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GreenScape CE

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Joint Strategy on strengthening Nature-based Solution implementation in CE.

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A. Introduction

Green urban spaces, from parks and gardens to green roofs and urban farms, provide a wide range of crucial benefits for people's physical and mental well-being. They also provide opportunities for businesses and a habitat for nature. They increase quality of life, reduce air, water, soil and noise pollution, provide protection from flooding, droughts and heat waves, and provide city dwellers access to nature, enabling them to reconnect with nature. While the protection and development of urban green spaces have increased, green spaces too often still lose out in the competition for land as the share of the population living in urban areas continues to rise.

Building on the input and feedback from earlier activities, the aim of this Joint Strategy on strengthening Nature-based Solutions (hereinafter NbS) implementation in CE, properly integrated as part of the urban planning process, can help to reverse these trends and translate the strategic framework into Local Action Plans for Urban NbS (LAP) in each pilot area.

The Action Plans with concrete measures and interventions related to NbS serve as an overarching framework articulating, formalising, and showcasing a city's commitment to promoting the implementation of the Nbs and urban greening.

A Joint Strategy on strengthening NbS implementation in CE is not a stand-alone, one-off document. It should be an integral part of urban planning and of a long-term strategy for the future development of the urban area – in line with other strategic plans, such as inter alia, those for urban development, mobility, building, water, energy, climate change mitigation and adaptation, air and soil quality, waste and noise. Green infrastructure and built infrastructure need to be planned together. Therefore, while certain aspects of NbS implementation might be presented in one document, NbS also be an integral part of the entire urban planning process. The trategy outlines the strategic framework and what to take into account when developing Local Action plans of urban NbS and measures to strengthen NbS application in the urban context.

The purpose of this Joint Strategy is not to set concrete targets, but to create a vision and set the direction for strengthening NbS implementation in pilot countries and CE.

B. Background and Conceptual Framework

GreenScape CE aims to lay the groundwork for integrating green into grey infrastructure in urban areas thus contributing to climate-proof landscape and urban planning. Through improved policy, cross-border peer-to-peer learning and the cooperative development of Local action plans for urban NbSs, the project aims to equip local governments and communities with the necessary skills to set up and fund viable NbS projects to ease environmental and socio-economic impacts of climate change risks in urban areas.

Despite the highly differentiated biogeographical areas in CE, urban areas face similar challenges. Growing urban sprawl turns green into grey areas, leaving the urban areas more prone to the adverse effects of extreme weather events and climate change, intensifying the effects and occurrence of urban heat islands and urban floods, and leading to air pollution, health challenges, biodiversity loss, and growth in energy demand.

The comprehensive GreenScape CE approach will offer solutions to the CE cities' needs in climate threat through a number of activities that will address both the climate change and the governance aspects of the identified challenges.

By implementing the following innovative elements that go beyond existing practice, the GreenScape CE project focuses on practices that will contribute to integrating green into grey infrastructure in CE urban areas:

- Mapping the current and potential GI areas in pilot cities by using the existing environmental and spatial data – Such visual display is not available for many urban areas, and it will be used to draw attention to the areas that are more prone to be affected by the urban floods, air pollution, urban heat islands and other common climate challenges. A user-friendly visual map will serve as a coordination and communication mechanism that will enable easier communication about the GI importance with local governments, citizens and other stakeholders involved in capacity-building and decision-making activities of the project.
- Strengthening capacity building in the GI field and shaping the policy framework that will support the development of the NbS measures in pilot areas and foster integrated climate change adaption policies through a series of workshops with local government representatives and officers in pilot areas. Such a setup aims to encourage the vertical and horizontal integration of GI policies with the broader social, political and business priorities of the city and break the departmental and technical silos that are a common sight in governments of all levels. In parallel, GreenScape CE partners will engage local communities of interest through hackathon-style events to leverage community support and lay the foundation for the co-creation of NbS action plans and identifying pilot activities.
- Development of 5 action plans for implementing NbS in the pilot urban areas based on the participatory approach and decision-making involving decision-makers and local communities. Action plans will streamline the feedback on existing challenges and present the common solutions for tackling climate change in CE urban areas, proposing a new approach with evolving solutions, such as NbS, and not just the usual obsolescent grey solutions.
- Pilot actions will foresee the joint development of pilot actions for integration of NbS/GI in urban areas which will result in 3 solutions: citizen engagement and co-creation model, technical and tendering solutions and financing models. Build a pipeline of promising NbS projects based on the Local Action Plans in each pilot area through transnational knowledge exchange and by showcasing good-practice examples across the region to allow replication and exploitation of NbS.

- Develop a joint transnational strategy on implementing and funding NbS projects in urban areas with recommendations on integrating green into grey infrastructure and linking single NbS actions into a coherent GI network that expands outside the city borders.
- Initiate a transnational network of cities fostering peer-to-peer, trans-disciplinary capacity-building between cities implementing pilot actions and replicator cities. Initiating such a diverse community of urban areas will encourage open dialogue between stakeholders across Europe, engage replicating cities and potential re-naturing locations, showcase pilot actions and joint solutions and trigger a co-creation process that engages local communities.

GreenScape CE paves the way for integrating NbS and (GI) in the grey infrastructure in 5 CE urban areas, significantly affected by aggravating urban heat island effects.

1. Exploring the Context European Union in relation to NbS

The European Union has firmly positioned itself as a global leader in promoting and implementing NbS. The recently released EU Biodiversity Strategy for 2030, Strategy on Adaptation to Climate Change, and Forest Strategy - all representing key pillars of the ambitious European Green Deal (EGD) - rely on NbS to both preserve and restore ecosystem integrity and increase climate resilience. Although European research and policy have advanced the conceptualization and operationalization of NbS, a much wider adoption is needed to reach the ambitious goals of the EGD and fulfil its vision of transforming into a sustainable, climate-neutral, climate-resilient, fair, and prosperous EU by 2050.

The European Commission defines NbS as “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience; such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.”

The challenges addressed by the global processes are deeply interconnected and do not stop at national borders yet are often dealt with in isolation. In this context, NbS have come to the forefront for their potential to address multiple challenges in parallel while providing wider long-term benefits. NbS are cost-effective, locally adapted and resource-efficient solutions that are supported by nature and ‘simultaneously provide environmental, social and economic benefits and help build resilience’ by bringing ‘more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes’ (EC 2015). NbS are understood as an ‘umbrella concept’ for other established ecosystem-based approaches, such as ecosystem-based adaptation (EbA), mitigation (EbM), and disaster risk reduction (Eco-DRR), natural water retention measures (NWRM), sustainable management and ecosystem-based management and blue and green infrastructure (BGI) (Nature, 2017, Seddon et al., 2020; EEA, 2021). Central to the NbS concept is its emphasis on multifunctionality, i.e. the capacity to provide multiple and diverse benefits to people and nature in parallel (and the problem-centered approach. Accordingly, NbS target specific societal challenges, such as climate change mitigation and adaptation, disaster risk, food and water security, human health, and socio-economic development.

In the last decade, the EU has placed the ‘working with nature’ approach at the centre of several of its sectoral policies, including those on flood management (EC 2007), climate change adaptation (Ec, 2009, EC., 2013), biodiversity (EC 2011a), water retention (EC., 2012, Ec, 2014), and disaster risk management (EC 2011b). The EU Research and Innovation (R&I) agenda on the environment further introduced the concept of ‘innovating with nature’ to stress NbS's role in promoting a more resource-efficient and competitive economy, fostering economic growth and creating new jobs. The recently released EU Biodiversity Strategy for 2030 (EC 2020a), Strategy on Adaptation to Climate Change (Ec, 2021a, EC., 2021a), and Forest Strategy (EC 2021b), as key pillars of the ambitious European Green Deal (EGD) (EC 2019), rely on NbS to both preserve and restore ecosystems, increase resilience to climate change impacts, and manage forests

sustainably. In particular, the Biodiversity Strategy highlights the critical need for ecosystem restoration to achieve its aims. It foresees the development of legally binding EU nature restoration targets, focusing on ecosystems to capture and store carbon and minimize natural disaster impacts. The Strategy on Adaptation to Climate Change (Ec, 2021a, EC., 2021a) places NbS and related concepts as cross-cutting priorities due to their potential to cost-effectively provide multiple benefits. It calls for further EU funding and investment programmes to support NbS uptake across EU Member States, advance research on climate change impacts on ecosystems and NbS in particular, and develop robust ecosystem management measures to reduce climate change risks. Finally, the Forest Strategy (EC 2021b) embraces a closer-to-nature forestry approach to achieve sustainable forest management (e.g. through ecosystem-based approaches) and contribute to climate change adaptation and forest resilience. By supporting major EU policy priorities, NbS are expected to play a key role in fulfilling the vision of a sustainable, climate-neutral, fair, and prosperous EU set out in the EGD. Yet, while the EU has made important contributions to the conceptualization and operationalization of NbS, a much wider adoption is needed to reach these ambitious goals.

NbS for Climate change adaptation are increasingly implemented across sectors and geographic areas in Europe, particularly in those prone to the negative impacts of climate change (e.g. water management, forests and forestry, agriculture -including agroforestry-, urban, coastal and mountain areas). The increasing implementation of NbS for climate change adaptation has been evidenced by the EEA (2021).

Screenings such as this can reveal the type and scale of NbS measures implemented in practice, societal challenges addressed, and the degree of innovation and wider applicability of the measures in relation to governance and financing set-ups. It can also (to some degree) reveal the type of challenges encountered at the local and regional levels.

2. Building the strong partnership for NbS/GI in Central Europe

NbS have gained growing attention in recent years for their capacity to address global challenges. NbS have the potential to address all 17 Sustainable Development Goals. A strong added value of NbS is the multiple co-benefits they provide and the main challenge they are designed to address.

The formation of CENTRAL EUROPE partnerships and collaborations benefits the sharing of knowledge and resources by adding evidence-based best practices and stories of success and failure. This is a crucial step towards capacity building and awareness raising on the NbS concept and approach, which will further enable the design of even more effective, affordable and sustainable NbS interventions.

The GreenScape CE consortium consists of 12 partner organisations from six CE countries (AT, HR, HU, IT, PL, SI). It encompasses five pilot areas where NbS projects will be identified and participatory decision-making tested. The implementation of the GreenScape CE project leans heavily on the expertise of involved institutions, as well as strong and deeply rooted relations with policy and decision-makers in their respective areas. The project is committed to enabling the wider uptake of NbS in pilot urban areas by enhancing policy learning and improving multilevel governance structures that will enable better collaboration between decision-makers and local communities. Partner organisations represent a multitude of relevant types of organisations, each equipped with specific strengths and know-how that is complementary to other partners.

Out of five pilot areas encompassed by the project, three cities are included as project partners (Szegedin, Warsaw and Zagreb), whereas the other two urban areas (Milano Metropolitan Area and the City of Ptuj) are included as ASP.

Pilot areas will be supported in all their activities by facilitating partners: REGEA (Croatia), Energiaklub (Hungary), AMBIT (Italy) and ZRS Bistra Ptuj (Slovenia), all of which are active in their regions and have strong ties with key stakeholders from both private and public sector, some of which have joined the consortium as associated partners. Facilitating partners in each country will support creating the specifications for 5 NbS pilot actions and their implementation through preparing the initial documentation for those pilot actions in five different regions. A considerable number of potential replicator cities, communities and NGOs are included as ASPs from all parts of the project region and will provide inputs to ensure the transferability and dissemination of GreenScape CE results.

The partnership also consists of five knowledge partners who will act as specialists in their fields linked to green infrastructure and assist pilot areas in implementing key activities in pilot regions.

UIRS – a Slovenian public institute specialising in urban planning – will spearhead the development of a visual mapping tool to allow for easier communication about the GI importance with citizens and other target groups. ASTIPH is a Croatian teaching institute specialising in public health issues and will contribute to the consortium in identifying optimal NbS pilot actions based on public health and quality of life. Grün statt Grau is an Austrian competence centre well versed in developing and promoting the use of GI and NbS on buildings and implementing large-scale NbS demonstration test beds across Austria.

Knowledge and expertise gained through numerous NbS projects aimed at citizens and urban areas will support the development of pilot actions and enhance policy learning within the consortium. To support smooth capacity building and preparation for pilot identification, AMBIT with its expertise in green infrastructure and sustainable solutions will supervise the progress of setting the NbS in motion and will help out the facilitation of multi-level and transdisciplinary governance. Etifor, a Padua university spin-off with extensive experience in valuing NbS impact, will oversee the development of the joint funding solutions, whereas REGEA (also a lead partner) will supervise the development of pilot actions in cooperation with other local PPs. To ensure the sustainability of project results, ALDA+ will be in charge of disseminating the project knowledge across the CE region and will wield its network of local and regional authorities to communicate and connect with replicating cities and institutions.

Multidisciplinary and inclusive partnerships can foster the uptake of NbS in response to climate-related challenges. They can create and catalyse synergies between different parts of society by pooling together resources, skills, and knowledge. Involving citizens in urban decision-making can help to make cities more liveable, identify opportunities for implementing NbS, and create trust, ownership and stewardship.

This partnership can serve as a strong foundation for promoting NbS and can help to inspire future partnerships for, and investments in NbS.

3. NbS in GreenScape CE pilot cities

In the quest for sustainable urban development, the integration of NbS has emerged as a pivotal approach. The International Union for Conservation of Nature (IUCN, 2020) defines NbS as "Actions to protect, sustainably use, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits". This encapsulates the essence of leveraging the inherent capacities of nature to address pressing urban challenges while fostering both human prosperity and biodiversity.

