

# How using a roadmap can encourage cities to replicate more nature-based solutions in the planning process

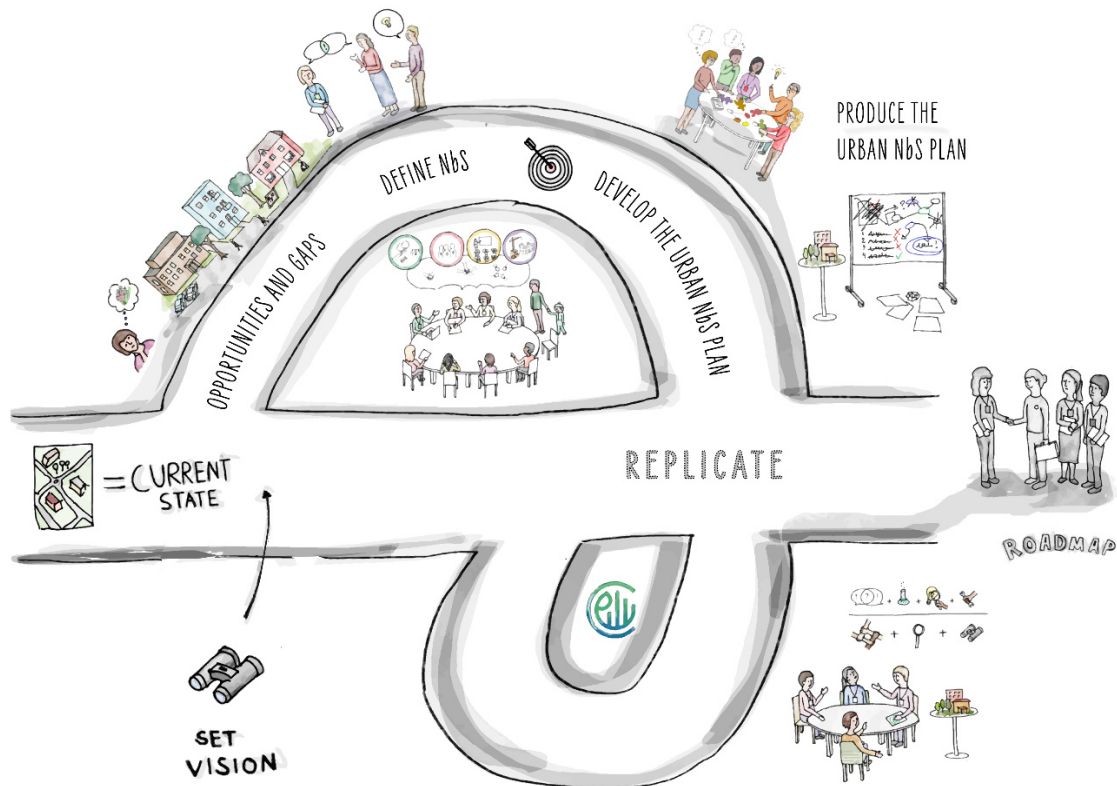
## Key Points

- A roadmap can outline and capture a city's path towards co-creating their own local nature-based solutions (NbS) plan. It can help cities to create and follow up on their plan of how to overcome identified barriers and challenges and mainstream NbS replication activities into existing local (and/or national) policy, legislative, governance and citizen engagement structures as well as repeat replication activities in other districts.
- In the CLEVER cities project, each of the fellow cities (Belgrade, Larissa, Madrid, Malmö, Quito, and Sfantu Gheorghe) constructed a template for a generic roadmap that could be filled in and adjusted for each city.
- The idea behind the roadmap was that it would then help the city to develop its own NbS plan that could then be applied. A NbS plan can be understood as a generic term and the form it can take in each city is different as each city's conditions are unique. It can address different urban scales and be framed differently, depending on the existing political frameworks and institutional structures in place. It can be a draft of a chapter embedded in an overall existing citywide strategic plan or masterplan or the document might be an NbS plan focused on a certain neighbourhood.
- Depending on the type of plan/document being produced the roadmap will support the cities in coordinating the activities in the process of developing an urban NbS plan. The roadmap was designed to be a living document that can be adapted, added to and adjustable to fit the needs of the individual city.

## Structure of the roadmap

The structure of the road map is inspired by the international standard "Sustainable development in communities – Management System for Sustainable Development" (ISO 37101). The different steps in the road map are not to be understood as linear and successive but are to be treated as overlapping with one another in both time and practice. The process will unfold and become more tangible and will therefore require feedback loops that allow for adjustments and improvement. Considering the dynamics of city politics, back-and-forth loops between steps are not only to be expected, but even desired.

### Different steps of the roadmap:



Based on @Veronika Hoffmann, CLEVER Cities

- 1) **Current state** - By using existing knowledge and engaging local stakeholders, collating data and information about the city creates a baseline or starting point for each city.
- 2) **Set vision** – When the city has its starting point it then needs to identify where it wants to go and establish targets to get there. It can be valuable to include multiple stakeholders in the development of the vision and work with residents that will be affected by the outcome of the plan.
- 3) **Opportunity and gaps** – The vision can then be compared with the current state and what is lacking to reach the vision can be identified. This is a move from the initial analysis of the current state on city- and district-level towards a collaborative and co-creative process which aims at getting involved locally.
- 4) **Define NbS for chosen district** - By brainstorming possible solutions and measures, as well as testing and analysing their desirability and feasibility, the NbS that are most suitable for the plan can be selected. It can be that there are multiple solutions to be applied in a large-scale plan or area.
- 5) **Develop the urban NbS Plan** - The purpose of the NbS plan is to mainstream nature-based solutions into existing local policy and planning. Using the information brought together in the sections described above, a city can develop its own urban NbS plan.
- 6) **Produce the urban NbS Plan** - It is important to define the scale and frame of the plan to prepare and implement a relevant submission strategy and a communication package for the plan.

## Malmö's roadmap

Malmö found writing the roadmap to be a really useful process to understand what is needed in the area of Lindängen in terms of NbS. We started with mapping out the current situation, looking at the history of the local area as well as the needs of the local community.

We used these needs, as well as an understanding of the local context to set the vision.

'Lindängen is a green, health promoting place with a focus on sustainable urban development'.

Exploring the opportunity and gaps gave us the chance to identify some challenges and recognise some barriers that exist, such as the re-organisation of Malmö into specialised department and committees instead of being organised into geographical districts. This has made cooperation and development from a local (area based) development perspective difficult. We also found that many people, on all levels, did not know what NbS were, and many local residents did not know how they could make a difference in their local area and push for more greener solutions.

This helped us to develop the realisation that our plan would be a guide informing local residents, municipal staff and property owners on benefits of NbS and why they should be incorporated into plans, as well as inspiring local residents how they can make change happen in their area.

The roadmap really helped us to develop these ideas and gather all the information we needed to move forward.



Image by Malmöstad/Apelöga

## Experiences with replicating/upscaling the NbS roadmaps

The three cities, London, Milan and Hamburg, have developed a series of activities to develop their own NbS roadmaps. In the first phase, each city has worked to identify those successful experiences that could have the potential for replication. Among all the experiences identified, each city has selected the one with the greatest interest for its replication and/or upscaling. Thus, each city has been able to adapt the replication to its reality; in the case of London, by giving continuity to its Community Design Collective (CDC) in the different urban regeneration projects, in the case of Milan, by identifying the renaturation of the school at the Giambellino park, as an action with a great capacity for expansion to other schools, and finally Hamburg, more focused on upscaling different experiences for their integration on the city's adaptation strategy.

Once the strategies with potential for replication were identified, the methodology tested in the Fellow Cities was taken as a starting point but adapted to the context and reality of each Front Runner city. In this way, cities will be able to have a document adapted to their needs and the current reality of their planning and co-creation contexts. In this sense, each city will have a document with a real capacity to advance in the replication of the project results. In this way, it has been sought that the NbS roadmaps can continue generating a real impact in the different areas of action, trying to avoid a roadmap that is not adequate to the current reality of the Front Runner cities.

## Informing the European Commission's Guidance for the Urban Greening Plans

The [EU Biodiversity Strategy for 2030](#) lays out ambitious and long-term goals to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030 and contains specific actions and commitments, also in relation to urban ecosystems, which are recognised as a key part of achieving the aims of the strategy. In order to bring nature back into our cities, the European Commission calls on all cities above 20,000 inhabitants to develop Urban Greening Plans (UGPs) as strategic, multi-scale frameworks that enable the mainstreaming of urban biodiversity as a priority across municipal departments and across sectors.

The [European Commission's current draft UGP guidance](#) was developed through an extensive consultation process with dozens of European cities. The concept of the NbS Roadmaps developed in CLEVER Cities as well as the experiences and lessons learned coming out of the roadmap development in the CLEVER Fellow Cities played a leading role in the conceptualization of the UGP guidance. Following CLEVER's NbS roadmaps as a blueprint, the UGP process includes a number of steps based on the cyclical Integrated Management Approach as defined in [ISO 37101](#) which is driven by a local co-creation process.

## Policy relevance and implications

The roadmap was a productive tool to initiate the narrative alignment of the fellow cities' different ways of working towards planning of nature-based solutions by highlighting certain steps of development. Although the road map was used in different ways by the different cities, it provided a robust framework for the co-creation process that structured the descriptive planning steps of the key stakeholders in each fellow city.

