Network Nature

Design Brief 3

Biodiversity-positive Design in Urban Areas with NBS:

Mobility Network, Green associated with Buildings, Vacant Plots, Brownfields

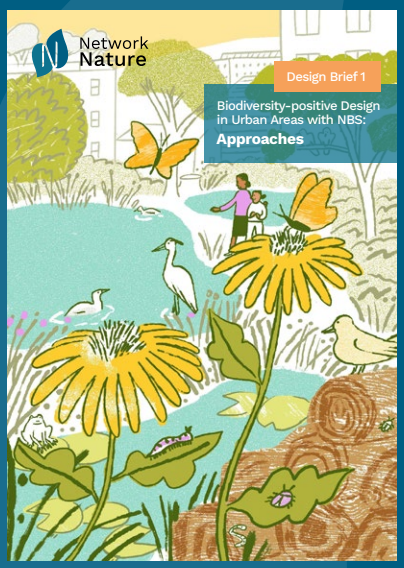
A Series of Design Briefs

This NetworkNature design brief series, the first of its kind, comprises three design briefs on biodiversity-positive design recommendations for urban and peri-urban areas with nature-based solutions. The series, developed with support of IFLA Europe, presents simple design suggestions for renaturing in built environments to restore or provide habitat for nature.

It is not meant to replace professional ecological or landscape guidance, but rather to encourage designers to intentionally consider how they can adopt an interdisciplinary approach to make projects more biodiverse. Specifically, it encourages professionals to adapt to and achieve biodiversity positive design in urban areas via nature-based solutions (NBS).

Design Brief 1

Learn more about Renaturing and biodiversity-positive approaches

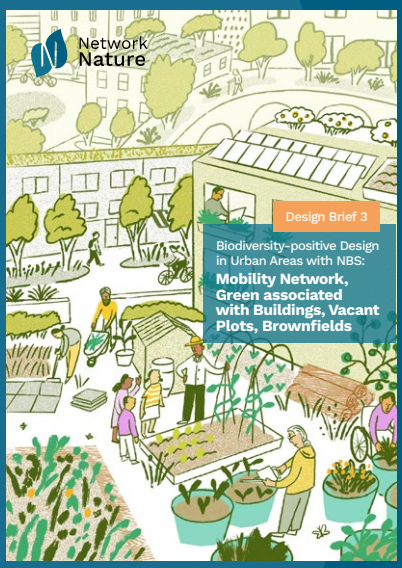


Design Brief 2

Learn more about Biodiversity-Positive Design Recommendations for Wildlife-friendly Areas, Conservation Sites and the Public Realm

Design Brief 3

Learn more about Biodiversity-Positive Design Recommendations for the Mobility Network, Green associated with Buildings, Vacant Plots and Brownfields



Why this Design Brief Series? Why now?

The European Green Deal, which strives to achieve carbon neutrality in Europe by 2050, seeks to protect and restore ecosystems and biodiversity, and to promote the widespread adoption of nature-based solutions (NBS) in policy and implementation. The EU Biodiversity Strategy for 2030 highlights a pressing need to incorporate biodiversity considerations into all policy areas considering the numerous human activities that are threatening it. More specifically, the EU Nature Restoration Law, which was recently proposed and is under review, marks the first legal requirement to mandate large-scale nature restoration to prevent further deterioration of protected habitats and species. This law aims to implement restoration measures in at least 20% of the EU's land and sea area by 2030, with the goal of restoring all ecosystems in need by 2050. Furthermore, this document can be seen as a complementary contribution to the Urban Greening Platform of the European Commission alongside the Urban Greening Plan Guidance Draft and the pending

At a global level, the United Nations has declared the decade from 2021 to 2030 as the Decade on Ecosystem Restoration, which sets a course to repair and restore ecosystems around the world. In addition, the Kunming-Montréal Global Biodiversity Framework (GBF), a key outcome of COP15 from December 2022, builds a strong foundation for global action on biodiversity. It complements the Paris Agreement on climate change by outlining a roadmap for protecting and restoring nature and using it sustainably for current and future generations. The agreement includes specific targets for protecting 30% of global terrestrial and marine areas and restoring 30% of degraded ecosystems, as well as a mechanism for financing these efforts through the Global Biodiversity Fund. It also includes a financial package of international solidarity, particularly for the most vulnerable countries and those with the most biodiversity. There is a growing recognition of the need to prioritise nature protection globally, and those delegates that have painstakingly negotiated the Kunming-Montréal's text, should be applauded. However, the ultimate impact of this agreement will depend on how governments and practitioners implement nature protection policies and design interventions at the local level.