In this pursuit, the pilot cities of the GreenScape CE project have demonstrated commitment in implementing various initiatives to integrate NbS, each tailored to their unique urban contexts. For instance, the City of Zagreb has recently invested significant effort in providing practical and concrete guidelines for implementing activities that systematically introduce NbS in urban environments, all to mitigate and adapt

to the consequences of climate change (Grad Zagreb, 2021). City of Szeged has prioritized the requalification of its city streets, incorporating natural elements such as trees and permeable paving to manage stormwater runoff, improve water quality, and create recreational spaces for residents. Meanwhile, the City of Ptuj, influenced by its historical context, is promoting sustainable development by emphasizing the nexus between the NbS and the preservation of the cultural and historical heritage of the city. To Metropolitan City of Milan has embraced the concept of Sponge City (original project name in Italian *Città Spugna*), implementing 90 NbS project throughout its whole territory, varying from desealing, bioretention areas, infiltration trenches, tree box filters, detention basins, wetlands, bioswales, permeable paving etc... (Città Metropolitana di Milano, 2022). The city of Warsaw, on the other hand, is actively promoting green urban development through initiatives such as encouraging businesses to collaborate with the Green Areas Managing Authority, incentivizing citizens to build water retention facilities while implementing eco-friendly projects that integrate rainwater storage and greenery. Considering these diverse yet impactful initiatives, the pilot cities participating in the GreenScape CE project are embarking on a collaborative journey. Recognizing the importance of shared learning and cross-city collaboration, the project envisions an ongoing exchange of knowledge and experiences among the pilot cities. The aim is to collectively harness the potential of NbS for sustainable urban development, ensuring that the unique local contexts of each city are considered in the project's implementation process.

As outlined in Deliverable D1.1.1. Typology and criteria for planning CCI/GI/NbS', the pilot cities have taken a step forward by collectively defining 17 specific NbS, applicable in the urban context, that will be explored throughout the project. These solutions span a wide spectrum, encompassing measures for biodiversity conservation, climate change adaptation, historical preservation, community engagement, and economic development. The participating cities will delve into the benefits offered by each solution, meticulously studying their adaptability and effectiveness within their respective urban landscapes.

The diverse types of NbS encompass:

- Bioswales designed to manage a volume of runoff from a large impermeable area, such as a parking lot or a road.
- Infiltration Trenches/Strips are constructed to promote the infiltration of runoff volumes through the top surface of the trench and their subsequent filtration into the subsoil through the sides and bottom of the trench.
- Bioretention Systems and Rain Gardens are shallow depressions in the ground covered with vegetation, designed for collecting and treating rainwater drained from surrounding impermeable surfaces through filtration and removal of pollutants.
- Tree Box Filters are small biofiltration systems composed mainly of three elements: a box, soil, and plant species. These systems allow for completely natural filtering and purification of water, similar to bio-retention areas, while combining the major advantages trees provide in urban environments, such as reducing heat islands and improving air quality.
- Detention Basis are shallow vegetated spaces designed for temporary surface storage and flow control of rainwater. They also facilitate some settling of particulate pollutants.
- Retention Ponds and Constructed Wetlands are basins with a permanent body of water where rainwater is conveyed and can be designed to serve multiple objectives, such as attenuation, rainwater treatment, increased biodiversity, and recreational potential of the area.
- Permeable Pavements ensure the surface runoff of rainwater that permeates into the ground through modular elements, such as concrete blocks or reinforced plastic mats, characterized by voids or joints filled with permeable material (sand or gravel), allowing the infiltration of runoff water.

- Green Barriers are used to protect residential, protected, or recreational areas from noises produced by roads, highways, railways, and industrial plants. By passing through a vegetation strip (trees, shrubs, tall grass), the sound is forced to undergo a tortuous path that tends to degrade it into heat.
- Green Facades and Living Walls refer to all different forms of vertical vegetated enclosures. Greening can be achieved with plant species planted on the ground, with support panels and containment elements anchored to the facade, or through modular structures integrated into the vertical enclosure.
- Vegetated Pergola and Pergola Pathways are portions of sidewalks equipped with supporting structures for shrubs and climbing plants that can quickly create a shaded path, protected from excessive sun exposure and, to some extent, from automobile emissions and noise.
- Green roofs are a particular finishing solution for the covering of a building, characterized by a vegetative installation on a waterproof structural support layer. Green roofs differ from all other types of roofing because the visible "finishing" material is made up of plant species rather than inert materials.
- Balcony Gardens are greenery on balconies and terraces, even in limited spaces, that can produce interesting effects in terms of mitigating summer temperatures inside the rooms and acting as a filter for atmospheric pollutants.
- Street Trees generally refer to the arrangement of trees along city streets, including residential neighbourhoods, transit roads, traffic arteries, or squares. Street trees represent a relatively small fraction of the urban tree heritage but play a crucial role in terms of visual impact, air pollution from traffic, and climatic comfort.
- Urban Forestation, according to FAO, is a network or system that includes forests, groups of trees, and individual trees found in urban and peri-urban areas. This includes forests, street trees, plants in parks and gardens, but also those present in abandoned areas. Urban forests are the "backbone" of green infrastructure, connecting rural and urban areas and improving a city's environmental footprint.
- Community Gardens are public spaces with sociocultural and environmental purposes. Unlike traditional public gardens, community gardens involve active citizen participation in the creation and/or management of a revitalization project for abandoned or unused spaces to make areas more livable and enhance opportunities for social interaction.
- Pocket Parks and Parklets are small-scale urban design tools, intermediate spaces between the public and private dimensions, to revitalize and stitch together fragments of the city by creating a network of green spaces experienced by citizens. They are typically the size of a building lot, generally bordered on two or three sides by adjacent buildings or facing the sidewalk.
- Urban Farming and Urban Orchard hold a high potential for innovation and knowledge closely tied to specific contexts (local markets, social relationships, urban space utilization, traditions, cultural heritage, etc.), playing sociocultural, environmental, recreational, educational, and therapeutic roles. Simultaneously, urban orchards represent agricultural activities with potentially significant environmental impacts, considering the substantial inputs required to support production. Therefore, particular attention must be paid to soil fertility conservation, rational water resource management, protection of crops from weather conditions and pathogens, and minimizing the use of chemical substances.

An essential criterion for the successful implementation of NbS and GI lies in their multifunctionality, designed to yield a diverse array of benefits that extend beyond their primary purpose. Therefore, while delivering environmental benefits, it is crucial to ensure that improvements to the urban area do not inadvertently lead to negative social effects, such as gentrification. Instead, a focus should be placed on fostering social inclusion and equitable community engagement.

Moreover, recognizing the intricate interplay between communities and the environment, the approach of co-creation, co-design, co-implementation, and co-management (additionally co-monitoring) emerges as a

guiding principle. NbS and GI interventions should ideally be forged through collaborative efforts, engaging local stakeholders, residents, technical experts, and policymakers to shape and execute these solutions collectively. By involving diverse perspectives, these initiatives are more likely to effectively address the needs and aspirations of the community they serve.

In tandem with this collaborative approach, a fundamental consideration is the site-specificity of NbS and GI interventions. These solutions ought to be meticulously tailored to each specific location's unique characteristics, challenges, and opportunities. A one-size-fits-all approach is inadequate in the face of the dynamic urban landscape; hence, a keen understanding of the local context and its intricacies is indispensable in crafting interventions that resonate with the immediate environment and its inhabitants.

Following these main principles of multifunctionality and integration, the co-creation method, site-specificity, and social inclusion and equity, public officers and local decision-makers are empowered to strategically plan and implement comprehensive NbS and GI and Climate Change Initiatives (CCI).

C. Framing NbS in Urban Planning

As cities struggle with issues ranging from climate change to population growth, the exploration of NbS becomes not just a choice but a necessity for shaping resilient and harmonious urban landscapes. This chapter delves into the multifaceted realm of NbS in urban planning, unravelling their significance, benefits, and the transformative potential they hold for the cities of tomorrow.

We find ourselves amid the urban century, a period defined by the pervasive influence of urbanization driving extensive global environmental transformations. These changes, in turn, impose stress and substantial disruptions on both urban life and ecosystems. While cities worldwide may differ significantly, they share a commonality in the concentration of people, infrastructure, and economies. This concentration creates and amplifies risks stemming from climate change, pandemics, and economic downturns. The prevalent model of urban development tends to cover natural elements in cities, leading to increased heat retention, heightened flooding risks, and the displacement of human and ecological communities. Simultaneously, this development model offers efficiencies and opportunities to support the ever-expanding global population.

The current urban landscape accommodates 4.2 billion residents, all needing quality housing, food, clean water, and a healthy living environment. This demand is projected to escalate, with an anticipated two-thirds of the global population residing in cities by 2050 (UN Habitat 2018; Dodman et al. 2022). Consequently, we stand at a pivotal juncture, contemplating how to construct new cities and retrofit existing ones, regions, and neighbourhoods to align with our shared normative goals for present and future generations.

Simultaneously, ongoing environmental crises fueled by human activities, including climate change, biodiversity loss, and pollution, persistently steer us towards dystopian scenarios dominating discussions about our collective future. The escalating frequency of threats such as rising sea levels, landslides, air pollution, and extreme weather events like heat waves, wildfires, floods, and droughts poses substantial global risks to communities and infrastructure. Cities, where human populations and values concentrate, are especially vulnerable, particularly those in low-lying coastal areas facing intensified development.

Many coastal cities are at an elevated risk due to the growing exposure of people, infrastructure, and economic activities to coastal storms and rising sea levels. This risk is not exclusive to coastal areas; cities worldwide face heightened vulnerability to extreme heat resulting from the compounding impacts of urban heat islands, rising temperatures, and air pollution. Urban regions already experience more than twice the warming observed in non-urban areas, with projections suggesting that some of the world's largest cities could see a temperature increase of up to 7°C by 2100 (Estrada et al. 2017). As the toll of extreme events continues to rise, there is an urgent imperative to integrate sustainable and resilient solutions into urban planning in the Anthropocene era.

This shows that water, on the one hand, can be a threat to cities and urban areas, but on the other hand, it is a precious good, which already shows its scarcity in many areas. Measures to manage heavy rainfall or water scarcity directly contribute to the resilience and safety of cities and settlements. Ecological building and planning also include rainwater management's technical, economic and ecological scope. The basis for this at the European level is the EU Water Framework Directive (Directive establishing a framework for Community action in the field of water policy), the EU Floods Directive (Directive on the assessment and management of flood risks) and the EU Waste-Water Directive (Council Directive 91/271/ECC concerning urban waste-water treatment).

Cities globally are adopting ecological and nature-based designs, encompassing green and blue infrastructure, as alternatives and complements to conventional "hard" and "grey" engineered infrastructure. This shift aims to address and adapt to the challenges of climate change and urbanization. Simultaneously,

urban ecological infrastructure, also termed as nature-based solutions to societal challenges, not only helps mitigate environmental issues but also provides various urban services, such as recreational spaces and opportunities for social interaction, for the benefit of urban residents.

4. The planning process

The planning process of Local Action Plan for Urban NbS is based on a coherent methodology, which consists of steps that build on each other. The aim of LAP for Urban Nbs is to reinforce the key aspects of the planning NbS/GI by emphasising better and more consistent processes and highlighting examples of good practice. A good LAP balances the needs and aspirations of the community with the requirements of the planning authority (if any) and the expectations of developers and other stakeholders. It provides a framework for delivery that guides quality and facilitates consistency in development management.

In the next chapters, we will walk you through its most important elements and will provide specific instructions as a guide to creating your Local Action Plan for Urban NbS.

Figure 1. Methodology for drafting of the LAP

We present the logic and the proposed detailed structure of the LAP:

- Proposes steps to better understand the city/neighbourhood -will outline the strategic framework and what to take into account when developing Action plans and measures to strengthen NBS application in the urban context.
- Introduces the tools which can be used to deliver the LAP on city or neiberhood level.
- It helps to identify very specific neighbourhood/city-level actions.
- Supports the setting of priorities and the allocation of resources.

At the end we are presenting the ready-to-use templates that can and will be applied during the planning process, specifically:

- The detailed template of the local plan.

Those responsible for coordinating the NbS planning process on city level will probably benefit more if they start by carefully reading the Strategy. However, they can use it more like a reference document whenever a question comes up during the planning process.

The most pragmatic part of the document is the collection of specific steps- these have been designed in a way that they can be easily applied as they are or with minor modifications (certainly after translation to the local language) in the appropriate phase of the planning process.

5. The role of NbS in urban development: multiple benefits

Let's delve deeper into the benefits and considerations associated with the implementation of NbS in urban environments to enhance resilience against the impacts of climate change and mitigate heat-related challenges.

Cities stand to gain substantially by embracing NbS, which extend beyond the immediate advantages of heat reduction. Green infrastructure, such as parks and urban gardens, not only serves as carbon sinks, aiding in climate change mitigation but also fosters biodiversity, promoting a healthier and more balanced urban ecosystem. Diversifying plant species in these green spaces enhances aesthetics and contributes to ecological resilience, creating habitats for various fauna and insects.

In urban planning, an additional layer of sophistication can be achieved by incorporating intelligent design principles beyond mere aesthetics. Integrating urban greenery strategically can act as a buffer against extreme weather events, reducing the risk of flooding by absorbing excess rainwater. Moreover, it provides an opportunity to create interconnected green corridors, facilitating wildlife movement and gene flow, thereby contributing to the preservation of urban biodiversity.

Water Retention

Water management, a critical component of resilience-building, can be further augmented by integrating nature-inspired solutions. Wetland restoration within urban areas can act as natural water filtration systems, enhancing water quality while providing additional recreational spaces. Incorporating blue-green infrastructure, such as sustainable urban drainage systems and green roofs, helps manage stormwater runoff, reducing the burden on conventional sewage systems and mitigating the risk of urban flooding.

Integrative rainwater management offers the possibility of keeping the rainwater - which falls on built and sealed surfaces - in the natural water cycle and, therefore, relieves the burden on sewers. Rainwater infiltrates on-site, replenishing the soil with water, securing drinking water, and allowing for evaporation processes through plants and soils, which bring about a cooling effect (microclimate creation). Additionally, it supports the efficiency of waste-water treatment plants. It provides financial benefits for the public through reduced flood damages, as well as financial advantages for flood protection measures (heavy rain event management). Rainwater management can be quantified: The runoff coefficient indicates the portion of precipitation water that drains after a rainfall event. A value of 1.0 means that 100% of the precipitation drains away. Steep roofs have runoff coefficients ranging from 0.8 to 1.0 depending on the roughness of the covering material, gravel flat roofs have approximately 0.7, and green flat roofs up to 0.3. Gardens can absorb up to 100% precipitation (value 0.0 - 0.1). In a block perimeter development with a courtyard that is 50% sealed, the average runoff coefficient without roof greening is 0.72. Full roof greening reduces this to 0.48 in this example. Therefore, roof greening in this example reduces the rainwater discharged into the canal by approximately 30%. Retention-optimized construction methods and intensive roof greening can even achieve higher values (GRÜNSTATTGRAU, 2021).