All fellow cities deviated from both the sequence and priority of the six steps. This highlights the flexibility and adaptability of the roadmap tool which ensures that the urban NbS plans are locally anchored and applicable.

## References and further readings

- NbS roadmap template to guide cities
- NbS roadmaps from the fellow cities
- UrbanByNature webinars
- UGP policy brief
- UGP guidance at EC website, [https://environment.ec.europa.eu/topics/urban-environment/urban-greening-platform\\_en](https://environment.ec.europa.eu/topics/urban-environment/urban-greening-platform_en)
- ISO 37101 'Sustainable development in communities — Management system for sustainable development'

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# Positioning nature-based solutions in policy: Learning from Quito's successes

## Using Ordinances in Quito

### Key Points

1. NbS is being promoted as an option for decreasing the effects of climate disasters such as landslides, floodings and heat waves.
2. Protecting Quito's natural remnants strengthen water catchment management, biodiversity protection through policy creation.
3. Quito has been mainstreaming NbS in the recent years through inclusion in ordinances and long term plans aiming towards climate change adaptation. However, there is a need for increasing knowledge of NbS among all stakeholders and also to state clearly their roles regarding NbS in the city.

The concept of NbS has been included as part of local regulation in Quito in recent years. This scenario has produced many implications due to mainstreaming being done from the Municipality. For example, stakeholders still lack knowledge about NbS potential, therefore, there are still some uncertainties regarding the technical and economic feasibility of NbS projects. On the other hand, raising awareness about NbS is changing the way stakeholders value nature and is being seen as a tool for climate disaster risk management.

An Ordinance is legislation built at municipal level. In Quito, this type of legislation must be aligned to the city long term plans such as the PMDOT and PUGS and country level legislation such as the Constitution and others. This type of legislation can be more demanding compared to its national equals if required. For example, vehicle emission standards in Quito are stronger than national ones. Also, Ordinances offer more flexibility to approve city wide projects including policy tools for its increased technical and economic feasibility.

### Real World Example:

- Ordinance 041 approved in September 2022 aims to establish a regulatory framework of protection, encouragement and preservation of urban vegetation aligned with Quito's Urban Green Network. NbS is aimed to be promoted as part of greening efforts within the urban area of the city in addition to sustainable drainage systems (SuDS).
- Green and Blue Ordinance project, soon to be approved (before July 2023). This ordinance promotes climate resilience against natural disaster risks through green and blue infrastructure implementation. NbS are heavily present in the ordinance as a mean to reduce vulnerability against climate effects but also for conservation, water catchment and the promotion of permeable areas within urban areas. Implications are greater since NbS is still a novelty in Quito therefore the approval of this ordinance is considered a major breakthrough as it changes the way how nature is conceived by the population and reaches a major role in the city's planning.

- Metropolitan Land Use and Development Plan 2021-2033 (PMDOT in Spanish) states NbS as a climate change adaptation policy that reduces social and economic gaps while increasing access to green spaces.
- Land Use and Management Plan 2021-2033 (PUGS in Spanish) establishes NbS as part of the Urban Building Standards, more specifically related to the design of public spaces encouraging permeable areas, green infrastructure, community gardens and others.

### Policy relevance and implications:

Ordinances are a great option to mainstream NbS in Quito. Because PMDOT and PUGS consider NbS as part of long-term planning for the city, political support is improved and increases the probability of main stakeholders being part of the development of NbS related ordinances. Relevant stakeholders had expressed their concerns about natural disasters and how Quito is building its resilience around them to reduce the population vulnerability to such effects. Climate risks such as floods or landslides are increasingly being part of the NbS pitch in Quito and, because of its multiple benefits, more local legislation is being considered for approval. Recently, the Urban Trees Ordinance, which contains NbS content, passed. Moreover, the even more NbS specific Green and Blue Ordinance project is expected to be approved this year. Clever Cities Quito expects to contribute to this Ordinance by including the NbS Urban Plan content to its standards in order to increase NbS mainstreaming.

The sanction process of the Green and Blue Ordinance helped to identify the need of reorganizing municipal roles and to find sources for NbS project funding. NbS in Quito still is in the early stages of development and mainstreaming, therefore, including NbS in current and future regulation is a huge step for increasing the generation of NbS projects in the city.

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# Stakeholder Engagement in the Co-design of Nature-based Solutions: Experiences from the CLEVER Cities project

## Key Points

1. This brief presents results from the stakeholder engagement activity in the co-design phase of selected Nature-based Solution (NbS) cases from the CLEVER Cities project, in particular regarding the choice of stakeholders, strategies, approaches, and tools utilized for their engagement.
2. Key factors informing the choice of stakeholders to be engaged in the co-design of NbS included the required expertise and/or skills, motivation, and financial and/or material resources of stakeholders. Conversely, the choice of participation tools was primarily guided by their cost-effectiveness, stakeholder characteristics, and existing participation practices from the local context.
3. Success in stakeholder engagement throughout the NbS co-design relies on understanding context-specific enabling factors for the engagement of key stakeholders, as well as on the flexibility and resilience of the stakeholder engagement activity to adapt to internal process dynamics and/or changing landscape conditions.
4. The end-users of NbS interventions, such as the inhabitants of a housing block or the pupils of a school, are key actors for the co-design process. Their continuous and tailored engagement (even beyond the co-design phase) can increase their sense of ownership and identification with the interventions, enhancing the impact and success of the NbS interventions.
5. The choice of participation tools should be consistent with the overall engagement strategy and adaptable to the specific needs and goals of stakeholders. It is important to carefully assess the effectiveness of the tools themselves at an early stage and align them, where possible, with existing participation practices from the local context.
6. Integrating "co-design experts" into project teams can facilitate capturing a broad range of perspectives from stakeholders, making them a determining factor in achieving the stakeholder engagement and co-design objectives.



## Aim & Background

This brief presents learnings from the stakeholder engagement activity throughout the co-design phase of selected Nature-based Solutions (NbS) cases from the Front Runner (FR) cities of the CLEVER Cities project, namely London, Hamburg, and Milan. The concept of "co-design" is defined within the CLEVER Cities project as the primary activity for the CLEVER Action Labs (CALs) in the three FR cities: it involves the collaborative design of NbS interventions by engaging local stakeholders and citizens, emphasizing a highly inclusive approach and communication effort (see Morello et al., 2018a).

The evidences informing this brief are investigated in the context of the CLEVER Exchange programme, an integral activity of the CLEVER Cities project aiming at fostering peer-to-peer exchange and promoting dialogue between the cities involved in the project. The scope of the information presented therein this brief extends to and covers the topics of stakeholders' choices, strategies and approaches as well as tools utilized for their engagement during the co-design of NbS. Various factors were identified and afterwards assessed to analyse and determine their influence on different aspects of the stakeholder engagement process. These factors were informed from empirical research on co-creation and living labs, primarily from the work of van Geenhuizen (2018), whereas the data collection has been conducted through the documentation of the experiences and workshops with the involved organizations in the selected NbS cases. Through a qualitative and comparative case study analysis of the selected experiences from the CLEVER Cities project, patterns of success factors and challenges were identified, and recommendations formulated.

The three investigated exemplary "NbS co-design" cases from the CLEVER Cities project were selected as successful examples of co-design of NbS interventions through enhanced participatory and collaborative approaches, one per FR city.



## Hamburg "Mobile garden for the elementary school Neugraben"

The project focused on creating moveable raised beds, seats, and storage containers for three schools to be used in the schoolyards. The restructuring measures were co-created with the involvement of pupils. The project was realized through a novel collaboration between the local partners of the CLEVER Cities project, school officials, pupils, and the parents' council. The raised beds and benches were made through a guided workshop by a local carpenter, with participation from the school pupils. As a result, the schools gained four raised beds and four storage benches, and the construction manuals were revised to be used as a replication tool.



Image by [Karsten Bergmann](#) from [Pixabay](#).



Mobile garden solutions  
(Grundschule Neugraben, 2022)



Mobile garden solutions (steg mbH, 2022)



## Milan "Green roofs and walls of the towers of via Russoli"

The project focused on redesigning the green roofs of the tower buildings in the Via Russoli 18 area in Milan. A co-design approach was taken, where over 40 stakeholders from various industries, residents, and the local government collaborated in designing, testing, and implementing (NbS) packages. The roofs comprise a total area of 3,500 square meters and feature orchards, vegetable gardens, flowers, meadows, and photovoltaic panels. The project aimed to improve energy efficiency, enhance water management, and provide better living conditions for the inhabitants of social housing in the area. The project also aimed to promote the practicality and usefulness of NbS in urban areas and serve as an example for others to follow.



Image by [joecrupier](#) from [Pixabay](#).



The rendering of the green roofs and walls of the towers of via Russoli (RiceHouse srl., 2021)



The rendering of the green roofs and walls of the towers of via Russoli (RiceHouse srl., 2021)

## Experiences from the Stakeholder Engagement in the Co-design of Nature-based Solutions

As such with any urban regeneration or development project, the selected cases from the three FR cities underscore the importance of stakeholder engagement activity also in the context of NbS co-design. It was widely recognized among the local project teams that this activity is a critical aspect that can significantly influence the process, outcomes, and overall success of the project in the long run. The three examined cases from the CLEVER Cities project employed various strategies, approaches, tools, and methods to engage stakeholders in the co-design phase, resulting in similar and distinct experiences, impacts, and outcomes from this process across the cities.