Earth's ecosystems are in decline globally at rates unprecedented in human history – similarly, the rate of species extinction is accelerating, anticipated to have massive adverse impacts for people and nature around the world. The crisis, which has resulted in one million species being at risk of extinction, is a particularly significant topic for designers working in areas planned for urban and peri-urban development and particularly greenfield development. How can new developments incorporate biodiversity into their design? What design strategies can help create healthy and resilient spaces for both people and nature?

Who should read this?

The series is intended for anyone working with nature-based solutions (NBS), for example:

- practitioners directly involved in the design, development and implementation of NBS and across urban ecosystems,
- policymakers, and
- landscape managers,

who are active at the local and regional levels, tasked with implementing legislation issued by the European Commission or by national authorities themselves.

The United Nations Fifth Environment Assembly in March 2022 defined NBS as "**actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.**"

Introduction

Biodiversity matters

The term "biodiversity" refers to the diverse range of life on Earth, including the variation among species and all forms of life, including rare, threatened, endangered, and even poorly understood species such as microbes, fungi, and invertebrates. According to the online glossary of the European Environment Agency (EEA), it is "*an umbrella term to describe collectively the variety and variability of nature. It encompasses three basic levels of organisation in living systems: the genetic, species, and ecosystem levels.*" Plant and animal species are the most recognised units of biological diversity, thus public concern has been mainly devoted to conserving species diversity. Biodiversity has value in many aspects of our lives, both for the benefits it provides to humans and for its own inherent worth. Utilitarian values of biodiversity include meeting the basic human needs such as food, energy, shelter, and medicine. Ecosystems also provide important services like pollination, seed dispersal, climate regulation, water purification, soil purification, nutrient cycling, and pest control. In addition to these practical values, biodiversity also has a cultural value by offering opportunities for recreation, relaxation, and inspiration. However, the intrinsic value of biodiversity refers to its inherent right to exist, independent of its value to humans or anything else. Finally, biodiversity can also be valued for the relationships it helps us form and maintain with each other and the environment. These relational values contribute to our sense of well-being, responsibility, and connection with nature. Understanding the different values of biodiversity is important to inform urban and peri-urban planning choices practitioners make every day. Biodiversity-positive design is about taking design decisions that reinforce the positive impacts on biodiversity and ecosystems and reduce the negative ones.

However, in the past century human actions have caused rapid ecosystem changes and significant loss of biodiversity worldwide, leading some to call our current era the "Anthropocene." While the Earth has always experienced changes and extinctions, they are now occurring at an alarming rate. Major threats to biodiversity include habitat loss and fragmentation, unsustainable use of natural resources, invasive species, pollution, and climate change. The root causes of biodiversity loss, such as environmental degradation, inequalities and overconsumption, are often complex and interconnected.

The Kunming-Montréal Global Biodiversity Framework

The Fifteenth meeting of the Conference of the Parties (COP 15) has been a significant moment for the planet, when the Kunming-Montréal Global Biodiversity Framework (GBF) was published to establish a shared commitment to protecting 30% of land and seas by 2030. This has been unanimously welcomed as the 'Paris moment' for biodiversity. Governments must follow through with their commitments on policies, action plans, and financial resources. This includes prioritising critical biodiversity hotspots, investing in urban green infrastructure, addressing over extraction, and transitioning towards a nature-positive economic model.

NBS and Biodiversity-Positive Design

Fortunately, humans have the opportunity and means to change actions and protect species and ecological systems. By understanding the threats to biodiversity and how they operate in specific contexts, designers can better prepare for conservation challenges. Conservation efforts in the past have made a significant difference in the state of biodiversity. On the one hand, protected areas such as national parks, wildlife refuges, game reserves, and marine protected areas, managed by governments and local communities, can provide habitat for wildlife and help prevent deforestation. On the other hand, when protecting habitat is not enough, other actions such as restoration, reintroduction, restrictions to land use conversion and controlling invasive species, have also had positive impacts. These efforts have been supported by measures to improve environmental policies at all levels. Additionally, individual and community lifestyles can greatly impact biodiversity and the environment.