Innovations can represent new elements of sustainable, integrative rainwater management and (among other things, in roof greening or infiltration and retention systems) make a valuable contribution to the small-scale structuring and differentiation of habitats. They thereby lead to an increase in biodiversity and provide highly diverse living conditions for flora and fauna. Additionally, they create open space functions and enhance existing open spaces. Integrative rainwater management must, therefore, always be

considered on a large scale (settlement level, neighbourhood level) and consist of various components that are integrated as objects in and around buildings as well as in street and green spaces.

Sponge City

The sponge city principle approach allocates more space for plant roots even under streets, parking lots, and sidewalks, enhancing their performance. Led by the Austrian Society of Landscape Architecture (ÖGLA), the "Sponge City Working Group" actively advances practical solutions. In Austria, specialized companies strive to provide technologies for various applications, focusing significantly on building greening. Some of the applications include:

- Special substrates and layer constructions with enhanced retention capacity and installation criteria (e.g., Stockholm System component) for urban trees and shrubs
- Permeable pavement systems as alternatives to asphalt, concrete, and similar materials
- Rain garden complete systems as applications for public green spaces, streets, or front yards
- Retention and detention layers, components, and corresponding control systems for integration with conventional greening structures of all kinds
- Rainwater management-optimized designs for roof and façade greening
- Multifunctional retention areas such as floodable and over-dustable parklands
- Application of plant-based sewage treatment principles to various construction methods for onsite purification and reuse of rainwater, graywater, process water, and blackwater
- Integration of the sewage treatment plant with energy production from the green infrastructure itself (Bio-electrochemical systems - BES)
- Infiltration trenches and pipe infiltration: Rainwater is directed either above ground into a gravel-filled trench (infiltration trench) or underground into a perforated pipe embedded in gravel or other material (pipe infiltration). If plastic hollow body elements are offered, the storage volume is 95%. This requires minimal excavation volume and surface area availability. Elements are available in the market that can be installed beneath traffic areas.

Greywater

Irrigating green infrastructure with greywater is already common practice in many countries around the world, offering a sustainable and future-oriented alternative to resource-intensive irrigation with fresh water. In Europe, however, using a previously underutilized water source is not well established. Nevertheless, the necessary laws and standards for greywater recycling exist. Comparisons with plants irrigated with freshwater showed only minor species-specific differences and chlorophyll content and growth was not affected by greywater irrigation. Furthermore, only a slight increase in soil pH and electrical conductivity was observed. Thus, reusing greywater for irrigation purposes represents a long-term stable water resource to ensure the necessary water availability for climate-effective greenery in minimizing the Urban Heat Island Effect. (Hofbauer, 2022)

Air Quality and Evapotranspiration

The diverse effects of building greening are the subject of intensive research activities. There are now scientifically well-established findings in this regard. Green infrastructures on buildings can be used to address various challenges in building optimization and urban development. Roof greening has pronounced effects on the surface temperature of buildings, affecting both the exterior and interior temperatures and the heat transfer through the building's external components. Compared to bitumen and gravel roofs, roof greening can reduce surface temperatures by up to 17°C. The heat input on summer days can be reduced

by 30-60% compared to a gravel roof. Irrigation can lower surface temperatures by 4°C. The evaporation capacity of green roofs averages 45% of the annual precipitation, and with optimized designs, it can reach up to 100%. Lowering the air temperature by a maximum of 1.5°C at the roof level can reduce the Urban Heat Island Effect (BuGG, 2019).

In summer, humidity levels can increase by 20-40% compared to non-greened areas. Green roofs also contribute to air purification, showing a 10-20% higher filtering capacity than non-greened roofs. The CO2 absorption capacity of a three-year-old green roof is 0.8-0.9 kg/m2. Another valuable effect of green roofs is the retention and storage of rainwater. With extensive greening, up to 70% (during the growth phase 80-90%) of rainfall can be retained, while green roofs with a storage capacity of 30-160l/m2 can retain 60-99% of rainfall. In comparison, gravel roofs retain only 18% (BuGG, 2019).

Biodiversity

Increasing biodiversity and creating habitats are among the most significant potentials. Especially flying flower visitors such as bees, butterflies, beetles, ants, bugs, ladybugs, as well as bird species, benefit from the plant varieties. Approximately 230 wild bee species that use green roofs as nesting sites and food sources have been identified so far (BuGG, 2019).

Building Protection

Considering the inflation of weather extremes, rooftop greenery serves as a natural shield against the destructive forces of hail, providing an additional layer of defense for buildings. Especially in the larger size range (tennis balls), extreme roof damage occurs, with such projectiles penetrating all roofs; in some cases, even roof rafters are knocked off. Even with low winds, such chunks can shatter windows, completely destroy cars (windows hit by a 1 cm chunk may already shatter), dismantle any lighting, and cause deep, large dents. At this size, holes also appear in grassy areas if they are not planted on extremely hard ground. Tiled roofs can be damaged by hail as small as 4 cm in diameter. Perforated roofs can occur from a size of 6 cm. Following the extreme roof damages, water damage usually ensues, affecting the entire house when heavy rain and meltwater invade the unprotected attic.

The vegetation, including resilient plant species, acts as a physical barrier, absorbing and dispersing the impact energy of hailstones. The complex structure of the green roof, comprising soil, vegetation, and additional layers, functions as a natural cushion, reducing the velocity and potential damage caused by hail. This protective layer not only mitigates the risk of structural damage but also extends the lifespan of roofing materials, making green roofs a sustainable and resilient solution in regions prone to hailstorms. The Institute for Fire Protection Technology and Safety Research in Linz (Austria) tested the impact of hailstones up to 5 cm in diameter on green roofs, consisting of 8 cm in substrate height, which sufficiently protected the roof structure below from damage.

Furthermore, the insulating effect of a green roof structure leads to a reduced heat loss in winter, which can decrease by 2-10%. Additionally, green roofs contribute to reducing indoor noise levels. The substrate on the roof absorbs sound, reducing it by 8 dB when dry and 18 dB when moist, while street noise is reduced by 6 dB. Moreover, the greenery protects the roof from weathering and extends the lifespan of the sealing by reflecting and absorbing 40-80% of solar radiation. Economically, green roofs are cost-effective, constituting only 0.4-1.3% of total building costs. A solar green roof can increase the yield of a PV system by 5%. Through a multifunctional green roof of 5,000m2, utilizing rainwater harvesting and cooling effects, up to €6,000 in electricity costs can be saved annually (BuGG, 2019).

Green facades offer similar positive effects to green roofs, albeit with different impacts on the surrounding temperature. 8-19 °C can reduce the surface temperature of the facade, and green facades can extract up to 2.4 kWh/m2 of heat per day from the surroundings. Green facades contribute more to reducing the heat island effect due to their vertical position than green roofs. On extremely hot days, a reduction in air

temperature of up to 5°C is possible, while the relative humidity increases by 20-40% in summer and 2-8% in winter.

The leaf fall of ground-bound climbing plants can generate a biomass calorific value of 23 MWh/ha per year. Air purification effects were investigated on a 1000m2 area with a 20 cm depth of ivy, showing a CO2 sequestration of 2.3 kg/m2a and an oxygen production of 1.7 kg/m2a.

Green facades can enhance building insulation, with the effectiveness depending on the construction method. Wall-mounted systems achieve up to 7°C higher temperatures in the ventilation layer during winter, while ground-bound climbing plants like ivy exhibit a temperature difference of 3°C between the outer leaf surface and the façade. A reduction in transmission heat losses compared to uninsulated facades by up to 25% has been measured. Additionally, ground-bound greenery with ivy or Virginia creeper causes sound absorption of 2.7-5 dB, while wall-mounted systems absorb 4-9.9 dB depending on construction and substrate thickness. Climbers, especially scaffold climbers, effectively impact the indoor environment by serving as vegetative sun protection and shading elements, resulting in a 43% cooling cost savings. The foliage absorbs 40-80% of solar radiation. The shading rate by deciduous climbing plants is 70-95%. These plants offer attractive habitat, nesting places, and food sources for various bat, bird, and insect species, promoting urban biodiversity. (BuGG, 2019).

Beyond that, green facades offer a unique acoustical benefit by significantly reducing ambient noise levels in urban environments. The dense vegetation on building exteriors acts as a sound absorber, dampening and diffusing noise generated by traffic, industrial activities, and other urban sources. The leaves, stems, and soil collectively absorb and reflect sound waves, effectively lowering the overall sound intensity. This natural sound reduction is particularly beneficial for buildings situated in busy urban areas, contributing to a more peaceful and conducive living or working environment. Additionally, green facades can act as a barrier that prevents the direct transmission of sound, further enhancing their role in mitigating noise pollution and promoting a harmonious urban landscape.

Expanding on the concept of cooling surface materials, innovations in material science offer novel possibilities. Advanced materials with enhanced reflective properties can be explored, and their thermal conductivity optimized to ensure more effective heat dissipation. This not only aids in surface temperature reduction but also contributes to the overall energy efficiency of the urban environment.

D. Engaging the whole community

Overall, civil participation identifies issues, creates and promotes meaningful social discourse and solutions in communities. When citizens know about and use their ability to voice opinions in political deliberations concerning pivotal issues and decisions, it can lead to greater transparency, acceptance of decisions and trust in their elected representatives.

What are the benefits for all?

Civil participation in decision-making can foster a democracy more inclusive, transparent, and efficient, ultimately benefiting the local authorities, citizens and the entire community as a whole.

Benefits for Local Authorities and Elected Officials:

Building trust and legitimacy: When the public authorities regularly involve citizens in making decisions, it shows that they care about what everyone thinks. This makes people trust the public authorities more, and they're more likely to work together to follow the plan and contribute to implementation. When people have a say in decisions, they're more likely to accept the results. Building trust is a long-term process which requires commitment from public institutions.

Better decisions and getting things done: When the public authorities listen to what people say, they learn about what is important for citizens. This helps them make better decisions. It also makes it more likely that the authorities' plans succeed and help ensure that public money is spent effectively.

Finding out about problems at an early stage: Talking to people early on can help the government find and fix problems in the community before they become big issues. By talking and working together, they can prevent arguments and make everyone agree on what's best.

Benefits for Citizens:

Being more empowered: Participation in decision-making can empower citizens by giving them a direct role in shaping policies and initiatives that affect their lives.

Having better services: Citizens who provide input to decisions related to public services, such as healthcare, education, or infrastructure, can make these services better suited to their needs and preferences.

Learning about policy: Involvement in participatory processes educates citizens about policy issues and the democratic process itself, fostering greater civic awareness and engagement and resulting in a stronger democratic society.

Building a stronger community: Through participation, citizens interact with their neighbours and fellow community members. This can strengthen social bonds and a sense of community.

What conditions are supportive for a participatory process?

The following supportive conditions for participation further enable people to take part in the decision-making easily:

- Culture of engagement between the public authorities and citizens to make sure that there is a common understanding of the goal and objectives, experience of previous engagement and knowledge of procedure.
- Commitment to an inclusive participatory process on both sides, in order to ensure that the principles of meaningful participation are respected, there is a readiness to complete the process, as well as learn from it.

- Availability of resources, which refers to skilful human resources, financial budgets or other material resources necessary for preparing and carrying out the process.
- Sufficient time for carrying out meaningful engagement, as well as use of various methods in case necessary.
- It is rarely possible to have all perfect conditions in place; however, with time and reiteration, there will be opportunities for feeding back into the process and improving these conditions.

Enabling environment for civil participation

Participation requires all involved to honestly and sincerely exchange viewpoints to ensure that the positions are effectively considered by the public authorities with decision-making powers. The enabling environment for engagement with citizens and civil society is, therefore, very important to the overall success of participation.

The right to participation, or as you can sometimes see "the right to participation in the conduct of public affairs" is a composite right. This means that for it to be successfully implemented in practice, states must conform to and guarantee such fundamental freedoms as freedom of expression, association and assembly and absence of reprisal in case the citizens' opinions do not coincide with the official line.

How to engage the community in urban development and transformation?

Questions to consider:

- Why is civil participation important to you, your community or your organisation?
- What do you want to achieve through civil participation? What are your expectations?
- When you look at the current governance landscape in your area, which groups do you think are missing from the conversation?
- Are the conditions for civil participation, including legal framework, supportive for participation? If not, how could they be strengthened, and situation improved?

While it is important to choose an appropriate method for a civil participation process, the choice of method is the wrong place to start when planning. Before selecting the method, it is important to establish what the civil participation process aims to do, which participant groups it needs to reach out to and the history of the issue. It is also important to gain buy-in from decision-makers and key stakeholders. Ideally these considerations should be thought through before the choice of method is made.

Choosing a method for civil participation

Planning a civil participation process can feel overwhelming due to the number of methods available. It is not possible or necessary to know all methods of participation.

There is no perfect method for every process; the choice of a tool must be based on your situation. In many cases multiple methods are needed to reach all intended participant groups, or to achieve the desired outcomes. Below are the aspects you must consider when choosing different civil participation methods.

Background

It is important to understand the situation in which you are trying to carry out civil participation. What is the history of the policy area you will focus on? Has there been a lot of conflict around the issue? Has civil participation been attempted previously, and if so, what was the result? If the issue is complex or conflict prone you might want to select methods that are particularly good at managing such situations, e.g. facilitated discussions, targeted reach out, smaller focus groups.

Purpose

It is important to understand what you and others want to achieve through civil participation. The goals might be to raise community awareness, gain more information on public preferences before a policy decision, or develop policy solutions together with the affected groups. Once you are clear on what you want to have at the end of the process, you can identify better methods than others for delivering these results. For instance, participatory budgeting can be a good way of mobilising communities and creating a sense of empowerment. However, it would not be a good method for gathering the views of a representative sample of the population. It can also be useful to reflect on the levels of participation and to try to identify how much influence the participants will have in the process. Also, consider how much time and budget you have available, since some methods, such as citizens assemblies, are more time and resource-intensive than others.

Participants

Do you have a particular number or type of participants in mind? Some methods work well with large numbers of participants, such as citizen cafés; others are better suited for smaller groups, such as focus groups. You also need to consider whom you want to engage with. Are there inequalities and/or barriers to participation for certain groups? Certain methods might work better for particular groups but not others; for example, varying levels of digital literacy mean that digital approaches might exclude certain groups, or on the contrary, not using digital may not attract the younger generations.