Image by [Vanessa Loring](#) from [Pexels](#).

### Key factors informing the choice of stakeholders

The main identified factors informing the choice of stakeholders to be engaged in the NbS co-design, without differentiating on their levels of engagement or roles in this process, were: expertise and skills; motivation; and, financial and/or material resources.

- **Expertise and skills** were perceived as essential to achieve the co-design objectives, especially in those areas where technical know-how was needed, informing consequently the choice on engaging certain stakeholders satisfying these prerequisites in the process. For instance, expertise in the form of carpentry skills was a key integral part of the wooden garden elements design in Hamburg; whereas technical farming knowledge was employed for the green roof design in Milan. Yet, in this context it is also important to consider the value of “lived experiences” for the co-design process i.e., engaging someone who holds deep knowledge about the project site, something that the technical experts might not necessarily possess.
- The **motivation** played a significant role in targeting local stakeholders, in particular citizen groups, with a strong interest towards the NbS projects. This was in particular dominant in the contexts of Milan and Hamburg where the residents and the school community respectively showed a high motivation since the initial phases of the projects. Yet, this aspect played a role also in those cases where citizens from the project area were initially hesitant towards the projects, for instance in London. To overcome this, the local project team took ad hoc trust-building measures to trigger citizens' interest and motivation and effectively engage them in the co-design process.
- Along with the recognized necessity for adequate funding allocation for the whole stakeholder engagement activity, it was widely confirmed that the ability of certain organizations to mobilize **financial and/or material resources** necessary for the implementation of the interventions was another crucial factor for their engagement in the co-design activity. For instance, in Milan, the engagement of a retail chain was imperative for selling the products from the rooftop farming after the implementation phase. In contrast, the local project team in London enabled citizens from the project area to actively engage in the co-design process through the provision of financial incentives.

However, the **type of NbS** in hand was also recognized as an important variable informing the choice of stakeholders engaged in the co-design of the interventions, but as a cross-cutting and underpinning variable of the three above factors. **Local policies and regulations** were instead recognized to have hardly played a role with regard to the choice and role of stakeholders in the co-design process, but their relevance in other contexts of NbS projects is not to be excluded. Yet, engaging the project site owners in the process,

although not directly in the co-design phase, was recognized in most cases as a crucial enabling factor for the NbS projects.

The **participation culture and previous practices** from the local context were also identified as particularly influential. In these regards, the availability of local co-creation expertise with a deep knowledge on the local project contexts, as well as the presence of existing local stakeholder networks engaged in comparable projects in the past, played a significant role in facilitating the choice of stakeholders and the extent of their engagement in the process. The pre-established stakeholder networks facilitated the identification and engagement of certain organizations perceived as crucial for the co-design objectives from the local project teams, thereby helping local project teams also to save time and resources.



*Image by [Maike and Björn Bröskamp](#) from [Pixabay](#).*

### Engagement of the NbS end-users

The CLEVER Cities experiences showed that the engagement of residents and citizens from the project areas, referred in this context as the end-users of the NbS interventions, was critical to the success of co-design objectives, consequently requiring careful consideration of the overall engagement strategy and approaches. The local project teams adopted various approaches to engage the end-users at different stages of the co-design process, with a particular focus on ensuring their continuous commitment even after the co-design phase. Keeping end-users as well as other key stakeholders engaged in the co-design process

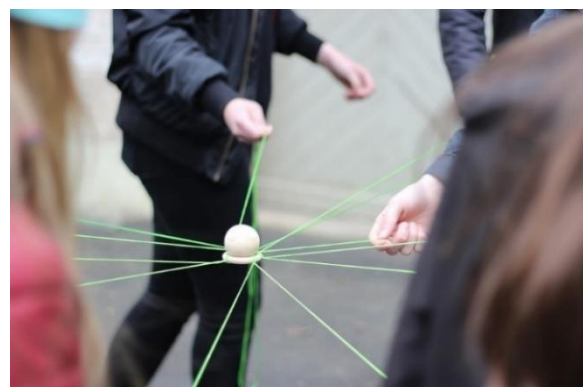
and throughout the whole co-creation of the NbS was widely recognized as crucial to enhance the sense of ownership and identification with the interventions, as well as a measure to save resources for the participatory process overall.

For example, Hamburg involved school pupils in gathering ideas and preferences for the solution even before and after the co-design phase, while London's "deep engagement" (i.e., community empowerment) strategy focused on the financially incentivised and continuous engagement of smaller community groups consisting of residents' representatives from the project area. Milan had a very active end-user group engagement through the residents' association, a crucial actor not only in the co-design process but also in the other phases of the project development.

### Coordination & management

The coordination and management of stakeholder engagement in the three NbS co-design processes was predominantly horizontally organized in network typologies, with unique management structures (local project teams) evident in each case. Yet, such structures should be seen as an integral part of the broader co-governance models emerging from the deployment of a robust co-creation methodology within the CALs in the course of the CLEVER Cities project (see Bradley et al., 2022).

Milan, for instance, relied primarily on a very active residents' association and the local project partners for the stakeholder engagement activity, supported by an



*Image by [Andre Grunden](#) from [Pixabay](#).*

architecture office in charge of the NbS design; whereas London presented a strong bottom-up engagement structure consisting of representative boards of civil society and project area residents, supported by a loose network of other local organizations, and an architecture office responsible for the NbS design. Hamburg on the other hand involved a local urban planning and development agency and a public university



(both project partners) in charge of stakeholder engagement and the NbS co-design, altogether supported by the other local project partners.

### Challenges with stakeholder engagement

Engaging stakeholders in co-design processes presented also unique and common challenges across the three cases. In London's experience, the main burden in these regards was the pre-existing context of scattered representative organizations of local communities as well as residents' general apathy and lack of trust towards public authorities. These challenges were tackled with tailored trust-building measures, including enhanced communication and incentives. Meanwhile, COVID-19 restrictions hindered the interaction with residents in Milan and the school participants (pupils, parents, teachers) in Hamburg, but face-to-face formats were reintroduced as soon as possible due to the particular motivation of these stakeholder groups. In the end, it was widely recognized the need for specialized expertise in capturing and integrating a broad range of perspectives into the design of the solutions, and finding organizations with such capacities might also be a challenge for NbS project initiators.

### Key factors informing the choice of participation tools

The co-design of NbS also involved the deployment of various participation tools across the three cases. Based on the tools' catalogue provided in advance to the local project teams through the CLEVER Co-creation Guidance (Morello et al., 2018b), the CLEVER Cities experiences showed that the main factors informing the choice of tools were: cost-effectiveness; characteristics of the stakeholders; and, existing participation practices from the local contexts.

- **Cost-effectiveness** was considered essential, with many digital participation tools being used primarily also due to the impact of COVID-19. The assessment on the cost-effectiveness showed that digital tools and holding events in existing facilities were found to be the most effective approaches, significantly contributing to the overall efficiency of the deployed tools. In the case of Milan, the participatory process through digital tools, such as the MIRO board and excel sheets, was associated with very low costs. In Hamburg and London, events such as roundtables and festivals being held in existing venues and as part of existing events and activities also proved to be very cost-effective.
- The **characteristics of the stakeholders** to be engaged also informed the choice on the most suitable participation tools on a case-by-case basis. For example, the involvement of school pupils in Hamburg led to the choice of most suitable workshop formats for such a target group (see Arlati et al., 2021).
- The local **existing participation practices** also played a significant role. For example, it was crucial in the London case to choose the right mix of participatory tools – from communication- and awareness rising- to incentive-based – to overcome the residents' apathy and lack of trust towards public authorities as a result of previous participation practices in the project area.



*Community co-design event in South Thamesmead London (Heald, 2021)*



*Co-designing the school garden model with the pupils in Hamburg (steg mbH, 2019)*

While other framework variables such as **local policies and regulations** had minimal impact on the choice of participation tools, the **engagement of public agencies and other key stakeholders** as part of local project teams was vital in legitimizing the selection of the tools. This way, novel participation tools were piloted as an answer to the various framework conditions of each NbS project. For instance, beside the communication

and awareness rising campaigns, the London project team relied extensively on an incentive-based participatory approach through the establishment of the representative boards of civil society from the project area, a crucial measure to overcome the pre-existing context of scattered representative organizations of local communities and residents' general apathy and lack of trust towards public authorities.



*Co-design activity with the residents of the towers of via Russoli (RiceHouse srl., 2021)*

### Challenges with the deployment of participation tools

Challenges were also encountered in the deployment of the participatory tools, particularly due to the **COVID-19 pandemic**. However, the pandemic presented an opportunity to explore alternative ways of engagement, such as the use of innovative tools like the "Co-design Kits" in London – a digital tool embracing a mix of purposes such as connecting, learning, collaborating among the various local stakeholders. Additionally, digital tools proved also effective in reaching a larger group of stakeholders, although limitations were initially recognized in reaching out to elderly people which were later overcome through alternative digital co-design tools.