Many years before the latest NBS definition by UNEA's Resolution, Eggermont (Eggermont et al, 2015) proposed a framework of three types of NBS to address environmental and social challenges:

- Type 1 - Minimal or zero intervention in ecosystems: Aims to maintain or enhance the provision of a variety of ecosystem services both within and beyond preserved ecosystems, with little to no intervention in the natural systems. Examples of this approach include safeguarding mangroves in coastal regions to reduce risks from extreme weather events and provide benefits for local communities, and establishing marine protected areas to conserve biodiversity within these areas while supporting the fishing industry through the export of biomass. This type of NBS is closely linked to the concept of biosphere reserves, which feature protected core areas for nature conservation such as those belonging to the Natura 2000 network, and buffer and transition zones where sustainable human activities take place.

- Type 2 - Sustainable and multifunctional management of ecosystems: Involves adopting sustainable and multifunctional management strategies for ecosystems and landscapes that are either extensively or intensively managed, with the aim of improving the delivery of specific ecosystem services beyond what conventional approaches could achieve. Examples of this approach include innovative planning of sustainable agricultural landscapes to increase their multifunctionality, or the use of approaches to enhance tree species and genetic diversity in forests to improve their resilience to extreme events. This type of NBS is closely associated with concepts such as natural systems agriculture (Jackson 2002), agroecology (Altieri 1989), and evolutionary-oriented forestry (Lefèvre et al. 2014).

- Type 3: Design and management of new ecosystems: Involves managing ecosystems in highly "invasive" ways or even creating entirely new ecosystems. This type can only be considered NBS if it contributes to the preservation of biodiversity and the sustainable management or restoration of ecosystems while delivering a range of ecosystem services. For agro-ecosystems and green spaces in urban areas, for instance, it is important to consider ecological complexity and connections with surrounding ecosystems to provide biodiversity benefits. Under this category there are actions aimed at increasing green space in squares and streets, restoring degraded areas within the city such as slopes or even quarries, provision of sustainable water management, etc.

The past few years of global pandemic have highlighted the importance of having access to natural spaces and nature in our communities. Protecting and enhancing nature is important not only in nature reserves and other protected areas (NBS Type 1), but also across urban and peri-urban landscapes, where one can find NBS Types 1, 2 and 3. New developments should be designed to support nature recovery networks and allow wildlife to thrive and move through the landscape, improving biodiversity. In this sense, local and regional authorities, through the planning and development consent processes, can positively affect the way in which developments are planned from concept to realisation. Landscape architects, designers and planners, along with staff working in local government planning agencies, have a key role for conserving biodiversity in human-modified landscapes or, where possible, enhancing it. Net-gain principles have been carried out in many countries such as the UK, Germany, France, Spain and Australia. Professionals can reconcile the needs of communities and healthy ecosystems to benefit both, connecting people with nature – e.g., creating new opportunities for children and young people to become immersed in nature and learn about the benefits through education. The more people understand and care for nature, the more they will contribute to protect biodiversity.

However, landscape designers and local government planning agencies often lack knowledge of wildlife ecology (e. positive and negative effects of cinegenic species on biodiversity) and biodiversity net gain, and the required skills for planning. Thus, there is an urgent need for recommendations guiding the design, planning, construction and 'stewardship' of urban ecologies. The approach is, by nature, a multidisciplinary one in tandem with the needs and aspirations of the human community inhabiting the urban realm.

Biodiversity-Positive Design Recommendations for the Mobility Network, Green associated with Buildings, Vacant Plots and Brownfields

Many authors recognise that green spaces in urban and suburban areas can provide habitat for the preservation of native plants and wildlife (Goddard et al., 2009; Kowarik, 2011), given that such spaces can take various forms: parks, gardens, green roofs, road verges, vacant lots and wastelands, hard surfaces and walls, cemeteries, allotment gardens, etc. (Müller et al, 2013). It is key to be open about the limitations of small-scale green spaces in terms of providing wildlife habitats for fauna, as these might be beneficial for cinegenic wild species, but not for fauna species that require wider life areas ranges or have specific trophic or nesting requirements. However, the potential of urban and peri-urban green spaces to support biodiversity enhancement should be further explored. Designers will find here some recommendations to enhance biodiversity.

