who is affected by the risks of natural hazards or affected by implemented solutions emerged. The role of stakeholders was assigned, and phases were considered most active. Finally, their influence on the decisions made regarding solutions addressing natural hazards, and their affectedness by natural hazards as well as potential solutions were evaluated. Five core stakeholder types based on these real-life constellations could be clustered: “stakeholders in charge”, the “wise and active stakeholders”, the “affected silent stakeholders”, the “officials moderately concerned”, and “observers”. The systematic stakeholder mapping as presented in this analysis can support how different stakeholder groups can be involved in collaborative co-planning and co-design processes to have the needed stakeholders on board or ensure the necessary level of involvement throughout the process. Rather than identifying the “right” stakeholders to be on board, the presented stakeholder mapping provides a methodology for encouraging those "in charge" to strategically consider who might or should be involved at each stage of the co-creation process and which role each stakeholder will have.

Further Reading: The snapshot is based on the joint publication from the teams from both PHUSICOS and RECONECT working on stakeholder involvement, see more Zingraff-Hamed et al (2020b).

2.4.2. Systematic strategies to involve stakeholders - Living Labs and tailored approaches.

One approach to systematically frame and institutionalise intensive collaboration and co-creation processes can be the use of so-called “Living Labs”. A wide variety of activities are carried out under the umbrella term “Living Labs”, and it can be seen as a methodology, system, concept, environment or “Ecosystem” for in-depth collaborative planning (Leminen 2015). The EU Parliament and the Commission promote the application of innovative

approaches towards collaboration such as Living Labs, as a means to create solutions, and involve stakeholders and end-users in the design and implementation of NBS (EC 2015).

In Europe, concepts that foster intense and inclusive multi-stakeholder collaboration like Living Labs emerged around 2005 (Edwards-Schlachter et al., 2012, Purerari et al., 2018). These approaches began to receive strong attention from the European Union (EU), being recognized as progressive forms of experimental and inclusive mode of planning, project design, and implementation, fostering innovation (European Commission, 2009). In line with strengthening democratic processes in the EU, policies strongly encourage collaborative and co-creation approaches in order to achieve innovation and the involvement of stakeholders by including them into the design and implementation of different fields of research and development. This resulted in the emergence of policies and programs that promote the use and application of collaborative co-creation approaches, including its application in landscape and environment related topics.

The most important goals of applying a Living Lab approach are (creation of) “knowledge”, “collaboration” and “participation” of “stakeholders”. The four sectors of public organisations, private companies, users (or end-users), and academia (or knowledge institutions) interact, link with each other, and intertwine in a Quadruple Helix Innovation Network (Carayannis and Campbell, 2009). Key characteristics are seen in creating “innovation”, “openness” and “spontaneity” of processes, which create “sustainable solutions’ and “multiple benefits” (Lupp et al., 2020). Living Labs can be considered both as an arena (i.e., geographically, or institutionally bounded spaces), or as an approach for intentional collaborative experimentation of researchers, citizens, companies and local governments (McCormick & Schliwa, 2016).

Urban Living Labs (ULLs) can also be viewed as spaces designed for interactions between a context and a research process to test, develop and/or apply social practices and/or technology to a building or infrastructure due to their focus on co-creation by experimentation through explicit geographical embeddedness (Mahmoud et al., 2021a). The Joint Programming Initiative (JPI) Urban Europe, which is the main funding agency for Living Lab related projects in European cities, introduced the term “Urban Living Lab” and defines it as “a forum for innovation, applied to the development of new products, systems, services, and processes, employing working methods to integrate people into the entire development process as users and co-creators, to explore, examine, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex and real contexts” (JPI Urban Europe, 2019).

Living Labs usually follow a stepwise approach, and three main phases of a Living Lab can often be identified. **In the first phase**, the goal is to determine the challenge or problem and identify stakeholders that can and would collaborate. With a strong focus on end-users or people benefiting from a solution, most strategies are developed as a means to involve these groups in a more profound manner, by deeply acknowledging their needs or demands in the whole process. I**n the second phase**, the emphasis is placed on the development and testing of a solution or product, in this case NBS. **The third phase** of the Living Lab process is dedicated to evaluation of the process and the solution in place. The results, products, or solutions are tested for usability, benefits, and acceptance (Lupp et al., 2021). In CLEVER Cities, three core phases for Living Labs can be identified: The Setup phase bringing together stakeholders and proceeding in the definition of problems to be solved, the working phase to jointly elaborate a solution and the outcome and the Evaluation phase. Additional phases can deal with dissemination, upscaling and replication of the solutions found (Mahmoud, et al. 2021a).

Box 4. Living labs co-creation approach in GO GREEN ROUTES

On the way to demonstrate the impact of NBS in practice and planning, GO GREEN ROUTES[12] (GGR) adapt "the living labs co-creation approach" as a framework in the "Cultivating cities" (where the NBS implementation happen in GGR): Lathi, Umea, Versailles, Tallinn, Burgas, and Limerick, named GGR "Urban Well-being Lab", with the aim to investigate the grounds of nature-based solutions local effectiveness. These cities pioneer in implementing NBS such as green corridors, linear parks, pocket parks and shared walkways to enhance the physical and mental health of their urban residents. By maximizing the public space available people can move around the city more actively, enjoy their free time and interact with others, whilst there is also room for restoring ecologically valuable spaces. GoGreenRoutes set in each of the Cultivating cities an Urban well-being lab in order to analyse and identify the area with particular key aspects to perform the NBS interventions. Challenges and opportunities were analysed with the SWOT method analyses. Further to this, a "challenges workshop" was run in each of the Cultivating cities in order to recognise a variety of potential NBS interventions (Noppenberger et al, 2021).

Box 5. Considering specificities for Engaging stakeholders in URBiNAT

The tailored URBiNAT co-creation methodology is organised in four stages - co-diagnostic, co-design, co-implementation, co-monitoring (URBiNAT, 2019a, 2021). URBiNAT and partners are aware of the specificities, requirements and limitations experienced by the various segments of citizens, as key factors that influence participation, such as the ones outlined in URBiNAT (2019a): time, mobility, geography, language, culture, skills, knowledge, age, status, network and discrimination.

The recognition and respect of the specificities of individuals and groups are indeed a key part of URBiNAT's approach to the participation of citizens for urban regeneration, aiming at enabling the inclusion of all in analysing the complex combination of social challenges and devising and co-creating solutions to tackle urban regeneration. It justifies, for example, the strategic targeting of certain citizen segments according to their specificities as described in URBiNAT's Code of Ethics and Conduct: childhood, gender, functional diversity, older adults, race and ethnicity, citizenship status, religious diversity, (URBiNAT, 2019b, p.14)

2.5. Co-diagnostic with stakeholders: An example from URBINAT project

With a variety of tools and methods existing to introduce, activate and motivate stakeholders for co-creation, systematic strategies and stepwise approaches can help to better integrate various groups. URBiNAT addresses these challenges by exploring an interdisciplinary approach, where experts of several fields collect data and develop an interpretation about the current situation of an urban area, a city, or a network of cities (Moniz, et al., 2022). These experts offer a holistic perspective of the urban phenomenon in terms of historical development, demographic change, social activity, economic activity, environmental characteristic, mobility, urban morphology, etc. Although urban spatial analysis is the first step of this planning process, the traditional methods (mapping and statistics) were combined, with new technology as data science and data visualisation (GIS), and with new social and humanistic dimensions as the participatory processes to engage the citizens' knowledge, views, and voices. In this sense, the first stage of the co-creation process is the activation of the living labs taking into consideration the stakeholders that were identified and are available to collaborate.

The process of approaching and engaging citizens and stakeholders in taking part in participatory activities should explore the combination of methodologies to collect complementary data and involve different target groups. **In URBiNAT four main methodologies for the co-diagnostic stage** were put in practice: cultural mapping,

[12] https://gogreenroutes.eu/about/project

motivational interviewing, critical proximity, and participatory design (URBiNAT, 2019b, p.21; Moniz et al., 2022).

1 - **Cultural mapping** serves as a methodology and a process of collecting, recording, analysing and synthesising information in order to describe the cultural resources, networks, links and patterns of usage of a given community or group in a specific locale (Duxbury et al., 2015). Cultural mapping may be applied during the diagnostic phase to map intangible cultural assets which are more qualitative in nature and not easily counted or quantified. Examples include values and norms, beliefs and philosophies, language, community stories, histories and memories, relationships, rituals, traditions, identities, and shared sense of place.

2 - **Motivational interviewing** is a methodology and technique to promote behaviour-change in extended communities. The core originally took the form of dialogue for the purpose of building understanding about outstanding needs. Motivational interviewing thus starts out with collaborative, person-centred communication methods and guidance to generate an understanding of needs, and to elicit and strengthen motivation for the changing of behaviours. Motivational interviewing is particularly devised to strengthen personal motivation and commitment towards a specific goal by eliciting and exploring each person's own reasons for change within an atmosphere of acceptance and compassion. It integrates features of human, face-to-face interaction and mechanisms for establishment of trust, to build incentives for positive changes.

3 - **Critical proximity** – is an ethnographic approach that intends to establish trust between the facilitator and citizens in order to enable critical reflection concerning the participatory process. It means to re-think knowledge about a given context from the inside (Latour, 2015; Ingold, 2013) and to develop citizen contributions (either as needed or as a proposal). It can take the form of a meeting, walk, or a coffee. The facilitator is a participant Observer and organises an ethnographic diary to register the dialogue with the citizens. It has been a key approach in improving interaction with citizens during the four stages, namely in the co-design for the joint development of proposals in Porto[13].

4 - **Participatory design** aims at designing, experimenting, and validating a model that has its heart and soul the participation of all stakeholders in the innovation and conceptualization process and it is framed by the vision of having the user at the centre of the system. Participatory design started from the simple standpoint that those affected by a design should have a say in the design process. This perspective reflects the then-controversial political conviction that controversy rather than consensus should be expected around an emerging object of design. In this situation, participatory design sided with resource-weak stakeholders (typically local trade unions) and developed project strategies for their effective and legitimate participation in design. A less controversial complementary motive for participatory design was the potential to ensure that existing skills could be seen as a resource in the design process.

The activities developed within this methodological framework should respect ethical requirements framing the collection of data, their processing, and the interaction with people, see Box 6 for more details.

[13] Cruz, T. (2019). With Teddy Cruz on "Power" and "Powerlessness". Interview by Şevin Yıldız. https://archinect.com/features/article/93919/with-teddy-cruz-on-power-and-powerlessness

Box 6. *Co-diagnostic steps in URBiNAT*

The co-diagnostic needs to be planned in several steps that guarantee the effective participation of citizens, stakeholders, municipalities, companies, academia as well as different target groups. It is also important to prepare the activation of the next stage, co-design. In this sense, URBiNAT proposes six steps:

- Involvement - develop activities to map and call citizens and stakeholders that can and want to contribute to the participatory process.
- Team building - create a positive environment for co-creation, where everyone feels comfortable.
- Awareness - share information between participants to create a common knowledge about the topics that will be discussed, such as, the definition and practices of nature-based solutions.
- Data collection by participatory activities - collect qualitative and quantitative data through activities organised with people, such as, interviews, focus groups, walkthrough, photovoice, gaming, mapping, etc.
- Integrate - to involve and listen to citizens on the results and conclusions of Local Diagnostic to define needs, opportunities, categories and typologies of solutions, material and immaterial.
- Presentation of local diagnostic - share the results of the local diagnostic with the participants in the participatory process and with the local community to engage and support the co-design stage.

Summary

Chapter 2 provides an overview of identifying and understanding stakeholders as an important, decisive step for successful co-creation processes. As in-depth collaborative approaches and intense stakeholder involvement often need to stretch the limits of normative and regulating systems or intend to go beyond them to test out new ideas and stimulate innovation processes, section 2.2 outlines the importance of being aware of the different planning cultures, place-based contexts, and culture to set the frame for such processes. Before starting a co-creation process, it is useful to reflect on stakeholder roles and their capacities for co-creation processes as outlined in section 2.3. Using tailored or given schemes from literature, support a systematic identification and mapping of stakeholders needs to occur to support the following co-creation processes. Systematic mapping approaches as described in section 2.4 provide a basis for inclusive processes consistently engaging a broad range of stakeholders including those who have little or no voice in normal planning processes, despite being affected by both the problems most or have little influence on creating solutions and potential benefits. Finally, section 2.5 describes the co-diagnostic approach adopted from URBiNAT, including a variety of methodologies and steps based on a trans- and interdisciplinary way to activate stakeholders and co-creation processes.

3. Co-Creation in Action

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3.1. Introduction to the action phases: co-design and co-implementation

The foundational benefit of co-creation processes lies in bringing together different sources of knowledge for better outcomes and increasing the transparency of the development process. There is much value in tapping into the learnings of a local community and channelling it into ideas, proposals, and solutions. Another positive aspect, especially with respect to NBS, includes establishing connections between people and places, both materially and psychologically, during such processes. A third source of benefit emanates from the role of participation in shaping perceptions and the creation of a sense of ownership thereby helping to instil a greater appreciation of the outcomes achieved (Van Herzele 2004; Kahila and Kyttä, 2009; Brown, 2015).

The initial work with stakeholder mapping and engagement should set up the process for both detailed contributions of representative groups as well as contact with a wide cross-section of stakeholders across a specific community. This should help stakeholders to not only be informed but also involved in the process of change. Involving people at the core phases of the project allows stakeholders to accompany the main decisions and feel connected to the outcomes (Brandsen et al. 2018). It also allows for a wide range of stakeholders to be involved in the creative process rather than just identifying problems.

The heart of co-creation processes are typically the action phases where creative design and implementation occur. So, referring to **"co-creation in action**", covers the major stages of decision making throughout the implementation of NBS. The process of decision making can be critical and transformative for both the wider community and the stakeholders most intensely involved in the process (Morello, et al, 2018). In this sense, the process is grounded by the guiding principles of equalising power relations, democratic practices, situation-based actions, mutual learning, and appropriate tools and techniques (Kensing & Greenbaum, 2012; McKercher, 2020). Co-creation processes may need to be supported by a number of methods to help break through traditional silos and challenge boundaries and traditions of standard development processes.

On this basis, co-design is a method that encourages collaboration and a mixing of the roles of researcher, designer, and end-user to elicit collective creativity in the design development process (Sanders & Stappers, 2008). Co-design is, therefore, a collaborative design approach in which technical experts aim to work together with stakeholders of impacted communities to create appropriate solutions (Holmlid, 2009). It evolved as an approach for combining the insight of the various actors who are affected by a particular problem (Bradwell and Marr, 2008), to collectively transform the insights into co-creative solutions. This leads to contextually appropriate solutions and empowers locally impacted communities directly (Hofstad et al., 2021). Thus, the co-creation of NBS uses local knowledge to bring communities together and produce multiple co-benefits.

Much of the public participation happens within the co-design stage of the co-creation process. Nonetheless, it is fundamental to acknowledge the relevance of several participatory approaches as an integrated part of the whole co-creation process and not just during one specific stage. Therefore, it may help to empower the local community in the process and

increase their sense of belonging and commitment towards co-management of place (Mahmoud & Morello, 2023). Developing functional nature-based solutions is based on improving co-production of knowledge and organisational systems which is an iterative process of reciprocated learning and respect (Greenbaum & Loi, 2012; Luck, 2018).

Some of the key principles and guidelines of participatory design methods (adapted from Greenbaum & Loi, 2012) include:

- Equalising power relations — giving a voice to everyone inside organisations or communities (Luck, 2018; Smith & Iversen, 2018); see more in section 2.3 and 2.4.
- Situation-based actions — working in place with all parties for a deeper understanding of their actions and bringing accountability to the result (Luck, 2018; Simonsen et al., 2014);
- Mutual learning — creating harmony among participants validating all knowledge as important and complementary (Luck, 2018; Simonsen et al., 2014);
- Appropriate tools and techniques — facilitating the participants expression of their needs, allowing reflection to take place (Ehn, 1993; Luck, 2018);
- Holistic use of technology — applying technologies to increase fairness and depth of stakeholder participation (Karasti et al, 2018; Smith & Iversen, 2018);
- Democratic practices — creating fairness among stakeholders through practices and role models (Greenbaum & Kensing, 2012; Luck, 2018).

This process can be demonstrated exemplary by the **URBiNAT** case study (see Box 7).

Box 7. URBiNAT participatory design process

The example of the **URBiNAT** participatory design process, reinforces the importance of involving the Stakeholders in all the Macro stages of the project - from co-diagnostic to co-monitoring. From the beginning Urbinat designed all actions around the citizens' participation and engagement. First actions comprised visits and dialogue with local NGOs and all city council levels, politicians, administrative and technicians. Another aspect of the participatory design process is to develop the objectives throughout the whole sequence, considering the citizens perspective as well as the project's perspective. This overall structure of the co-creation process allows the URBiNAT team to create more than 23 activities using different methods and techniques such as: workshops; world cafes; charrete, ideation sessions; Triz validation dynamics, among others.