Technology

Technology provides new ways for individuals and groups to participate in public policy and decision-making. Civil participation can take place online, offline or in a hybrid format. It is rarely useful to restrict oneself to one approach, and what works best depends on the situation and people involved. If the geographical area you want to cover is large, you might need to consider digital methods to enable people in far-flung areas to participate. New tools are constantly being developed, especially in the digital field. However, electronic platforms are only a means for participation rather than an end in themselves. Setting up a government website or posting a document online doesn't automatically mean this will constitute a meaningful consultation.

Questions to consider:

- On what level do you think most participation happens in your city? Is it realistic to move to other levels of participation?
- What civil participation methods do you and your organisation have experience of?
- What civil participation methods do you and your organisation need to learn more about?
- When running civil participation processes, do you prioritize certain groups? And what are best methods for them to take part?
- How could you build your and your organisation's skills and competencies around civil participation?

E. Interconnected challenges and opportunities

Navigating the intricate landscape of NbS implementation within the GreenScape CE pilot cities unveils a web of interconnected challenges and opportunities that shape the trajectory of sustainable urban development. This narrative delves into the multifaceted nature of these challenges, acknowledging the symbiotic relationships among them and identifying potential opportunities for transformative solutions.

In the realm of NbS planning and implementation, a myriad of critical questions arises, demanding interdisciplinary knowledge and collaborative approaches. These questions encompass site selection, societal challenges addressed by NbS, technical requirements, financial mechanisms, maintenance considerations, stakeholder involvement, justice considerations, and the utilization of planning tools.

Urban environments, in particular, introduce additional challenges, such as spatial competition, altered ecosystems, stakeholder inclusion for environmental and social justice, cultural path dependencies, and the misconception of cities as devoid of nature. The choice of NbS type is intricately linked to regulatory frameworks, financial constraints, and geophysical factors, with considerations for stormwater management, financial availability, and suitability based on soil type and climate.

Understanding the interconnected challenges and opportunities in implementing NbS within pilot cities involves a comprehensive assessment juxtaposing the existing scenario with the envisioned condition. In the GreenScape CE project, such an analysis evaluates key considerations for each aspect: technical, financial, and engagement. The following sections outline the primary challenges encountered in each aspect, while Deliverable 'D1.1.2. Gap analysis of barriers and opportunities in deploying NbS/GI on the local level' systematically describes the challenges for each pilot city and the opportunities these cities envisioned for their desired future.

6. Technical issues

The planning and implementation of NbS pose a variety of critical questions: Where should NbS be built or invested in within a city? Which areas need revitalization or regeneration through NbS? What type of NbS is best suited to address a specific societal challenge and sustainably fits the local context to yield additional benefits? What are the technical characteristics and requirements for the selected NbS? What are the maintenance and sustainability requirements for NbS? What is necessary for planning and implementation, and which stakeholders must be involved? What justice considerations should be considered in NbS planning? What planning tools and approaches exist for NbS? All these questions require an interdisciplinary knowledge base and a collaborative approach across disciplines to guide their development and design.

In urban areas, special challenges must be considered associated with specific requirements for NbS implementation. These challenges include potential conflicts in spatial competition heightened by urban density; the unique environmental conditions in cities with anthropogenically altered ecosystems, habitats, and limited connectivity, leading to significant impacts on biodiversity; the need to involve multiple stakeholders and values in NbS planning and governance to enhance environmental and social justice conditions; the presence of long-lasting path dependencies in the cultural and planning history of each city; and the need to address the misconception that cities are artificial, technological landscapes devoid of nature.

Regulatory frameworks, financial considerations, and geophysical factors influence the choice of NbS type. In the United States, hybrid engineered NbS such as bioswales are often implemented to meet stormwater management regulations tied to new urban development. Financial constraints and funding availability also play a significant role in selecting NbS. Geophysical factors like soil type and climate influence the suitability of NbS, with considerations for infiltration and groundwater recharge.

Understanding the long-term function of NbS and their spatial placement present challenges. Temporal changes, including sediment accumulation and reduced infiltration, impact NbS performance over time. Maintenance requirements vary between ecological and engineered NbS. Spatially, catchment science engineering guides NbS placement based on hydrologic hotspots, optimizing stormwater management. However, practical challenges, such as land acquisition and stakeholder coordination, often dictate opportunistic NbS placement.

One area where our understanding is lacking involves how NbS function over time and in specific locations within a catchment area. Factors contributing to temporal changes include the gradual accumulation of sediment and pollutants, decreased infiltration rates, and alterations in maintenance practices that impact physical, chemical, or biological processes. While many models assume consistent performance, long-term field studies reveal significant variability, ranging from stable performance to hydrological or water quality efficacy declines. While some NbS, particularly those with ecological features, may require minimal maintenance, others, especially engineered solutions, may need ongoing upkeep to sustain their water resilience functions.

Another challenge concerns the optimal spatial positioning of NbS. Engineering approaches in catchment science aim to place NbS strategically, focusing on hydrological hotspots where concentrated runoff converges, such as areas critical for stormwater management. Advancements in high-resolution spatial data enhance our ability to identify and target these hotspots more effectively. While centralized locations might offer efficient runoff collection, distributed NbS systems can provide greater redundancy, resilience, and better mimic pre-development hydrology, managing floods more effectively.

However, practical, socio-economic, and political hurdles, such as land acquisition issues in optimal locations, pose significant challenges. For instance, large-scale floodplain restoration might necessitate the purchase of properties and coordination among various stakeholders and agencies. Consequently, the placement of NbS often becomes opportunistic, utilizing available land resources as they become accessible. (McPhearson et al., 2023).

Maintenance of green walls and roofs

When it comes to buildings, it's important to ensure permanent accessibility to green areas for maintenance. In cases where ladders aren't sufficient, lifting equipment should be used, and both access to and the setup area for this equipment must be legally secured. Regular checks should be conducted on growth aids and wall-mounted systems to detect any damage, such as corrosion, breaks, or overloading. Plant control on facades and roofs should be done routinely, especially after extreme weather events. Removing dried-out or faded parts helps reduce the fire risk, while pruning is necessary to prevent thick growth in sensitive areas and maintain the planned growth pattern. Dry leaves, branches, and flowers can be seen as a nuisance or pollution and should be managed through appropriate plant selection and seasonal cleaning. Additionally, the biomass, including leaves and green waste, can be reused for soil production or energy generation. (Pfoser et al., 2014)

Knowledge Gap and Governance

The successful implementation of NbS hinges on a robust understanding of their functions, performance, and benefits. However, accessing this knowledge can be challenging due to its scattered nature and complex presentation. Moreover, the lack of high-performing private companies in the field of urban forestry and sustainable drainage can hinder NbS implementation. One solution is to involve local stakeholders, including technical experts and city department staff, in project design and delivery. Efforts to improve information sharing and learning from past experiences are mainly happening at a higher scale but need to be systematized at the city level. This involves incorporating diverse perspectives and expertise to achieve multiple benefits such as climate adaptation and improved well-being. City planners may need to engage external experts and facilitate public discussions during the design process. Promoting successful projects

and official certification can also raise awareness about NbS. Additionally, considering local constraints such as soil type and climatic conditions is crucial for effective NbS implementation. Overall, evidence-building should rely on locally sourced knowledge to address region-specific factors.

NbS highlight the potential for positive interactions among environmental, economic, and social systems, offering multiple benefits. For instance, green spaces designed for various purposes like sports, recreation, and community gatherings can also aid climate adaptation and enhance neighbourhood aesthetics. However, achieving such multifunctionality requires effective governance structures, which can be challenging for local authorities accustomed to departmental structures. Often, single-objective solutions that cater to individual departments are prioritized over hybrid or multifunctional approaches. Additionally, tensions may arise between different levels of government due to varying political ambitions and legal responsibilities related to NbS governance and management. Overcoming these challenges demands authorities to break out of traditional structures and collaborate on cross-departmental planning, asset management, and budget allocation. Clear delineation of responsibilities and coordination among departments are essential for successful collaboration. Involving external experts, such as those from universities, can facilitate collaboration by certifying the usefulness of cross-departmental solutions and mediating between departments. Ideally, city governments should establish horizontal positions within their political and management structures to enhance coordination and policy integration. (Schmalzbauer 2018)

Trade-offs and Public acceptance

NbS aim to achieve environmental, social, and economic objectives simultaneously. However, planning and implementing NbS can be challenging due to potentially conflicting interests among stakeholders, each focusing on different goals. One approach to address this challenge is to involve a wide range of stakeholders early in the process, increasing understanding of diverse goals and priorities. Additionally, during the planning stage, it's crucial to identify synergies and conflicts between economic, environmental, and societal interests, along with potential trade-offs, and communicate this information clearly to all stakeholders. Spatial mapping and assessment tools, like those used in Liverpool and Adelaide, help locate, identify, and quantify the functions and services of green infrastructure within a city. In some cases, hybrid solutions combining green and grey infrastructure elements can be beneficial in addressing multiple priorities while minimizing trade-offs, leveraging existing infrastructure where possible.

A lack of public support can hinder the successful implementation of NbS for various reasons. Resistance may stem from a lack of appreciation for environmental benefits, concerns about increased costs for implementing and maintaining green spaces, distrust in projected costs and benefits, or fears of rising housing prices due to 'eco-' or 'green gentrification.' Consequently, vandalism risks may arise, necessitating sensitivity to NbS locations and their potential social impacts. To address concerns about gentrification, anticipated effects on property values can be assessed during planning, with the active involvement of the local population to support neighbourhood stabilization efforts. Involving social policy experts and economists in NbS planning can help address these issues. Environmental education and capacity-building initiatives can inform the public about NBS benefits while engaging children and youth in project activities can enhance community support. Additionally, landscape architects' involvement in NbS co-design, combining ecological functionality with aesthetic principles, can increase acceptance and reduce vandalism risks.

Upscaling

Scaling up NbS faces various challenges in terms of co-design and implementation. Barriers include the lack of quantitative evidence for successful upscaling, increased pressure on governance structures, and potential conflicts over land ownership. The upscaling process requires collaboration among different actors and departments, along with the transformation of knowledge, practices, and technologies to a larger scale. Land ownership issues, where financial interests may override environmental goals, can also pose a significant challenge. Institutionalizing the upscaling process involves aligning city objectives, stakeholder

views, and expected NbS benefits with spatial plans, business models, financing mechanisms, and delivery and maintenance mechanisms. Regulatory measures and financial incentives, such as mandatory green roofs on new buildings or subsidies for green spaces, can promote NbS proliferation. Strategic collaboration with business incubators can support promising start-ups in the field. Lastly, the tension between place specificity and replicability necessitates flexible design approaches for marketable NbS to adapt to specific needs. (Schmalzbauer 2018)

7. Financial issues

NbS can help tackle climate change and advance urban sustainability by using nature to deliver social, ecological and economic benefits. However, their success largely depends on implementation, for which several barriers exist.

One of the main obstacles to their upscaling is related to funding for the different phases of the NbS project, which generally include:

- Initial investment: covering transaction costs and NbS design
- Implementation-related investment: covering operational costs
- Self-sustaining financing: covering the long-term running costs (e.g., maintenance)

The financing barriers to mainstreaming NbS in urban areas are diverse, and for simplicity, we can consider them divided into 3 main macro-categories:

Cultural and knowledge barriers

- **Cultural divide**: Problems relating to the "cultural divide" are most evident among smaller municipalities, i.e. a lack of specific skills with respect to NbS. This problem is less noticeable in larger cities. Professionals who should deal with the proposal and development of this kind of intervention should have multidisciplinary and transversal skills (engineering, urban planning, ecology, natural sciences, among those most frequently mentioned). Furthermore, the "engineering" vision adopted by technicians often does not allow for the consideration of broader aspects related to sustainability and impact, such as the provision of ecosystem services and their possible trade-off. In this sense, there is a need to facilitate the knowledge dialogue (also by encouraging the transition between academia and project implementers). Cultural barriers also emerge from **citizens**, as a lack of knowledge of the impacts of these solutions and a lack of clear communication of the benefits is often reflected in resistance to accept these kinds of interventions and a reluctance to pay a potential tax increase.
- **Grey Infrastructure Default:** Public authorities have extensive experience and expertise in these projects, leading to a tendency to favour them. Overcoming this challenge involves not only finding technical experts but also educating municipalities about the cost-effectiveness and additional benefits of nature-based projects (Urban20, 2020)

Financing barriers

- Input Costs: In Europe, input factors for NbS projects, like labour and land, are generally expensive. The high land cost and opportunity cost further inhibit potential investments (European Investment Bank (EIB) and Bankers without boundaries, 2023).
- Maintenance Costs: As NbS are long-term projects, it's important to consider their maintenance costs to ensure they continue to provide benefits effectively.

- Low Returns: Investors might perceive NbS projects generate inadequate returns - such as debt repayments or income streams - compared to established technologies. The perception may be that NbS is more expensive to manage or maintain (Brears, 2022).
- Short-termism: Investors favour short-term profits, which conflicts with long-term NbS projects requiring substantial upfront capital and offering long-term returns. The extended timeframes and uncertain natural world risks create a higher risk profile, discouraging many investors (European Investment Bank (EIB) and Bankers without boundaries, 2023). Moreover, the need to intervene in an emergency or in a fast way, following a post-intervention action rather than a preventive one, leads to a preference for interventions capable of producing immediate impacts.
- Perceived Higher Risk: Limited historical cost-benefit data for NbS, unlike the extensive data available for grey infrastructure, increases the perceived risk associated with NbS projects in economic analysis (Brears, 2022).
- Limited Financial Advisory Support: The sector lacks adequate access to financial advisory assistance for municipalities and urban project promoters (European Investment Bank (EIB) and Bankers without boundaries, 2023).
- Grant Dependency: In Europe, the dominance of grant funding in the NbS market creates challenges. This dominance limits the project pipeline for other kind of investors (e.g., commercial investors) excludes different types of repayable investors, and hinders the construction of an efficient project pipeline (Fi compass, 2020).
- High Transaction Costs: Research and administration costs in developing and financing small-scale NbS projects can significantly hinder project implementation when transaction costs are high (European Investment Bank (EIB) and Bankers without boundaries, 2023).
- Municipal Borrowing Constraints: Municipal budget constraints and national restrictions on indebtedness hinder urban project implementation. Public financing shortages push for private and citizen investments, sometimes becoming obligatory. Citizen groups' unequal benefit from public goods can reduce willingness to pay taxes, impacting public funding availability (Fi compass, 2020).