### Keeping stakeholders engaged beyond the co-design phase

Finally, the relevance of establishing and maintaining local stakeholders' network along the co-creation processes was widely recognized. In these regards, strategies and measures to keep stakeholders engaged beyond the co-design phase showed in all cases that the main approach was to involve them (where possible) in the implementation and/or management of the measures and deploy continuous communication about the NbS project developments.

For example, hands-on through co-implementation workshops was key to grasp people's attention and integrate them into the development processes, such as in the Hamburg case (see Arlati et al., 2021). Moreover, a multifaceted approach was deployed in London, which included continuous engagement through events, social activities, and get-togethers, keeping online channels open even after the co-design phase – beside the incentive-based participatory programme supporting the continuous engagement of key stakeholder groups i.e., civil society and project area residents. Similar approaches were also employed in Hamburg and Milan (see Mahmoud & Morello, 2021). Overall, the co-design of NbS involved a flexible approach in selecting and deploying various participatory tools, considering the unique framework conditions of each project area.



*Implementation of the mobile garden solutions in Hamburg (steg mbH, 2022)*

## Recommendations for future Co-design of Nature-based Solutions

Based on the CLEVER Cities experiences covered in this brief, the following recommendations on the stakeholder engagement activity are elaborated, targeting cities, public agencies, or non-state sector organizations responsible for developing and designing NbS interventions through enhanced participatory and collaborative approaches.

### Project teams in charge of the co-design of NbS interventions should ...

- Be aware of the local policy and regulatory landscape to navigate complex collaboration and engagement processes, both in terms of stakeholders to be engaged and participation tools.
- Carefully consider the flexibility and resilience of the stakeholder engagement process in a timely manner, particularly when trust among local stakeholders is scarce or formal policies do not govern the engagement process. The success of the stakeholder engagement activity along the co-design phase hinges on an understanding of the context-specific enabling factors for the engagement of key stakeholders as well as the willingness and ability to adapt to the process dynamics and/or changing landscape conditions (e.g., Covid-19 pandemic).
- Carefully assess and understand the different levels of relevance among stakeholders in terms of potential contributions to the co-design of the NbS and tailor their engagement strategies accordingly, including strategies for the less motivated stakeholders. End-users of NbS – like inhabitants or elementary school pupils – are key stakeholders for the co-design process. Their continuous engagement throughout the co-creation process can significantly contribute to increase the sense of belonging and identification with the interventions, thereby increasing also the impacts and success of the NbS.
- Ensure that the choice of participation tools is consistent with the overall stakeholder engagement strategy and adaptable to the specific needs and goals of the single stakeholders and the whole NbS project. The effectiveness of the participation tools should also be carefully and timely assessed, as well as aligned to existing participatory practices where possible.
- Consider each project's specificities and the team's skills in effectively managing stakeholder engagement in the co-design process, including specific stakeholder engagement needs and challenges. The integration of expert organizations able in capturing and integrating a broad range of perspectives into the design of the solutions, i.e., "co-design experts", as part of the project teams, may be a determining factor to the whole stakeholder engagement and co-design objectives.

### Guiding Template for Stakeholder Engagement in the Co-design of Nature-based Solutions

The template was initially conceived and used as a descriptive tool for the stakeholder engagement activity of the selected Nature-based Solution (NbS) cases investigated in this brief. Yet, practitioners from the partner cities widely agreed on the usefulness of the template beyond the CLEVER Cities project as a **prescriptive (guiding) tool** for stakeholder engagement in the co-design of NbS interventions.

The "Guiding Template for Stakeholder Engagement in the Co-design of Nature-based Solutions" can be found in the CLEVER Guidance under Co-Creation in practice.

## References & further readings

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# Urban Greening Plans

## Key Policy Implications from Applying an Integrated Planning Framework for Urban Nature

### Key Points

1. Urban Greening Plans are no-regret measures that offer cities an actionable and relevant strategy for addressing the impact of climate change and ecological degradation on human health and the environment and that support the EU Biodiversity Strategy 2030.
2. The Urban Greening Plan Guidance and Toolkit provide guidance to local governments seeking to enhance and restore urban nature and biodiversity for the benefit of plant and people.
3. Cities can learn from one another as they navigate their unique and common implementation barriers and enablers.

Cities are home to an increasing portion of the world population and a main driver of landscape change and biodiversity loss (IPBES, 2019). At the same time, cities have the potential to be hotspots for biodiversity and innovation (Connop et. al., 2016; Wilk et. al., 2021). Furthermore, the European Union (EU) has identified biodiversity loss as a key area of concern that threatens livelihoods and the health of human and ecological communities.

Urban Greening Plans (UGPs) offer governments an actionable strategy for addressing the impacts of biodiversity loss by utilising nature-based solutions (NbS) as a key approach in urban planning. Such plans systematically integrate nature into the structure of a city, achieving socio-ecological targets while keeping costs low (Wilk et. al., 2021). While there is political support for UGPs on the European level, current approaches to urban planning are often falling short of the challenge. There is thus a clear need to address implementation barriers through the creation of institutional frameworks, policies, and planning instruments that clarify goals, responsibilities, commitments, while considering multiple levels of government.

The NBS Replication Roadmaps developed in the CLEVER Cities project laid out a step-by-step approach to co-create an integrated planning document to foster NbS in cities. The Roadmap approach was later used as a template for conceptualising the key elements and process steps of the official guidance for cities to create their own Urban Greening Plan. The [Urban Greening Plan Guidance](#) articulates a 10 step process to prepare and implement a successful UGP which can be adapted and integrated according to the local context. Cross-

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**Urban Greening Plan:** a planning document or portion of a planning document that explicitly and intentionally integrates biodiversity-enhancing practices and structures into legally binding urban plans and policies, effectively weaving nature into the physical structure of a city or community. UGPs are an integrated planning framework for urban nature, and are ideally included in all planning processes.

**Nature-based Solutions:** defined by the European Commission as “solutions that inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits, help build resilience. They must therefore benefit biodiversity and support the delivery of a range of ecosystem services.”

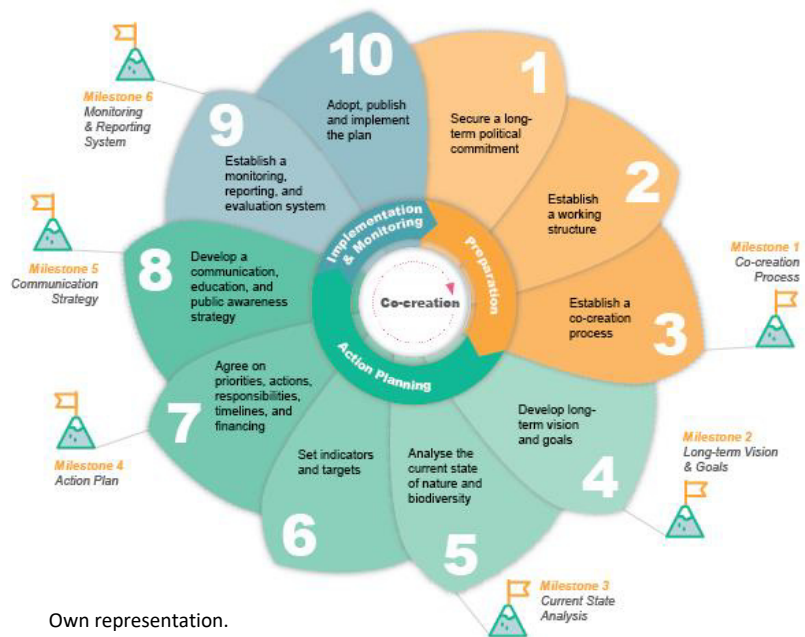
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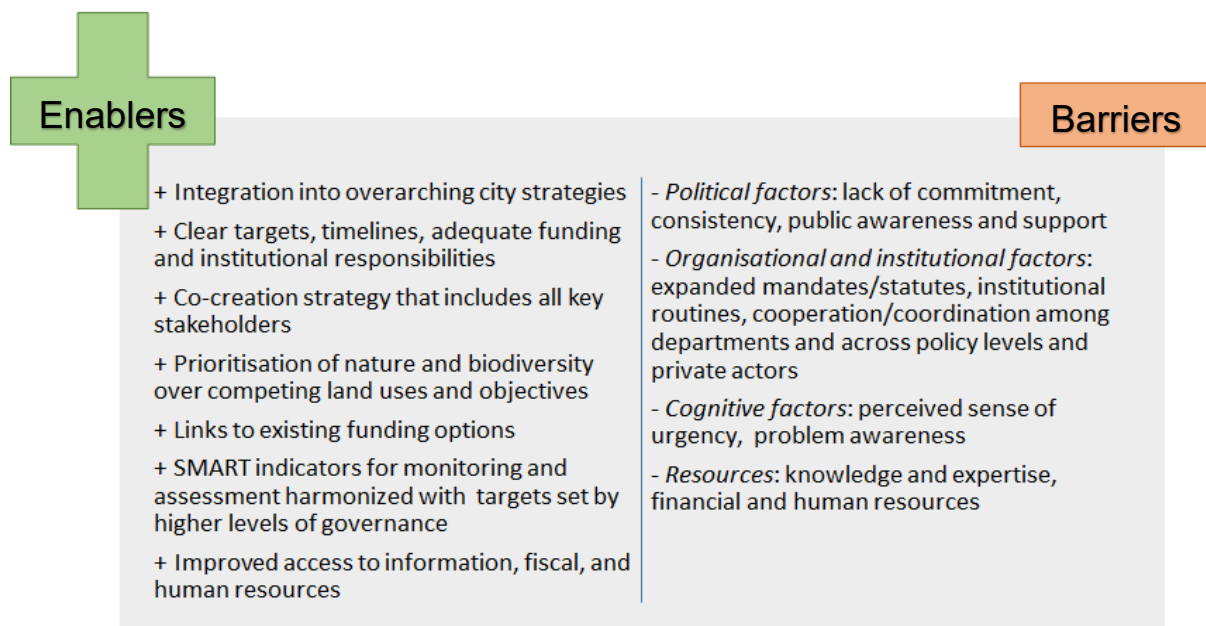
cutting all the steps is political commitment and meaningful engagement of different levels of government, citizens, and stakeholders:

It is possible that some of these steps may have already taken place as part of other planning processes and will only need to be updated as part of the UGP process.