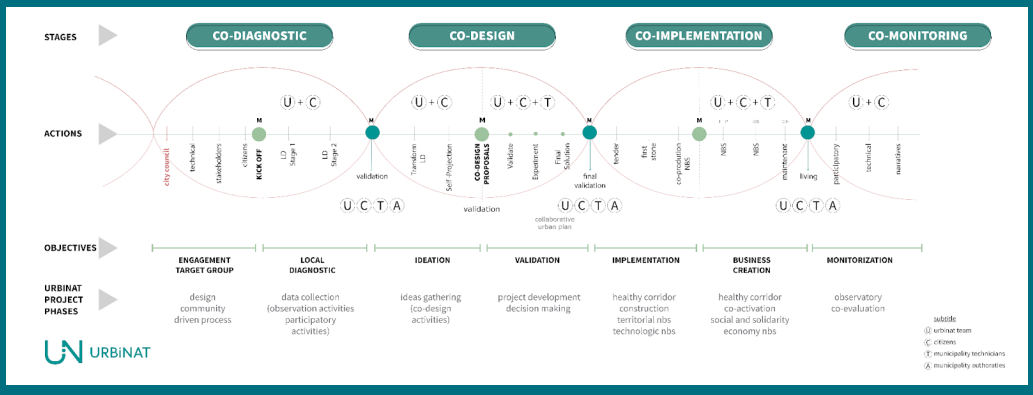

Figure 4 Urbinat Overall PD - Participatory Design Process by GUDA and CES

This overall participatory design process worked as a project roadmap and was adapted and personalised by each of the URBiNAT cities. Each city has its participatory culture, previous experience and a deep knowledge about the context dynamics and power relations.

During the iterations of the decision phases, monitoring and evaluation should also be integrated (Dinshaw et al, 2014) as well as wider validation and approval. The process should be nonlinear and dynamic with a wide range of channels for both sharing and collecting information and experiences.

3.2. The co-design process: setting the conditions through to ideation

The collective design of a project adds depth to the quality and validity of the solutions. Co-design processes can be started at different points along a development process and design information can be collected early on, and in parallel with the stakeholder mapping process. During co-design, we need to be aware of context, the goals and stages in order to apply the methods that are better suited for the project (Mahmoud & Morello, 2021).

There are, in most cases, both extensive conceptual and technical phases of the design processes and local stakeholders can be involved in both. Institutional and technical stakeholders must be aware of the complexities, adding time and budget as needed to perform the process effectively. This stage of co-creation must synthesise many diverse and often divergent opinions, issues and demands into one multifaceted design solution. It can be a demanding period of interaction with many sessions of “back-and-forth discussion” between designers, community, and the co-creation team (see Van Breda & Swilling, 2019).

Stakeholders work together with designers and/or facilitators to develop concepts, ideas, forms, and other solutions. This will start with the collection of ideas, demands and issues from the community and progressively pass through multiple cycles of feedback as designs advance in resolution and detail to become mutually accepted and community-validated solutions and eventually detailed, buildable designs. It can involve many creative engagement sessions, scenario developments, budgetary and value engineering reviews and it is a complex, time consuming process. A diverse range of tools and activities will be applied to enable participants to access, generate, and test experiences and ideas in a spatial context (Leonor et al, 2017; Blomkamp, 2018).

Divergency, selection, convergency, synthesis and analysis are key design thinking processes that must be collectively employed to structure the collaboration and participation methods (Magnanini et al, 2022). This approach to design often follows a series of stages that can include:

1. Co-planning the conditions - setting the scene and engaging citizens.
2. Self-projection - motivating and empowering citizens.
3. Projection - sharing purpose & scenario development.
4. Design/ideate - conceptualising, diverging then converging.
5. Discuss and validate - counterpointing, dialoguing and consensus building.
6. Prototyping - experimenting and testing in place.
7. Systematise - preparing for future iterations and next stages.

In this context, the design is a process that moves between creation, ideation, evaluation (and/or validation) and then back to creation over a number of cycles. Including people in

such a process requires providing an environment where people feel they are being supported enough to have consistent and sustained participation (McKercher, 2021).

This may include a process of learning for communities, researchers, decision-makers, and institutions which combines spatial, technical, and social information with concerns related to sustainability. For example, stakeholders must be prepared to deal with adaptation and change (Simonsen & Robertson, 2013). People also present different levels of creativity in general and in different contexts and moments of their lives, which suggest the use of a range of different techniques to bring out the strengths of the participants through exploration techniques and testing (Sanders & Stappers, 2008; Hofstad et al., 2021). Background information, visualisation skills may be needed, as well as some level of understanding of specific urban design and environmental topics. Participants themselves may identify the need to acquire specific skills, and knowledge to participate effectively in the activities (Frantzeskaki et al., 2018). Access to information about NBS and how to support the implementation process, is critical for its success. Stakeholders might understand the importance of developing NBS projects but still need to put that into the context of wider initiatives concerning sustainability. This implies providing the time for the participative process to develop and this extended time can also contribute to build trust amongst the participants.

In order to reach a diverse range of people, some form of recognition for their participation may be needed. Motivation is a key element. Direct incentives for residents such as offering salaries, vouchers, accredited learning, support activities for families or other means can contribute to keeping up the level of involvement over time (McKercher, 2020). The level of incentive will also depend on the degree to which people are already motivationally aligned with the project, so it is important to know the stakeholders. Respecting the people's time and offering comfort, family support and considerable variability in the process are also good strategies. This may go as far as creating satisfying activities that double as engagement: street events, music, games, curiosities. In general, motivational strategies are a core part of successful co-creation actions, *see section 2.3.*

Box 8. Co-design process in CLEVER Cities

The example of Hamburg's CLEVER Cities urban living labs demonstrate the importance of learning and preparing participants for the project. In this case, the co-design process was put in place in the Neugraben elementary school in Hamburg and learning was an integral part of the conception. The co-design process was initiated through the joint work of a core team composed by the school personnel, the local district development agency steg, the HafenCity University (HCU) and the district of Harburg. Some preconditions were provided by the school personnel: the NBS should be movable, have clear educational purposes and be installed in the schoolyard. Based on these preconditions, STEG (Stadterneuerungs- Und Stadtentwicklungsgesellschaft Hamburg Mbh) and HCU conducted a series of workshops involving pupils, their parents, and teachers to collect ideas on what issues the NBS should address and how the NBS could be implemented. Much effort was given in explaining the concept of NBS at the very beginning of the process. Pupils were involved through intriguing pictures and colourful examples, as well as by encouraging them to handcraft their own ideas of the elements to be implemented. Parents were asked to react to pupil's work and to share concerns and ideas on the use of the NBS and its meaning for the pupils of the school. Teachers were involved mainly in support of the educational aspects, contributing to conceptualising how the NBS could be used for teaching activities. It was by taking these ideas and collecting these perspectives, that the core team developed the NBS with targeted regular meetings that led to the definition of the final designs. These meetings concentrated themselves, to some extent, on technical issues, such as the most appropriate material to be used or which protection measures for sharp edges could be put into place. However regular crossover meetings were held with stakeholders during the entire process.

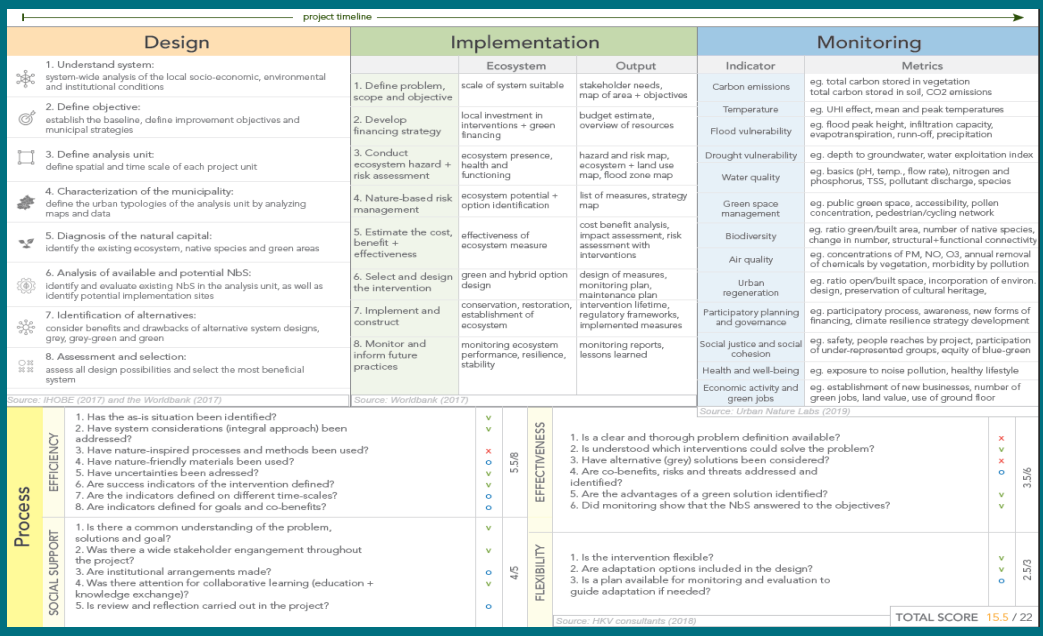

Figure 5. Co-creation framework[14] developed for the Hamburg case study - an example of co-creation process monitoring (used with permissions from Kirya Heinemann at HafenCity University, 2020)

It should be clear that involving a community in a co-creative process that includes the development and validation of the design solutions can be expected to take more time (and budget) than top-down decision-making processes. These approaches can also be more demanding in terms of time and skills of both organisers and participants (Nesshöver et al., 2017; Wickenberg et al, 2021). However, other indirect benefits accrue in the quality and grounding of the ideas presented and in the avoidance of push-back or direct resistance from community groups. Conflicts, protests, and other critical delays in projects can be vastly more costly than the time involved in a collaborative process.

In order to succeed in this collaborative process, the participants must also feel empowered. Empowerment is a process where organisations, communities and people have influence over issues they perceive as concerns (Hämäläinen & Rill, 2018). Empowered participants will create an emotional bond to the outputs, which is called ownership (Rijn & Stappers, 2008). According to Zimmerman (1995), psychological empowerment can be broken-down into three components: intrapersonal, interactional, and behavioural:

- The intrapersonal component is how people think about themselves. In co-design, it can be translated into the participants' confidence to communicate their own ideas, believing that they are valuable to the process.

- The interactional component refers to the participants' awareness of what is needed in order to achieve the goals. This means that participants understand contextual factors influencing the design and have the needed methods and skills.

[14] Presentation held by HCU during the online seminar in the frame of the CLEVER Exchange programme in WP3, Task 3.6, CLEVER Cities project.

- The behavioural component refers to actions that address needs in a specific context. This implies developing solutions that are useful for the community.

People will be prepared to accept different levels of empowerment in co-design as a result of their background, role etc. An external facilitation might help to understand these power dynamics and manage them in order to enable, under the same conditions, the participation of everyone and avoid self-bias (Lee et al., 2018; McKercher, 2021).

Visioning, forecasting and scenario development are all important means of understanding local contexts, identifying local aspirations and resources as well as the challenges and options available for enhancing NBS practices (Baibarac & Petrescu 2019). The visioning stage of the co-design process allowed us to better understand the local framing of the issues and potentials. Identifying a shared purpose is a critical step in defining the tools and practices that will be needed for the community to progress. This stage can involve a number of design experiments that provide information and knowledge to the facilitators, designers, and policymakers, helping to clarify the direction forward. Community goals and objectives need to be collected even if they are produced in a wide range of formats and with different levels of detail. It is a critical phase to have community members opening up and sharing their lived experiences (McKercher, 2021). Typically, there is a very wide range of observations and aspirations expressed in each of the steps of the co-design process (Wickenberg et al, 2021). In fact, information collected directly from the community can range from generic dissatisfaction to very specific requests for change.

The specific methodologies to develop co-creation actions comprises conceptualisation tools, approaches, and methods aimed at helping citizens to work effectively in the context of design thinking processes. Engaging stakeholders in NBS co-design also helps develop better systems for resolving conflicts, building trust, and providing learning opportunities (Blomkamp, 2018). The strategies most involved in the process of conducting co-design support information are sharing, deliberation, conceptualisation, and synthesis. Activities should focus on brainstorming, recombining, associations, conceptual development, and other means of promoting creative solutions.

Co-design is often associated with the use of practical tools to enable participation and to generate and test prototypes and ideas. “Although co-design is more than a ‘toolkit’, the visual and tangible methods that it offers are one of its key characteristics” (Blomkamp, 2018 p. 733). Being able to express design solutions and dialogue with technical members of the team is critical. Holding productive sessions where lived experience can be translated into design decisions will always be essential. It is important to explore all the tools available for the most creative phases of the project. Projects like Engage2020 (2015) have structured and organised different engagement methods for different phases and scenarios encountered in the co-creation process. For example, it is possible to use art and modelling, photography, and graphics, moodboards and digital visualisation tools and methods. Other methods such as card sorts, model building, and mapping can help reveal more nonverbal and intuitive perspectives (Blomkamp, 2018; McKercher, 2021). Prototyping is an important tool of co-design, and has the advantages of being a quick, low-cost way to test an idea by implementing a sample or model for feedback (Blomkamp, 2018). The use of successful case studies and site-visits can help people visualise solutions that may seem impossible given the local context.

It is important to choose the right co-design tools for the context and to help overcome limitations that might hamper participation. The goal is to use a mix of tools to help increase an understanding of the issues and objectives as well as build stronger relationships between stakeholders. Even the use of geographic information and other digital tools helps provide the necessary adaptability regarding decision making (Smith & Lazarowj, 2006). In this

context, digital participation tools promote social learning for better collective decisions and provide further transparency as well as trust that community knowledge is being applied in participatory processes (Ataman & Tuncer, 2022). Facilitation requires having specific guidelines for those who can assume the roles of intermediaries. It involves reflecting on why people should participate in the process and being clear about purposes and rules. While setting a meaningful deliberation process is focused on developing a clear decision-making process, and ensuring equal rights of expression (Nunes et al., 2021). More than simply voting, the focus is on interaction, democratic decisions, and expression.

3.3. Communication, social learning and validation

Co-creation actions are intrinsically communication and learning actions. In order to work in a collaborative manner, it is necessary to create and support stakeholder networks that are held together, in large part, by systemic communications. Literature on participatory design has frequently highlighted mutual learning as a core outcome of co-design activities (Simonsen & Robertson, 2013; Bratteteig, 1997). In fact, Sanders and Stappers (2008) place social learning at the heart of co-design. Social learning refers to the sharing and development of adaptive group strategies for individual learning, based on observation and problem solving in group settings (Sanders, 2005). Fisher et al (2021) understand "design as learning", meaning that learning happens within the design process itself. Their findings outline the significance of the problem setting for learning. They show how the way co-design is organised not only determines the result, but also how its internal dynamics and socio-material arrangements are closely intertwined with different learning outcomes.

The first "learning communications" that reach stakeholders may seek to inform and educate stakeholders about the process, but they also need to captivate and motivate people to interact with it. Most co-design learning, including awareness raising, is generally applied in a transversal manner throughout the entire co-creation process. In the initial stages of the project, awareness raising will be a key focus to bring stakeholders into the project. This may include influencing their beliefs about the process and inducing a reaction in stakeholders towards the achievement of defined purposes (Fisher et al, 2021). If people are not motivated and/or aware they will not participate in co-creation. Being a collaborative approach, co-creation needs people and ideas to develop and innovate NBS.

Innovation does not happen automatically, so a continuous process of informing, involving, and empowering by creating multiple channels of contact with people is at the core of this process (Osborne & Brown, 2011). There are some crucial components needed, including:

- Communicating: demonstrating knowledge and awareness of the desired message and communicating it in different manners as a means to approach different target groups and stakeholders. Providing information about the benefits, features and impact of NBS; activating and mobilising different stakeholders for a certain purpose and strengthening networks.

- Engaging: stakeholder involvement is key to the process and communication techniques that ensure the message is received and helps create the context for collaboration.

- Practising: demonstrating through actions a commitment from all the parties involved concerning change.

- Advocating and validating motivating others to conform and/or adopt the co-developed changes in a consistent and sustainable way (Adapted from Oxfam, 2005, as cited in Sayers, 2006).

How you communicate and through which means and channels has a huge impact on the level of engagement. You need to think about providing information and communication mechanisms that are easy to access, read, and understand, acknowledging the specific target audiences you are addressing. This involves preparing information and mechanisms that are tailored to the community on both digital and analogue platforms, with both language and style that consider the interests and limitations of target groups. Communication shapes the ground for dialogue and consensus building. It shapes how stakeholders come to understand and act upon problems and opportunities in a collective context. The process involves interventions with intrinsic communications on roles, rules, procedures, technologies, and incentives. It is design work that involves making specifications about how communication functions, reasoning and the way designs communicate (Aakhus, 2015).

NBS co-creation projects may communicate asynchronously or synchronously via digital means (email, online meetings, private groups, blogs etc.) and may also communicate via written material or physical events. Both the message itself as well as the communication mechanism is an opportunity to be innovative and creative in order to reach the audiences and convey the messages. In relation to this, arts and performance arts may play a role as a means to move beyond the more traditional marketing and promotional actions.

In operational terms communicating with citizens (Nunes et al., 2021) should cover at least the following:

- Communication strategies and conception.
- Audience awareness.
- Communication materials and channels.
- Multichannel interaction.
- Codes of conduct related to communication and ethics.