Structural barriers

- **Information gaps:** Limited, asymmetrical, or absent data on climate change and environmental risks lead to uninformed decisions. Projects struggle to gather relevant performance information for informed investment decisions, resulting in 'information failure.' (European Investment Bank (EIB) and Bankers without boundaries, 2023).
- **Impact assessment issues:** A well-known problem is also the difficulty of measuring and monetizing the impacts generated by NBS solutions, which also highlights the potential effectiveness and efficiency compared to traditional grey solutions. In this way, companies fail to account for the benefits and obtain additional financing resources.
- **Place-Based Complexity:** The complexity of NbS projects varies significantly based on the local context, such as differing land ownership and regulations. This localized nature makes direct replication challenging, hindering the scalability of investments in NBS in Europe (European Investment Bank (EIB) and Bankers without boundaries, 2023).
- **Undervaluing natural capital**: Being unable to account for all the costs and benefits of natural capital is one of the biggest challenges for the economic support of NbS projects. Neglecting the externalities linked to environmental degradation leads to underestimating biodiversity risks, influencing misguided policy and investment choices (Brears, 2022)

8. Engagement issues

Engaging communities and stakeholders is a crucial aspect of the integration of NbS in planning, promoting collaboration, and ensuring the sustainability of projects and initiatives. The effectiveness of NbS depends not only on its technical and financial feasibility but also on the level of involvement and support from local residents, businesses, and institutions. In this context, addressing engagement issues becomes of utmost importance. Understanding the dynamics of engagement is also crucial for overcoming obstacles and leveraging the collective knowledge of communities to integrate NbS into urban environments and beyond. Contrarywise, NbS serves as the foundation for social cohesion and fosters citizen engagement with nature.

The challenges in engagement for NbS are multifaceted. On one front, citizens often lack awareness and understanding regarding the services and benefits offered by NbS/GI. This gap in knowledge can hinder community support and active participation in NbS initiatives. On another front, public officials, crucial players in the decision-making process, may also grapple with a lack of awareness and understanding of NbS. The unfamiliarity of public officials with the services and benefits that NbS can provide may impede the integration of these solutions into broader urban planning frameworks. Additionally, public officials' knowledge base is limited for implementing engagement strategies, highlighting the need for targeted education and capacity-building efforts to bridge these awareness and knowledge gaps.

Furthermore, the challenges extend to potentially conflicting priorities and interests among citizens and stakeholders, adding complexity to the engagement process for NbS. Balancing divergent concerns and aligning interests becomes essential for fostering collaboration. Additionally, there is a notable lack of motivation among citizens to allocate time for engagement activities.

Other challenges encountered in navigating effective engagement include communication barriers, time and resource constraints, such as the substantial time commitment required for engaging citizens, socio-economic disparities, and the challenge of ensuring long-term commitment. Communication barriers can impede the flow of information and understanding between stakeholders, hindering collaborative efforts. Time and resource constraints pose significant challenges, particularly when engaging citizens, as the process demands a considerable time investment. Socioeconomic disparities add an additional layer of complexity, as diverse communities may have varying access levels, resources, and priorities. Overcoming these disparities is crucial for equitable participation and the success of NbS initiatives. Additionally, ensuring long-term commitment from all stakeholders is a persistent challenge, as shifting priorities and interests may impact sustained support for NbS efforts.

Insufficient communication between municipal or institutional departments, and unclear roles, poses another significant barrier. When communication channels between different departments are lacking, there is a risk of fragmented efforts and a lack of synergy. Departments may operate in isolation, unaware of each other's activities and objectives related to NbS. This lack of coordination can result sometime in duplicated efforts, inefficient resource allocation, or even in missed opportunities. Without a clear delineation of tasks and responsibilities, there is a potential for key aspects of NbS implementation to be overlooked or neglected. This ambiguity can impede decision-making processes and hinder the overall progress of NbS initiatives. This becomes the first obstacle that also impedes the engagement of stakeholders and citizens. Clear channels of information exchange, regular meetings, and collaborative platforms can help foster a shared understanding of goals and activities.

F. Strategic goals and benefits

NbS have been gaining momentum in the past few years. On the international stage, 2022 was a pivotal year for incorporating NbS in key intergovernmental agreements. In March 2022, the fifth United Nations Environment Assembly adopted 14 resolutions to strengthen actions for nature to achieve the Sustainable Development Goals. Among these, world governments formally agreed on a definition of NbS.

At the UNFCCC COP27, NbS emerged for their potential to address climate change and featured in the Sharm el-Sheikh Implementation Plan. The Egyptian COP27 Presidency, Germany and IUCN also announced the ENACT initiative for NbS.

Both the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC) recognise the role of NbS in addressing the twin biodiversity and climate crises.

Civilisations throughout the ages and across the planet have attempted to harness and utilise the power of nature, often with some success (in the short- or long-term) but also in ways that have caused great social, economic, and environmental harm. However, human-induced global warming, climate change, environmental degradation, and biodiversity loss – caused by pollution, lost or damaged natural habitats and urban sprawl – have all placed greater emphasis still on how our societies modify ecosystems, how we access their benefits or utilise their services, and how we protect ourselves from natural threats and disasters.EC emphasises that “NbS must benefit biodiversity and support the delivery of a range of ecosystem services”.

It further emphasises that “NbS must benefit biodiversity and support the delivery of a range of ecosystem services.” Urban and rural communities alike rely heavily on ‘conventional’ infrastructures and systems for water supply, heating, lighting, drainage, cooling and other services such as places to meet or relax. The evidence is that these older systems and technologies may no longer be fit for purpose in the light of global changes whose impacts are being felt with increasing severity and frequency. The urgency of these issues is accompanied by the need for rapid changes to deeply embedded and often highly valuable cultural heritage, legal frameworks, governance systems and professional and personal norms which have developed gradually, i.e. Over millennia. The networks and systems that have been built up are central to how we make agreements and handle disputes between people, communities, cities, regions and countries, or even continents. The scope for making mistakes is, therefore, huge, but the opportunities are also great, particularly if we innovate together and learn from one another.

NbS therefore offer a major chance for innovation, with possibilities to deliver lasting and tangible benefits across different social groups, in a range of environmental, economic and cultural settings, and in sharp contrast with how conventional, ‘traditional’ or ‘grey’ solutions are designed, constructed and managed over time. However, many NbS remain relatively novel solutions, presenting important challenges and unknowns regarding their (co)design, operation, maintenance and how we organise their implementation. The CORDIS Results Pack on nature-based solutions feeds into ingoing discussions about how to improve the framework conditions for NbS at the EU policy level and support the growing European research and innovation community in the field. Source: Nature-based Solutions: State of the Art in EU-funded Projects’ (Wild et al. (Eds.).

Strategic goals

The **main strategic goal is to mainstream NbS as innovative and cost-effective measures** that should bring more diverse nature and natural features and processes into cities and systemic innovation that should support the process. That is widely advocated in global research communities and in cooperation with more advanced policymakers and practitioners. There is much evidence of the environmental, social and

economic co-benefits provided by NbS to address multiple urban sustainability challenges and resilience build-up.

It is more of a rule than an isolated case that the implementation of NbS lags ambitions, often left limited to isolated demonstrations.

Nonetheless, the on-the-ground implementation of NbS lags behind ambitions, often remaining limited to isolated demonstration projects and without attention to the potential of mainstreaming. Institutional, organisational, and cultural barriers that city governments face when planning NbS are among key barriers.

Mainstreaming the NbS is a novel approach and requires attention to the institutional structures and organisational routines of the urban planning, project and budgetary planning context rather than solely on integrating NbS into established fields of activity. It will require inter- and transdisciplinary collaborations and inclusive interventions. The 'business-as-usual' way of working within city governments that are structured in departmental silos and follow rigid and narrow funding procedures that prioritise economic cost-effectiveness over social-ecological benefits will need to change in order to make progress in this area.

The approach will require, among other things:

- Co-creation processes to support more inclusive NbS
- New sets of skills and upgraded governance capacities
- New planning tools and practices
- Institutional and political support
- Cooperation with academic, businesses and innovation community
- Awareness raising on various levels
- Disruptive processes resistant to policy and governmental changes
- Involvement of different funding options
- Novel approach to storytelling – to ease the understanding of the NbS

Systemic innovations are used to address complex sustainability problems in cities. They can foster institutional learning processes and facilitate breaking through incumbent and obdurate institutional barriers. Systemic innovations move beyond identifying barriers, stepping stones or leverage points and point towards transformative potentials. The desired goal, tested through pilots, is to define how the city teams can change the underlying governance arrangements to put in place the conditions needed for moving towards a solutions-oriented agenda involving a wide community of stakeholders across multiple sectors.

On top of the envisaged technical and financial solutions being developed in the project, a novel, silo-breaking ecosystem that sets more inclusive governance conditions for a more integrative, collaborative and learning-based approach to urban governance will be tested. Systemic innovation will be tested using different tools and experimental approaches, as experimentation with co-production, NbS accelerators and development of living labs testing grounds, and reflexive monitoring of the integration into organisational procedures and planning procedures.

Opportunistic political support is a crucial step in any novel approach that is undertaken in local or regional governance and is often a deal-breaking point. To be able to obtain political support all defined processes, knowledge and especially the disruptive innovative mainstreaming approach needs to be brought to the level of sufficient understanding and credibility. Obtaining long-term political support will be a challenge that can only be overcome with early engagement and clear processes.

Changes in legislation, norms and administrative procedures are very well familiar to local and regional governance and are, in most cases, top-down driven, especially from the national level. Early involvement of all stakeholders from various levels in the co-creation processes and proper positioning and advocating, using the developed solutions should bring a positive influence and stabilize the long-term sustainability of the approach.

Communication will be key to ensure the sustainability of the approach, given the complexity of introducing of NbS even as a concept. Communication goals are simplicity in an appealing way, using principles of storytelling, to create new discourses around the significance of NbS and build and consolidate networks, showcasing the importance of mainstreaming. We will build upon already available solutions and, obviously, one developed within the project.

G.Putting Theory in Practice: Pragmatic Steps to Co-create Local Action Plan for Urban NbS

This section sets out the steps needed to prepare and implement a successful LAP on NbS/GI. In some cases, these steps may be familiar, or completed, with suitable structures in place – especially if other planning processes have already been undertaken, for example: adaptation to climate change plans, sustainable urban mobility plans, or sustainable climate and energy plans. In same case, you will **just update these plans with chapters focused on NbS/GI.** Some cities will use this to prepare own local plans based on need.

As such these steps should be seen **as a guide which can be adapted and integrated according to the local context** and need and be integrated in local strategies and other plans of the city (for example: local urban plan, plan of green infrastructure, etc.). The local action plan is written in the local language. In the context of the project, we prepare a **Template for summarizing the LAPs** with your key actions, barriers, priorities, in English. This Template serves as the main document for the WP leader to prepare a summary of the activity and will be used for reporting. Template is part of the annexe to this document. When creating a Local Action Plan for urbna NbS, we rely on various recommendations of the European Union. The most important among them is the EU Strategy on adaptation to climate change, which gives great importance to spatial planning and the development of NbS/GI networks. It also supports the development of local and regional strategies for climate-neutral places. Green Deal recognises the potential of NbS to address societal challenges stemming from the changing climate and provides a framework to mobilise their implementation across the EU and to increase funding of such solutions. The Territorial Agenda (TA) 2030 also addresses the importance of spatial planning and the development of NbS/GI networks that link ecosystems and protected areas, all of which is aligned with the TA 2030 second overarching objective “A Green Europe”. EU Strategy on Adaptation to Climate Change sets out the pathway to prepare EU regions for the climate change impacts and adapt to it by multiple approaches. The systemic adaptation stresses the urgency to promote and implement NbS on a larger scale but also to better quantify their benefits, and to better communicate them to decision-makers and practitioners at all levels to improve take-up. Biodiversity Strategy is important in preparing LAPs, since most of NbS/GI use trees and shrubs as the main ecological elements to sustain such solutions (parks, urban forests, rivers, wetlands, etc.). We also rely on the provisions of the New Leipzig Charter, which emphasises the need to approach the green transformation of cities through integrated urban development, with a multilevel and participatory approach, and to use the NbS to accommodate extreme weather conditions.

NbS/GI are proliferating in European cities over the past years as viable solutions to urban challenges such as climate change, urban regeneration and ageing infrastructures. With evidence amounting about NbS, there is a need to translate knowledge about nature-based solutions to future policy and local urban planning.

Purpose of planning or of Local Action Plan for Urban NbS s is to preserve biotic diversity, improve the lives of residents in urban environments, provide sustainable urban planning solutions, increase the resilience of urban environments against climate change, and encourage a participatory approach in the design of urban planning solutions and ensure the sustainable development of cities.

Both NbS/GI play crucial roles in the fight against climate change and offer a range of benefits:

- Carbon Sequestration: NbS, which involves practices like afforestation and reforestation. These activities effectively capture carbon dioxide from the atmosphere, playing a vital role in reducing greenhouse gas emissions.
- Enhanced Resilience: GI helps cities and communities become more resilient to the impacts of climate change, such as extreme weather events, floods, and heatwaves, by providing natural buffers and regulating water flows.

- Biodiversity Conservation: NbS fosters biodiversity by preserving and restoring natural habitats, protecting endangered species, and maintaining ecological balance.
- Improved Air and Water Quality: Both NbS/GI contribute to improved air quality by absorbing pollutants and reducing the urban heat island effect. They also aid in filtering and purifying water, promoting healthier ecosystems and water resources.
- Sustainable Urban Development: GI promotes sustainable urban planning and development, creating healthier and more livable cities with better access to green spaces and recreational areas.

Both concepts are used in GreenScape CE to support cities in choosing solutions and measures that will be part of their action plans and of the Joint Strategy for strengthening their implementation in Central Europe (hereinafter CE) cities. While the term Climate Change Initiatives (CCI) will refer to all the actions or networks mutually co-created by the GreenScape CE stakeholders through the deployment of NbS and/or GI.