These steps also provide insight into implementation enablers and barriers facing cities.



Own representation.



### CLEVER Case Studies:

#### Belgrade, Serbia

With support from ICLEI and local experts such as the Centre for Experiments in Urban Studies (CEUS), Belgrade applied UGP methodology for a Linear Park planning along a former railway corridor in the urban municipalities of Stari Grad and Palilua (23 ha). The development process began in 2019 with the establishment of a Task Force established by the Mayor, gathering over 40 institutions from diverse sectors. This invited the participation of a wide range of voices via focus groups and vision creation, workshops on plan development

process, and panel discussions with wider public etc. Community input continued with a **survey of local residents** that evaluated their priorities for urban green space and confirmed a desire for increased urban natural areas. Resident input was then used by participants in a subsequent Linear Park design contest for Serbian young transdisciplinary teams. Ideas from the winning teams formed the basis of the city's official strategy for the area.

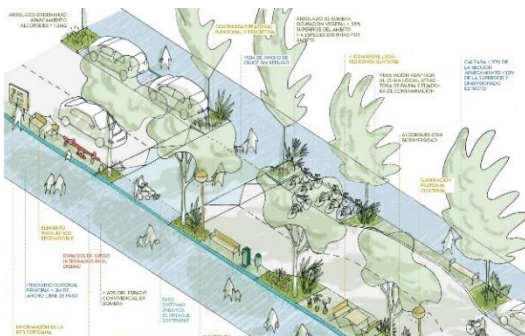
The planning process in Belgrade included the **first four steps of the UGP framework** and was finalised with a public debate, which was continued post-plan adoption. The key enablers were a **strong political commitment** and devoted testing of a **co-creation** as a central approach, while barriers were **insufficient capacities of public administration** and **lack of experience in facilitating a truly participatory decision-making process**. The most severe challenge was to **balance profit from the project between public and private sectors**, with particular concern how adverse effects, such as gentrification, can be avoided.

The success of the project is in part due to its **institutionalisation**: the Linear Park is a core activity in the Green City Action Plan. Further NBS have been integrated into additional official strategies such as the draft Belgrade Development Strategy and the draft General Urban Plan of Belgrade 2041. The city of Belgrade also intends to create a Green City Infrastructure Strategy (2023), which will utilise the forthcoming UGP Guidance and will upscale the Linear Park approach to include the entire city.

## Madrid, Spain

Madrid has created a working model for NbS that addresses urban regeneration, social cohesion, and climate resilience based on city experience developing a green corridor in one of the most vulnerable areas of the city. The development process began with a **holistic evaluation** of the intervention area and the definition of technical solutions that could drive urban regeneration. Concurrently, tools were either identified or created that would allow for the **monitoring and evaluation** of the intervention process, implementation, and socio-ecological outcomes.

Two particular areas of **co-creation** were identified as being of especial relevance: the participation of residents and interest groups outside the city administration, and cross-department city officials and staff. The co-creation process connected multiple municipal departments and external stakeholders in order to develop cross-sectoral and departmental projects. The aim of co-creation was not to impose NbS on communities or administrations, but to enhance its strength by integrating it into a wide range of urban plans and policies, for example urban regeneration, air quality and/or mobility plans.



Del río a Pradolongo' CLEVER CITIES project. Ayuntamiento de Madrid.

In Madrid, the UGP was used to trigger innovative work procedures and ensure the implementation of NbS throughout the city. This was done in part by **integrating greening in other city plans** such as mobility, and inscribing collaborative work schemes. Examples include refurbished schoolyards and surrounding areas or pedestrian projects that were developed using the **UGP framework**.

Madrid is currently defined by a siloed, vertical, and **rigid government structure**, which hampers the development of inter-departmental initiatives, cross integration of policy and interventions, and thus the inclusion of a variety of innovative planning models that are not clearly embedded in a given competency area, such as NbS. These interventions therefore consistently receive **inadequate support and attention** from decision makers. Creating an integrated UGP in Madrid revealed how much the success of NbS interventions hinges upon municipality structure, competency, regulations, and leadership.

#### Policy relevance and implications:

EU level recognition of the interconnection and mutual reinforcement of the climate and biodiversity crises is found in policies and initiatives such as the EU Biodiversity Strategy for 2030, the UN Decade of Ecosystem Restoration, the EU Green Deal, and the Kunming-Montreal Global Biodiversity Framework (EEA, 2021). The EU Biodiversity Strategy 2030 called for all cities with populations over 20,000 to draft an UGP to address biodiversity, climate change, and human health (Wilk et. al., 2021). UGPs are no-regret measures that offer cities an actionable and relevant strategy for addressing the impact of climate change and ecological degradation on human health and the environment.

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# Success Factors of Open Urban Data and Urban Data Platforms for Nature-based Solutions

## Key messages

- Nature-based solutions (NbS) are essential measures to address the challenges posed by climate change in urban areas, encompassing a wide range from flooding to heat islands and water shortages. The planning, implementation and monitoring of these solutions should be rooted in accurate and high-quality urban data to foster their efficiency and effectiveness.
- To enhance acceptance and adaptation to local challenges, NbS should be presented to and discussed with citizens and other stakeholders through a co-creation process. This approach allows for the incorporation of ideas and suggestions. Furthermore, continuous monitoring is imperative to assess their impact. The monitoring data should be made publicly available, enabling improvements in future implementations and driving technological progress.
- The successful execution and evaluation of NbS involve several steps: planning, co-creation, participation, construction and/or planting, monitoring, and maintenance. These steps have a higher likelihood of success when integrating open urban data provided by, but also publishing resulting data on, a user-friendly urban data platform based on open standards.
- The establishment of a digital strategy and an urban data platform are recommended, not least to support digital participation systems and significantly enhance co-creation in both the digital and physical realms.

In urban areas, nature-based solutions (NbS) are typically highly visible, audible, and tangible interventions. Yet there is another side to them, which is not immediately apparent but which can profoundly facilitate not only their (co-) planning, but also their (co-) creation, (co-) implementation, (co-) monitoring and (co-) evaluation: open urban data.

Several advantages emerge from utilizing open urban data from the public administration, made available through a centralized and easily accessible urban data platform, to plan NbS interventions and showcase the results digitally, opening up new possibilities across all stages of the NbS implementation process. In that way, an urban data platform is essentially an information hub or communication channel for NbS: while in the initial stages, NbS planning primarily requires urban data to enhance efficiency and effectiveness as well as for co-creation and digital participation, during and after implementation, the stakeholders may transition to the data provision side. They can use the urban

**Urban Data:** encompasses a wide variety of datasets, which may vary in scale, time reference, complexity, and provenance, but have in common that they represent information about urban spaces, such as green areas in the city, biodiversity information, playgrounds and schools, traffic light signals and public transport information, the availability of rental bicycles, cultural events, or weather data. *Open* urban data is publicly accessible, mostly provided by a central administration, and can be searched, used, and analyzed by anyone.

**Urban Data Platform (UDP):** is a comprehensive framework to integrate and interconnect urban data across various urban domains and fields of expertise, such as land use plans, social infrastructure, traffic, and environment efficiently and seamlessly. It empowers users - administration, companies, research, citizens - to access, visualize, configure, analyze, and evaluate data through standardized interfaces and user-friendly web applications and portals in real time depending on their needs. Thus, it facilitates quick decision making and prevents redundant data, additional cost, and duplicate work. A well-established production grade UDP is run by the Free and Hanseatic City of Hamburg (<https://www.en.urbandataplattform.hamburg/>).



data platform to disseminate information about the implemented NbS, the principal project outcomes, and its effects on the environment.

In this brief, we explore potential ways in which NbS processes can benefit from urban data and an effectively implemented urban data platform. We also discuss the challenges that may arise for all stakeholders and provide a real-world example from the Free and Hanseatic City of Hamburg, Germany, to help illustrate theory with practical experiences, and provide a list of resources for further reading.

### Utilizing open urban data (platforms) for nature-based solutions

To demonstrate the practicality and supportive possibilities of utilizing open urban data within the realm of NbS, we examine possible contexts in which such data could be used from three temporal perspectives: pre-greening, during greening, and post-greening. These are each described below in detail.

Pre-greening: Preceding the actual implementation, the existing urban data within an urban data platform can play a significant role in aiding the planning and co-creation of NbS.