In the co-design and implementation phases, the eventual goal is to validate the process in which concepts, ideas, designs or details are presented to both representatives and, as far as possible, a wide range of the community for evaluation and feedback. There needs to be some type of approval or recognition that a collective agreement has been attained. Validation can become an integral part of the sharing power in relation to decision-making through the act of co-governance (see more in Chapter 4).

Finally, building trust is integrally connected to transparency and the sharing of information. This means making sure all designs and documents are accessible to stakeholders and avoiding hidden agendas or budgetary information. It also supports participants being able to speak about expected results that are both positive and negative, and to give feedback about what is going well and what is not, which will impact expectations and trust (Nunes et al., 2021). Trust is further developed over time and is aided by a range of encounters and sharing of stories and perspectives in face-to-face encounters that include a series of types of relational signalling and empathy. This may include clarifying expectations, recognising the legitimacy of others' positions, demonstrating the ability to change your own decisions and more (Six et al., 2010). Trust may impact citizen engagement to a greater extent according to the local context, such as in the case of distrust or a history of failure and disappointment, which require the exploration of different mechanisms (Fung, 2004). It involves, namely: ensuring that everyone is part of the conversation and deliberations, documenting the activities to promote ownership, qualifying local ideas instead of bringing many ideas from practitioners/experts, properly communicating and translating what the residents feel, as well as repeating people's opinions.

3.4. Co-Implementation that collectively builds and transforms NBS

The co-design and implementation phases are not necessarily in a rigid, linear sequence. Early examples of implementation can help bring out more stakeholders as seeing the beginning of change happen may pique curiosity and interest. It is, therefore, helpful to see both co-design and implementation as transformative moments in a community. Co-implementation especially has the power to alter the community from a social, learning and economic perspective. One approach to co-implementation involves developing democratic partnerships between researchers and community stakeholders with the view of involving end-users in the design of research, promoting their understanding and capacity, and encouraging uptake of findings. Stakeholders may be both the potential recipients of the interventions and responsible for implementing them (Jackson et al, 2015).

Co-implementation will consider how communities can be involved in the physical change of their neighbourhoods, but it will also focus on the transformation of the people in the community itself as a result of the implementation process, which includes not just technical but also social, financial, organisational, and environmental aspects (DeLosRios, 2020; Stevens & Dovey, 2022). This requires an understanding of regulatory processes and the approval of different social actors, groups, and organisations (Barquet et al, 2022). Co-implementation entails management of the planned solution(s) and the overall budgeting associated with it. Stakeholder expertise is needed on procurement processes, permits and maintenance, as well as coordinating with and obtaining feedback from the stakeholders involved in both implementation and maintenance (DeLosRios, 2020).

There are a number of different levels of involvement in the building process, some of them are more light touch than others. But any significant level of intervention by local stakeholders will involve a high level of training, organisation, and preparation (Lydon & Garcia, 2015). This challenge is an opportunity for stakeholders to grow and learn new skills. It may be possible to professionalise or set up support businesses that are connected to the new interventions. It also has social and health benefits for the users as the process brings people together, outside, to realise physical activities as well as help to create community bonds. It is also one the best ways to give people a sense of empowerment and ownership as well as increasing their skills and confidence.

3.4.1. Participation in the implementation

The participation of the local stakeholders in the implementation process is one of the most challenging and rewarding components of a co-creation process. Typical construction processes are highly sophisticated, programmed and regulated, so bringing local residents and other non-technical personnel into the process can be extremely demanding. This can include more complex budgeting, a range of health and safety preparations, and ongoing financial pressures for contractors. For larger NBS implementations, any constructing, upgrading, or updating will need to be a shared responsibility amongst professionals and local stakeholders, perhaps in collaboration with a local association or community building organisation (Stevens & Dovey, 2022).

For each type of implementation, there is an appropriate level of community involvement that allows for the stakeholders to take ownership of the space (Brand & Peters, 2019). For some NBS implementations it will be small light-tough interventions where residents personalise or alter the position of elements, or they may be responsible for small sections. In these cases, co-creating NBS can be as simple as planting, supporting photography, painting or adding details (Lydon & Garcia, 2015). But when considering more complete participation in co-implementation, it can involve such activities as resident-built components, material acquisition, and participation in the management process. It may be a prototyping activity in

order to get the NBS absolutely right for the various activities' citizens foresee happening in a space. The solution is to tailor the co-implementation process to the scale and sophistication of the implementation process. Utilise all of the community resources available to provide stakeholders with spaces and tools they need as well as to promote management capabilities.

Through co-implementation, citizens and stakeholders can be empowered and take on a shared responsibility for many of the building tasks and this connects directly to the subject of shared governance (Stevens & Dovey, 2022; Manzini, 2015). The building phase is where local residents can leave their mark on the land, creating deep psychological connections with the place by physically implementing, altering, or personalising NBS. This part of the co-creation process is a powerful way of connecting people to their surroundings.

3.4.2. Catalyst for community transformation

Sociologists define social change as the establishment of new human interactions and relationships that transform cultural and social institutions (Spanos, 2019). In a co-creation context, it is important to consider how to utilise co-creation to support social change through positive social interactions as well as individual skills and local economic development (Brand & Peters, 2019). Evidence is mounting in support of co-creation as a key catalyst for social change (Frantzeskaki & Rok, 2018; Van der Jagt et al, 2020). Community-led actions are a catalyst for positive change in areas such as education, the health sector, transportation, urban regeneration, citizenship, and many others (Irwin, 2020).

Co-implementation is a process with high levels of programming, training, skills and scheduling and, as such, can be an important part of social change. Involvement in co-implementation can be an opportunity for stakeholders to grow and learn new skills and to, perhaps, advance professionally. It is possible to encourage positive transformations in matters such as social cohesion, local skills, and the range of work opportunities available. It can help make some people feel more autonomous, and more confident in their ability to affect change. If co-implementation becomes a permanent part of the local culture, it will in itself constitute a driving force behind positive social change. Strategically, a section of the stakeholders involved should have the specific capacity to support social change and deliver social benefits as part of the co-implementation (Lydon & Garcia, 2015; Stevens & Dovey, 2022). These actors should be introduced into the co-creation process at an early stage to allow for social goals and measures to be integrated into the co-implementation of NBS. This also requires public institutions to facilitate collaboration internally between those focused on ecological goals, technology, housing, social services and coordinate collaboration across departments and sectors. It is not only the changes to urban spaces that will help but also the act of people collaborating across social and cultural divides for the common good. The act of participating or supporting a building process can be transformative as communities of practice are formed as part of a process of collective learning and action (Wenger & Wenger-Trayner, 2015; Stevens & Dovey, 2022).

3.5. Systematising: preparing for future iterations and next stages/phases

The degree of involvement of the community in a co-implementation process, will determine the different ways collective management can occur which, in turn, will impact on the opportunities for social contact, skills development and other transformational objectives (Hofstad et al., 2021). When community stakeholders are involved in smaller sections or for a limited time in a co-design or implementation project, there will be limits on developing wider social contact and less opportunity for training sessions and the like. Nevertheless, all

interventions should be considered as an opportunity to begin contact between local residents and a chance to create the context for learning by doing.

There are a number of challenges to be considered in these phases of the co-creation process. They include:

- Finding balance in stakeholder contributions and creating a sense of fairness. Dealing with power imbalances and including both technical knowledge and lived experiences.
- Synthesising diverse stakeholder contributions into coherent solutions.
- Making sure that time and resource constraints do not hamper your planned co-creation strategies.
- Managing expectations and avoiding opportunism related to the wide range of inputs from stakeholders.
- Budgeting in time for some cycles of feedback and learning.
- Establishing multiple channels of communication, balancing both face-to-face and online approaches.
- Reconciling conflicting viewpoints, making trade-offs, and reaching consensus on design choices.
- Incorporating hybrid nature-based and hard engineering solutions.
- Scaling up and making the solutions more systemic, (see challenges in Section 4.3)

With increased involvement of local stakeholders, more significant social structuring and capacity building become possible. This might include some level of management experience and confidence building. Multiple training and working sessions are possible and social networks with a higher possibility of lasting beyond the period of one project. Having sections of a co-creation process that are controlled by community groups, creates the context for organisational development and helps provide the confidence within the community by demonstrating that they can manage change (Stevens & Dovey, 2022).

With more extensive levels of community involvement in a co-creation process, it is possible to offer not only a range of capacity building options, including formal and certified programmes but also to work at professionalisation through internships and local hiring as well as business development by mentoring and supporting local start-ups that can act as service providers or possibly contribute to parts of the supply chain. We need to take into account the difficulties and challenges for people to be part of a time-intensive development process including different routines, needs and aspirations of communities.

Some of the most sophisticated forms of participation in co-creation involve developing local supply chains and/or providing co-financing for full project control (typically for smaller projects) or to start small businesses. Efforts to utilise local suppliers can be difficult as building systems are connected to international networks of supplies. However, steps can be taken to help connect local groups to the development process by identifying the strategic resources and skills available and/or by offering non-material support such as catering. Co-creation may be sustained through partnerships and co-financing arrangements. This could translate into partnerships between housing associations and the municipality, private businesses or sports clubs in the area, where it is possible also to contribute by volunteering time in the process (Lydon & Garcia, 2015). In general, bringing people into the process can be strengthened by providing a range of incentives, including access to mentoring,

accreditation, removal or barriers and of course, financial incentives. As community-led actions become a more intrinsic part of culture, the range of co-benefits for those taking part will continue to expand.

Summary

Chapter 3 presents the core concepts of both the co-design and co-implementation phases of NBS co-creation, including the need for communications and the validation of solutions with the community. Principles like mutual learning and the selection of the appropriate tools for each phase and context of the process are critical to the overall process. In Section 3.2, the different steps that move from co-planning the conditions for co-creation to implementation are listed. The URBINAT example (Box 7) demonstrates a version of these steps as applied in urban living labs. This section then covers the critical considerations needed to move to the ideation phase including the upskilling of all participants, the removal of barriers and the consideration of incentives to participation. Section 3.3 focuses on the different forms of communication and validation that must accompany the co-creation of NBS. This includes engaging, demonstrating through practice, advocating and more. Section 3.4 describes how co-implementation brings benefits, like management skills and an increased sense of ownership to the process by involving people in the construction process. It also points out how such participation in, and in support of, implementation can be transformative for the community as it can help people develop economically, while improving aspects such as social cohesion. Lastly, Section 3.5 lays out some of the challenges to the process and describes how some of the co-benefits of this process can become more permanent through their systemic application.

4. Towards a Co-Governance Approach for Nature-based Solutions

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4.1. Introduction to collaborative governance of NBS in a nutshell

- Key attributes of collaborative governance of NBS within co-creation processes

Collaborative governance approaches in urban planning often refer to the mechanisms in which citizens take part in the decision-making processes alongside local authorities and public or private stakeholders while i) generating partnerships and ii) aligning NBS with strategic priorities within a place-based setting[15]. As no one-size-fits all, the processes of co-governance, within the large-scale, NBS urban regeneration projects, are more often looked at as the core vehicle to drive the co-creation processes (Mahmoud et al., 2021). Working with different stakeholder types and a range of different modalities of engagement within a specific socio-spatial contexts is a catalyst for the co-creation processes as they do not happen in a vacuum[16].These co-governance modalities evolve and change within **the lifetime** of a project and within **spatial contexts** with specific configurations (Mahmoud et al., 2022a). It is also important to understand that as collaborative governance systems evolve along a route of urban transformation, the role of different actors also changes along the process timeline. The move towards a system of shared governance entails a few essential changes to support key elements of participation by creating trust and favourable conditions for cross boundary engagement and dialogue.

A European Commission report (Bulkeley, 2020b), examines how 24 European projects related to NBS enable participation and inclusion, highlighting the challenges to move beyond the usual suspects of urban planning (see section 2.4.2). Concerning NBS as an urban policy for the reintroduction of nature in the urban environment, researchers and international organisations have recognized the need for the inclusion of actors in the decision-making process besides the usual suspects (Frantzeskaki & Rok 2018; IUCN 2020), emphasising a switch in current practices of governing urban change by including also lay persons, activists, social movements and others alike (Gross & Hoffmann-Riem, 2005). To move beyond traditional participation in urban planning towards co-creation of NBS requires decision-makers to incorporate collaboration into the process by expanding it into the co-design, co-implementation, and co-monitoring phases of development (Ferreira et al., 2022; Hofstad et al., 2022; Mahmoud et al., 2022b). While it is the responsibility of decision-makers to guarantee the social and environmental fairness of the NBS and its co-creation process, it is also an opportunity for collaborative models of governance, in what concerns the design, production, and evaluation phases, to open up new possibilities in the realm of participatory planning.

- What: From governance to co-governance: criteria and guidance for transition

In the following sections, starting at 4.2, a possible definition for co-governance is developed in part from academic references but also informed by practice from the living labs. In

[15] See more https://environment.ec.europa.eu/news/how-increase-use-nature-based-solutions-urban-areas-2022-12-07_en

[16] See more https://www.re-dwell.eu/concept-definition/19

addition, this section reviews some criteria of evaluation and offers guidance for the transition from governance to “good” co-governance in cities.

- How: Co-governance in relation to different NBS co-creation drivers and barriers; examples from settings in EU Funded projects

Under section 4.3, a general co-governance approach is discussed based on drivers and barriers; while section 4.4 gathers a selection of co-creation strategies and examples in different EU funded projects dedicated to NBS.

- Why: Collaborative Governance models of NBS decision-making processes, examples from CLEVER Cities project experiences

Section 4.5 closes this chapter offering a set of governance network typologies and actors constellations, as well as a possible pathway for implementation within different networks of stakeholder types and actors constellations. Lastly, multiple possible pathways that led to a range of governance networks are presented, each of which is valid in its determined context. As projects have different local contexts and distinct starting points, the evolution of governance networks will always be a dependent route that unfolds in a unique manner.

4.2. Co-governance: a (possible) definition, and approaches to transition

This section will discuss the definition of co-governance and its implications. It will explore the concept of governance and its use in urban contexts.

For the scope of this report, co-governance (or collaborative governance) emphasises the aspect of a continuous engagement process which seeks a shared responsibility and collaborative environment to deal with the decisions at hand by involving all participants (Ansell & Gash, 2008). The concept can be retraced back to the need to positively transform public administration routines, typically providing social services, by engaging their users (Ackerman, 2004; and Pestoff, 2012). In literature, co-governance can be understood, in its functional sense, as *“processes and structures of public decision-making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished”* (Sebastian & Jacobs, 2021: 1302). Thus, it can be argued that co-governance moves forward from public participation theories, providing more inclusivity and transparency in an institutional decision-making process.

In the literature on governance, the term governance is ubiquitous (Bevir, 2012) and difficult to define (Obeng-Odoom, 2012). In academic literature, the concept of governance has been used to describe the process of governing that transcends hierarchies and, therefore, enables horizontal arrangements of stakeholders in favour of a mode driven by cooperation from the governmental bodies (Mayntz, 1998). Ferreira (2009) defines it as a set of actions and activities triggered and developed in networks of actors with the aim of giving direction to their actions through collaborative coordination.

A significant part of the debate focuses on the role of political institutions in government and on the role of the State, which has been diminishing, even though it remains dominant in terms of controlling critical resources (Peters & Pierre, 2018). Yet, governance has become increasingly popular among non-academics (Hufty, 2011). When referring to processes happening within cities, one speaks of urban governance, describing different institutional and working arrangements among urban actors (Obeng-Odoom, 2012) to solve complex, “wicked” problems (Rittel & Webber, 1973).

Specifically, urban governance is defined as: *"the 'software' that enables the urban hardware' to function — the enabling environment requiring the adequate legal frameworks; efficient political, managerial and administrative processes; as well as strong and capable local institutions able to respond to citizens' needs"* (UN-Habitat III 2017, p.48). Principles of subsidiarity, respect for local autonomy, trust and dialogue are considered fundamental for an effective multi-scalar governance, thereby representing the voices and interests of all (ibid., 48-49; Van Lierop, 2020). More recently, the New Leipzig Charter of 2020 underlines the necessity for pulling together governmental and non-governmental stakeholders to achieve success regarding good urban governance (Van Lierop, 2020).

It is possible to see parallels between governance and the concept of public participation. This concept of public participation in planning is not new (see Arnstein, 1969; Lane, 2006), traditionally it involves problems that are jointly identified, followed by a set of solutions, which are designed ad hoc, from the inputs of all participants. It is therefore a moment in time in which the decision-making is temporarily opened to a wider public (see D'Albergo, 2010). Governance includes participation as a particular practice for the engagement of different urban actors over time. The result could lead to a specificity in urban policy as well as to the setting-up of more resilient systems. Hence, the broader concept of ongoing involvement of stakeholders, associated with governance, leads to new formulations such as participatory governance, shared governance, and collaborative governance (Frantzeskaki et al., 2022).

The latter three terms are used interchangeably in literature (e.g., Gustafson & Hertting, 2017) and, in support of this, all of them describe it as a **process** that is **open, continuous, and consistent.** Moreover, they share a set of practices, initiatives and interactions that aim at the integration of citizens and civil society in the act of governing, giving direction to public policy and management (Ferreira, 2022). Some scholars tagged on some additional attributes such as **multi-phased, iterative, inclusive, flexible, and adaptable** (Mahmoud et al., 2021a). Others refer to collaborative governance as **reflexive governance**, particularly as actors try to reconcile the demands of reflexivity **(being open, self-critical, and creative**) with the demands of their existing political world (closed preferences, agenda driven, control) (see Hendricks & Grin, 2007). The definition proposed in this report is therefore the following:

Collaborative governance refers to a governing arrangement that sees the engagement of different actors at all levels of governance characterised by a multi-phased, iterative, inclusive, flexible, and adaptable process which applies forms of reflexivity for a continuous deepening of participation of stakeholders to enable adaptation to currently be faced challenges.