This design brief is part of a series, and it provides NBS design recommendations considering the following typologies of space in urban and peri-urban areas:

- Urban and Suburban Mobility Network (Roads, Streets and Axes)
- Green associated with Buildings (Green Roofs and Facades)
- Vacant Plots and Brownfields

A solution classified in one type of space does not mean it cannot be implemented in another if it is considered appropriate. In addition, there are several solutions that are transversal to all spaces.

The design recommendations presented here derive largely from two urban manuals: Madrid's "Handbook on Nature-based Solutions: Promoting Biodiversity in the City of Madrid" and London's "Urban Greening for Biodiversity Net Gain: A Design Guide".

The prior design brief of this series has provided NBS design recommendations considering the following typologies of space in urban and peri-urban areas:

- Wildlife-friendly Areas
- Conservation Sites
- Public Spaces (Urban Green Areas, Parks and Gardens)

The Urban and Suburban Mobility Network

Designers can considerably contribute to biodiversity with their interventions alongside passages, roads, streets, and axes, pushing for slow mobility. Additionally, the design of Sustainable Drainage Systems (SuDS) along the street network can be seen as opportunities for biodiversity friendly measures, and not only to manage rainwater runoff. Is it also key for designers to recognise the conflict for space in cities, and the competition for space for cars versus for public use and biodiversity. Sustainable mobility plans should push for green, walkable and biodiversity-friendly cities.

In terms of using axes to enable ecosystems and improve connectivity:

- Medians, roundabouts, and islets in the city can be used to plant vegetation and create small green spaces, even providing food for species. It is important to consider maximum speed requirements to avoid fauna roadkill.

- To avoid creating trap habitats, it is recommended that designers analyse the spatial conditions and consider biodiversity habitats and moving patterns. Traffic-calming measures can be helpful in some cases.

- The street network can get groves, shrubs, meadows, herbs, aromatic plants, or vegetables, and serve as connections to larger green areas.
- They also contribute to the creation of green corridors and the capture of rainwater.
- Since many such structures do not have public use, they allow for the introduction of different layers of vegetation, given that visibility is safeguarded.
- The selection of plant species should be aimed at promoting pollinators and a diverse range of species.

In terms of improving tree pits along streets and axes:

- Tree pits on city streets can be revegetated with native herbaceous plants.
- Wild herbaceous plants in tree pits can also attract birds, insects, and many species of pollinators. In areas near seed sources, these plants may already be present.
- Planting seeds in various tree pits can attract birds and insects. It is important to choose species that do not compete with the tree.
- In some situations where there is no water scarcity, tree pits can get irrigated to support species that stay green year-round. However, it is recommended to choose species that are aligned with the climate. Settings without irrigation are also welcome, as there is nothing wrong in dry-looking solutions.

- Herbaceous plants in tree pits can attract birds and insects.
- Tree pits can be designed to manage rainwater and have improved infiltration capacity. Channels can collect rainwater forming a small-scale sustainable urban drainage system and direct it to the tree pits, which is most effective on sidewalks at least 3m wide.
- Planting vegetation in tree pits can be done by individuals or groups, bringing multiple benefits to the community.
- Not all tree pits can be used for planting: it is recommended that the tree is at least 3 years old, the tree pit must be wide enough, the planting hole must not be obstructed by roots, and the tree species must have deep roots to avoid cutting them during planting.
- Some European initiatives allow neighbours to "adopt" tree pits temporarily to plant vegetation at their base. It's important to implement informative programmes and place indicators showing the tree pit is being maintained privately to alert municipal maintenance staff.
- Tree pit adoption processes can be facilitated with management systems, and tree pits can be protected from trampling with curb stones or fences.
- Supertree pits (example: 3x3m) should have a soil volume of at least 15 m^3 per tree and can support multiple trees, creating shaded areas in public spaces. Root space can be increased with cells or structural soils with pavements, and different plant layers can diversify habitats for wildlife.
- Large tree pits tend to allow improved tree growth and can accommodate different layers and species. Stanchion furniture can protect tree pits from trampling and sidewalks.
- To increase tree pit size without losing sidewalk width, one can connect two or more tree pits and plant herbaceous or shrubby plants.
- Do not excavate beyond pavement for connected tree pits if trees exist prior to the intervention.
- Another solution is to design continuous tree pits, which provide continuous green spaces along streets, allowing passage and integration of urban furniture, and shrubby and herbaceous species.
- Design them to allow for water collection and include a temporary fence to protect from trampling but allow water passage. These tree pits can support trees, shrubs, and herbaceous layers and have integrated furniture, a strip for pedestrian shelter or vehicle access, and steps for transverse crossing to prevent trampling.
- Conventional tree pits can be enlarged with structural soil, a mixture of sand, gravel, and large, angular stones that supports soil and vegetation without compaction and can withstand heavy loads.
- In highly dense urban settings, structural soils can increase root space beyond the tree pit area and can be covered with vegetative soil, piece pavements, or conventional pavements like concrete tiles. Piece pavements can have filtering joints to function as a sustainable drainage system, and an angular stone structure is created to allow the structural soil to retain vegetation soil without compaction or deformation. Structural soil can also be used in passable routes and the tree and furniture strip but should not be introduced if there are already trees present as it may damage roots. Structural cells made of polypropylene can be used to enlarge tree pits and contain vegetative soil, supporting pavement and preventing soil compaction to promote tree growth and health. Conventional and piece pavements can be supported on structural cells but avoid using them if there are already trees present as roots may be damaged. However, if there is enough space, preference should be given to larger tree pits.