- **Information about existing green areas and NbS:** Web applications based on an urban data platform may provide a good and comprehensive visual overview of already existing green areas, flora, and fauna in the city. For example, Hamburg provides the species register<sup>1</sup> and a portal for bathing waters and the current water quality<sup>2</sup>.
- **Identification, evaluation and selection of suitable areas and locations for NbS:** If an urban data platform provides mapping data on measurements such as temperature, precipitation, or air quality, optimal NbS locations, such as very hot and dry or frequently flooded places that would most benefit from NbS, can be identified by combining and overlaying these data sets. Likewise, satellite imagery could reveal particularly dry areas using object detection technologies, and habitat assessment data could indicate areas where protected species reside which may benefit of certain NbS. In this regard, the constant availability of up-to-date urban data and land use plans could significantly expedite the NbS planning workflow for local administrations as well as planning offices and other private companies.
- **Creation of platforms for cooperation and digital co-creation:** Digital and interactive platforms could utilize the openly provided urban data to present and illustrate the issues, challenges, and opportunities for NbS in a planning area. This could foster connections and collaboration among local stakeholders, including residents, to discuss current issues, create solutions and jointly develop ideas for improving the NbS and thus actively contribute and participate in the process. In this context, open urban data can find uses beyond maps and visualisations:
  - **Augmented Reality (AR)** might aid citizens comprehending NbS by explicitly visualizing positive effects on the surrounding environment.
  - **Chatbots** could provide citizens with quick and precise responses to individual questions as well as inform NbS project managers about frequently asked questions about the project.

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<sup>1</sup> <https://geoportal-hamburg.de/artenkataster/>

<sup>2</sup> <https://www.hamburg.de/badegewaesser>



During greening: Throughout the implementation phase, the urban data platform can serve to communicate progress.

- First, an urban data platform could function as an **information hub** for updates on the process. This could entail broadcasting photos to depict the ongoing progress or the provision of progress metrics.
- Additionally, a dedicated **project website** or other online platforms could use the data about the NbS provided on the urban data platform to gather and present even more information, such as feedback from the local media and if and how it influenced the construction, lessons learned during co-creation and co-implementation, details about inauguration celebrations, and suggestions on how citizens can get involved.

Post-greening: Once the NbS has been put into effect, the publication of data on an urban data platform can allow to easily integrate geolocation, description, technical information, and contact addresses in web and smartphone applications for information and promotional purposes while also ensuring transparency in the assessment and evaluation of the NbS impacts.

- Publishing the precise location and additional data of the NbS or an entire network of NbS may facilitate seamless **integration into third party applications**, including outdoor and hiking apps and services.
- Concerning **NbS monitoring**, the publication of monitoring results via an open urban data platform has several beneficial effects: Firstly, open urban data platforms are frequently used by many applications and web portals, which makes the data easily accessible and comprehensible for a broad audience. Also, the dataset might appear in a section - such as "newest datasets" - on the urban data platform information website and pique the interest of users who may not have previously encountered NbS. Secondly, data provision through standardised interfaces ensures easily accessible monitoring data. Available raw data makes published analyses more comprehensible, trustworthy, and traceable for stakeholders. It also improves direct comparability with similar projects in other areas.
- Thinking further, NbS might, especially when very technical systems with multiple sensors are installed, also feed log data into an urban data platform, which could then be used to feed applications for **predictive maintenance**.
- Offering NbS data via an urban data platform through standardized interfaces may facilitate **automatic harvesting of raw data as well as its metadata**. Consequently, datasets can be discovered not only within the platform itself, but also in other metadata portals, possibly encompassing a broader geographical scope. Examples are national and european data portals such as GovData<sup>3</sup> and the official portal for European data<sup>4</sup>.
- Openly providing data via an urban data platform can also enhance the overall **governance** of NbS. Publication of monitoring data, and other documents, such as records of discussions and decision-making processes, fosters transparency and accountability. This, in turn, improves stakeholder and community engagement as well as mass acceptance.

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<sup>3</sup> <https://www.govdata.de/>

<sup>4</sup> <https://data.europa.eu/en>

## Challenges in implementing an urban data platform

The opportunities of open urban data, not only for the context of NbS, naturally bring forth a few challenges that can momentarily overshadow the positive long-term impacts. An urban data platform is a central hub to access and disseminate urban data. But such a platform does not emerge out of thin air - the organizational and technical establishment of an urban data platform demands considerable effort from the public administration. Built on an essential political will and the commitment of the city's top leadership, this endeavor entails not just the provision of personal and financial resources. It necessitates the creation of an organizational unit that is responsible and accountable for conceptualizing and building such a platform. Additionally, it involves delineating responsibilities and fostering collaboration across a diverse range of administrative departments. On the technical level, it requires actual access to original datasets and their ongoing updates, and even, at times, digitization if they were originally created in analog format. This must be accompanied by scalable data storage solutions, the use of open standards, interfaces, and protocols for data and metadata storage and exchange. Data security must be addressed and, ideally, web portals (e.g. Masterportal<sup>5</sup>) facilitate data search and visualization. A Spatial Data Infrastructure (SDI) addresses all these requirements. Hence, a SDI serves well as core component of an Urban Data Platform. If the project is to extend beyond the prototype stage, the long-term costs associated with operation, support, and ongoing development need to be factored in. However, these costs are quickly balanced by cost savings resulting from efficient and easy data exchange as well as synergies.

While the administration can initiate the UDP with a limited set of open datasets, it can only come to real life when more and more entities from diverse areas of the public administration and potentially also academic partners and private companies are willing to open their data silos and actively share information about the city. Legislative measures can play a pivotal role in this process. For instance, Hamburg's transparency law enacted in 2012 obliges the administration to provide a substantial volume of information, data, and documents online without charge or the need for registration or application. It is important to note that this doesn't encompass data linked to individuals; urban data exclusively pertains to the city. This includes aspects such as maps, urban infrastructure, traffic, education, cultural offerings, services provided by the administration for physical activities, technology, and science.

On the other hand, the UDP truly realizes its utmost potential when the disseminated datasets are actively utilized. For instance, they can be harnessed in online map applications, which could be developed and offered by any interested party, including the administration itself, or in traffic and mobility analyses or more broadly to pinpoint the needs of citizens within the urban environment. To guarantee the applicability for various applications, the urban data platform should provide data through standardized interfaces, for example as advocated by the Open Geospatial Consortium (OGC). Additionally, data that isn't easily discoverable and accessible is data that remains untapped. Hence, adhering to a unified metadata scheme and not only making the raw data available, but also the accompanying metadata in an open metadata catalogue becomes imperative.

## Challenges for urban data in the context of NbS

The utilization of urban data from an urban data platform in co-creation for NbS presents new challenges which might impede the complete realization of the potential benefits. While it is the responsibility of the administration to ensure easy access to the urban data platform and provide urban data through readable,

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<sup>5</sup> <https://www.masterportal.org/home.html>

standardized protocols, complemented by informative and clear metadata and searchable in metadata catalogues, technical proficiency is also necessary on the side of the planners and stakeholders engaged in NbS planning and implementation in order to be able to autonomously and effectively engage with the data. As many of them are not data engineers, they might need to seek assistance from geoinformation experts. This may be compensated by reduced communication efforts with the administration to access the data at all. Upon employing the data in citizen-centered initiatives, one must account for differing levels of digital literacy, the digital divide, and the capacity to comprehend spatial information. The utilization of digital data requires extensive communication, education, and support. Yet, over time, it can result in invaluable advantages, fostering enhanced information sharing and data-driven decisions.

## Recommendations

For cities that are currently in the process of establishing a smart city or urban data platform and intend to leverage it in the context of NbS, we would recommend considering the following areas as initial steps:

- Laying the political groundwork through a digital strategy and/or laws ensuring urban data transparency
- Allocating budget and responsibilities to a dedicated team, department, or organizational unit
- Seeking guidance from administrations that have already succeeded in building an urban data platform
- Prioritizing user requirements, particularly those of NbS stakeholders
- Assessing existing technical infrastructure; leveraging an established geodata infrastructure can be very cost-efficient and thus advantageous
- Implementation of an IT infrastructure connecting existing systems with the urban data platform
- Promote the use of open standards for technical interfaces
- Implement organizational interfaces as well as a city internal UDP consulting unit
- Outlining a systematic process for coordinated integration of datasets into the platform
- Devising a communication strategy encompassing workshops, trainings, and online user resources

In the subsequent box, we describe the Urban Data Platform Hamburg, one of the most advanced production-grade Urban Data Platforms in Europe.

### **Real World Example: Free and Hanseatic City of Hamburg**

In Hamburg, the Urban Data Platform serves as the primary hub for open urban data, offering a comprehensive collection of over 3.700 datasets, of which more than 540 data sets feature information across various urban domains, such as population and society, health, environment, traffic, science, and technology. Critical political milestones that contributed to this achievement include the city's digital strategy, the Hamburg Spatial Data Infrastructure Law, the enactment of the Hamburg Transparency Law, and the implementation of the *Urban Data Hub* at the Agency for Geoinformation and Surveying. The Urban Data Hub is a central entity responsible for conceptualizing and developing the Urban Data Platform as well as advising the administrative authorities of Hamburg regarding urban data. The datasets are made available through standardized and interoperable interfaces, facilitating their integration into any geodata application. For the public, the most straightforward access point to the Urban Data Platform is Geo-Online (<https://geoportal-hamburg.de/geo-online/>), a web-based geodata portal designed and developed by the Agency for Geoinformation and Surveying as part of the city administration using open source technology (<https://www.masterportal.org/>). Geo-Online empowers anyone to visualize, inspect, combine, intersect, and download both the actual datasets and their accompanying metadata according to their unique requirements.