The purpose of the planning system is to achieve sustainable development, which is about meeting current needs without harming the ability of future generations to meet their own needs. The LAP for NbS/GI sets out the key elements of the planning framework for each region/city/district, and the approach to its long-term physical development to achieve the vision of what sort of place cities want to become.

It is necessary to provide a method by which those interested and involved in pushing forward the development of NbS and green infrastructure planning on the ground might develop their own action plans. The purpose of the Strategies is to facilitate the production of geographically based LAPs. This method may help to provide a more informed and systematic way to consider the competing priorities of NbS/GI within the spatial planning process. The objective is also to provide a catalyst for discussion and the exploration of methods of green infrastructure planning – it does not aim to provide a prescriptive methodology but a flexible technique that can be moulded to fit 'real world' requirements.

For NbS to start getting involved in city planning processes, it is necessary first to determine what needs to be preserved in the existing environment, what needs to be improved or changed, and what and where new green infrastructure needs to be created and how.

Embedded within NbS/GI planning is the idea that stakeholders should have the opportunity to be involved in shaping environmental and green space planning at various scales. Recent enthusiasm for pushing forward green infrastructure planning indicates that GI has become a 'muster point' for academic, public bodies and practical agencies interested in greenspace issues and a way to help develop environmental thinking across disciplinary and political boundaries.

Green infrastructure is not seen as a 'fixed' asset, and the purpose of green infrastructure planning is to:

- Value existing green areas and prevent deterioration.
- Enhance the quality and diversity of these green areas to better address local needs. Connect green areas to form a cohesive, strategic entity greater than the sum of its individual parts.

Over time, ensuring the comprehensive integration of NbS/GI into regional and municipal spatial documents is necessary. It is necessary to include a series of scenarios (according to the variant study principle) in NbS planning, which will be based on consideration of land use, urbanization trends, climate change and other socio-economic forecasts (e.g. demographic studies, migration), and in vulnerability and risk analyzes dynamic processes that constantly evolve over time.

Local Action Pplan for urban Nbs is a pragmatic planning document proposing specific interventions to strengthen the links between the NbS/GI to enable effective policies and practices, promote the use of NbS by practitioners, and stimulate global and political momentum for the financing and implementation of NbS. In addition to formulating interventions and policy proposals, LAPs for NbS/GI also recommend NbS

principles and practices to be used in urban development projects (like when building a new road, or when a public space is rehabilitated, etc.).

There is a need for a greater recognition of the strong interlinkages between green resources and natural systems, and this needs to be translated into more consistent public policies. Equally, there is a need for concrete actions on the ground that materialize this recognition. This might be done by accelerating the implementation of NbS in the cities.

When planning for NbS/GI, there are key principles to be applied: The planning process needs to be truly participative – NbS/GI directly affects the lives of citizens. A good NbS/GI plan results in a significantly better environment for citizens. NbS/GI planning needs to rely on a thorough, detailed analysis.

This analysis uses information from a variety of sources:

- Higher level statistical data.
- Climate-related data available either on a national level or locally.
- Planning needs to rely on extensive surveys collecting information on habits of citizens, traffic, GI related perceptions and feelings.

Planning needs to use an integrated approach. Plans need to be aligned with other urban development areas. It is important to stress that better NbS is not just about improved GI: plans need to address the GI challenge in an integrated way.

In this Strategy, we will provide specific guidelines, methodological tools and templates for the preparation of LAPs for cities.

There needs to be a dedicated organization or department that coordinates the planning process. There is no one-size-fits-all solution, but basically, local authorities have the power and the authorization to bring together various actors at city level. Having a dedicated organization is a key factor, but if no staff member has the tasks related to LAP in her/his job description. It will become just another frustrating activity nobody wants to deal with. So, it is important to appoint one person and dedicate a certain percentage of her/his time to lead the planning process, to monitor the implementation and to involve the relevant stakeholders. Stakeholders are all local organizations or institutions with an interest or potential role in greening the city and integrating NbS.

The exact list of stakeholders may differ from city to city, reflecting the local circumstances, but typically include the following actors:

- Local authority,
- Public/city companies dealing with infrastructure (green, blue, grey),
- Secondary educational institutions,
- Higher education institutions (if any),
- Business support organizations,
- R&D organisations, research institutions,
- Relevant NGOs,
- and last but not least, the civil society.

We further discern that urban planners need to have an open approach to collaborative governance of NbS that allows learning with and about new appealing designs, perceptions and images of nature from different urban actors, allows the forming of new institutions for operating and maintaining NbS to ensure inclusivity, liveability and resilience.

Understand your City

To implement the NbS in your city, first and foremost you need to understand better your main assets and challenges - from an LAP perspective. In other words, you must deliver a quick Audit of your city. Consider the general framework of factors presented in Chapter 6– and see what is already in place and what is still missing. For each factor, you should use a small number of basic indicators and a brief qualitative assessment.

The rationale for conducting the needs assessment should be clear from the outset and objectives must be realistic and achievable. Activities should respond to the key questions about the project.

- How are existing urban NbS/GI used and perceived by the public? What NbS and greenspace resources do local people value?
- Is greenspace provision currently adequate, equitable and geographically distributed?
- How should the NbS and GI maximise benefits, and for whom?
- What conflicts or gaps exist?
- Are there tensions and contradictions between social groups?
- What problems and disservices exist, and how might these be resolved?

It might also happen that the needs assessment provides unexpected answers or new insights.

When collecting the data for your audit, you can use the analysis results of your urban development strategy (most cities have such a document in place).

There are many online platforms, tools, and resources that can be used to analyse local communities. Map-based portals are especially helpful for exploring communities and visualising queries. For example, climate change satellite data (e.g., Earth Observation Browser), environmental quality data (e.g., the European Environmental Atlas map), and NbS (e.g., the Urban Nature Atlas). National spatial data portals are typically used by spatial planning departments, where environmental, land use, health, demographic, and spatial planning data are integrated. Nowadays, it is possible to create platforms that allow individuals with minimum prior GIS training to use open-source software, e.g., QGIS, to create detailed maps from a large number of open access datasets (e.g., land use data, climate data, environmental data, Lidar, etc.).

Understand your Target Group

Stakeholders refer to people whose needs the proposed project intends to address, or who, in some way, will have an interest or will be affected by the initiative. Defining this group correctly creates an understanding of any gaps that exist and identifies who needs to be involved. This might include, for example, local residents, schools, youth groups, sports clubs, naturalist societies, other people who use the greenspaces regularly, including occasional users/non-users, and socially marginalised groups.

The stakeholders can be identified through desktop research or participatory workshops among many other methods. Their composition, activities, credibility, key contact points, etc need to be identified. The next crucial step is prioritisation: all stakeholders are important and valuable, but you always need to remember your objectives and prioritise stakeholders that are more directly involved and useful for your assessment. Some criteria to rank your stakeholders are visibility, relevance, power, credibility, influence, and availability.

Following the identification of your stakeholder's group, and concerning the available resources, the next step is to reach out to them. The challenge is to work out the best means of communication the places to reach these groups most easily, and the techniques to engage and involve them in the assessment.

Mapping the stakeholders should also be done in a participative way, involving at least the most important stakeholders, and preferably also representatives of the target groups. At each phase, you should answer at least the following questions:

- What are the specific needs of the target group in this phase?
- What are the key touch points between the city and the target group?
- What would nudge the stakeholder to choose our solution over other possibilities?
- What may drive the target group away in this phase?

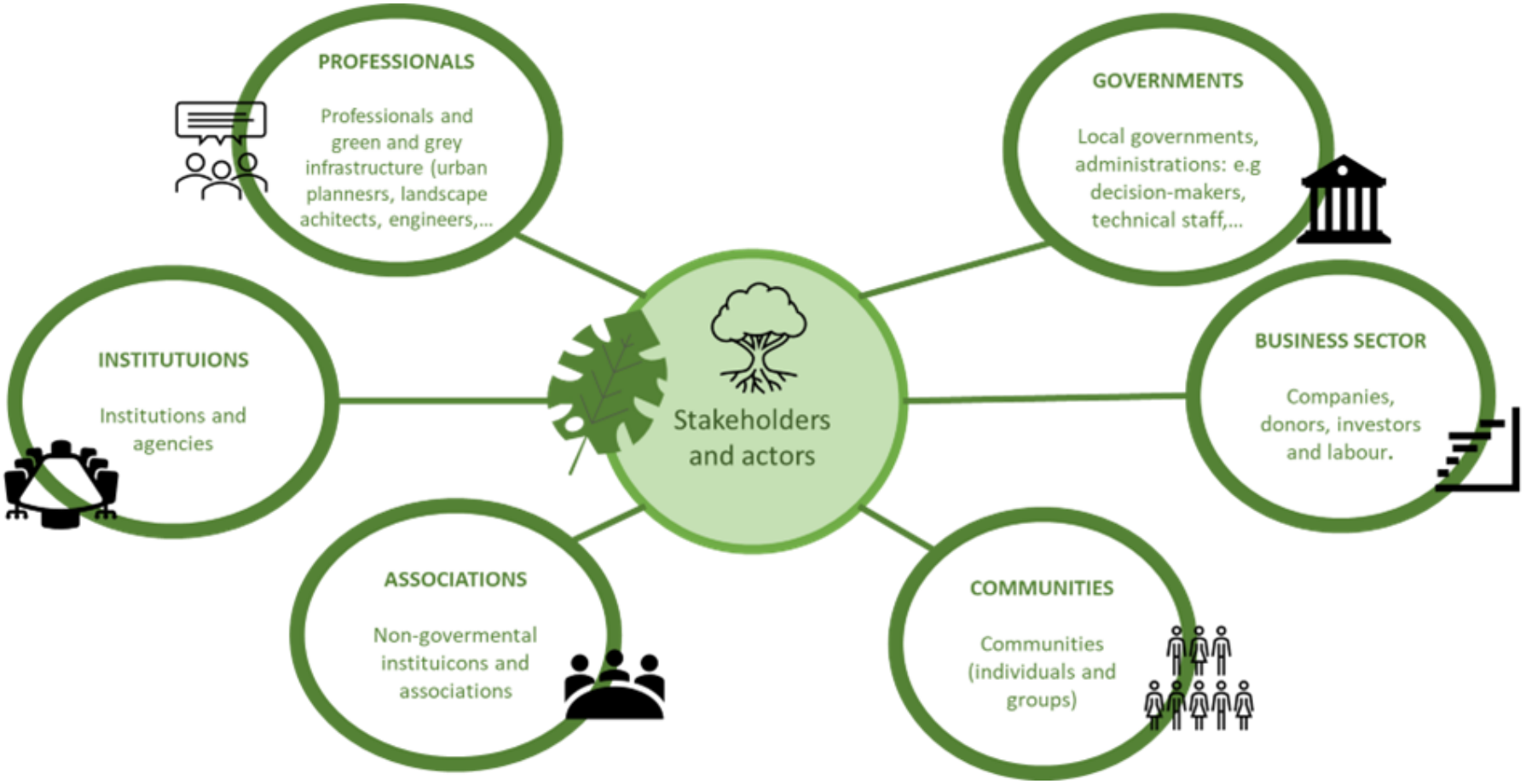

Figure 2. NbS/GI stakeholders and actors. (Source: Adapted from FAO, 2016)

Plan your Actions - steps for establishing the Local Action Plan (LAP)

After having the final list of what our city can/should do to implement NbS/GI, specific details must be defined, which will lead to an idea for a real and feasible action or establishing our own plan:

- it consists of several activities,
- it has clear outputs and results,
- it demands human and/or financial resources,
- its implementation requires a certain time.

Joint Strategy sets out the steps needed to prepare and implement a successful Local Action Plan for urban NbS. In some cases, these steps may be familiar, or completed, with suitable structures in place – especially if other planning processes have already been undertaken, for example: adaptation to climate change plans, sustainable urban mobility plans, or sustainable climate and energy plans. In same case, you will just update these plans with chapters focused on NbS/GI. Some cities will use this to prepare their own local plans based on their need.

As such these steps should be **seen as a guide** which can be adapted and integrated according to the local context and need and be integrated in local strategies and other plans of the city (for example: local urban plan, plan of green infrastructure,). Each partner can choose how he will follow the steps (which are priority for him). The Local Action Plan is written in the local language. In the context of the project, we prepare a Template for summarizing your Local Action Plan (Annex 1) with your key actions, barriers, priorities, in English. This Template will serve as the main document for the WP leader to prepare a summary of the activity and will be used for reporting and communicating with JS together with your original plan. The template is part of the annexe to D1.5.1 Joint Strategy.

