

Landscape-based Solutions for enhancing urban biodiversity

Anna Lambertini

Abstract: Landscape Architecture deals with the conscious transformation of open spaces and works with the living processes. It bases its planning and design approach on the themes of growth, movement, narrative, and the construction of relationships between diverse entities, between humans and nonhumans agencies, in space and time, in extension and depth. Observing the urban settlements through the lenses of Landscape Architecture means recognizing open spaces as their primary components, essential to support the web of life and biodiversity. Constantly exposed to the risk of being filled, eroded, and consumed, open spaces constitute the negative of built volumes: this concerns public and private areas, encompassing permeable and impermeable surfaces, planned places and vacant lands, small residual fragments of free land or vast and composite territorial areas, bodies of water, agricultural areas, and forested spaces. Open spaces should be interpreted dialectically, as entities in dialogue with the solids of the built environment and with other spaces not built, with particular attention to those with active organic soil. This applies to all possible scales of reading and interpretation (geographical, topographical, historical, temporal, etc.), considering open spaces in their different and multiple characterizations (ecological, environmental, socio-symbolic, historical, expressive, aesthetic). Every open space has a promising role (potential or actual) and it does not necessarily have to fulfil a human function. Starting from these premises, the article introduces the concept of Landscape-based Solutions as a device for improving Urban Biodiversity, also proposing to move from the paradigm of greenery to that of an open space system.

Keywords: Landscape Architecture, Urban Nature, Open Space System, Landscape-based Solutions, Biodiversity

1. Interpreting Urban Biodiversity

The concept of «urban biodiversity», which emerged in the 1990s¹ from the broader field of urban ecology as a specific area of research (Sukopp 2002; Nilon and Aronson 2024), is currently at the center of numerous scientific discussions, environmental policies, and social awareness campaigns. It has now become part of everyday vocabulary².

¹ Among the first authoritative scientific contributions to the study of urban biodiversity is *The Ecological City: Preserving and Restoring Urban Biodiversity*, published in 1994 as a collection of proceedings from the multidisciplinary symposium organized four years earlier by the Chicago Academy of Science. The symposium aimed to explore the city as a biodiverse habitat and fertile ground for interactions between human populations and nonhuman biological entities. In Italy, a first useful and innovative contribution to the topic in the form of a textbook was by Marco Dinetti, with the 2009 publication of the book *Urban Biodiversity: Understanding and Managing Habitats, Plants, and Animals in Cities*.

² Having become part of the sustainable planning lexicon around the turn of the 21st century, this phrase has enjoyed prodigious media coverage over the past two decades or so: for example, anyone searching the web via Google would find at least 3,100,000 results in 0.21 seconds for the Italian version and a staggering 104,000,000 results in 0.26 seconds for the English version. What emerges is a miscellany of informational materials and documents from beyond the technical and scientific literature.



Fig. 1 – Proposing Landscape-based Solutions for reinventing a public open spaces system in the Municipality of Granarolo, Metropolitan Area of Bologna, Italy. Scheme designed within the framework of the NATU.R.E.R applied research, coordinated by Anna Lambertini and developed thanks to a collaboration agreement between the UNIFI Department of Architecture and Regione Emilia Romagna., 2024-2025). Graphic design: Benedetta Pavone.

As a relatively new multidisciplinary key concept, the expression ‘urban biodiversity’ lends itself to exploration from various critical perspectives, at the intersection of different disciplinary approaches.

In this paper, I propose to explore its meaning from the perspective of Landscape architecture, a discipline concerned with the conscious transformation of open spaces and which, by tradition, is dedicated to working with living processes. Landscape architecture bases its planning, design and management approach on the themes of growth, movement, narrative, and the construction of relationships between diverse entities, between humans and nonhumans agencies, in space and time, in extension and depth. Observing the cities through the lens of Landscape architecture means recognizing open spaces as integral components of the built environment. It also means acknowledging them as essential common goods for sustaining the web of life, ensuring the proper functioning of the urban ecosystem, and achieving the visual and perceptual quality of human settlements. Constantly exposed to the risk of being filled in, fragmented, eroded, or consumed, open spaces constitute the negative of built volumes: they include public and private areas, permeable and impermeable surfaces, designed places and residual fragments, “green” and “gray” spaces, cultivated and uncultivated areas, pieces of *Third Landscape* (Clément 2005), bodies of water, and forested areas. Every open space has a multifunctional role (whether potential or actual); it does not always have to serve a human-centered function directly.