Both the Urban Data Platform and Geo-Online have already demonstrated their usefulness and success across numerous projects and domains. For instance, they have played pivotal roles in the EU projects *smarticipate* and *mysmartlife*, as well as the social planning tool in Hamburg (CoSI). Over the past years, their value has also been showcased within the scope of the CLEVER Cities project in Hamburg:

1. The data about green spaces and biodiversity in Hamburg played a crucial role in identifying suitable locations for NbS in the project area in Neugraben-Fischbek.
2. Particularly emphasizing the essential aspect of co-creation in CLEVER Cities, the Urban Data Platform furnished the indispensable informational foundation for several participation processes conducted using the digital participation system DIPAS. This wouldn't have been possible without the UDP: the city map and urban data relevant to the planning area were sourced directly from the UDP. This lends plans a tangible quality and empowers contributors to form opinions grounded in current urban data. For instance, the inaugural CLEVER-DIPAS process in Hamburg in 2018 unveiled the project area and invited citizens to propose locations and ideas for green and social enhancements.
3. The heavy rain drainage analysis, which was developed jointly with the local water supplier, Hamburg Wasser, utilized resources from the UDP, including the digital terrain model and land use data.
4. Data created, collected, or generated within CLEVER Cities in Hamburg, including geodata and monitoring data, may also flow into the Urban Data Platform and as such be available for investigation and analysis by any interested party. As an example, the CLEVER project areas, corridors, and active projects in Neugraben-Fischbek were published early in the project, recently supplemented with the biotope mapping of a rainwater retention basin.
5. The CLEVER Cities consortium collaboratively developed and introduced the CLEVER Data Hub (<https://clevercities.eu/resources/clever-data-hub/>), a public open data portal that offers a central search interface for data produced within the context of CLEVER in the local data platforms of the Front Runner cities, thereby enhancing the visibility and accessibility of CLEVER to a wider audience.

**DIPAS (*Digitales Partizipationssystem, digital participation system*):** Integrated digital system for citizen participation online and on site that operates seamlessly without media disruptions. Empowers citizens to access real-time information about ongoing urban planning projects, view digital maps, aerial photos, 3D models and other geodata from any location using personal digital devices. Additionally, it facilitates participation at events through digital data tables, enabling citizens to provide precise, location-specific feedback, suggestions, and critiques. Developed by the public administration of the Free and Hanseatic City of Hamburg, DIPAS has been made available as open-source software at <https://dipas.org/>.

## Conclusions

In summary, we see many possibilities and ways through which the utilization of urban data in the context of NbS can significantly bolster and streamline the planning phase, for example to identify the best spots and to intensify digital co-creation and participation and can even serve as a communication channel during and post-implementation. The digital integration with an urban data platform<sup>6</sup> augments project visibility, not only for regional entities but for a wider array of stakeholders, thereby augmenting transparency across the board. Moreover, other NbS projects may benefit from public monitoring and evaluation data over the long term. The use of open urban data is an effective way to expedite the development and realization of NBS projects, fostering collaboration among disparate stakeholders to tackle intricate challenges. To fully harness the advantages of an Urban Data Platform, open urban data should be conveniently and digitally accessible via standardized and interoperable interfaces and protocols. The data should be described by meaningful metadata presented in a standardized format. Additionally, the public administration should equip citizens with tools to promptly view and use the data, eliminating the necessity for technical expertise. In Hamburg, the incorporation of the CLEVER Cities project data into the Urban Data Platform guarantees

<sup>6</sup> <https://www.en.urbandataplattform.hamburg/>

their future availability, ensuring that they are accessible online and usable by anyone. This accessibility extends not only regionally but also internationally through the CLEVER Data Hub.

Looking towards the future, the notion of utilizing urban data within the realm of NbS could be expanded into the domain of urban digital twins. Essentially, the concept of the Urban Digital Twin is similar to that of a construction kit, where the building blocks are combined anew for each problem. An urban digital twin consists of multiple components: geo base data, specialized data, an application environment to render the technology accessible, and analytical tools to work with the input data. Envisioning an urban digital twin for the NbS context, the first component would encompass urban data, such as fundamental maps and orthophotos, while other components could contain data and tools which might be necessary for the detection and monitoring of NbS, including trees, weather data, a tool for heavy rain drainage impact analysis, a tool to detect sealed surfaces from orthophotos, and a tool for citizen participation. In the application component, predictive functionalities could be integrated to illustrate diverse scenarios detailing the effects of interventions on their surroundings. After implementation, the resulting monitoring data could also be integrated into the city's urban data platform.

### Resources:

Website of the Urban Data Platform Hamburg: <https://www.en.urbandataplatform.hamburg/>

UDP Cockpit: <https://geoportal-hamburg.de/udp-cockpit/#/>

Geo-Online / Geoportal Hamburg: <https://geoportal-hamburg.de/geo-online/>

Masterportal: <http://masterportal.org/>

Metadata Catalogue: <https://metaver.de/portal>

DIPAS: <https://dipas.org/>

CLEVER Data Hub: <https://clevercities.eu/resources/clever-data-hub/>

Heavy Rain Drainage Analysis: [https://clevercities.eu/fileadmin/user\\_upload/City\\_Publications/drainage-analysis-for-heavy-rainfall-neugraben-fischbek.pdf](https://clevercities.eu/fileadmin/user_upload/City_Publications/drainage-analysis-for-heavy-rainfall-neugraben-fischbek.pdf)

Hamburg's Transparency Law: <https://www.hamburg.de/transparenzgesetz/>

OGC: <https://www.ogc.org/>

Schubbe, Nicole, et al. "Urbane Digitale Zwillinge als Baukastensystem: Ein Konzept aus dem Projekt Connected Urban Twins (CUT)." *ZfV-Zeitschrift für Geodäsie, Geoinformation und Landmanagement zfv* 1/2023 (2023). Available online: [https://geodaesie.info/images/zfv/148-jahrgang-2023/downloads/zfv\\_2023\\_1\\_Schubbe\\_et-al.pdf](https://geodaesie.info/images/zfv/148-jahrgang-2023/downloads/zfv_2023_1_Schubbe_et-al.pdf)

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## Gaps and opportunities to sustainable urban development through nature-based solutions

The multifunctional character of nature-based solutions (NBS) enables them to provide responses to both social and environmental challenges. Analysis has shown that there is significant potential for NBS to help achieve sustainable urban development objectives. Nonetheless, challenges for mainstreaming NBS remain. While some of these can be addressed at the local level, others need to be addressed at the national and/or EU level with strong support from the international level.

### GAPS: LOCAL AND NATIONAL LEVELS

- **Lack of cooperation** across different administrative levels, agencies and sectoral departments
- **Time-consuming and bureaucratic administrative processes** due to public tenders, anti-corruption controls, etc.
- **Institutional inertia**, inflexibility to implement new ideas due to path dependencies, lock-ins
- **Lack of trust in the performance of NBS** and their potential to deliver benefits
- **Lack of awareness amongst citizens** about NBS initiatives and their multiple benefits
- **Lack of (innovative) financing mechanisms and investments** from the private sector (e.g. construction sector or property owners)
- **Insufficient revenue funding and municipal resources to maintain NBS interventions** after their construction has been finalised

### GAPS: EU AND INTERNATIONAL LEVELS

- No accepted standardisation of the NBS concept to date, instead **differing use of terms and related concepts**
- Sustainable urban development and NBS are not yet priorities on the political agenda; **lack of mainstreaming and integration of sustainable urban development and NBS across policies**
- **Lack of capacities and capabilities** of local authorities **to access EU funding** to implement local NBS supporting sustainable urban development
- Lack of EU funding for research on the cost-effectiveness of NBS and evidence backing up their implementation; **narrow scope of activities that are eligible for EU funding** at the local level
- **Communication gap regarding NBS benefits** and their relevance for different stakeholders

### OPPORTUNITIES: LOCAL AND NATIONAL LEVELS

- **Foster exchange of knowledge and experiences across cities** to develop and increase trust in NBS performance and benefits
- **Conduct cost-benefit analyses of pilot cases** to better inform decision-making and planning processes
- **Create demand for NBS** by encouraging public engagement and raising awareness among citizens directly and indirectly impacted by the planned NBS
- **Secure funding and resources for NBS** and their maintenance through planning obligations and requirements for developers
- **Strengthen NBS** in sustainable urban development **as a response to growing societal challenges**, e.g. for climate change adaptation (linked to stormwater management and flooding etc.) or in upcoming urban resilience strategies, sustainable urban mobility plans, and strategies for viable and liveable cities

### OPPORTUNITIES: EU AND INTERNATIONAL LEVELS

- **Policy reviews and revisions** can function **as entry points** through which the integration of sustainable urban development and **NBS** can be enhanced, particularly when NBS are framed as a tool to **help achieve multiple cross-sectoral policy targets** (e.g. SDGs)
- **Alternative funding instruments** such as public-private-partnerships or bottom-up financing could create opportunities to further strengthening sustainable urban development and NBS
- **Increased funding for research on NBS** evidence and cost-effectiveness via case studies and pilot projects could generate evidence and raise awareness about NBS
- **Financing pilot projects** which include local stakeholders in the co-creation of knowledge and empowering involved populations in order to increase the acceptance of NBS



## Local needs from the European and international levels

NBS is still a relatively **new concept**, which **lacks the experience and evidence** that is already established in technical standards for more traditional grey infrastructure solutions. As an example, there are **no clear requirements for NBS in the procurement process** in Malmö and cities state a **lack of specific knowledge and evidence** on NBS to support wider uptake (Madrid). Additionally, some cities find it hard to measure and predict the benefits (Malmö) or **doubt that there is actually a business case** for NBS.