Green associated with Buildings (Green Roofs and Facades)

Green areas associated with buildings can foster biodiversity. Rooftop habitats present the opportunity to create habitats that can be integrated into an ecologically diverse landscape. Customised designs that consider local biodiversity priorities and replicate priority habitats in composition and structure will have a positive impact on wildlife. Green facades are being increasingly installed in cities for their aesthetic value or to address local environmental issues. By making simple design choices, these structures can contribute to biodiversity netgain.

In terms of choosing the type of green roof to be designed, consider the following:

- Extensive green roofs can withstand windy, exposed locations on tall buildings and require minimal maintenance.
- Semi-intensive green roofs are suitable for areas with shallow soil due to building structure and can be used to create flower-rich, prairie-like habitats with a diverse species mix.
- Intensive green roofs are better suited for protected or shaded locations, but their deeper soils and trees place a greater load on the building structure. They offer the greatest potential for creating a wide range of habitats.
- Blue roofs can hold more water than other green roofs. If the outlet pipe is raised above ground level, temporary wetlands may form, providing significant benefits for people and wildlife.

- In these spaces, plant selection is determined by size and the ability to complete their life cycle in pots.
- The introduction of green roofs can be compatible with a design intended for social use, for producing food, for producing energy, or for both. It is essential to calculate the load supported by the building's structure.
- Green roofs can provide habitats for various species, but also mitigate the urban heat island and function as a sustainable urban drainage system. Prefabricated modules have a drainage layer (perlite) and seeded or planted soil.
- Solar panels can be incorporated into green roofs. In fact, these can provide shading to green roofs and enlarge the selection palette of the species.
- Light green roofs can be installed on areas with limitation related to weight, such as some existing buildings. They are made of prefabricated plastic pieces that contain a layer of substrate, usually 5-20 cm thick, which can be adjusted based on the roof's weight capacity. These roofs partially work as sustainable urban drainage systems, help reduce the urban heat island effect, and allow for the creation of Sedum or herbaceous meadows. Lightweight green roofs can include herbaceous or Sedum meadows. Lightweight roofs have the lowest benefits for people and wildlife but require minimal maintenance. These modular lightweight green roofs can have built-in irrigation. Adding protective elements, such as continuous benches, to green areas prevents damage.

In terms of choosing the type of green facade to be designed, consider the following:

- Modular green walls are constructed with pockets, troughs (soil-based), or fabric (hydroponic) for plants. They usually require irrigation, which can be expensive, and require regular maintenance. Some designs provide nesting sites for birds.
- Traditional climbing green walls have climbing plants rooted in the ground and supported by trellises or steel cables. This is a low-cost measure. Typically, it does not require irrigation but offers nesting habitat until they are well-established or mature.
- Balcony planters are planted spaces integrated into balcony architecture and require less irrigation but may suffer from windburn. Window boxes, often temporary planters installed by residents, need regular watering due to windburn and desiccation.
- Nest boxes for birds and bats can be integrated into facades and green walls, but some species are territorial and will not use boxes that are too close together or at the wrong height or aspect.
- Facade planters provide space for planting various species, especially climbing plants, which are a simple and cost-effective way to green vertical surfaces. They can cover large areas and provide feeding and shelter habitats for various species while occupying minimal ground space.
- Facade planters are particularly useful on narrow streets with a single platform. A small, continuous planter, 30-50 cm wide, already allows for vegetation on the building facade.
- Research has shown that facade vegetation, apart from promoting biodiversity if properly designed, also has an insulating effect, reducing wind impact, protecting from UV rays and high temperatures, and absorbing water from potential basement dampness without harming foundations, despite the common belief that it damages buildings.
- Tensioned cables can assist in the growth of climbing species alongside the facade.
- Climbing plants on facades can be paired with ivy screens between opposing buildings. By installing tensors between facing facades, shaded and comfortable areas can be created. These structures enable cross-movement.
- Prefer to irrigate the green wall with rainwater and/or greywater, given that chlorine can directly harm microorganisms.
- Include native grasses and herbs that provide homes and food for pollinators such as butterflies and moths.
- Consider natural vertical habitats and incorporate plant groupings and structure into the wall design.
- Provide artificial nesting and roosting sites for bats, birds, and solitary bees.

- Involve residents by providing balcony planters and window boxes on residential or office buildings.
- To protect nocturnal wildlife like moths and bats, refrain from lighting green walls.
- Do not utilise combustible materials.
- Avoid solely relying on non-native plant species that do not provide homes or food for the early life stages of most invertebrates.
- If it is not possible to increase the size of planters due to the presence of utilities or a need for a temporary solution, green space can be extended using subtle interventions on the surface. One option is to use large seeded or planted bags, which create a naturalised look and can incorporate urban furniture.
- It is important to select plant species that provide pollen, nectar, fruit, or seeds attractive to local wildlife populations.

Vacant Plots and Brownfields

During the process of spatial planning, certain urban or suburban areas may have become vacant, abandoned or even neglected, being referred to as vacant or residual spaces. These can be brownfield sites, disused buildings, disused facilities such as train stations, airports, factories, old car parks, old roads, wasteland, etc. Brownfields, as abandoned lands that were previously developed or used for industrial purposes, may have soil contamination issues on the one hand, but may offer a high biodiversity value on the other hand. In fact, many vacant plots may be perceived as insignificant by the community but may provide invaluable habitat opportunities for wildlife. Also, the process of allowing abandoned or contaminated sites to naturally recover can lead to surprisingly positive results in terms of biodiversity. In fact, biodiversity might be richer in brownfield sites than in managed parks and gardens.

There are various plots of land within cities that are designated as vacant, as well as private plots

that are undeveloped. These spaces represent an opportunity to increase naturalised areas in cities, but it is necessary to conduct studies on prior ownership before any action can be taken. In plots that are designated for green spaces, more extensive planting can be done, including the planting of trees. In plots reserved for other purposes, temporary or reversible plantings are recommended, not to cause problems when the final use of the space is determined - these areas may favour the planting of non-tree plants.

Due to a lack of intensive management, abandoned sites often have sporadic or localised disturbance, which, combined with their varied, low-nutrient substrates, supports various insects. To ensure that brownfields with high biodiversity value are protected and recognised for their potential to support biodiversity, they should be identified and communicated to decision-makers before planning applications are submitted. This is crucial in some cases, given that bare, unpaved urban soil, known as functional soil, is often considered a scarce resource in dense cities and therefore there might be high competition for their occupation.

In terms of improving or preserving biodiversity in vacant plots:

- Understand the biodiversity baseline of the vacant plot before intervening. Abandoned plots might be supportive of diverse populations of wild insects, such as, for example, wild bees, birds and bats. On a larger scale, their interconnection with green biodiverse areas might be key in maintaining pollinator communities.

- Existing pollinator landscapes that need protection can be found in various vacant plots. Anticipatory land-use planning and improved land-use management can create and reconnect pollinator habitats in areas with high potential, such as brownfields, unused urban areas, green corridors, green roofs, sustainable drainage systems, and road, railway, and waterway verges.

- Recognise the biodiversity-value of brownfield sites before planning uses, especially if these have large areas. Brownfields larger than 2500 square metres can be used as networks and exchanges for seeds and species, as these sites have the potential to facilitate the exchange of species between sites, reduce the risk of extinction for plant populations, and supply seeds that can colonise other sites (Muratet et al., 2007).