In addition, co-governance is not simply about working with communities, but it pursues the act of sharing power in decision-making with all intervenient in a setting where *"citizens and communities [are] at the centre of decisions about city resources"* (Foster & Iaione, 2022, p.167).

A number of **settings** may influence governance approaches related to NBS. Particularly, aspects like underlying consensus building (Díaz-Reviriego et al., 2019), flexibility coupled with long-term perspective, and people-centred processes and the necessity to emphasise the design and implementation of a methodology based on local needs are critical factors for co-governance. Furthermore, strategic management and a paradigm shift in public sectors towards a comprehensive framework for co-creation and co-governance will produce valuable results for society (Torfing et al., 2021).

However, technocratic argumentations are a recurrent limitation of the participatory processes (Ferreira, 2022), arising from the bureaucratic nature of the State (Avritzer, 2020) and the logic of efficiency that can be found in the current of New Public Management (Haque, 2004). In response to these challenges, Avritzer (2020) designates as informal governance the recent trend of valuing citizens and their contributions to decision-making processes, involving multiple stakeholders in public policy making and introducing more horizontal forms of action. Collaborative dialogue helps adapt the context of policy in favour of a shift towards a new paradigm in the governance model, which implies making a system more adaptable or versatile as a means to address the complexity of environmental management (Connick & Innes, 2001). Likewise, informal dialogue helps remodel the collaborative approach to urban planning, where innovation can play a key role in augmenting systems flexibility and allowing for the flow and feedback of actions. A combination of hybrid, multilevel and cross-sectoral approaches may help to increase the effectiveness and efficiency of environmental and social governance, particularly if interconnected to long term sustainability strategies (Lemos & Agrawal, 2005).

In this context, the need to enact a transition towards more collaborative forms of governance is assisted. This transition requires the sharing of competences and responsibilities among all participants (Ansel & Gash, 2008), whereby political actors are asked to participate directly and not through delegation (Hansen, 2005). It is fundamental to start building trust among the community where the project is going to be co-created. As Ackerman (2004) states, collaborative governance is the way to *"tap into the energy of the society"* (p. 447). However, such a process has to resonate with a responsive and engaged government apparatus in order to dissipate inequalities and to provide incentives for everyone to be engaged (Ansel & Gash, 2008).

4.3. Co-governance components, barriers, and enablers from European projects

Most commonly, the collaborative approaches to governance are centred at the initial design stage of the processes, when an overall strategy, vision and mission are being delineated. Public actors gather the most relevant stakeholders that are seen as being crucial from a strategic point of view and consult them regarding possible directions, eventual partnerships, and common benefits. While **co-creation** and **co-governance** are terminologies that suggest a **collaborative approach**, there are specific criteria to define the full scope of participation. The use of **participation** as an innovation strategy contributing to an inclusive and just urban regeneration is dependent on **engaging citizens** directly, but it is also related to acknowledging and addressing resistance while incentivizing empowerment, institutionalising forms of participation, and offering to citizens to have **more influence in the decision-making process** (Bussu, 2019). The deployment of participation strategies in co-governance processes also requires reimagining the role that citizens can play in such processes (Elstub & Escobar, 2019), as well as guaranteeing other levels of commitment, including: a) cooperation and co-production between citizens, public authorities, non-governmental organisations and other stakeholders (Pestoff, 2012; Peters & Pierre, 2018); b) diversity of participants; c) opportunity for discursive interaction and d) consensus building based on opportunities to influence, negotiate and deliberate (Bussu, 2019).

From the previous section, it is possible to identify different components of co-governance, namely ***actors, processes, and practices.***

Actors are individuals or groups of individuals that act in a process characterised by a more or less recognizable behaviour correlated with their role in the process; they differ from the general definition of stakeholders (*see chapter 2)*, since they have a powerful position in leading the governance process. Their behaviour and role can be derived from knowledge of

their interests and resources (Dente, 2014). Co-governance sees the actors collaborating towards the achievement of a common objective, rather than in a conflictual tension. For the specific context of NBS, co-governance considers diverse actors in a more horizontal configuration, reducing the use of hierarchies (although considering them when appropriate), which together should lead to a more equal distribution of power among the actors (van der Jagt et al., 2020; see also Wolfram et al., 2019). The shift from controlled or top-down governance towards co-governance should not simply remove hierarchies, rather it should bring to the fore diverse methods and tools to allow coordination, confrontation, and dialogue (Ackerman, 2004; Ansel & Gash, 2008).

The collaboration **processes** conducted according to a co-governance approach for NBS is normally characterised by an increased effort in terms of resources and time (Frantzeskaki, 2019; Mahmoud & Morello, 2021). Processes can be featured in presence and realised and supported online with a wide range of tools and methods (see case studies in Mitić-Radulović & Lalović, 2021; Arlati et al., 2021; Mahmoud et al., 2021a). This is due to the need to reflect all the necessary features characterising co-governance processes as explained above, namely being an open, continuous, and consistent process. In fact, keeping the process going emerged as one major problem, as in the project's examples represented in this report (*see more in section 4.4).*

Practices refer to standardised procedures by which a certain process is carried out, whereby ideas and projects are concreted (see Jones and Norris, 2005: 97-99). A comparative study highlighted that co-governance is essential to accomplish favourable outcomes for NBS (Frantzeskaki, 2019). In this sense, co-governance approaches have a high potential in producing changes when it comes to existing practices and the implementation of NBS in urban governance. The co-governance practices suggest systemic participation among actors allowing for new and innovative forms of solving collective issues and leading to other co-benefits. These may arise from merging the different perspectives from diverse actors in the process as well as to the emergence of new practices applied to address societal challenges through collective discussion (Head & Alford, 2015).

Figure 6 below, presents a systematic approach to paving the way in identifying lessons learned from four different European Projects. It illustrates barriers/ limits, controversies, and drivers/opportunities, that enables to frame implementation strategies to overcome challenges and seize opportunities, looking towards more sustainable co-creation processes (i.e., the most suitable mechanisms and activities for participatory implementation of NBS).

A key to building upon lessons learned is to assume a reflexive mode concerning the production of knowledge to rethink and sharpen collaboratively the co-creation process (Feindt & Weiland, 2018; Nunes et al., 2021). This is the case for the drivers and barriers of the co-governance approach that can be derived from the ongoing monitoring, evaluation and learning processes related to implementation and practice. A solid praxis emerges, bringing together lessons learned and a combination of guiding building blocks that lay a foundation for all collaborative work. These include getting to know each other, building relationships and trust, building shared motivation, transparency, communicating benefits of using co-creation in decision making, sharing examples of stakeholder contributions for the co-creation of NBS, exploring examples of NBS co-governance models in practice, and more *(see more in section 4.5).*

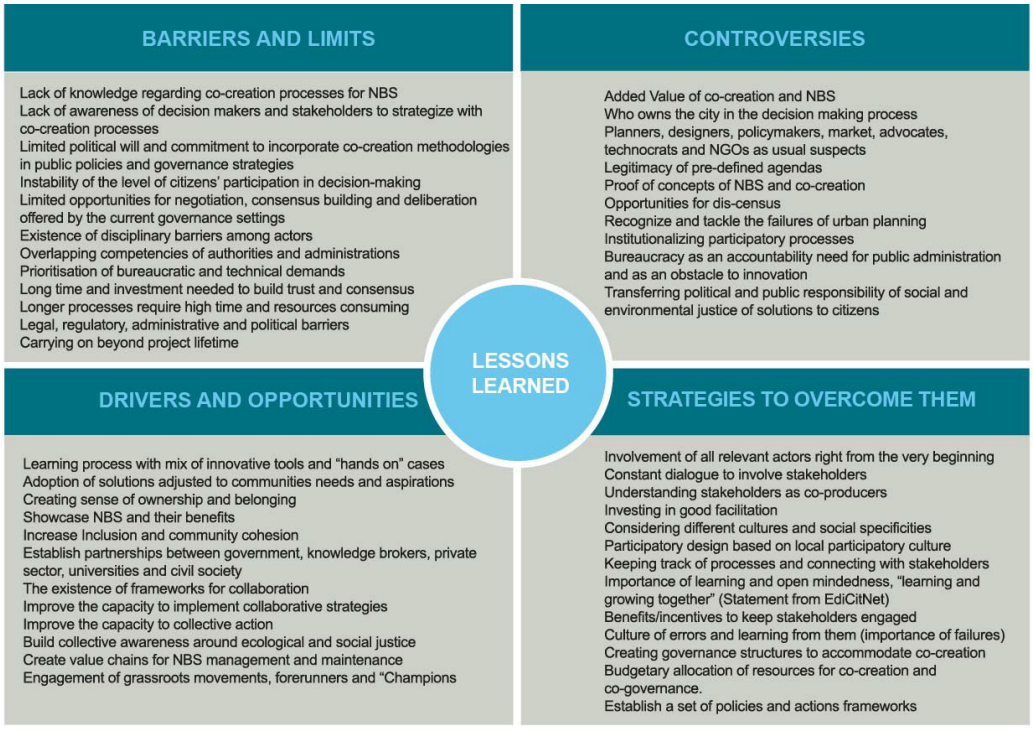

Figure 6. Identifying lessons learned on implementation strategies of co-creation processes by CLEVER Cities, Phusicos, URBiNAT and GO GREEN ROUTES

Graph ideated by Gerd Lupp and Nathalie Nunes, contributions from Isabe Ferreira, Israa Mahmoud, Alessandro Arlati and Mari Carmen Garcia-Mateo

In the following boxes, a study on (i) **Challenges/barriers**, (ii) **Strategies/enablers** is presented. It demonstrates solutions found through co-governance approaches in different European projects.

Box 9. Challenges/barriers & Strategies/enablers in URBiNAT

While most approaches to co-governance prioritise the design stage of the projects, the URBiNAT project applies a general co-governance approach. Co-governance spans the whole co-creation process, starting with a clear identification of who, how and what, including: a) a diagnostic on who are the actors to be involved *(see Chapter 2)*; b) a strategy on how these actors should be involved *(see chapter 3)* based on the local participatory culture; and c) what will be the focus of the intervention, based on a diagnostic of the needs and ambitions as perceived by the residents of the intervention area.

The following co-design stage will then typically benefit from using many participatory methodologies targeting different groups. The qualitative research conducted in URBiNAT (Ferreira et al.,2022), highlighted several **(i) challenges,** namely:

- transferring the collaborative energy from the design stage to a cross-cutting approach throughout the co-creation process of NBS
- the existence of disciplinary barriers among actors which inhibit dialogue and understanding;
- the prioritisation of technical projects over the needs of the participatory process;
- bureaucratic and technical discourses jeopardising the focus on needs and ambitions as perceived by citizens and communities;
- distrust, based on previous experiences that did not demonstrate responsiveness; and
- Most importantly, the level of citizens' influence in decision-making is still not guaranteed, particularly regarding negotiation, consensus building and deliberation.

To tackle these challenges and improve the sustainability of the participatory processes, a (i) strategy for co-governance is needed, aiming to: 1) move from a project-oriented approach towards a strategy for a general co-governance approach; 2) improve the capacity to implement collaborative strategies; and 3) put in practice co-creation methodologies throughout the organisational structures. A strategy for co-governance includes three main components (URBiNAT, 2019b):

1) tracking the complex decision-making process within the organisational governance structures, offering the participants of the co-creation process knowledge on the functioning of organisational systems;
2) improving the level of understanding and commitment among citizens, politicians, technicians, researchers and practitioners, through a clearer commitment to express and discuss agendas and interests during all stages of the co-creation process (addressing the second challenge);
3) generating new governance structures, useful for supporting more transversal and collective decision-making processes, e.g., multi stakeholder committees.

Based on evidence from comparative research conducted in Portugal and Canada (Ferreira, 2022), committees emerge as an interesting space for participation. They constitute a formal space for dialogue, inter-knowledge and learning about the diverse interests of citizens, technicians, and politicians. The committees facilitate and strengthen the degree of consultation between the State and other non-governmental organisations, helping to increase the quality of democracy and strengthen civil society.

Box 10. Barriers and enablers in PHUSICOS

With the increasing popularity of NBS, a number of (i) **barriers** hindering or slowing down the implementation processes in practice also become visible within the EC Innovation Actions projects. PHUSICOS as a Horizon 2020 Innovation Action demonstrated the use of NBS in rural and mountain landscapes and large-scale demonstrator case sites with sub-projects being established in Italy, Norway and in the French and Spanish Pyrenees. Many of the barriers experienced in rural settings have the same causes as the ones described in urban areas. A number of review studies have summarised and classified barriers mainly in urban settings (e.g., Kabisch et al., 2016, Sarabi et al., 2020). The main barriers identified in literature and experienced in PHUSICOS, were institutional factors, resistance among stakeholders, as well as technical and economic issues. A key element observed, and an outcome obtained from in-depth interviews is the lack of knowledge regarding natural hazards, related risks and the ability of NBS to deliver co-benefits providing new opportunities and business models in addition to their risk-reducing effects and procurement issues in later stages of NBS implementation (Solheim et al., 2021, Lupp et al., 2022).
Studying key governance (ii) **enablers** in NBS implementation from retrospective cases results, highlights a number of crucial governance enablers for NBS. One was polycentric governance models with novel arrangements in the public administration that involved multiple institutional scales and/or sectors, *(see more in section 4.5)*. Innovative stakeholder participatory processes catalysed processes and had an important influence on the final NBS design. The development and a maturing network of pro-NBS interest and coalition groups helped to drive co-design processes. Finally, financial incentives such as funding community-based implementation and monitoring of NBS played a vital role for long-term commitment on the NBS found (Martin et al., 2021).

4.4. Co-governance integration methods and examples from European projects

A diversity of methods to integrate co-creation and co-governance strategies of NBS into policymaking at the local level are consolidating among Horizon 2020 research and innovation funded projects. This section systematises co-governance operationalisation methods as key enablers of collaborative innovation within some European projects with relative NBS interventions. It also addresses key principles, challenges, and potential solutions to operationalise a systemic approach towards policy making processes. The goal is to contribute and strengthen an integrative perspective across cities and regions to support the creation of NBS, while at the same time foster innovative planning and governance and also enable the transition towards sustainable urban regeneration models.

Box 11. Advisory boards in URBiNAT

URBiNAT's proposal to the cities was to establish advisory boards or municipal committees as a regular and formal governance structure dedicated to making decisions collaboratively. While these governance structures are not new, they can be designed, in terms of form and composition, to offer opportunities that balance the distribution of participants, extend the opportunities of discursive interaction, cooperation and co-production between citizens, public authorities and stakeholders. These boards also help build consensus by increasing the possibilities of influence, negotiation and deliberation on decisions (URBiNAT, 2019b; Ferreira et al., 2022), *see more in section 2.5.*

As part of the co-monitoring phase, municipal committees can play a key role in monitoring and evaluating the NBS implementation process, by identifying monitoring procedures, tracking the flow of each proposal and activating unblocking procedures (Ferreira et al., 2022). In this context, the municipal committees can take advantage of participatory methods and processes such as community-based monitoring (Allegretti et al., 2014) and empowerment evaluation (Fetterman, 2021).

After the design stage, the URBiNAT team systematised all the collected information and prepared a decision process with the political representatives, using an adaptation of the TRIZ method (Sheng and Kok-Soo, 2010). This culminated with two online sessions to discuss the three categories of decision: NBS to be developed, NBS to be channelled to other municipal projects, and NBS not to be developed. Finally, the approved NBS proposals were integrated into an urban green, healthy corridor project that was presented and discussed at an online session with all the actors involved. Some NBS are already being developed in parallel, namely the immaterial solutions that will be fundamental to activate the use of the healthy corridor and the surrounding public space.

During the ideation stage, new NBS were identified at online sessions covering four main categories: public space, culture and sports, social economy, and education. These categories inspired the composition of the working groups that follow and catalyse the engagement of citizens, local stakeholders, together with the members of the local task force, moving forward the implementation and monitoring & evaluation stages. The following working groups have been meeting on a regular basis (every 2/3 weeks), with around 35 participants per session, to develop proposals around the following themes (URBiNAT, 2021):

- Education and environment, developing and implementing projects with schools, such as technological green infrastructures;
- Culture and sports, focusing on initiatives and a platform to value the local heritage and cultural assets of Campanhã;
- Solidarity economy, developing and implementing a solidarity market, a seed bank and a community kitchen.

Working groups meet with political representatives in the framework of the Working Commission for the Healthy Corridor COT.CS. This Commission meets twice a year, reinforcing opportunities of the co-governance strategy applied in URBiNAT.

Box 12. Living lab approach in PHUSICOS

Co-creation processes in PHUSICOS followed the Living Lab approach. Engaging all stakeholders continuously is a key element of most Living Lab definitions. Despite the challenges of working with different levels of knowledge on NBS and awareness of the problems to be addressed, the project produced a number of positive outcomes.