When viewed as part of a system, open spaces take on the role of connective tissue, a fabric, or a framework, and provide an inverted image of the city.

A widespread, capillary network of interconnected open spaces, with particular attention to those with biologically active organic soils, constitutes the fundamental prerequisite for maintaining and enhancing urban biodiversity - a dimension that, in addition to biological diversity and the variety and multiplicity of species and habitats, implies the recognition of the cultural, figurative, aesthetic, socio-symbolic diversities and historical-testimonial value of places. Building on this disciplinary and critical-interpretive framework, I propose a paradigm shift that replaces the notion of urban green space with that of open space systems, thereby introducing the multidimensional concept of *Landscape-based Solutions* as a useful tool for developing planning and design instruments that promote urban biodiversity.

2. Urban Green and Nature-based Solutions

Although the various expressions of nature within built environments have been observed and studied for centuries, the interpretation of cities as significant reservoirs of biodiversity has only been embraced by the broader scientific community in recent decades. Since the beginning of the third millennium, renewed emphasis has been placed on the role of “urban green spaces”, which have taken on increasing importance in environmental policies formulated at the global, European, and national levels.

A product of functionalist urban planning that emerged in the early decades of the 20th century, the term *urban greenery* refers to the collection of public open spaces characterized by the presence of vegetation. Parks, gardens, and tree-lined avenues are its archetypal expressions. From its earliest uses, this term has carried different shades of meaning, though initially these were always tied to hygienic, aesthetic, social, and educative considerations. Despite the conceptual weaknesses and interpretive ambiguities of a term based on a chromatic and largely quantitative approach—one that refers simultaneously and indiscriminately both to the totality of plant formations distributed throughout the public city and to the open spaces that host them—the expression *urban green* maintains a dominant position in common parlance, as well as in technical, scientific, and regulatory lexicon. Furthermore, over the past two decades, it has taken on additional nuances, precisely in relation to the spread of the notion of biodiversity. The various definitions of urban green space tend to emphasize its connecting role and its infrastructural connotations. At the same time, they emphasize the need to adopt a multi-scale approach. However, they frequently adopt a perspective that is heavily skewed toward the ecological-environmental-quantitative dimension. Moreover, this dimension is interpreted in a markedly performance-oriented manner, based on dimensional parameters and biophysical indicators (such as the number of trees planted or the CO₂ absorption capacity of various tree and shrub species).

As the climate emergency has intensified and urban populations have grown, the traditional restorative, therapeutic, and healing role attributed to green spaces in cities has been increasingly emphasized in recent years. The introduction in 2004 of the new *One Health* model (which considers human, animal, and environmental health as a single entity) and the dramatic and unsettling experience of the recent SARS-CoV-2 pandemic have contributed to fueling the debate on its benefits. Recognition of the close correlation between biodiversity, ecosystem health, and human well-being underpins policies and measures guided by the ecological-economic paradigm of *Nature for People*, to which the well-established concept of ecosystem services belongs: human populations are considered part of ecosystems, and Nature provides services indispen-

sable to their sustenance and health, which can also be quantified economically. This paradigm also encompasses the widely adopted concept of Nature-based Solutions, introduced in 2009. The potential strategic and multifunctional role that NbS can play has been extensively explored and documented. It is worth highlighting, however, the problematic aspect: NbS thrive on the ambiguity of a paradigm that remains skewed toward a predominantly anthropocentric vision.

3. Ideas of Nature, Urban Landscape and Paradigm Shifts

Georgina Mace, a British ecologist considered one of the most brilliant and rigorous scientists of our time, writes that the concept of *Nature for People*, intertwined with the idea of biodiversity conservation, began to emerge in the late 1980s: until then, international nature conservation policies (and related practices) had been predominantly shaped by the notions of *Nature for itself*³ and *Nature despite People*⁴.

The three paradigms of nature just mentioned reflect different attitudes, developed over time by urban societies in response to the effects of the progressive expansion of human settlements across the planet's surface. They evoke different ethical and aesthetic ideas of *Nature* and the *City*, filtered over the course of the last three centuries or so (Brevini 2013), through the dominant cultural frameworks that have established a sharp opposition between urban and natural, between human and nonhumans, and between cultivated and spontaneous.

It seems appropriate to recall that from the evolution of the *Nature for People* paradigm in an ecological-economic key have derived the concepts of Natural Capital, Ecosystem Service, and Nature-based Solutions. For this reason, various scholars have not missed the ambiguous flavor of an idea of Nature that is compliant, serviceable, and salvific, working primarily to satisfy the needs of the human species.