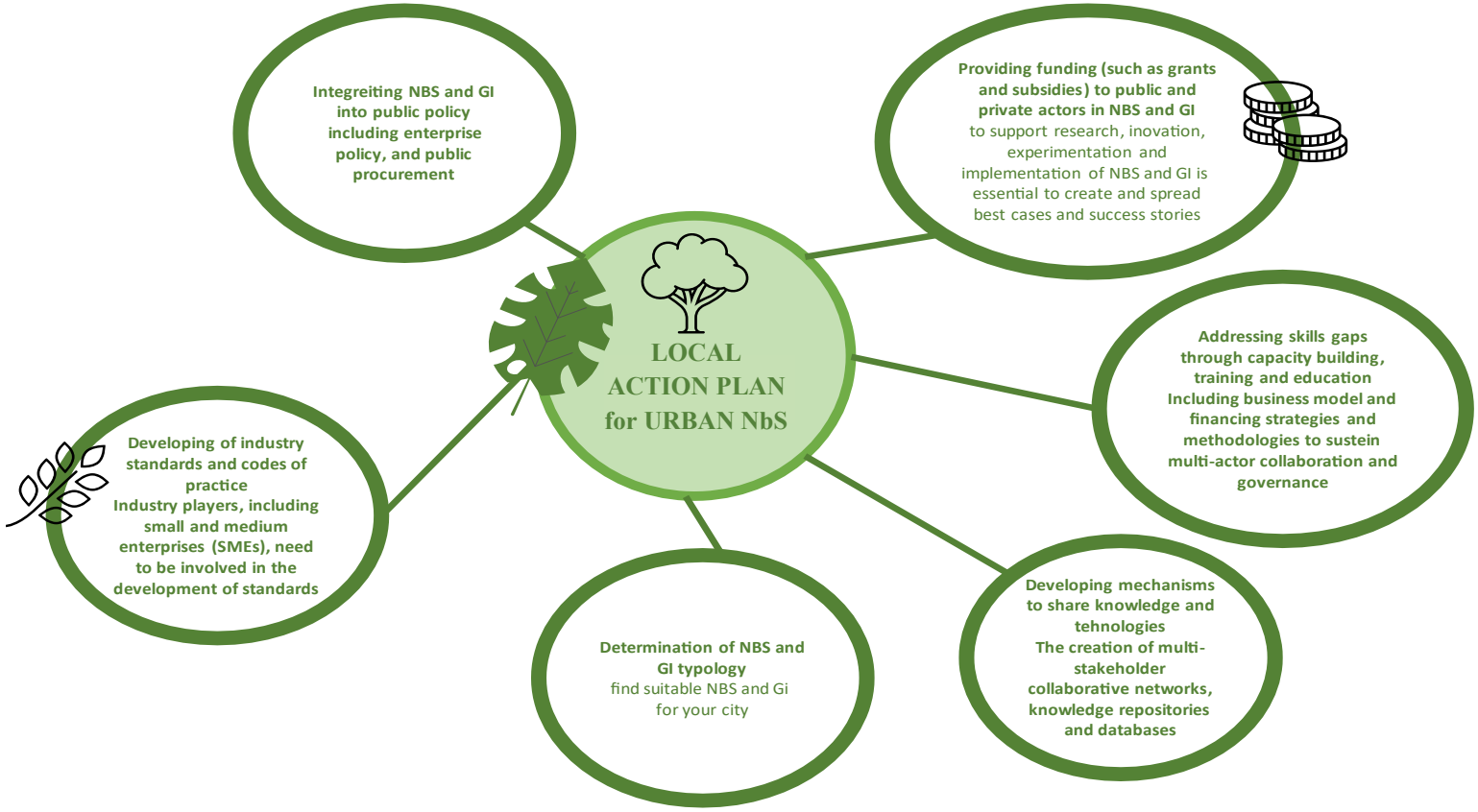

Figure 3. Goals of Local Action Plans for Urban NbS

As such these steps for the Local Action Plan for urban Nbs should be seen **as a guide** which can be adapted and integrated according to the local context

The process steps are set out in summary below (based on the Urban Greening Plan Process):

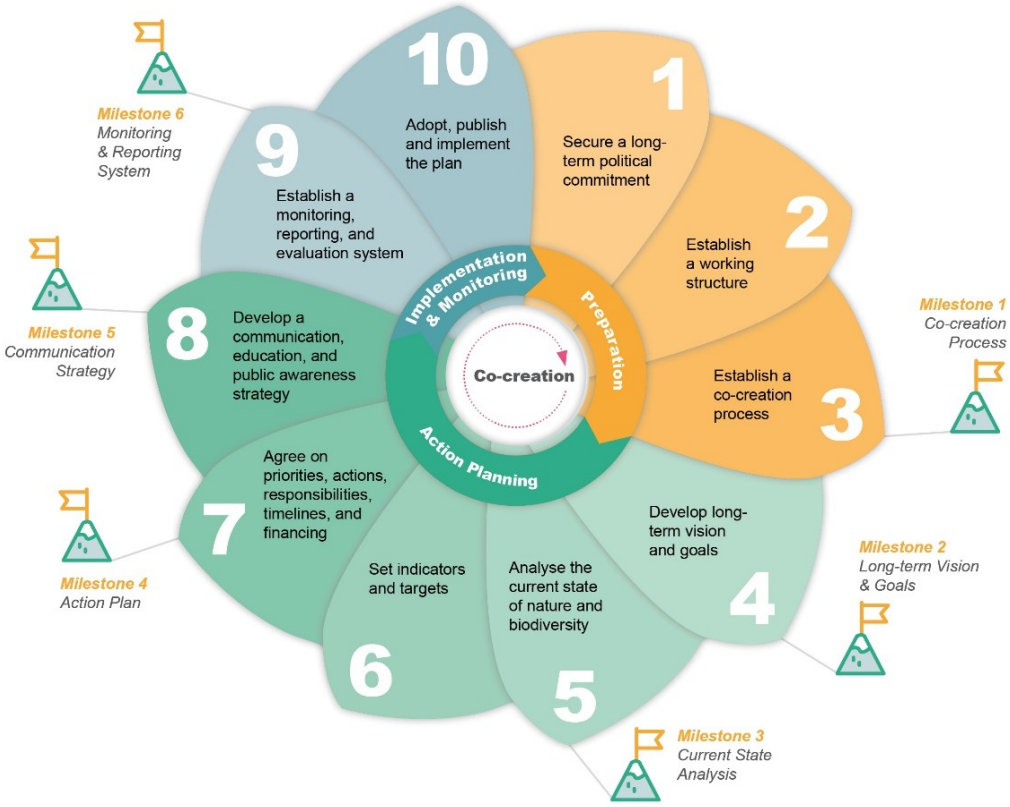

Figure 4. Guidance for cities to help prepare an Urban Greening Plan (Source: European Union)

Implementation presents challenges for local governments that lack the capacity and resources to act alone. Increasingly this results in mosaic governance and partnership-led approaches to urban NbS implementation.

The practical business of implementing the plan, therefore starts with the establishment of a working structure to coordinate the programme on the ground. They will identify responsible parties and key steps in the process, which will include the following:

- defining detailed aims, objectives, and targets
- securing funding and resources required
- preparation of detailed management prescriptions, resource allocation and timelines
- managing work on the ground
- ongoing communication with wider stakeholders
- continuous monitoring and evaluation

Step 1: Secure a long-term political commitment

The **starting point** for developing a Local Action Plans for Urban NbS is the political **decision** to improve the current status of urban nature and biodiversity within the city. By committing to a Plan, a local government sets a strategic direction to bring nature back into the city. Ensuring senior political buy-in from the beginning is essential to the process. It shows a high prioritisation of urban nature, provides for a concerted effort to work across municipal entities and departments (breaking down silos by providing a multi-level

planning approach) and begins the process of mainstreaming nature, biodiversity and nature-based solutions[1] into all aspects of the municipal administration.

The Mayor and/or Council should give the official green light to legitimise action by municipal staff. Exactly who and from which departments are involved heavily depends on the local context. However, a variety of municipal staff from multiple departments (e.g. environment, transportation, land-use, finance etc.) as well as regional stakeholders from surrounding districts need to be informed and engaged early on in the process, as they will institutionalise and implement the process and monitor developments.

Checklist:

- Official approval from city council\mayor secured.
- Integrated, cross-departmental involvement secured.

Step 2: Establish a working structure

Developing and implementing an Local Action Plans for Urban NbS is a complex process that requires **working across boundaries and sectors** and coordinating between related policies and organisations (i.e. the political, educational, economic, cultural, mobility, health and environmental sectors). Cross-departmental collaboration on urban greening is essential to ensure **coherence** with existing policies and foster the mainstreaming of nature-related urban planning across.

To coordinate and manage the Local Action Plans for Urban NbS process, a clear **project coordinator** with sufficient capacities, resources, and authority within the organisation is needed to drive the process forward. They will need the support of a diverse **team** and a functional **governance structure** that ensures buy-in, effective decision-making, and coordinated planning and implementation throughout the process. Ideally, the working structure established (e.g. steering committee or task force) includes a wide number of municipal departments and participation of essential actors representing the city's various environmental and socio-economic dimensions.

The team's coordination tasks and mandates, communication mechanisms and relations to other groups within the local government should all be **clearly defined,** and the team should be given **appropriate authority** and ability to drive forward the development of the Urban Greening Plan process.

The successful implementation of an urban greening plan is not only about undertaking specific greening actions, it is about aiming to ensure that all aspects of a city's urban planning process have a net positive impact on local nature and biodiversity. Establishing a strong working structure ensures that the urban greening plan is properly **integrated** throughout the planning processes of the administration and can be an important step towards mainstreaming nature as an administrative priority. Mainstreaming urban greening, biodiversity, and NbS can address multiple strategic objectives at the same time and can be achieved, for example, by including nature-positive requirements in tender and procurement policies, regulations and contractual agreements.

Checklist:

- Local Action Plans team is established and includes cross-departmental staff.
- Roles and responsibilities are assigned to team members.
- Urban greening and NbS is on the agenda in other policy/planning/financing decisions, for example: transport, water, energy, air quality, health, and of course part of the overall housing/development planning process.

Arrangements must be put in place for managing all aspects of the work on the ground, such as:

adapted by the Guidance for cities to help prepare an Urban Greening Plan (draft); EUROPEAN COMMISSION

- supervision and coordination of contractors on site to ensure high standards are met.
- compliance with legislation, particularly with regard to health and safety practices and environmental standards.
- ensuring appropriate risk assessment procedures and signage are in place, both for site workers and for members of the public.
- efficient troubleshooting to resolve any unexpected issues/ problems encountered.
- effective financial management to ensure timely processing of payments/grants claims.
- maximising and integrating the role of local volunteers with contracted work.

Step 3: Establish a co-creation process

Tapping into the diverse perspectives, knowledge, and experience of local stakeholders is vital to ensure the Local Action Plans is relevant, supported locally and has a real impact. A co-creation process is designed to fully engage key stakeholders in the process of developing and implementing the Local Action Plans, including key civil society groups, academia, the business community of the city, as well as relevant municipal departments.

Co-creation should be approached with equity and justice in mind and respect the participants' different knowledge, skills, time availability, and resource constraints when setting meetings and designing activities. The resulting Urban Greening Plan will then reflect participants' values and create a sense of shared ownership. The aim is that participants continue to be involved and become champions of the concepts created beyond the time horizon of the planning process.

Giving special consideration to directly involving vulnerable groups (children, elderly people, people with physical disabilities, mental health issues, socially disadvantaged people, and migrants) broadens the impact of the Local Action Plans and aligns with the European Green Deal objective of a ‘just transition,’ and ‘leaving no one behind’.

Checklist:

- Local Action Plans team with key stakeholders established.
- Who, when, where, and how citizen groups and individuals will be included has been decided.
- Broad participation in meetings and events and final decisions include the opinions of a wide range of stakeholder groups.

Step 4: Develop long-term vision and goals

This has been discussed in the previous section. Essentially, the plan should be part of a tiered system with an overall urban NbS strategy at the city or city-regional level, which considers broader strategic themes such as rural-urban linkage and green infrastructure.

- What do we want our urban green spaces to look and feel like?
- What type of urban greening do we want?
- What kind of ecosystem services do we want our urban green spaces to supply? Or which ones we want to prioritise?
- Which type of environmental pressures should we tackle or mitigate to enhance ecosystem conditions and biodiversity?
- What is the difference between where we want to be in urban greening and its derived benefits and where we are?

These are the types of questions that should guide a visioning process. A vision provides an aspirational description of the future in 20-30, even up to 50 years and guides planning and implementation activities. It places urban greening and nature in the context of the urban and social environments and is supported by mid-term goals with a 10–15-year time horizon. (The vision should be created and agreed upon with all relevant actors from steps 2 and 3).

Checklist:

- Co-creation process used to develop and agree upon vision and goals
- Long-term vision (20–30-year time horizon) for urban greening is formally adopted.
- Included long-term goals (10-15 years) that are specific, measurable, achievable, result based and time bound (SMART) and assigned to a responsible individual or organisation.

Step 5: Analyse the current state of nature and biodiversity

Any LAPs will need to be based on an understanding of not only all the different types of vegetation / green space in the municipality but also how this relates to a wider understanding of other land use in the city. This means an understanding of, for example, residential /retail/transport land, agricultural land, waterways, and industrial land. For green planning, an understanding of future plans and past developments is also essential. In addition, other aspects of the urban area/municipality are also needed to help with implementing a successful plan, including, for example, an understanding of the socio-demographic make-up of the area, the accessibility and equitable distribution of public green spaces.

A LAPs should also include an understanding of some the key components of the urban ecosystems, such as the variety and extent of plant and animal species.

Many towns and cities already have a number of the basic elements required for this assessment of the current state of nature and biodiversity, but some additional mapping and measuring may be required. This assessment should also include a comprehensive overview of the actions and policies already in place that relate to urban greening.

Checklist:

- Current status of green and blue infrastructure, biodiversity, and other significant categories related to urban greening are documented and mapped.
- Analysis made of policies, strategies, plans, and programs relevant for this urban greening plan.
- Preliminary results are shared with the City Council and the general public for comment.

Step 6: Set indicators and targets

Based on the agreed vision of the municipality, and the assessment of the current state of nature and biodiversity, indicators can be chosen and targets set.

Targets may be quantitative or qualitative, and are expressions of desired value, quantity, and/or quality of specific indicators. Setting ‘final’ as well as intermediary targets will allow you to track progress as you move towards the end of the plan’s operational cycle. Targets can also include socio-economic aspects and can relate to “avoidance”, “reduction” or “improvements”.

Checklist:

- Core targets, actions and indicators agreed upon and set in line with the Plan vision and goals.
- Additional targets, actions and indicators selected and incorporated into the Plan.
- Indicators and targets for urban greening, biodiversity, and NbS are as ambitious as, or more ambitious than, the long-term goals of the EU Biodiversity Strategy to 2030.

Step 7: Agree on priorities, actions, responsibilities, timelines, and financing

A clear description of the prioritised **actions, time frames, roles and responsibilities** for implementation and support, as well as available **resources** is the cornerstone of a successful Urban Greening Plan. Specifying these components will make it clear and transparent how the objectives and targets will be reached.

This includes detailed prescriptions for various NbS compartments and for urban green infrastructure within parks, streets and civic areas. A professional should work up the specifications. Details to include could are:

- planting density, species composition and tree protection on new sites,
- harvesting, thinning, pruning and other tree-related management works on existing sites,
- public access infrastructure, including path specifications, interpretation, parking, signage etc.,
- detailed costings, work schedules and timelines for all activities,
- staff involved and their actual roles and responsibilities in project management,
- tendering and procurement procedures,

Break the goals and objectives down into specific actions and describe them in as much **detail** as possible. This process should answer the following question: Where should this take place? When should it take place? What are the positive and what are the negative impacts of each action? Who will be responsible for the action? How much will it cost, and how is it paid for?