Tailoring the approach to the local needs, mapping stakeholders as early as possible and forming groups based on the mapping for different session types were seen as a success factor to move forward in terms of co-creation processes. Differentiated materials and data according to the knowledge of NBS, field trips and hands-on cases were seen as very useful to catalyse the Living Lab processes and co-design processes. A very flexible, adaptive process was used and not expected to work in the long-term, yet a fixed roadmap was seen as a key success factor. As the different NBS solutions emerged and evolved, so did the respective Living Lab processes according to the needs and phases of the respective NBS implementation. The Innovation Action project type of PHUSICOS has been very useful as a measure in demonstrating how projects could be implemented. Therefore, something of worth for stakeholders to actively engage could be offered. Research was seen as an important contributor to the PHUSICOS Living Labs given that it was perceived as being neutral by all stakeholders.

4.5. Co-governance models, typologies and actors constellation: An example from CLEVER Cities project

In the previous sections, the definition of co-governance, the drivers that push towards implementation, and the possible barriers hindering the process are discussed. As in Chapter 2, the stakeholders involved in the co-creation processes of NBS are presented. This section shows how these models can be organised in a co-governance setting.

Based on the insights developed within **CLEVER Cities**[17] project, an important move towards more collaborative models of governance resides not only in a shift from top-down, command and control models to loosen emergent networks *(see section 4.2)*, but also to more hybrid forms of governance (Baud et al., 2021; Bradley et al., 2022). A tendency to move from the extremes of either top-down or bottom-up systems to a middle ground was observed where 'structured horizontal' or 'delegated horizontal' models are used (ibid. see range of collaborative models[18]). The ability of a given governance structure to host co-governance arrangements depends on many factors *(see section 4.3*; see also van der Heijden, 2019: 4-5). A relevant aspect in this context is the concern with participatory culture: the presence or absence of participation forms in the current planning practices can determine the effort needed in setting up co-governance models (*see section 2.1)*.

Following the definition of co-governance in section 4.2, when it comes to NBS or nature-related projects, these models necessarily put actors in the condition of learning to work with other unconventional types of partnerships such as: "governmental agents working with grassroots community groups or community members learning to work with technical or agency stakeholders" (Bradley et al., 2022: 6; Frantzeskaki & Rok, 2018).

Thus, the shift towards co-governance will often refer to a shift from a top-down setting as a starting point towards a typology that is more horizontally organised. This has proven to be useful given that it provides some guidance and structure to the decision-making process and a level of clear responsibility for day-to-day management activities. However, in this constellation, personal motivations and commitment are, in general, low especially in the absence of a strong decisional centre in the constellation of actors. Conversely, it is also possible to see a move from a bottom-up starting point to a governance model that involves some level of specialisation with leading or management roles. Here, the motivation of the participants might be higher as the process is not imposed from above, whilst the organisation and structure of the group is more ad hoc and could hinder reaching an agreement. The move towards the centre, reflects the creation, either by voting or delegating, of a group or groups to take on management activities or bringing in specialised organisations that can guide and aid in the collaborative process (Bradley et al., 2022 & Naumann et al., 2023). This move reflects the need for openness, continuity and consistency of the co-governance process *(see section 4.2).*

The move towards more collaborative forms of governance networks tends to occur following at least one of three changes:

1. Alterations in the network nodes, particularly to add new roles that may promote, mediate or change leadership dynamics.

[17] see more https://clevercities.eu/ and https://cordis.europa.eu/project/id/776604

[18] For the entire list of different collaborative governance structures, see Bradley, et al., (2022), https://www.mdpi.com/article/10.3390/su142315566/s1

2. Adaptations to portions of the networks, including or removing multiple nodes, connections and altering more significantly the power relationships between them.
3. A move towards polycentric networks that can bring diversity and a cross-perspective collaboration while maintaining some independence of the individual network groups (ibid.15).

These changes in the networks are an integral part of the development of co-governance models. These approaches to collaboration are flexible and open, they embrace conflicts, dissensus and disagreements as fruitful mechanisms to reach desired outcomes of co-governance processes (Turnhout et al., 2020; Bussu, 2019). Hence, it is expected that their relationships become more equal, thereby incentivizing horizontal transformational learning and relational thinking (Frantzeskaki & Kabisch, 2016). Mutual learning is claimed to be a result of the induced interrelation and equalisation of the different actors providing their varied perspectives and values (sharing cultural experiences). This approach allows the use of knowledge in a more integrated manner and focuses on letting the know-how emerge organically rather than top-down research driven knowledge (Caniglia et al., 2022; see also Turnhout et al., 2020). Thereby, new roles can emerge in relation to the uptake of multiple responsibilities shared among the actors involved.

In addition to these changes, there are a range of ways to guide governance structures towards more collaborative models (Bradley et al., 2022: 12-13). The following list reports some of these forms from a top-down to a bottom-up approach:

1. Designing governance networks partially or wholly.
2. Creating/strengthening intra-network connections.
3. Incentivising co-governance networks to emerge.
4. Strengthening the management and other capacities of existing nodes.
5. Letting networks emerge organically with minimal interventions.

Each point has the objective to enhance the progress towards a more collaborative mode of governance, while helping consolidate new relationships in the network of actors. For example, from a bottom-up perspective, in order to attain its objectives a community group may need to accept either some hierarchical, specialised working arrangement by accepting an appointed lead, or forming a partnership with an organisation more connected to governmental processes.

Box 13. Collaborative governance process in CLEVER Cities

Within CLEVER Cities project, the Tibaldi - Bocconi Train Stop in Milan[19], is a section of new infrastructure that was developed with innovative NBS solutions through a public-private-partnership model. The collaborative governance process was initiated by formal meetings organised by the local municipal authority, including, in a central position, the neighbourhood committee but also with a range of public and private entities from the framework of CLEVER Cities. During the co-creation planning and implementation, a co-design consultation process was activated with the neighbourhood associations and local residents in order to consolidate a polycentric governance model. The NBS implemented within the train stop include a green public space, noise barriers and green walls surrounding the entrances and exits of the station. The co-maintenance process experienced some difficulties in its implementation related to the shared governance model established with the neighbouring university and the private partners from the CLEVER Cities Milano consortia. This is mainly due to the complex technicalities of the implemented NBS in the station such as the green noise barriers and the living wall on the external walls which require specific and constant maintenance capacities to be established.

[19] https://milanoclever.net/2022/12/07/inaugurata-la-nuova-fermata-di-milano-tibaldi/

Summary

To summarise, this chapter proposes a discussion on governance approaches for NbS. It starts with a brief overview of the governance concepts, defining collaborative governance (co-governance) in section 4.1 as an **open, continuous, and consistent process being multi-phased, iterative, inclusive, flexible and adaptable including reflexivity as method for continuous adjustment towards more deep participation of stakeholders in the decision-making processes.** Such an asset can be described through three main components, namely **actors, processes, and practices** (see Section 4.2). While all these characteristics advance collaborative governance understanding, the implementation of co-governance is never easy or immediate. Section 4.3 identifies the main barriers to implementation as well as the key drivers. These include lessons learned from different participating projects. Section 4.4 provides examples from the European projects that have tried to implement co-governance processes for NBS projects. Finally, a reasoning derived from the definition and the components of co-governance (Section 4.2), drivers, barriers and lessons learned (Section 4.3), and the examples (Section 4.4) results in the delineation of potential co-governance models for NbS (Section 4.5). This section analyses the mix of bottom-up and top-down forces that are active in urban processes and concludes that a blended model, placed in the middle and featuring characteristics from both top-down and bottom-up approaches, is typically the most effective.

5. Monitoring and Evaluating the Co-Creation Process of Nature-based Solutions

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Contributing authors[20]***:*** *Arjen Buijs and Sander van der Jagt*
Internal review: *Israa Mahmoud, Gerd Lupp and Isabel Ferreira.*

5.1. Capturing the changes achieved through the co-creation of NBS

- Why is the participatory evaluation of NBS relevant?

Participatory evaluation expands the access, inclusion, and long-term participation of multiple stakeholders, in particular those who are underrepresented (going beyond usual suspect). It contributes to mutual learning considering the diversity of actors and an environment of knowledge sharing. It informs decision-making processes within the NBS design, implementation and long-term stewardship. Another point of importance refers to the improvement of accountability strategies and making the process more transparent. Participatory evaluation can verify achievement of the process and its outcomes, establish goals and support communities by identifying their demands. In addition, this method is relevant to better uptake findings, as well as develop a better understanding of data collected. Based on participatory evaluation, the accuracy of the reports can be improved through the participants' validation.

- How does the co-creation lens contribute to improving the NBS monitoring and evaluation?

Co-creation offers the opportunity to construct community-driven indicators that are easily collected and understood by the communities It catalyses a learning process on behalf of the participants concerning evaluated matters, improving their capacity at the levels of reflection, understanding and intervention, in this way reducing adverse effects and the risks of maldistribution of NBS benefits. As a fundamental part of urban planning, it contributes to the reduction of asymmetries (socio-economic exclusion, gender inequalities, among others), but also recognising and legitimising the inclusion of human diversity in the urban plans. Finally, it provides evidence of added value and money value in regard to the funders.

- Which lessons learned emerge from the EU-funded projects[21]?

Lessons learned can be related to methods, criteria and resources. This is crucial for the quality of evaluation, including advanced metrics. Attention is drawn to the financial investment in order to implement the most appropriate modality. It supports adopting a critical view towards participatory processes, instead of romanticised perspectives. Local decision makers become aware of eventual benefits and advantages that may arise for them. There is also an expanded capacity for creating a balance between the time allocated for evaluation and the expectation contained within political agenda. Finally, the process is also an opportunity for improvements considering that evaluation results can reveal critical remarks on governance structure.

While monitoring is an ongoing process in which the data collected serves to inform implementation and provides support for day-to-day management, evaluation can be

[20] This chapter received preliminary contributions from Ina Säumel, Spela Zalokar, Anne Roedl, Vera Koepsel, and other members of the Monitoring and Evaluation workstream group within TF6. Acknowledgements to Andreia Barbas who contribute with the chapter 5 lists of methods and methodological approaches - Annex2.

[21] Systematised from the results explored in the TF6 Survey on NBS Co-Governance and Co-creation.

understood as the process of systematically and objectively determining the value of a specific program, policy or activity (Gertler et al., 2018, p.7). The global tendency has been to guide evaluations, more towards results and away from inputs (Strydom et al., 2010; Cairney, 2016). Nevertheless, in many situations, evaluations are not prioritised, e.g., the lack of funding as one of the main barriers concerning implementation and monitoring of NBS as well (Seddon et al., 2019).

Evaluation is a crucial element in verifying whether particular outcomes were achieved, to confirm what desired or undesired changes took place and, also, the circumstances in which they occurred (Gertler et al., 2018; Weiss, 1997). Evaluation results are crucial to support public policies, namely the so-called *evidence-based policy making*[22].

Conceptual problems, especially related to the need of developing a comprehensive understanding of the social, political, moral and cultural dimensions of NBS have already been addressed in literature. The consideration of social cohesion and well-being as indirect or secondary to environmntal impacts of NBS is one of the critical aspects considered (Dumitru et al., 2020). Specifically, regarding the community-driven process, the tendency to romanticise the participatory process into the NBS practices makes it difficult to reflect on their pitfalls (Remme & Haarstad, 2022), challenges and barriers, as discussions around NBS, in general, are established in a positive way. In consequence, little attention is given to the unequal distribution of the benefits and adverse effects (Remme & Haarstad, 2022; Torres et al., 2021).

For example, NBS does not automatically lead to socially just and inclusive development. It can cause green gentrification or physical displacement when the interests and experiences of vulnerable groups are underrepresented (Borelli et al., 2021). There is a lack of evidence on the different uses of nature-based solutions by different groups (Dumitru et al., 2020), on the intangible values as a category of possible social impacts of NBS (Mahmoud et al., 2021) and on equity and social inclusion issues within the NBS design, implementation, and long-term stewardship (Stijnen, 2021; van der Jagt et al., 2022).

Arguably, there are some explanatory causes for this residual evaluation on social practices, effects and impacts interwoven with NBS. One reason is the limited evidence of co-produced monitoring and assessment approaches for NBS (van der Jagt et al., 2022). The authors mention that the political emptying (depoliticizing) of the co-creation processes makes vulnerabilities, asymmetries, and political commitment harder to see, therefore less visible. The agenda of local actors, in particular the municipalities, that prioritise physical-territorial aspects linked to expert knowledge over those of a societal transformation associated with the inhabitants' experience is another cause.

Nevertheless, some recent research seeks to fill this gap, e.g., Haase (2017)[23]. The author argues that NBS have to be improved as a comprehensive approach, especially in terms of their societal and social embeddings. Remme and Haarstad (2022) propose counter hegemonic strategies from communing approaches as alternatives to the instrumentalization and commodification of nature and urban spaces. The action framework for the participatory assessment proposed by van der Jagt et al. (2022) seeks politicising co-production effort, amplifying the possibilities of access and inclusion as well. Furthermore, Stijnen (2021)

[22] The lack of scientific evidence in policy making as a consequence of the weak interaction between science spaces and political arenas (Strydom, et al. 2010). The literature has demonstrated that the evidence-based data makes the public action more transparent and efficient.

[23] The authors underline that “nature-based solutions are not inherently socially just; when aiming at bringing together environmental sustainability and social equity/inclusion, then a range of issues have to be critically looked at” (Haase, 2017).

proposes a socially inclusive design process for urban NBS, that addresses the systemic challenge based on prejudices, marginalisation and discrimination. EU-funded projects such as URBiNAT and CLEVER Cities have also been testing methodologies recently, see boxes 14 and 15.

Box 14. *Monitoring and evaluating the Healthy Corridor (HC) co-design and co-implementation in URBiNAT*

The URBiNAT project has adopted a process-oriented (co-creation) and ex-ante/ex-post (urban area) research evaluation method (Weiss, 1997). This approach involves employing a set of six techniques from social science and humanities (SSH), namely in-depth interviews, focus group, participating observation, co-walks, visual sociology and static observation, taking into consideration the resources available from the local task forces in each frontrunner city (Porto, Sofia, Nantes) and follower city (Brussels, Siena, Nova Gorica, Høje-Taastrup). Regarding the urban area, the HC assessment considers the complexity of urban social contexts as a means to answer the question: how has the implementation of the HC affected the residents' understanding of space and its meanings?

The assessment on the co-creation process seeks to understand under what conditions do NBS co-creation effectively promote active involvement of citizens? Numerous opportunities emerge from this methodological design, the strengthening of the citizens' engagement, the capturing of the changes that occur in urban space, including perceptions, experiences, practices, and social production.

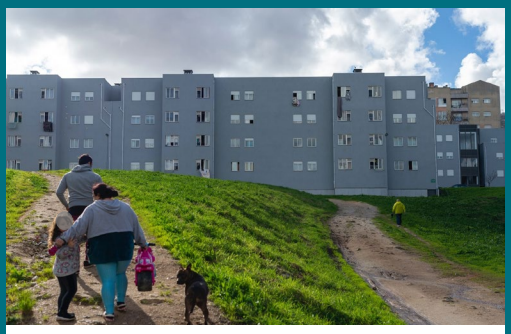

Figure 7. Co-walks and visual sociology in Porto, Credits: Carlos Barradas (2021)

Figure 8. Focus group in Nantes, Credits: Philippe Bodénan (2022)

Figure 9. Participating observation in Siena, Credits: Stefania Elisei (2023).

There are multiple benefits concerning participatory evaluation. It contributes to the engagement of different social groups. Its methods help bring the design of NBS closer to the real needs of its beneficiaries, the greater the degree of participation, the greater will be the chances for its alignment. In addition, the evaluation of co-creation allows measuring the different levels of intensity of participation and thus designing strategies to correct and mitigate risks (Rowe & Frewer, 2000). In relation to practices, in a co-creative perspective, the parameters, methods as well as conclusions are designed and drawn together by the community members themselves, making the results affordable and replicable. The bottom-

up methodologies focusing on sustainability indicators at a local scale (Reed et al., 2006) facilitate progress in monitoring. This helps to make clear the relationship between NBS and the immediate environment. The decision-making process is better informed, and accountability strategies qualified.

Resources: *NBS evaluation reports*

Assessment and monitoring systems have been suggested and used across European cities and projects. Many of these assessment approaches are based on the EKLIPSE model for assessing the impacts of NBS across different challenging areas (Raymond et al., 2017). This report summarises a comprehensive list of indicators of the impact evaluation framework for assessing the performance of NBS in dealing with 10 different challenges. More recently, the European Commission's handbook for NBS practitioners (Dumitru & Wendling, 2021), highlighted that evaluation and monitoring must be central to any project that focuses on NBS in order to ensure efficiency and sustainability. Nonetheless, Van der Jagt et al. (2022) points out that the EC Practitioner Handbook would benefit from inclusion of all stages of the NBS co-production cycle and a rationale on the relevance of participatory assessment.

Several results have already been reported, and their impact analysis is crucial for developing prevention, reduction, and improvement strategies for NBS, as well as enabling a comprehensive and longitudinal understanding of its effects. It calls for co-creating a theory of change to guide indicator selection, along with a shared monitoring and evaluation strategy and recommends a transdisciplinary approach and social engagement through citizen science. Transdisciplinary partnerships contribute to the mainstreaming of NBS through social learning, shared visioning, co-creation of new knowledge and innovative practices, growth of social capital and empowerment (Dushkova & Haase, 2020; Kabisch et al., 2016; O'Donnell et al., 2018; Schifman et al., 2017). In addition, they contribute to embedding NBS assessment into the wider local planning and political contexts.