Further research, sufficient best practice examples and the promotion of the relevance of NBS are thus crucial for cities in order to increase the acceptance of NBS among involved stakeholders such as decision-makers, practitioners, the private sector and civil society. In this regard, Hamburg has pointed out that **improvements generated by NBS implementation foster further uptake** of the concept. Sfântu Gheorghe explained: it is very important that a number of **European projects exemplify the importance and potential of NBS** in order to increase the interest of local stakeholders to duplicate these measures.

While the funding provided by research EU funding programmes, such as H2020, LIFE or BiodivERsA, already plays an important role in the creation of a knowledge evidence base and a narrative of NBS, **more case studies in different contexts** and with a streamlined approach to monitoring impact, cost-effectiveness, etc. are still needed. Furthermore, Sfântu Gheorghe identified the need for EU funding to **support the set up of multi-stakeholder partnerships**.

Local authorities often lack the capacities to access funding in order to implement NBS. In this regard, Larissa and Belgrade highlight that the **lack of common terminology** can be a hindrance when applying for funding in different programmes and Milan emphasizes the **relevance of EU structural funds** for implementing NBS in urban areas. Here, the objective to consider NBS and sustainable urban development as tools to support adaptation to climate change should be inserted. Furthermore, city representatives call for stronger **support of municipalities in navigating the complex funding landscape**, as well as for the **alignment of different funding programmes** to reduce the complexity of applications. In parallel, cities should continue to be provided with **guidance to support awareness of and access to available funds**.

Another issue in terms of financing that is criticized by city representatives is the fact that **EU funds** often focus on NBS implementation and individual projects, but **do not include funding to develop city-wide management strategies or plans for NBS**. In addition, London and Hamburg criticize insufficient funding possibilities to maintain the quality of an initial investment in NBS after the termination of a project.

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# What is Co-Creation of Nature-based Solutions?

## Key Points

### What does it mean to co-create nature-based solutions (NbS)?

*CO-CREATION means collaboration.*

*Empowerment of stakeholders.*

*Embeddedness of public participation*

*Breaking The Silos*

### What co-creation is:

Co-creation arose from the business world as 'the practice of collaborative product or service development: where developers and stakeholders are working together'. However, the evolution of co-creation in urban planning policies from a user-centred approach to a co-creative designing changed in the practice as well, since earlier 2007 emerging new domains of collective creativity.

### What co-creation is NOT:

- A 'utilitarian' relationship (use of the positive image of the partner without a real project).
- A client/supplier or service provider relationship.
- A short-term relationship or operation.
- A way of sharing social (NGO) and economic responsibilities.
- Sponsorship or philanthropy.
- A mere co-branding or labelling operation.
- A joint communication or public relations operation.

**Co-creation processes** are meant to engage diverse actors with different **knowledge and background** in a **reflective way** and bring them together **to strengthen** and **develop** the implementation and upscaling processes of NBS (Kabisch et al., 2016). NbS requires engagement with **multiple actors** (Raymond et al., 2017) and **social innovation** and **diversity** as fundamental aspects for co-creation (Frantzeskaki et al., 2019). Co-creating NbS goes beyond traditional approaches, introducing **connectivity** and **multifunctionality** along the process of restoring, co-creating, and co-designing urban green networks with nature (Dushkova & Haase, 2020). Moreover, co-creating NBS highlights the necessity to join efforts between local authorities, municipalities, and stakeholders to speed up the updating of sustainable solutions (Mahmoud & Morello, 2021; McCormick, 2020). Additionally, co-creation fosters productive collaboration of parties and result-oriented approaches (see Pater, 2009; Sanders & Stappers, 2008).

Comprehensively, the co-creation process for NbS should respond to some features and principles that are intrinsic in the pathway:

- (i) **be an iterative process**
- (ii) a **learning by doing** process (Bulkeley et al., 2016)
- (iii) **design thinking** (DeLosRios-White et al., 2020);
- (iv) a **locally adapted participatory process**.
- (v) a **creative** and **collaborative effort** (Wickenberg et al., 2021) of a variety of stakeholders.
- (vi) **thinking across boundaries** and
- (vii) **transdisciplinary** (European Commission, 2016) and **interdisciplinary** (Favre et al., 2017; Nesshöver et al., 2017).

Further to this, **planning** and **governance approaches integrated into policymaking** are considered **key aspects** for the success of co-creation implementation. According to Jansen and Pieters (2017, p. 4), **complete co-creation** processes are perceived as inviting and inspiring for cities to tap into their challenges, if the following principles are achieved:

- **Togetherness:** there is equal collaboration between all internal and external parties.
- **End-users:** they must play a central role in the overall process.
- **Ongoing:** the process is ongoing and participative in every phase.
- **Productive:** it leads to implementation of the co-created solution.
- **Transparent:** relevant information is accessible to all.
- **Supported:** supported by all stakeholders.
- **Value-driven:** results in value creation for end-users and involved parties.

#### What is special about co-creation of NBS compared to other types of co-creation?

- **NbS are living bodies**, which require constant care and maintenance. Hence, co-creation of NbS particularly stresses the continuous involvement of stakeholders, especially in the operational life of NBS, i.e., for co-maintenance and co-monitoring of solutions in place. In addition, the maintenance of green areas is a relevant economic cost for local governments, hence sharing responsibility with citizens and stakeholders is important.
- **NbS are manageable**, practical measures, easily achievable with simple co-construction (e.g., co-plantation) operations. This allows citizens to be involved in their production and maintenance, thus favoring the complete co-creation cycle, which is difficult to achieve in other urban regeneration application contexts where, on the other hand, the co-implementation of solutions by citizens is not feasible at all times.
- **NbS are place-based** which makes the co-creation process highly influenced by the context in terms of environmental and climate risks and hazards, as well as social impact. Co-creation processes hence become a melting pot of citizens engagement techniques with environmental analysis baseline information, to make it work at the ground scale.
- **Leave No one Behind:** Green creates a strong and empathic relationship with everyone. Everyone looks forward to connecting to nature, it is a primordial human need, and we aim to make nature accessible to all. Co-creation of NbS offers this opportunity to people, to get hands on with nature, from ideation to implementation and maintenance. This process needs time and shared governance schemes in order to succeed, which in its turn required the deep involvement of all stakeholders at different stages (co-design, co-implementation and co-management) and at different levels (information, collaboration, empowerment, etc).

## Co-creation in the CLEVER Action Labs and their characteristics

Co-creation process within the CLEVER Cities project follows an iterative pathway entailed in 5 phases and 16 steps with the aim to be as much transparent as possible for local authorities and their facilitators to feedback within the project different stages to check its process and open up for citizen engagement whenever possible.

Co-creation of NBS is experimented through CLEVER Action Labs (CALs), which are characterized by:

- The active involvement of the (end-) users in living lab activities so that they can have a clear impact in the innovation process and can ensure the legacy of NbS maintenance in the long term; Embracing all (or some) phases of co-creation, namely: co-planning, co-design, co-implementation, co-monitoring, and co-development of NbS.
- Testing and experimentation in real-life settings through a place-based approach.
- The use of multiple methods and tools originating from a range of disciplines and domains.
- The participation of a multiplicity of stakeholders (e.g., including the involvement of land managers, technology providers, service providers, relevant institutional actors, professional or residential end users).

### Real World Example : Milano Giambellino 129, Milan, Italy.



The CLEVER Action Lab of Giambellino Park 129, is an example whereas a complete co-creation process has taken place within the city of Milan. all images by Emilia Barone, PM, Milan local team.



### Policy relevance and implications:

- **Co-creation as the new business as usual:** Integrating co-creation pathways in planning and management practices in local authorities' routines, to ensure the successful implementation and maintenance of NBS in cities; for every urban green area project binding a co-creation pathway involving local communities.
- **Breaking the silos:** enhancing collaboration among institutions and divisions in local authorities, and bringing citizens closer to local authorities, and local stakeholders, thus increasing the sense of belonging to places and the overall success of NBS (Mahmoud, et al., 2021a; Mahmoud, et al., 2021b)

An online co-creation decision support system is being designed for practitioners and other interested groups allowing for different pathways to move through the process of co-creation of NBS. The tool will also help connect a community of practice who can discuss and improve content over time. The Beta Version of the support system is planned to be concluded by the Fall of 2023.

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