- Do not always think that interventions are the best solution. Some governments specifically have documents recommending the so-called “passive” renaturing, through which existing habitats remain untouched and spontaneous evolution can take place.

- Tiny Forests can be designed in empty, undeveloped plots with compacted soil. Various vegetation species are planted or sowed to create dense, low-maintenance, biodiverse groves. These spaces promote urban biodiversity and reverse sealed soil. They can be publicly or privately used, have a minimal cost, and provide numerous benefits to urban ecosystems, such as mitigation of head island effects, rainwater management and shading. They can be implemented on small, municipally owned urban plots.

- Vacant plots can be redesigned as biodiversity micro reserves, which are protected spaces that promote the development of animal groups through specific actions, such as butterfly gardens, pollinator meadows, amphibian ponds, and bat shelters. These areas can be specific to one group or more general, creating diverse niches for a variety of wildlife. Nest boxes, herbaceous and shrubbery areas can be introduced as habitats. Food sources, fruit trees, and small ponds are also recommended. Protective fencing with windows allows for observation, and informative signs help visitors understand the purpose of these interventions.

- Identify areas with high renaturing potential in vacant plots and consider “depaving” strategies. However, be aware that desealing is not to be confused with renaturing, which is related to the improvement of biodiversity, considering factors such as the size of green spaces, plant cover, habitats, and ecological connectivity. Desealing might restore the permeability of the top layer of the soil, but is not sufficient for the restoration of the soil’s ecological functions. (Grandin et al, 2022).

- If space allows, consider occupying the area with agroforestry, a biodiversity-friendly practice that combines agriculture with forestry by growing and integrating trees or other perennial plants

with animal husbandry or crop cultivation. It also helps reduce erosion and increase water retention, as well as improve resilience to climate-related challenges. Examples include combining food crop and biomass production and planting trees or hedges in field margins or in the field for wind protection.

- An alternative to agroforestry, if space is more adequate, is urban gardening, which can help promote biodiversity and provide social and educational opportunities for community involvement in urban transformation. They offer food and habitat for wildlife through a combination of vegetables, herbs, and flowers, using locally adapted horticultural plant varieties. Composting reduces waste and promotes soil health, fruit trees provide food, nest boxes and pollinator shelters attract pest-controlling species, signage promotes environmental education, and live hedges offer food resources for beneficial species.

Final Considerations

There are several ways for designers to promote biodiversity conservation, including designing biophilic and climate-resilient spaces, applying NBS, creating nature-sensitive road networks, and incorporating green infrastructure into urban planning. By being mindful of the recommendations presented here, designers can play a key role in preserving and protecting biodiversity.

The design recommendations set out in this document are not meant to be comprehensive. This document also refrains from providing recommended lists of plant species and to highlight single landscape master plans, given that Europe has very diversified climatic zones and biophysical regions. Designers of urban and periurban green spaces, public housing, buildings, street networks and amenities can benefit from the presented recommendations to contribute with more functional, attractive, and biodiversity-friendly networks. However, design details will obviously depend on the biophysical specificities and the Genius Loci of the areas they are being proposed for. Certain spatial typologies that can be found in urban and suburban areas were chosen for the compilation of this set of recommendations. The aim is for this document to serve as a reference for designers to integrate biodiversity-driven principles in their daily work.

To achieve biological health in urban environments, public support is crucial. Many cities have focused on keeping wildlife out, but it is important for public administrations to demonstrate that biodiverse environments are beneficial for both wildlife and humans. This entails providing the necessary resources and conditions for the survival and reproduction of different species ensuring access to food, water, and shelter, as well as suitable environmental conditions such as healthy soils, clean water, clean air, reduced light and sound pollution, reduced waste, and resilience to drought and floods. Biodiversity master plans should be developed for all settlements, rooted in a landscape management approach that integrates wildlife at all levels, harvesting multifunctional benefits and creating more liveable cities for both people and nature.

Finally, it is recommended that practitioners and planners, in order to complement their design decisions, consult indexes such as the City Biodiversity Index and the IUCN Urban Nature Index, which can help them to assess and track the success of their efforts to protect biodiversity. The indexes can measure various aspects of biodiversity, including native species, ecosystem services, and the management and governance of biodiversity. Cities that have used the Singapore Index have found it helpful in improving their biodiversity conservation abilities, determining which conservation efforts are most important, and allocating funding for these efforts.

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