5.2. Applying NBS participatory assessment

Co-creation of NBS not only relates to the process of designing and implementing NBS, but also to the evaluation and monitoring of its outcomes. To ensure development and uptake of evaluation and assessment approaches, for example, the CONEXUS project developed a participatory assessment framework that is used in the CONEXUS Life-Labs but is also applicable to other NBS implementation projects and processes. Participatory monitoring and assessment is an opportunity to link NBS development (co-diagnostic, co-design, co-implementation) with the co-evaluation of outcomes and impacts. Co-evaluation or participatory evaluation has many benefits for initiators, stakeholders, and the environment, ranging from awareness raising and empowerment of local stakeholders to reflexive governance processes important for the mainstreaming of NBS (van der Jagt et al., 2022).

Diverse challenges for mainstreaming NBS have been identified, including siloed decision making, lack of supportive governance mechanisms, including legal frameworks, resources, suitable technologies, and leadership to drive urban transitions beyond incremental improvements (Dorst et al., 2022). By providing knowledge on environmental and socio-economic benefits, NBS monitoring, and assessment can contribute to overcome some of these challenges. Improved data on co-benefits across different domains (Raymond et al., 2017), along with advanced metrics, represent key stepping stones towards the mainstreaming of NBS (Xie et al., 2020). Evidence on NBS performance is needed to demonstrate their contribution in addressing different challenges simultaneously and help to make the business case for market development. In addition, a well-structured monitoring and assessment approach contributes to inventory-building, improved management of NBS

and environmental awareness, especially if non-governmental stakeholders are engaged in monitoring activities through e.g., citizen science.

The need for participatory assessment

There is a growing understanding of the need to develop more participatory approaches to mainstream NBS in urban planning, involving co-design, co-production, and co-management. Co-design, co-production and co-management need to be tailored to place-specific contexts to be relevant, effective and successful. In addition, lack of evidence on NBS impacts on environmental and socio-ecological benefits, limited reflexivity, adaptive management, and lack of participation of stakeholders may prevent successful NBS interventions to scale-out to other cities or to emerge at higher policy levels (Buijs et al., 2016, 2019). This need for co-production of NBS also relates to the need for co-production of knowledge on NBS. While the relevance of participatory monitoring and assessment of NBS impacts is widely acknowledged, professionals and experts from academia or governments usually design the assessment framework, select the indicators, collect data and/or evaluate the data. However, such an expert driven approach to NBS assessment tends to forestall alignment of indicators with local needs and priorities.

To increase the impact of NBS assessment, stakeholders from governments, civil society, local communities and businesses need to be involved. The literature on participatory monitoring and assessment outlines a broad set of its benefits. These include:

1. Increased commitment and shared ownership of the outcomes (Plieninger et al., 2013; Reed et al., 2006);
2. Better recognition of NBS contributions to environmental and socio-economic challenges as well as improved accountability and transparency of the process (van der Jagt et al., 2022; Zafra-Calvo et al., 2017);
3. Social learning and increased reflexivity among actors, allowing for more adaptive and reflexive management of NBS (Fernandez-Gimenez et al., 2008; Kiss et al., 2022; van der Jagt et al., 2021);
4. Resilience and long-term continuity of monitoring and evaluation through the involvement of a wider diversity of stakeholders (DeMeo et al., 2015; Evans & Guariguata, 2016; Viani et al., 2017);
5. Empowerment of stakeholders individually (e.g., improved knowledge and more adaptive routines & assumptions), collectively (e.g., increased social capital), and politically (e.g., by ability to influence green space management practices) (Bautista et al., 2017; Constantino et al., 2012; Lawrence, 2006);
6. Forging of new partnerships spanning different disciplines, which contributes to an improved system of understandings regarding nature benefits, their interactions and interrelationships with culture and traditions, and how this bear relevance to policies and initiatives across different policy domains (Fernandez-Gimenez et al., 2008; Lee & Yan, 2019; Rogers et al., 2020; Sagoe et al., 2021; Tarrasón et al., 2016; Whitfield & Reed, 2012);
7. Improved delivery of socio-cultural ecosystem services, including health and well-being, awareness and learning, community cohesiveness and sense of place (Fernandez-Gimenez et al., 2008; Krasny et al., 2014; Uchiyama & Kohsaka, 2019);
8. Stronger public support for urban NBS as the local knowledge and values influencing co-produced assessment indicators might eventually help to improve NBS designs and management procedures (Neumann & Hack, 2022);

9. Higher relevance of outcomes for decision-making and improved organisational legitimacy;
10. Pragmatic benefits, including preventing the unduly replication of data collection efforts, external validation of results, and distributing the burden of investment and effort required for data collection and processing (Atkins & Wildau, 2008).

There are also some challenges or risks associated with adopting a participatory monitoring and assessment approach. One prominent issue is the challenge of equal representation. Stakeholders might have variable viewpoints on a particular issue, and central actors with decision-making power (e.g., about sets of indicators to adopt) are not always open to weigh these different perspectives equally[24].

5.3. Mapping methods and tools from EU-funded projects

Several EU-funded NBS projects have been testing approaches to respond to the co-creation challenges using approaches from social sciences and humanities. The CLEVER Cities project focused on a social monitoring framework using the application of NBS as a catalyst for social inclusivity in large-scale urban regeneration strategies (Mahmoud et al., 2021b). The Reflexive Monitoring method, proposed by the Connecting Nature project, enables users to gain insight concerning the progress and direction of their project in real-time. Both focus on the social assessment of the contexts (Lodder et al., 2022). In this way, Table 4 gathers a set of EU-funded NBS projects and their methodological assessment approaches, while the following Table 5 elaborates the tools and methods applied by the same projects.

Table 4. Methodological assessment approaches developed by EU-funded NBS projects.

	EU-funded project	NBS (co-creation) assessment approach and tools
Methodological approaches	**Conexus** Participatory Assessment Framework	The CONEXUS Participatory Assessment Framework consists of a practical five-step action framework to guide inclusive participation across different stages of monitoring and assessment of urban NBS. Indicators include i) NBS impact indicators, predominantly from the TF2 Handbook and ii) place-based governance indicators for mainstreaming developed from a review on previous frameworks, including environmental justice indicators. **More information**: www.conexusnbs.eu & van der Jagt et al. (2022)
	CLEVER Cities Social monitoring	In the case of CLEVER Cities, a specific social monitoring methodology was developed based on the project's main regeneration challenges: Human health and wellbeing, social cohesion and environmental justice and citizen safety and security. The goal of the social monitoring evaluation tool was to identify macro categories of evaluation that have sub-sectors of indicators that could be transversal to the whole project implementation

[24] There is a risk for data provided by volunteers to be used for purposes diametrically opposite to the very interests that motivated a volunteer to get involved (Lawrence & Turnhout, 2010). This is not to say that a participatory process – including those with centralised decision-making power – cannot result both in political and in personal empowerment (Lawrence, 2006). There is also the risk of misinterpreting the decentralisation of decision-making processes to the local level as more democratic – the 'local' trap (Purcell, 2006). Consequently, facilitators of participatory processes have a duty of care to engage a representative group of stakeholders and provide a mechanism to balance different viewpoints.

	EU-funded project	NBS (co-creation) assessment approach and tools
		pathway in different cities using combined indicators (binary, ranking, Likert scale and multiple choice). **More information :** Mahmoud, et al. (2021b)
	Phusicos Comprehensive Framework for NBS Assessment	The comprehensive framework assesses the beneficial role of NBSs in ecosystem services, which is a crucial metric for the overall evaluation of the implemented intervention and solutions. In addition, ecosystem services, environmental, economic, and social indicators are coupled with the above-mentioned risk management indicators, defining co-benefits, as well as potentially undesirable side effects and social perceptions. **More information:** Deliverable 4.1. Pugliese et al. (2022)
	URBiNAT SSH for a comprehensive understanding of NBS design and implementation	The URBiNAT project proposes a specific approach to evaluate and understand the Healthy Corridor socio-cultural, co-creation and co-governance dynamics. The framework is based on categories related to the co-creation components, benefits, and perception, focusing on assessing the outcomes and the process of the engagement. The assessment of Healthy Corridor impacts seeks to deeply understand these contexts where NBS are implemented. In addition, the methodological framework is used to verify whether and how sustainable solutions can generate new values for nature and better understand the changes occurring in public spaces in terms of experiences, practices, and production. Through six qualitative methods, the presence of more diverse and plural voices was promoted. **More information:** Deliverable 5.6 (November 2023).

Table 5. Tools and methods applied by EU-funded NBS projects.

	EU-funded project	NBS (co-creation) assessment approach and tools
Tools and methods	**Connecting Nature** Reflexive monitoring	Reflexive monitoring is an evaluation method that gives urban practitioners insight relating to the progress of their project in real-time. It helps them evaluate day-to-day activities and to respond to them while considering the bigger picture. This is especially helpful when addressing the complex challenges nature-based solutions tend to address, such as climate change and social exclusion (Guidebook, 2022). **More information:** Reflexive Monitoring Guidebook
	Phusicos Starter Toolbox for Stakeholder Knowledge Mapping to Co-Design	The Toolbox for Stakeholder Knowledge Mapping intends to support the preparation, co-design, implementation and evaluation of NBSs with a focus to reduce hydro-meteorological risks in European rural and mountainous regions and is applicable in other NBS co-creation contexts. **More information**: Deliverable 3.2. Living Labs and NBS co-creation processes

	EU-funded project	NBS (co-creation) assessment approach and tools
	Nature-based Solutions at Case Study Sites First Lessons Learned from Co-Creation and Living Labs	Stakeholder identification approach The report and publication describes initial knowledge of NBSs, their expectations on NBSs, and the Living Lab process. They present first experiences made with stakeholder engagement. **More information**: First Lessons Learned from Co-Creation and Living Labs
	URBiNAT Community-based monitoring Empowerment evaluation	Tool for participatory decision-making improvement. It promotes an organised way of collecting ongoing or recurring information by residents, to be used by local governments and civil society, for planning, budgeting, and implementing local development programs, as well as for monitoring and evaluating their performance. Its activities cover community mapping, mobilisation, capacity building, and information dissemination. **More information:** NBS CARDS Empowerment evaluation is the use of evaluation concepts, techniques, and findings to foster improvement and self-determination. Program participants conduct their own evaluations, with the support of an outside evaluator and an additional facilitator, in workshops to complete the following steps: a) developing a mission; b) taking stock of where the program stands; c) planning for the future. **More information:** NBS CARDS
	EdiCitNet Mistakes Survey	New mistakes survey. The EdiCitNet project focused on compiling errors that might occur at different stages of the co-creation, also their respective outcomes and possible solutions. The objective is to create evidence and visibility of mistakes instead of trying to hide them. The goal is to learn, grow and improve the co-creation processes. **More information:** New mistakes form

This preliminary mapping showcases diversity of approaches and tools by the different EU-funded projects. Despite the critical remarks pointed out in the section 5.1., generally speaking, the projects are all, at least to some extent, committed to assessing the quality of co-creation and using participatory methods and tools. Several projects focus on exploring more robust assessment frameworks, capable of covering all the complexities inherent to the co-creation process. Others, based on practical experience, are testing different tools and methods that can enhance the engagement of the stakeholders and learning from the experience for continuous monitoring.

5.4. Methodology for participatory assessments

A distinction can be made between methodology and methods. The methodology of participatory assessment refers to designing an overarching framework for the participatory assessment of the impacts of NBS co-creation. The methods include the procedures and activities undertaken to measure these impacts and can include concrete, quantifiable indicators, but also qualitative approaches, such as interviews and workshops. In this section,

we discuss the overarching framework, based on the CONEXUS participatory assessment framework (van der Jagt et al., 2022).

Designing participatory assessment

Participatory monitoring and assessment relate to the involvement of all relevant stakeholders from governments, businesses, and civil society in the different phases of the assessment of NBS impacts. Based on Lawrence (2006: 290), participatory assessment approaches may be classified into four different forms of citizen participation in monitoring: (1) consultative; (2) functional; (3) collaborative and (4) transformative. The consultative and functional levels of participation imply a government structure that allows the public to contribute to collecting information. In collaborative forms, the basic assumption is cooperation between public and private stakeholders. The transformative form refers to self-governance (or grassroot) initiatives. Citizens then take the initiative to collect data, often to substantiate criticism of existing policies.

In CONEXUS, the focus is on the collaborative form of participatory assessment, where stakeholders are involved in all stages of assessment: (1) defining shared monitoring goals and objectives, (2) participatory indicator selection, (3) participatory data collection and (4) participatory data analysis and evaluation (see Figure 10).

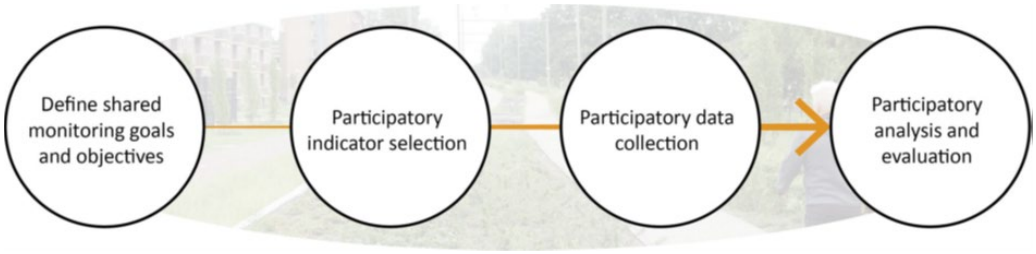

Figure 10. The four stages of participatory monitoring of NBS. Used with permissions from van der Jagt et al. (2023)

Step 1. Stakeholders define shared monitory goals and objectives.
Ahead of participatory monitoring and assessment procedures, stakeholder mapping should be carried out to decide on who to engage and at which stage of the participatory assessment process should this occur. Relevant stakeholder groups include public institutions, academia and research organisations, civil society organisations, community representatives and the private sector, with an ideally balanced number of participants from each of these groups. After relevant stakeholders have been identified, they should be engaged using a focus group, workshop or other appropriate method (see examples in table 5 and Annex 2) in the definition of shared monitoring goals and objectives. Selected objectives should be co-developed with various stakeholders, including local government and civil society, to correspond to their knowledge and needs.

Step 2. Participatory indicators selection
An existing assessment framework is selected providing a broad spectrum of indicators on NBS impact assessment. A pre-selection of indicators should be made from this, which are relevant to monitoring the objectives identified in Step 1. To gain feedback on these pre-selected indicators, a stakeholder indicator appraisal workshop is conducted involving public institutions, civil society, academia, and the private sector. This should be a light-touch and undemanding event by managing indicator numbers and minimising detailed technical

information. It is important to keep in mind that the ones getting involved in the project are not always data or impact assessment experts.

When meeting stakeholders on the selection of indicators, it is recommended to discuss the criteria on which the selection will be based. Several criteria can be defined for structuring and simplifying the selection of indicators. If envisaged to go beyond understanding the socio-economic and environmental impacts of NBS, to also include contributions to NBS mainstreaming, the indicators need to resonate with all relevant stakeholders. There are four guiding principles for the selection of indicators in participatory assessment of NBS to be considered: credible, legitimate, salient, and feasible (Skodra et al., 2021).

Step 3: Participatory data collection
This step involves collecting data. Participatory assessment relates to stakeholders contributing to the data collection as a form of citizen science. Citizen science offers potential advantages as an approach for integrating local knowledge and experiences. Meanwhile, it needs to be acknowledged that not all types of data can be easily collected using citizen science. Therefore, a balance between the benefits of citizen science such as efficiency of data collection, increased legitimacy and empowerment of participants and the feasibility of data collection from stakeholders needs to be found. This also depends on the interest and willingness of stakeholders to participate in citizen science. For practical information on how to organise citizen science and motivate citizens to participate, a number of handbooks on citizen science exist, including Pettibone et al. (2016); Russell (2021), and Zürich (2021).

Step 4: Participatory analysis and evaluation
The legitimacy of NBS assessment strongly relates to the involvement of stakeholders in the analysis as well as in the translation of results to policy makers and other powerful actors. Here, data transforms into powerful information that can be used to influence decision making. Interpretation and selection of results influence the story that is told about the benefits and challenges of NBS. Moreover, environmental justice aspects need to be considered as part of the analysis stage, including the distribution of benefits of NBS across the city and across socio-demographic groups.

5.5. Evaluating the NBS co-creation performance

Co-production and co-creation, rooted in the public collaborative management (Ostrom, 1996), urban commons (McCarthy, 2005) or science and technology evolution (Jasanoff, 2013), have demonstrated an innovative and transformative character within participatory processes. It establishes that the participation of citizens; end-users or consumers; of individuals or groups, is fundamental in the production of public services and products' development (Vershuere et al., 2012; Von Hippel, 2005). Co-creation embraces an open process of participation, exchange, and collaboration with multiple actors, thereby crossing organisational and political boundaries (Vooberg et al., 2015). Deeper information about how the co-creation processes occur, who is involved, what are the desires and expectations, perception, and feelings on the co-creation process, helps to evaluate and correct possible deviations.