Financing needs and any financing sources associated with the actions in the short, medium, and long term should be assessed. Implementation, operation, and maintenance costs should be included in the assessment.

Individuals and organisations who could take leading and supporting **roles** in implementing the actions should be identified. Consider abilities, competencies, and capacities. In some cases, it might be one individual taking responsibility for an action; in other cases, it might be a collaborative/interdisciplinary undertaking.

The action plan should map out the implementation phase and identify linkages between actions (1–3-year time horizon), objectives (3-7 year time horizon), as well as the order of implementation. In addition to available financial resources such as municipal budgets and national and EU subsidies, potential new funding sources should also be considered.

Checklist:

- Priorities and objectives are defined and agreed upon.
- Priorities and objectives are written and are SMART - specific, measurable, attainable, relevant, and time-bound.
- All linked actions defined and described.
- Lead and supporting roles\responsibilities assigned.
- Timeline for implementation agreed upon.
- Potential Impacts anticipated and assessed.
- Meaningful forecasts of expenses, revenues, and other financial items prepared.
- Financial analysis and assessment of possible funding sources completed, along with which organisations will fund or have the capacity to acquire more funding.
- Agreed upon action plans published for the general public.

Step 8: Develop a communication, education, and public awareness strategy

The process of creating a communication/education/public awareness strategy can significantly boost the acceptance, effectiveness and impact of the Urban Greening Plan. In addition to providing information through reports, memos, and publicity, a communication strategy should include behavioural change campaigns related to and awareness-raising of the benefits of healthy ecosystems and the risks of nature and biodiversity loss.

With any NbS/GI project, it is important to keep members of the public well-informed about the work and its progress. management activities, particularly felling, can be an emotive topic for members of the public and can create misunderstandings due to a lack of awareness or information. Appropriate media, such as site signage, press campaigns and public events should be an essential part of any NbS or GI. The aim should be to keep the public informed and involved in the project. As mentioned in other sections, a solid citizen engagement process helps to build trust and communicate the right message. Furthermore, citizens who are engaged in the process can become the best advocates for the project.

Plans should be seen as being part of a larger effort towards transformational change, which creates the basis for successful work at the city level.

Checklist:

- The communication, education, and public awareness strategy is in place and includes milestones, targets, activities, a monitoring system and allocates appropriate resources (human and financial) for the implementation of the plan.

Step 9: Establish a monitoring, reporting, and evaluation system

Monitoring and evaluation of both the planning and implementation processes are crucial to ensure meaningful results from an Urban Greening Plan. Monitoring and evaluation allow the plan to be adjusted and improved over time as necessary. It may allow decision-makers to justify where money was spent and upscale the most successful actions or to cancel certain actions if they are not proving effective.

For the whole process, transparency is very important. Transparent reporting ensures that evaluation results are considered in public debate and that future decisions are based on lessons learned. Sharing qualitative and quantitative data is important to understand how the plan has impacted citizens, such as equitable distribution of resources and gentrification. To build efficiency and avoid unnecessary redundancy, integrate your Urban Greening Plan's monitoring, reporting, and evaluation into existing processes whenever possible.

The Local Action Plans for urban NbS indicators and targets should be utilised to measure, monitor, and evaluate activities agreed upon to track progress towards the goals and objectives within the given timeframe.

Checklist:

- Monitoring and evaluation arrangements for all indicators developed.
- Responsibilities and budget for monitoring and evaluation agreed upon.
- Process for reporting and potential corrective measures defined.

Even if the physical work has been completed, managing the GI is far from over.

Any work undertaken should be part of a longer-term vision which may span several decades. It is, therefore, necessary to undertake monitoring and evaluation in the longer term. This should achieve the following aims:

- to ensure the aims of the intervention have been effectively achieved.
- there are no adverse consequences arising from the work, such as public safety issues.

- the work has satisfied the intended management objectives.
- the approaches have represented value for money and have proved effective.
- the potential for delivering benefits has been fully achieved, and
- further planned interventions reflect the latest knowledge and respond to current opportunities or threats.

Step 10: Adopt, publish and implement the plan

Developing and maintaining political commitment will remain a long-term activity involving major political groups, including the Mayor, other high-level decision-makers, different stakeholder groups and the general public at all steps of the plan and management cycle.

In addition to any legal/formal adoption procedures that may be necessary, holding an official launch/adoption event with those involved in its production can help to increase its visibility and create consensus and ownership – and give legitimacy to the plan.

Regardless of the method of adopting the plan, as an absolute minimum it should be made readily available online for any interested parties to scrutinise. Unless an Urban Greening Plan is available to view, it cannot be considered to have been produced in an open an transparent process. Ideally, the publication of the plan would go well beyond simply hosting the document online, but could form a web-based platform, including explanations of the process, updated sections on tracking and monitoring progress, and some interactive aspects to allow citizens to give feedback, and or get involved in the different actions connected to the plan.

How do you know you accomplished this step?

- Final draft of Local Action Plan for urban NbS compiled.
- Formal adoption by the City Council or equivalent decision-making body
- Status of implementation activities are consistently monitored.
- Progress evaluated at regular intervals.
- Necessary adjustments are identified, and discussed with relevant stakeholders, and appropriate corrective actions are implemented.
- Plan is readily and publicly available online.

H. Conclusions

Green urban spaces, from parks and gardens to green roofs and urban farms, provide a wide range of benefits for people and the planet. They provide vital space for physical and mental well-being and a very important habitat for nature, including for birds and pollinators. Green space helps reduce air, water and noise pollution, provides protection from flooding, droughts and heat waves and much more. This strategy aims to provide guidance and knowledge to support towns and cities in enhancing and restoring their urban nature and biodiversity.

It stresses the importance of the collaborative process of developing a LAP, including the need for working with citizens and other stakeholders, and for cross-departmental working and integration of the NbS/GI plan with other aspects of urban development, from mobility and health, air, and water, to energy and climate adaptation.

An LAP needs to have the support/commitment from the Mayor and/or the City Council or an equivalent decision-making body.

The development and implementation of an LAP should be made in close cooperation, coordination, and consultation between the different levels of government, relevant authorities, citizens, and local stakeholders. The Local Planning Authority should put in place appropriate structures and procedures. Integrated planning and implementation should include:

- Interdepartmental consultation and cooperation at the local level to ensure consistency and complementarity of the LAP with local policies, strategies and measures in related policy areas (such as water, transport, land-use and spatial planning, green infrastructure, energy, health; air and soil quality; waste; etc.).
- Close collaboration with the relevant authorities (i) at the different levels of administration and government (e.g. district, municipality, agglomeration, region, and Member States) and (ii) in neighbouring urban areas, in particular, to improve ecological connectivity. This exchange should involve, in particular, those bodies and authorities with responsibility for relevant green infrastructure for the nature and biodiversity of the urban area, such as those responsible for neighbouring/connected ecosystems.
- A transparent and participatory co-creation approach. The Local Planning Authority should involve the relevant actors – citizens, academics, as well as representatives of civil society and economic actors – in developing and implementing the plan from the outset and throughout the process to ensure a high level of acceptance and support.

This Strategy follows a linear process of plan preparation, corresponding to broad themes that should be addressed at each stage of the process. It is a structured, sequential and flexible process for preparing LAPs. The process should be flexible and iterative, that is, it should allow for existing or new themes to be revisited or introduced along the way. Each section outlines an important aspect or stage of the process, providing an outline of the main steps and elements that should be considered in planning for local communities.

I. Bibliography

- Brears, R.C., 2022. Financing Nature-Based Solutions: Exploring Public, Private, and Blended Finance Models and Case Studies, Palgrave Studies in Impact Finance. Springer International Publishing, Cham. https://doi.org/10.1007/978-3-030-93325-8
- BuGG (2019): BuGG-Fachinformation: Positive Wirkungen von Gebäudebegrünungen (Dach-, Fassaden- und Innenraumbegrünung) https://www.gebaeudegruen.info/service/downloads/bugg-fachinformation (last visit: 05.02.2024)
- Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press
- Dodman, D., Hayward, B., Pelling, M., Castan Broto, V., Chow, W., Chu, E. et al. (2022). Cities, settlements and key infrastructure. In Climate Change 2022: Impacts, Adaptation, and Vulnerability.
- Droste, N., Schröter-Schlaack, C., Hansjürgens, B., Zimmermann, H., 2017. Implementing Nature-Based Solutions in Urban Areas: Financing and Governance Aspects, in: Kabisch, N., Korn, H., Stadler, J., Bonn, A. (Eds.), Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice, Theory and Practice of Urban Sustainability Transitions. Springer International Publishing, Cham, pp. 307–321. https://doi.org/10.1007/978-3-319-56091-5_18
- Estrada, A., Garber, P.A., Rylands, A.B., Roos, C., Fernandez-Duque, E., Di Fiore, A et al. (2017). Impending extinction crisis of the world's primates: Why primates matter. Science Advances, 3(1), e1600946.
- European Investment Bank (EIB), Bankers without boundaries, 2023. Investing in nature-based solutions State-of-play and way forward for public and private financial measures in Europe.
- European Environment Agency, Castellari, S., Zandersen, M., Davis, M. et al., Nature-based solutions in Europe policy, knowledge and practice for climate change adaptation and disaster risk reduction, Publications Office, 2021, **https://data.europa.eu/doi/10.2800/919315**
- Fi compass, 2020. Stocktaking study on financial instruments by sector.
- GRÜNSTATTGRAU Forschungs- und Innovations- GmbH (2021). GREEN MARKET REPORT. Bauwerksbegrünung in Österreich: Zahlen, Daten, Märkte. Vienna, Austria.
- Hofbauer K. (2022). Innovative Bewässerung durch Grauwasserrecycling. Untersuchung der Eignung von Grauwasser zur Bewässerung gebäudenaher Begrünung.
- IUCN (2020). Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. First edition. Gland, Switzerland: IUCN https://doi.org/10.2305/IUCN.CH.2020.08.en
- McPhearson, T., Kabisch, N. & Frantzeskaki, N. (2023). *Nature-Based Solutions for Cities*. Edward Elgar Publishing.
- Partnerships for Nature-Based Solutions in Urban Areas – Showcasing Successful Examples; September 2017; Nature-Based Solutions to Climate Change Adaptation in Urban Areas (pp.275-289); CC BY 4.0
- Pfoser, N., Braunschweig, T. U. & Darmstadt, T. U. (2014). Gebäude Begrünung Energie: Potentiale und Wechselwirkungen.
- UN Habitat (2018). International Conference on Climate Change and Cities: Proceedings document. https://unhabitat.org/international-conference-on-climate -change-and-cities-proceedings-document-0 (accessed January 9, 2024).

- Schmalzbauer, A (2018). Barriers and success factors for effectively co[1]creating nature-based solutions for urban regeneration. Deliverable 1.1.1, CLEVER Cities, H2020 grant no. 776604.
- Toxopeus, H., Polzin, F., 2021. Reviewing financing barriers and strategies for urban nature-based solutions. J. Environ. Manage. 289, 112371. https://doi.org/10.1016/j.jenvman.2021.112371
- Urban20, 2020. Addressing Finance And Capacity Barriers For Nature-based Solutions Implementation At City Level

J. ANNEX 1: Template for summarizing and reporting the Local action plan for urban NbS

INTRODUCTION

- What is this document, who prepared it, and when?
- Purpose, logic and structure of your plan?

DESCRIPTION OF THE City, Neighborhood, or Street

Description of the pilot city/neighbourhood, area, and population with key information (local context). Description of territorial coverage, with the list of streets and coverage presentation on a map (you can also add a map). The description in document D.1.1.1 can be used. You can specify several locations where you would like to use NbS/GI.

Briefly describe the local context in and around the city as it is most relevant to developing an NbS/GI.

GENERAL OVERVIEW OF CURRENT STATUS OF NbS/GI

In the area of interest, the strengths, problem areas and opportunities are presented.

A GOAL AND VISION THAT WILL BE ACHIEVED BY INTRODUCING NBS/GI?

Indicate what problem (water management, heat stroke, greening of the city, etc.) you will solve with the help of this action plan with NbS/GI.

ENGAGE COMMUNITY - STAKEHOLDERS & TARGET GROUPS?

The goal here is to list everyone who needs to be involved in the planning process and the implementation. Stakeholders and target groups should be included. Please indicate how you included stakeholders and target groups (e.g., meetings, workshops, public forums, hackathons).

ACTIONS TO IMPROVE NbS/GI

NAME OF INTERVENTION 1	
Description of the action	Be as detailed as possible and try to limit this section to less than 2.500 characters.
Relevant GreenScape CE know-how	Good practices that you would like to adapt in the context of this action.
Output indicator	Output indicators are measurable to determine the immediate success of the action: number of events, e.g., number of new trees, installation of new urban equipment, m2 of roof greening)
Stakeholders&target groups only for this action	The goal here is to list everyone who needs to be involved in this planning action for implementation.
Timeframe	Identify the major implementation milestones.
Cost	Obtain Cost Estimation
Funding sources	Own sources, regional sources, national sources, private sources, EU sources,...

NAME OF INTERVENTION 2	
Description of the action	Be as detailed as possible and try to limit this section to less than 2.500 characters.
Relevant GreenScape CE know-how	Good practices that you would like to adapt in the context of this action.
Output indicator	Output indicators are measurable to determine the immediate success of the action: number of events, e.g., number of new trees, installation of new urban equipment, m2 of roof greening)
Stakeholders&target groups only for this action	The goal here is to list everyone who needs to be involved in this planning action for implementation.
Timeframe	Identify the major implementation milestones.
Cost	Obtain Cost Estimation
Funding sources	Own sources, regional sources, national sources, private sources, EU sources...

You can add more interventions to your LAP if you need to.

PROGRESS AND OUTCOME EVALUATION

Describe what impact and progress indicators will be used and, thus, how they will support evaluation and learning.

OTHER PROPOSALS TO IMPROVE THE NbS/GI IN YOUR CITY

In addition to NbS/GI improvements in your city, neighbourhood, or street, there may be a need to deliver actions which are not specified tied to the NbS solutcion but important to improve certain conditions in your city, neighbourhood, or street (example: improvement of walkability in this area (sustainable mobility), improvement of the management of this area (city marketing), etc.).