As a substantial body of postcolonial scholarship suggests, it is time, instead, to adopt a different ecological paradigm and to chart, once again, new paths for conservation biology and for planning and design practices in the human world. After all, there is a need to develop descriptive and interpretive tools that bridge disciplines and can then be translated into practical tools.

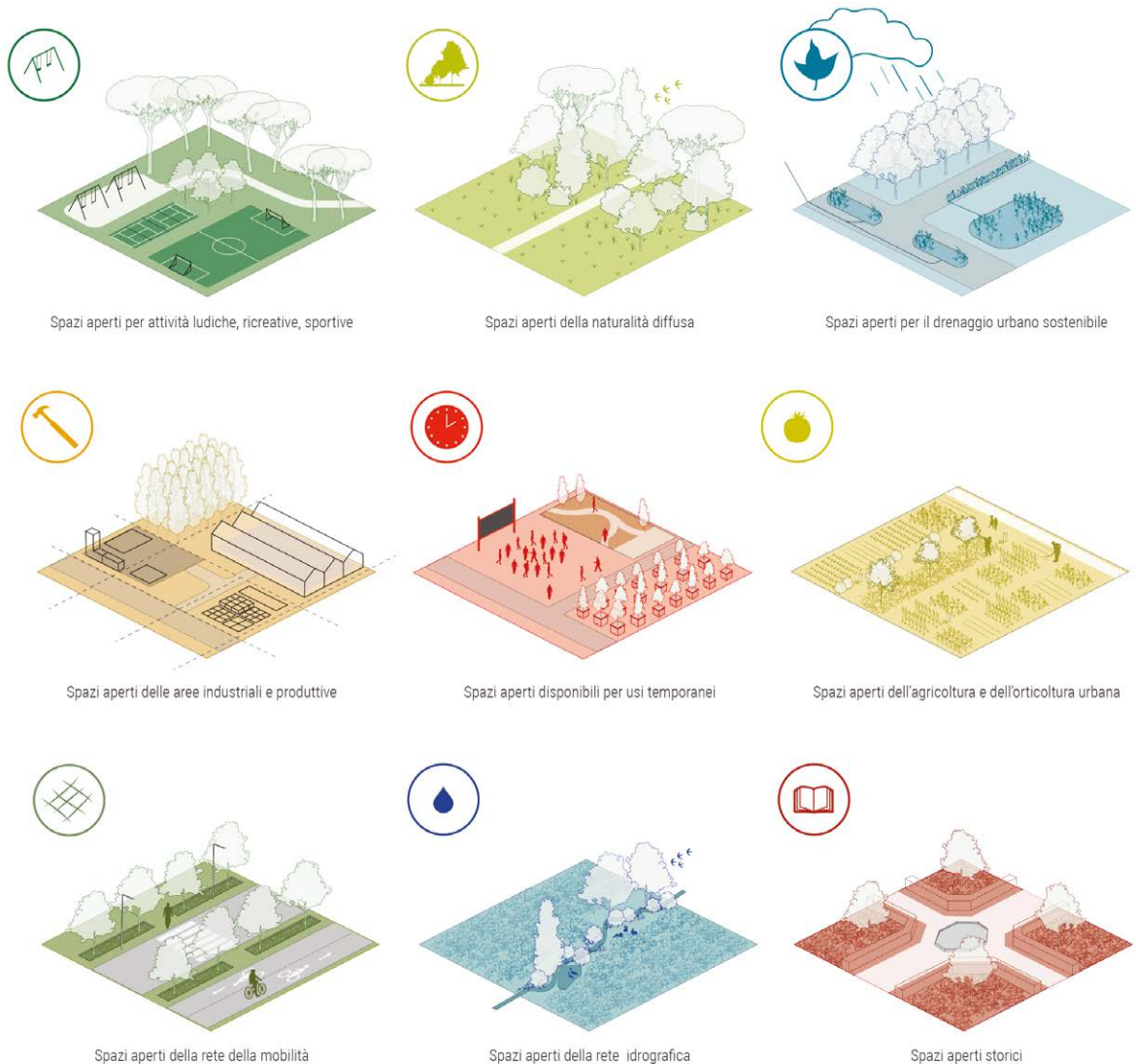
Mace, for example, has used the expression *People and Nature* (Mace 2014), which effectively emphasizes the coexistence of people and nature but still leaves open the possibility of an ontological separation. By reversing the order of the terms - a move that suggests a significant semantic shift - Randrup, Buijs, Konijnendijk, and Wild instead propose the phrase *Nature with People* (Randrup, Buijs, Konijnendijk, Wild 2020), placing the emphasis on the idea of humans as part of nature. Warning against the risk of exploiting natural resources due to the persistent reliance on the concepts of ecosystem services and Nature-based Solutions, these authors propose developing a

³ Cfr. Mace 2014. « Conservation thinking before the 1960s was broadly of the *nature for itself* type which prioritizes wilderness and intact natural habitats, generally without people, and has scientific underpinnings from wildlife ecology, natural history, and theoretical ecology. This thinking continued throughout the 1960s (...) and remains a dominant ideology for many people today ».