However, in many cases, equality of partnership is used as a discursive rhetoric that seeks to prescribe co-creation above any difficulty, uncertainty, or conflict. Despite its multiple benefits, failures in the interaction processes can occur, namely when actors involved in a partnership lack certain resources, such as information. It results in the decline of the state of well-being or transforms into frustration or loss of resources (Järvi et al., 2018). In this sense, is the evaluation an infrastructure for anticipating failures and supporting design solutions? In our perspective, yes, deeper information about how the co-creation processes

occur, who is involved, what are the desires and expectations, perception, and feelings on the co-creation process, helps to evaluate and correct possible deviations.

In the Handbook Evaluating the impact of nature-based solutions: a handbook for practitioners (Dumitru & Wendling, 2021) the indicator “openness of participatory processes” is proposed. The indicator’s method recommends three components for data collection and characterization, the participation techniques, the co-creation and co-production agents and the degrees of participation. Regarding the degrees of participation, different levels are pointed out, namely (1) information, (2) consultation, (3) collaboration, (4) co-decision and (5) empowerment) levels. This scale is particularly relevant to make visible the type of co-creation intended and translate its performance into a measurable indicator. The informative type, the actions implemented are more related to the explanation of the project.

The consultation model refers to the presentation of the project and collection of suggestions, but the decision making can be made with or without considering the inputs from participants. The collaborative degree means that the decision making takes the stakeholders recommendations into consideration. Under the co-decision type, the cooperation with stakeholders is directed towards an agreement for solution and implementation. Finally, the empowerment degree means delegation of decision-making on the project development and implementation by the stakeholders (ibid).

The assessment of the co-creation activities reduces the expected risks and lessens their probabilities. Assessment frameworks can help to deeply understand the dynamics of these processes. The actors’ feedback can help to understand if a certain NBS co-creation environment effectively promotes their active involvement and to self-evaluate the assessment design and implementation. Even with the advances seen in the set of EU-funded projects, a more robust and consistent European reference framework is needed to guide future NBS projects to correct shortcomings that have already been identified by the current ones.

Box 15. *CLEVER Cities Social Monitoring*

In the case of CLEVER Cities, a specific social monitoring methodology was developed based on the project's main regeneration challenges: Human health and wellbeing, social cohesion and environmental justice and citizen safety and security. The goal of the social monitoring evaluation tool was to identify macro categories of evaluation that have sub-sectors of indicators that could be transversal to the whole project implementation route in different cities using combined indicators (binary, ranking, Likert scale and multiple choice). A diversity of methods were used as well, such as online surveys, face-to-face interviews, focus groups and observations. The methodology encompasses 7 categories of data categorization: 1) Relationship with nature and well-being related to NBS in the area of intervention; 2) Place, use of space and connectedness to Nature; 3) Perceived ownership of space and place satisfaction; 4) Psychosocial issues and social interactions; 5) Citizen perception about safety and security; 6) Knowledge about CLEVER Cities interventions and 7) Socio-demographic data characteristics. More information is available at (Mahmoud et al., 2021b) or **https://doi.org/10.3390/su13179672**

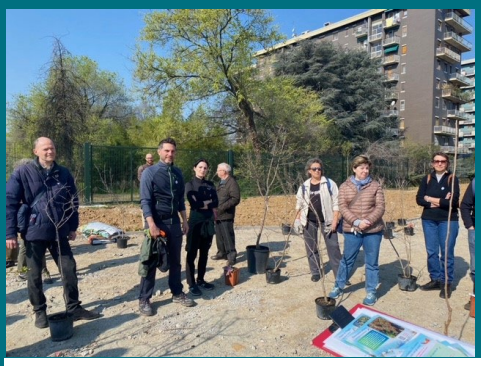

Figure 11 and Figure 12: NBS co-implementation activities in Giambellino 129 park, by CLEVER Cities Milano team. Source: (Barone, et al 2023)

Summary

This chapter contributes to showing stakeholders the relevance of participatory assessment for NBS societal transformation. It also aims to inspire an evaluation agenda that takes into consideration scrutiny of the quality of co-creation, observing what really happens in this context of interaction. The first part of the chapter underlines the advantages of evaluation to inform the decision-making process, to include underrepresented social groups and to make the process more transparent among others. In addition, the knowledge gaps pointed out by the literature around the NBS participatory evaluation are introduced. In the second section a tested participatory assessment framework is shared, as well as a list of methods designed by different EU-funded projects. Finally, a methodology for participatory assessments is described to guide the different projects, as well as the relevance of deeper information to evaluate the co-creation itself and correct possible deviations.

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Annexes

Annex 1: Detailed overview of building blocks for a successful co-creation process

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BUILDING BLOCKS	OVERVIEW
FOUNDATION BLOCKS: GUIDING PRINCIPLES	
Public participation	It covers strategies related to the culture of participation (Nunes et al., 2021). The focus here is to enable regular interaction with citizens, and transversely increase the culture of participation in all departments of the municipality, as well as to encourage, receive and adapt to spontaneous initiatives from citizens. [Chapters 1.3 and 2.1]
Collaborative governance	It describes strategies of governance based on principles of collaboration. Collaborative governance (co-governance) as an open, continuous and consistent process, being multi-phased, iterative, inclusive, flexible and adaptable including reflexivity as a method for continuous adjustment. [Chapters 4.1 and 4.2]
Co-creation	It involves stimulating and improving the co-production of public services, participatory processes, and product development, involving citizens in the implementation and delivery phases, as well as through an open process, including a wide range of key actors, namely end-users (Nunes et al., 2021). Moreover, the results of participatory processes are integrated in the sense of enlarging the scope of co-creation to validate the ideas developed, through cross-pollination, validation, systematisation, and definition of purpose. [Chapter 1.4]
Systematic strategies	These strategies are aimed at setting different approaches and levels of participation depending on the goals and real conditions for participation (Nunes et al., 2021). It involves systematic awareness of the conditions under which citizens are prepared to engage in actions of social innovation, as well as thinking about different steps for citizen engagement (e.g., communication, information, consultation, participation, co-building). [Chapters 2.2 and 2.3]
Sustainability	Co-created NBS contribute to increasing the local community's overall sustainability in both environmental but also in social and economic ways and establishing partnerships beyond the duration of the NBS co-creation project. [Chapter 1.1]
Ethics, human rights and gender	Applying these lenses contributes to the unveiling of deep-seated inequalities that need to be overcome (Nunes et al., 2021). It is also helpful to design the strategies that promote respect for diversity, acceptance of complexity, and improve conditions for participation. The emphasis would be on: defining principle guidelines on ethics, according to specificities of people and groups; designing ethics regulations, procedures and tools; establishing a framework for a rights-based approach, with special attention to gender analysis; mirroring these principles in the code of conduct for the communication and dissemination of activities; awareness of, and an ability to manage controversies, including complaints; taking into consideration that the behaviour of project researchers, technicians, and experts in the field, such as being accessible, responsive, and transparent, is at the heart of these interactions. [Chapter 1.1 and cross-cutting dimensions and guiding principles for all chapters]
Transparency	It covers arguments for encouraging efforts to act in a transparent manner, with an emphasis on reflecting on why people should participate in the process, and being clear about purposes and rules, as well as avoiding hidden agendas or information (Nunes et al., 2021). This means being able to speak about expected results that are both positive and negative, and to give feedback about what is going well and what is not, which will impact expectations and trust. It also requires having strategies to communicate and provide information. [Chapters 1.4, 2.2, 3.2,3.4, 4.2, 5.2 and 5.5]

BUILDING BLOCKS	OVERVIEW
STAKEHOLDER ENGAGEMENT BEYOND USUAL SUSPECT	
Heterogeneity of stakeholders	Heterogeneity of the stakeholder group such as age, gender, background, disciplines are considered as strengths for co-creation processes. If theoretical concepts are applied (e.g., Living Labs), actors and stakeholders from all described groups are engaged. To achieve this broad engagement of stakeholders, systematic stakeholder mapping and engagement strategies can be useful. [Chapter 2.2]
Stakeholder mapping and analysis	The efficiency and the legitimacy of the co-creation process is critical for the quality of the resulting solutions. Co-creation also aims at achieving multiple benefits for society by involving a broad spectrum of stakeholders in all stages of NBS projects (Fohlmeister et al., 2019). To ensure a well-functioning co-design process and to deal with potential conflicts, issues and constraints that may arise, identifying and addressing stakeholder values, interests and knowledge is a crucial step in the NBS process (Lupp et al., 2021). Systematic methods to identify relevant stakeholders are crucial to enable higher planning efficiency, reduce bottlenecks and time needed for planning, designing and implementing NBS. Characterising stakeholders is useful in order to understand the power relationship between them and their specific interest in the project to avoid pitfalls and failures of such processes (Zingraff-Hamed et al., 2020). [Chapter 2.3]
Communication and interaction	It involves communicating specificities for interacting with citizens, and covers, in operational terms: communication strategies, communication materials and channels, multichannel interaction, codes of conduct related to communication and ethics (Nunes et al., 2021). Depending on the city, building trust may be based on meetings and face-to-face encounters, whereas the use of digital tools is limited and aimed at incentivising being together. Social circles of residents may also be limited to close relatives, which enhances the importance of providing a space where people can communicate and not be frightened of being together. Furthermore, organisations working with specificities (e.g., childhood, gender, older adults, race and ethnicity, functional diversity, citizenship status, religious diversity) constitute important partners in establishing communication and interaction with particular groups and individuals. [Chapter 3.2]
Behavioural changes	The focus here is on instigating behavioural adjustments, or changes in behaviour, in some particular respect, namely by challenging traditional models of governance, expert advice, and implementation, as well as instigating adjustments of attitudes, mindsets, and behaviours in support of participation and collaboration (Nunes et al., 2021). It relates to communication and interaction in many ways, including how residents are shown that their inputs are valuable and can be applied for the creation of change; identifying and engaging agents of change; promoting participatory and creative activities to address specific behaviours (e.g., aggression, intolerance, lack of openness, and looking at the different cultures and existing boundaries built on the differences). [Chapters 2.4, 3.1 and 3.3]
Trust	It relates to improving or creating relationships based on trust between citizens, and between citizens and city staff, politicians, and other agents, with particular attention to confidence and team dynamics, as well as language (Nunes et al., 2021). Trust may impact citizen engagement to a greater extent according to the local context, such as in the case of distrust or a history of failure and disappointment, which require the exploration of different mechanisms (Fung, 2004). It involves, namely: ensuring that everyone is part of the conversation and following deliberations, documenting the activities to promote ownership, qualifying local ideas instead of bringing many ideas from practitioners/experts, properly communicating and translating what the residents feel, as well as repeating people's opinions. [Chapters 3.1, 3.4, 4.2 and 5.6]
Rules	Regulation is thought in terms of setting the frame and regulations for equal rights in the expression of visions and priorities (Nunes et al., 2021). It means not only to establish rules and regulations for the participatory process, but also promote co-decisional processes. The local contexts may bring additional critical issues, such as when rules are not followed. [Chapters 2.1, 3.4 and 4.2]
Private sector	Highlighted here is the definition of the relevance of the private sector, not limited to actors, among others (Nunes et al., 2021). It requires mapping who has links and can facilitate contacts with private actors (e.g., business associations, local companies, private owners), as well as their eventual roles in the co-creation of NBS. It also involves conducting meetings and workshops with specific groups to understand visions, priorities, and interests. Bringing all participating groups together facilitates devising a common vision and project, as well as to seek formal commitment. [Chapter 2.2]

BUILDING BLOCKS	OVERVIEW
CONTEXT SPECIFIC	
Engagement strategies	Engaging stakeholders in co-creation can help to find new and innovative solutions, to achieve environmental goals more efficiently and effectively, as a means to better cope with or resolve conflicts, build trust and provide learning opportunities. Often considered self-evident and self-catalysing, there is frequently a lack of strategies regarding systematic stakeholder engagement. Starting points to identify relevant persons to engage such as stakeholder mapping techniques to ensure relevant and meaningful persons could be applied, giving a contribution to co-creation processes that involve the engagement of underrepresented, disadvantaged or vulnerable groups. A variety of engagement strategy tools exist, namely as a result of EU-funded projects, such as URBiNAT (Mateus et al., 2021), PHUSICOS (Fohlmeister et al., 2019), CLEVER Cities (Mahmoud & Morello, 2021). [Chapters 3.4 and 5.5]
Geographic context - *urban, coastal, rural, planning cultures*	Consider the planning cultures of the geographical areas in framing co-creation. In geographical contexts, different NBS types might be more dominant, also consider that specific benefits might be more important or decisive for stakeholders, e.g., the importance of business models for local actors such as farmers when creating, managing and monitoring NBS in rural areas. [Chapters 2.1, 2.2 and 2.4]
Cultural context	The focus here is on articulating and making visible the multilayered cultural assets, aspects and meanings of a place, namely in terms of cultural mapping, which encourages the attachment of citizens to a location, and acts as a catalyst in the process (Longley & Duxbury, 2016; Duxbury et al., 2015). More than just another tool, cultural mapping is relevant if used as an approach to get to know people, address their specificities, what they like to do, and what they want to do. Moreover, cultural mapping emphasises processes that enable projects to be platforms for discussion, engagement, and empowerment (Nunes et al., 2021). [Chapters 2.1, 2.2, 2.4, 3.2, 4.3, 4.5 and 5.6]
Risk assessment and mitigation measures	Identifying the factors influencing co-creation processes, as well as those leading to the failure of co-creation and co-production, including basic requirements in the risk assessment of co-creation processes; mitigation measures corresponding to risk factors related to the process of engaging citizens in co-creation and their participation in the implementation and delivery phase; and clarity of the participatory process, its assessment, and improvement (Nunes et al., 2021).
Monitoring and evaluation	Monitoring and evaluation of the participatory process is relevant for information and follow-up, as well as for the ownership of the co-creation process and its results (Nunes et al., 2021). Therefore, it covers the process itself, the results and impact of participation, and the different aspects of evaluation guiding the selection of methods, including in terms of participatory monitoring and evaluation and participatory impact assessment. It could also take advantage of participatory methods and processes such as community-based monitoring (Allegretti et al., 2014) and empowerment evaluation (Fetterman, 2021). [Chapter 5]
Where	Having guidelines for the spaces in which the participatory events are held would address the place/setting, as well as its form and quality, in terms of incentivising people to work constructively (Nunes et al., 2021). The definition of these aspects is all the more relevant when dealing with a lack of space in which to speak and do things together, i.e., spaces to not only share visions, values, roles, dialogue with people, but also to create a dialogue between people, where they can express what they want to do and what they need. [Chapters 3.1, 3.3, 3.4, 4,3, 4.4 and 4.5]
When	Identifying the best moment for the participatory events covers time/day, date, and phase (Nunes et al., 2021). Therefore, it implies meeting the community and knowing as much as possible the needs of the people who live in an area, their habits and traditions, so that the participatory activities can be tailored accordingly. Moreover, to be relevant, participation cannot happen at the end of the process of planning a project, but there is a need to assess the right time/phase to engage when a project has already started, and according to its technical level. [Chapters 3.1, 3.3, 3.4, 4,3, 4.4 and 4.5]
Mediation	Mediation addresses the resolution of conflicts, and the use of dialogue to foster collaboration between people who do not have much experience in problem solving (Nunes et al., 2021). It covers strategies that are sensitive to local history and existing relationships, to build trust and foster being/working together, as well as the specific attributes and expected role of the mediator. [Chapters 3.2, 3.3, 3.4, 4.4 and 4.5]

BUILDING BLOCKS	OVERVIEW
INCLUSIVE APPROACH	
Co-benefits	The focus here is on the provision of economic, environmental and socio-cultural benefits. In terms of benefits of collaborative planning processes (Fohlmeister et al., 2018), they comprise multiple perspectives, transparency, fairness and openness, efficiency and effectiveness (time, resources), and pre-warning system by early detection of conflicting interests. In the matter of benefits to results, these include the combination of experiential knowledge with scientific knowledge, increased credibility of information, increased acceptance, legitimacy and salience, and creation of ownership. As for the benefits to involved parties, they involve the establishment of a constructive dialogue between public sector, private sector, civil society and knowledge institutions, networking, promotion of knowledge-sharing and learning across and between cases and increased social capacity. [Chapters 1.4, 2.2, 3.3 and 4.3]
Feedback loops	Feedback loops are vital to provide a culture of continuous response to what a person has perceived or understood. This enables everyone to react to the responses and permits correcting if necessary. This process is accompanied by regular evaluation and improvement of the co-creation process. [Chapters 3.1, 3.2 and 4.3]
Considering stakeholder abilities	Collaborative planning and co-creation of NBS benefits from collaborating with other actors to create unique knowledge. Key elements are to create a multiple-genre perspective and the interplay between capabilities possessed by the various stakeholders involved during co-creation activities. Key elements to ensure an arena for initiators are stakeholder networking capability and stakeholder mapping. Another important aspect is to include local knowledge and the establishment of new partnerships. A decisive element to motivate stakeholders in terms of participation and leverage their skills, abilities and potentials for innovative solutions is added value or benefits for the ones participating. [Chapters 2.3 and 5.5]
Innovation	Innovation can be understood as a process of creating value by applying novel solutions to meaningful challenges. Innovations may be technological, social, or related to service; they may include scaling (up-sizing) of existing solutions, sharing and converting experiences and know-how into shareable knowledge (Baregheh et al., 2009, Strout et al., 2021). Innovation cycle refers to adopting processes of rupture and searching for alternative solutions to address concrete social problems. It involves breaking the crystallised image of a problematic area, including observing a code of conduct for the communication and dissemination of activities, as well as connecting people, introducing creativity, and mobilising energy (Nunes et al., 2021). Participatory processes are relevant in promoting an innovation cycle when they focus on the resources, assets, and relationships of solidarity in the community available. In this regard, they also relate to strengthening capabilities and empowerment of the population, the satisfaction of their needs and the corresponding access to rights. [Chapters 1.1, 1.4, 2.2, 4.3 and 4.4]
Tools	Specific methodologies and guidelines to support mobilisation and inclusivity comprise protocols, approaches, and methods aimed at engaging citizens at different stages of the co-creation process (Nunes et al., 2021). In this framework, arts and community events can facilitate creativity. The appropriation of complex languages can also be carried through the inclusion of people's knowledge in dialogue with technical and scientific knowledge. Therefore, supportive methodologies and techniques would require lower degrees of formalisation, the articulation of knowledge, and considering culture as a platform. [Chapter 3]
Iteration	Promoting and ensuring a culture of feedback, evaluation and continuous improvement of collaborative processes (Fohlmeister et al., 2018). [Chapters 3.1, 3.2 and 4.3]
Added Value/ Why	Being clear as to why we need to engage citizens and support participatory processes requires clarity of purpose and rules, as well as consideration of different approaches in accordance with the goals and real conditions of participation (Nunes et al., 2021). It covers: the object, what we want to discuss and do with people; the purpose, why participation is important to the project in question, and what motivates people to participate; the ways of carrying it out, why we use specific methodologies; the relevance, since not everything needs to be in the form of dialogue/discussion. In fact, participation is not always the solution, and sometimes inputs can be received in other ways. [Chapters 1.4, 2,2 and 5.5]
Inclusion and inclusiveness	On the one hand, specific guidelines need to guarantee inclusion, in terms of different modalities of the participatory process, i.e., capacity and tools to address and welcome diversity (Nunes et al.,

BUILDING BLOCKS	OVERVIEW
	2021). It also requires not only pursuing the 'usual suspects' who always participate and are more engaged because of their availability, resources, and professional/disciplinary skills, but may also constitute an exclusive group. On the other hand, inclusiveness means to go beyond the term of the project and look at deep-seated inequalities. Therefore, reaching and engaging marginalised voices requires not only strategies and methods for the inclusion of their visions and perceptions in the development of NBS, but also investing time, energy, and resources for a consistent improvement in the quality of participation. It has to do with developing an understanding of the economic, social, political, and cultural dimensions of designing and implementing NBS, and seeing the implementation challenge beyond an immediate 'technical' issue (Wild, 2020; Bulkeley, 2020b). [Chapters 1.2, 2.2, 3.3, 4.1, 5.1, 5.2, 5,4 and 5.5]
Open mindedness	Open-mindedness attempts to re-orientate organisational values, norms and/or behaviours (Cegarra-Navarro et al., 2008). Cognitive structures, mental models, dominant logics and core assumptions that guide behaviours can be questioned and there is willingness for considering ideas and opinions that are new or different. This requires that existing organisational routines, assumptions and beliefs might ultimately be modified, deleted or replaced. Managers and facilitators of such processes need to foster a context that opens up pathways for new habits, patterns and ways of doing and interpreting things. [Chapters 3.1-3.5, 4.3 and 5.6]
Sensitivity	Respecting the local context, co-creation is embedded in, including relevant local policy, governance and socio-cultural factors (Fohlmeister et al., 2018). [Chapters 2.1, 2.2, 2.4, 3.1-3.5, 4.2, 4.3 and 4.4]
Facilitation	It requires having specific guidelines to address facilitation that include other participatory guidelines, aimed at training local facilitators and the elaboration of supporting materials (Nunes et al., 2021). Guidelines, training and materials would define: the main attributes of facilitation for an understanding of the role that is expected; the different steps of the co-creation process, including information about NBS; how to hold successful public meetings based, for example, on successful participatory cases; and principles and requirements of ethics. [Chapters 3.3, 3.4, 4.2, 4.3, 4.4, 5.4, 5.5 and 5.6]
Quality of deliberation	It depends on setting a meaningful deliberation process, through authentic deliberation, a clear decision-making process, and ensuring equal rights of expression (Nunes et al., 2021). More than simply voting, the focus is on interaction, democratic decisions, and expression. [Chapters 3.2, 3.4 and 4.3]
Citizenship rights	The focus here is on broadening the meaning of the appropriation of social, urban, political, and cultural rights, both internally concerning collective imagination, and externally regarding rejuvenated relationships with local powers (Nunes et al., 2021). It involves modalities of the participatory process which addresses, welcomes, and promotes diversity, as well as engaging the community in the analysis and discussion of problems, hence raising awareness and encouraging citizen participation. Therefore, the emphasis would be on addressing access to and implementation of rights, engaging/empowering, strategies designed to promote participation according to specificities, and codes of conduct related to research and ethics. [Chapters 2.2, 3.1, 3.3 and 3.4]
Ownership	Citizens having ownership of both problems and solutions depends on the assumption that practitioners can only bring knowledge if people own the process, i.e., practitioners providing the framework but not taking the lead (Nunes et al., 2021). It also requires enabling inputs from people by showing that contribution is possible and providing safe spaces, as well as implementing a diversity of appealing activities. [Chapters 1.4, 2.2, 3.2, 3.3 and 4.4]

Annex 2: Methods and tools for inspiring an NBS co-creation assessment design

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Anchored by the survey results, the following list represents methods drawn on SSH approaches that are being used by the EU projects. The objective is to provide a short introduction of each method to inspire practitioners, municipal local teams and researchers during the design of a participatory assessment proposal.

Conversations and interviews

Co-walks with interviews are different from the individual walk-through by the researcher, and the purpose is to collect information concerning the territory from the people living in the community. The objective of this method is to collect impressions and narratives about the area of interest from the individuals who use it while indicating elements and relevant aspects of the route. It is a reflective exercise regarding the different spaces that involves movement, and recording the choices made by the interviewee in terms of rhythm and route. Sharing, from an immediate experience, the sensations and impressions of the interviewee in direct contact with the space. The researcher should take a set of notes during and after the activity (as a way of collecting information). Likewise, it is important to keep the microphone close to the interviewee for later analysis of this information.

Photovoice

Photovoice is a technique in which participants represent moments of their daily lives by capturing their photographs. This way of collecting data it's focused on the participants. They select what is relevant to them. At the first moment, participants are informed about the topic of study and the objectives of the task (a minimum/maximum number of photos can be set). Afterward, the following questions should be pointed out in the discussion of photographs: a) What do participants see? b) What is happening? c) How does the image relate to the topic? d) Does the situation represent a concern or a strength? e) Can something be done about it? The dialogue is recorded and data is transcribed and analyzed along with the photographs. This technique is easy to implement and is low-cost. Specifically, in the context of NBS engaging the citizens and stakeholders. Photovoice contributes to the process of empowering people and communities by making visible their stories, memories, perceptions, and also ideas or dreams to transform the territory, (see more Berbés-Blázquez, 2017)

https://urbinat.eu/nbs/photovoice-2/

Stakeholder Analysis

Stakeholder analysis (Schiefer et al., 2006) is a complementary method of mapping stakeholders (chapter 2) - relevance of identifying all actors' direct or indirect involvement in the NBS implementation process, highlighted under section 2.4. The analysis of stakeholders consists of measuring the level of importance that each stakeholder group assumes regarding NBS results and their degree of influence. The matrix proposed by Schiefer et al. (2006) Includes different levels of influence: unknown influence, nor or low influence, some influence, moderate and influence. The analysis also provides the mapping of the interests of stakeholders in relation to the NBS. According to the author, at the end, this exercise supports, during the planning phase, the identification of the interests of different stakeholders and the effects of the project on that, their contributions, the importance of stakeholders for the success of NBS and the degree of influence.

Focus Group

Focus groups are formed by a moderator and a small group of people who come together to talk about a topic. The activity explores attitudes and perceptions, feelings, and ideas about the selected topic. This technique is useful to get an understanding of the relevant points and to explore the way things are perceived by participants. Three characteristics must be taken into account in the dynamic: i) the focus of the session should be based on the experiences of participants with similar knowledge; ii) the interaction of the participants should be a means of eliciting information; iii) the role of the moderator is to facilitate the discussion, not lead it. The focus group is usually 1-2 hours and it is composed of 6-9 people because it is important to have a range of views and opinions. It starts with a common question to all participants and from there the themes are discussed. The biggest challenge of the activity is to conciliate the availability of all those involved at a certain place/time. This qualitative data collection can be integrated into any stage of the NBS process. Specifically, for the co-design phase, it can be helpful to identify common needs and offers a moment to create joint suitable solutions.

https://urbinat.eu/nbs/walkthrough-focus-groups-in-situ/

Photo elicitation

Photo elicitation is based on the use of photographs during the interview. This technique evokes a different type of information because the brain processes visual information differently from verbal information. Three ways of using photographs can be pointed out. Firstly participants choose the photos to discuss during the interview. Secondly who leads the process takes the pictures to discuss. Lastly as a combination of the above. Photo elicitation allows the establishment of communication between multidisciplinary teams or stakeholder groups. Looking at the same images leads to produce a common understanding and bridge existing gaps between the points of view from different observers. This technique offers advantages in all phases of project implementation (co-diagnostic, co-design, co-implementation, and co-monitoring). The photo-elicitation can be applied as the next step of the photovoice or be used as an independent activity.

https://urbinat.eu/nbs/photovoice-2/

Cultural mapping

As discussed under the chapter 2, it can be helpful in terms of: baselines and data for thinking about places, people and resources; information and data not usually captured in standard statistic and profiles or other standard qualitative methods; ongoing monitoring and assessment of cultural vitality and community well-being (e.g. new cultural celebrations, production sites, intergenerational skills transfer), (see more Duxbury et al., 2015).

https://urbinat.eu/nbs/cultural-mapping-2/

Participating observation

Observation is a technique for collecting qualitative data by witnessing events/behavior. The interaction with fieldwork and participants promotes closer proximity. From a set of pre-established topics, the observer will look for specific points: What do I want to observe? Who is involved? What is the context? There are a variety of ways to record the observation's moments (e.g., the frequency of events, at a given point in time, duration of events, or a sample of people). It is important to point out that these analytical guidelines should not be rigid, because additional issues could arise from the field. For that reason, the observer should be receptive. Specifically, for co-design and co-monitoring, it can be helpful in terms of helping in the process of understanding/knowing what is being observed and capturing unforeseen issues.

Co-walks and walkthrough

Walk-through is a method of analysis that simultaneously combines observation in situ with an interview. It creates an accepting environment that puts a small number of participants at ease allowing them to thoughtfully answer questions in their own words and add meaning to their answers. It also identifies the negative and positive aspects of the environments analyzed and NBS. It allows identifying perceptions of the residents in the place where they live. By using this technique, a certain level of appropriation takes place as people evaluate the territory, its inadequacies, surplus or missing furniture, barriers and potentialities, among other important elements. Walkthrough is a participatory method and solution (NBS) that creates awareness while participants collectively walk and discuss what they feel, see and know. A variation of walkt-hroughs are the co-walks adapted from the URBiNAT project, individual interviews to collect impressions and narratives about certain NBS or urban areas, a conversation between who is the interviewer and who is interviewed. Reflecting upon the space while moving, recording the choices made by the interviewees in terms of rhythm and route. Sharing, from an immediate experience, the sensations and impressions of the interviewee in direct contact with the space.

https://urbinat.eu/nbs/walkthrough-focus-groups-in-situ/

Quali-quanti questionnaires

Questionnaires are designed to collect information to discover things, not to achieve the expected results. The data from questionnaires can be divided into two categories: factual information and personal opinions (attitudes, views, preferences, and so on). There is no rule about the number of questions that could be included but the following aspects are important in the construction of the questionnaire: only ask about what is vital to research; do not duplicate or confirm any question; the questions should be clear and concise; the instructions for responding shall be clear and straightforward to participants can respond as quickly as possible; take a pre-test to evaluate the duration of the questionnaire response and structure. The questionnaire should be divided into different sections. Although the sections are interlinked, it is important to point out what is intended in each of them. The great advantage of using questionnaires is to reach a large number of people and/or who may be geographically distant (in the case of the online questionnaire). Specifically, for the co-diagnostic phase, it can be helpful to map the different realities of each area/city and in the co-monitoring assess the activities in progress/concluded, (see more Arrigada, et al. 2009; Scerri & James, 2010).

Community-based monitoring

Tool for participatory decision-making improvement. It promotes an organised way of collecting ongoing or recurring information by residents, to be used by local governments and civil society, for planning, budgeting, and implementing local development programs, as well as for monitoring and evaluating their performance. Its activities cover community mapping, mobilisation, capacity building, and information dissemination. Its benefits include: identification of problems and solutions in areas with fragmentation of needs and different vulnerable groups, which make it difficult to provide standardised solutions; collective elaboration of simple and intuitive indicators; contrast to lack of transparency and clientele; creation of relations based on mutual trust between citizens and public officials; awareness concerning policy-making helping citizens understand the constraints of public action.

https://urbinat.eu/nbs/community-based-monitoring/

Empowerment evaluation

Empowerment evaluation is the use of evaluation concepts, techniques, and findings to foster improvement and self-determination. Program participants conduct their own evaluations, with the support of an outside evaluator and an additional facilitator, in workshops to complete the following steps: a) developing a mission; b) taking stock of where the program stands; c) planning for the future. Participants determine the type of evidence required to document and monitor progress. Subsequent evaluations, such as interviews and surveys, test whether strategies are working to allow mid-course corrections. Another formal assessment of activities allows comparison with the previous ratings of key activities. All results are recorded in accessible documents to be used as references, baseline and data point for planning, implementation, monitoring and evaluation of the co-creation process, (see more Fetterman, 2021).

https://urbinat.eu/nbs/empowerment-evaluation/

Approaches

Design thinking workshop

Design Thinking is founded on the ability to combine empathy relating to the context of a problem, creativity in generating ideas, insights and solutions, and rationality to analyze and match solutions regarding the context. Design Thinking processes are at the same time analytical and empathic, rational and emotional, methodical and intuitive, often tackle ill-defined problems where the use of creative thinking abilities is fundamental in finding and correcting a problem. Design Thinking is human centered and is based on understanding the needs and motivations of people. It is optimistic; it believes that there is always a solution to be found. From problem finding to problem solving. By using Gamification, Serious Games, Senses and Dreams, the Design thinking tools allow people to give first hand deeper information that it is crucial to complement and simultaneously cross-validate other sources of co-diagnostic gathered through other methods and tools, see more;

https://urbinat.eu/nbs/design-thinking/

Social monitoring impact

In the case of CLEVER Cities, a specific social monitoring methodology was developed based on the project's main regeneration challenges: Human health and wellbeing, social cohesion and environmental justice and citizen safety and security. The Scope of the Social monitoring evaluation tool was to identify macro categories of evaluation that have sub-sectors of indicators that could be transversal to the whole project implementation pathway in different cities using combined indicators (binary, ranking, Likert scale and multiple choice). A diversity of methods were used as well such as online surveys, face-2-interviews, focus groups and observations. The methodology encompasses 7 categories of data categorization: 1) Relationship with nature and well-being related to NBS in the area of intervention ; 2) Place, use of space and connectedness to Nature; 3) Perceived ownership of space and place satisfaction ; 4) Psychosocial issues and social interactions; 5) Citizen perception about safety and security; 6) Knowledge about CLEVER Cities interventions and 7) Socio-demographic data Characteristics, (see more Mahmoud, et al, 2021a), or

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Theory of Change (ToC) for NBS assessment

This approach is consolidated as a building block for impact evaluations. The rationale behind the ToC approach produces a comprehensive description and illustration of "how and why a desired change is expected to happen in a particular context". This particular approach has been used by different evaluators and researchers widely. According to Rogers (2014), the ToC can be applied in any level of intervention, an event, a project, a programme, a policy, a strategy or an organization. Summarily, the ToC "explains how activities are understood to contribute to a series of results that produce the final intended impacts". In terms of representation, there are different models according to the context and evaluation goals. Considering the cases of NBS, this approach is particularly interesting, eg., to verify the impact of clusters of NBS and the impact relation between them. In addition, Its potential for upscaling and replicability is mostly confirmed when the objective is to conduct an impact evaluation in a given site and apply the lessons to another. During the evaluation pathway, the ToC should be reviewed constantly to guide data collection, analysis and reporting, see also (Morello, et al, 2018).

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This report analyses co-creation and co-governance approaches for Nature Based Solutions (NBS). Each project represents different ways in co-designing, co-developing, co-implementing and co-monitoring NBS that are being deployed in diverse European contexts. The analysis presents best practices regarding the co-creation of NBS at its different stages, phases and scales. It provides guidelines for researchers, practitioners and other experts that are researching, implementing and/or evaluating territorial processes that prioritise and advocate for inclusive and nature-based approaches.

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