⁴ Cfr. Mace 2014. « In the 1970s and 1980s, rapid increases in the impacts of human activity and awareness of the consequences of habitat destruction, overharvesting, and invasive species led to the emergence of *nature despite people* conservation. Here, the focus is on threats to species and habitats from humans, and on strategies to reverse or reduce them. Ideas concerning minimum viable population sizes and sustainable harvesting levels, as well as intense debates about community-based management and the sustainable use of wildlife, stem from this period and persist to the present ».

more open and inclusive *Nature-based Thinking* (NBT), to be used primarily in urban transformation processes. “We define NBT as an approach to urban inclusive planning, drawing inspiration from nature to act socially, environmentally, and economically in the transition toward sustainable cities. (..) NBT does not only view nature as providing solutions to urban challenges; it also recognizes that more space needs to be allocated to wild nature. NBT takes a cyclical approach to creating space for wildscapes and less manicured urban green spaces, but also aims to be truly transdisciplinary” (Randrup, Buijs, Konijnendijk, Wild 2020: 921-22). Nature-based Thinking aims to promote the diversity of urban nature and takes a firm stand in favor of spaces of wild nature. This is certainly not a new principle, but it deserves our support. We must not forget to include the dimension of beauty in this approach, so as to avoid falling into the insidious trap of the stubborn and sterile dichotomy between ecology and aesthetics.

Fig. 2 – Possible open space classes to set up a Landscape Approach-based mapping. Classification proposed within the framework of the NATU.R.E.R applied research (coordinated by Anna Lambertini and developed thanks to a collaboration agreement between the UNIFI Department of Architecture and Regione Emilia Romagna, 2024-2025). Graphic design: Cristian Farina.



To describe and nurture the urban natural environments of the 21st century, we need new ethical and aesthetic categories, as well as to experiment with updated, trans-disciplinary operational tools for managing urban biodiversity.

In this context, among the emerging concepts pointing to promising research horizons is that of *Urban Wild* (Lambertini 2022), as a planning and design category that refers to different forms, expressions, and processes of spontaneous nature within urbanized territories.

In addition to representing one of the most prolific fields for experimenting with practices and poetics of critical landscape regeneration, the theme of the presence of spontaneous vegetation and wild animals in cities poses an important scientific and cultural challenge. A challenge specifically regarding the conservation of urban biodiversity through the management of networks of abandoned open spaces with free evolutionary dynamics capable of hosting secondary ecological successions.

To bring about the bold paradigm shift required by the ecological transition, it is not enough to ask ourselves what and how much natural capital to invest, or how many thousands of trees need to be planted in cities to secure the future of a species - the human species - that has become increasingly less generalist and increasingly specialized in living in urban contexts. Rather, we must understand what forms of urban governance can be experimented with to enable *Multispecies Urbanism*⁵, embrace super-diversity (Lambertini and Trovato 2025), and foster the complexity of interspecific relationships. The challenge of the biodiverse city is to make it desirable not only to cohabit with the welcome and docile companion species evoked by Donna Haraway (Haraway 2003), but also to coexist and co-evolve alongside a strange, surprising, even unsettling, cosmopolitan multitude of living entities (Schilthuizen 2021). All of this requires bold exercises of imagination.

4. A Cognitive and Imaginative Challenge

The loss of global biodiversity, documented over the years by numerous authoritative scientific studies and reports, is not merely a problem to be assessed quantitatively; it also involves a “perceptual, cultural, and epistemological crisis that challenges us as a Western society and, more broadly, as the human species, directly affecting the meaning that life—and its value—holds in and for us” (Di Stefano, Elisabetta, Valeria Maggiore, e Salvatore Tedesco. 2025). Since the 21st century, thanks to the powerful narrative of the Anthropocene, research trajectories have emerged that invite us to break free from the binary structure upon which the Western mind has been shaped for centuries. Thinking in terms of pairs of opposing categories such as nature/culture, organic/inorganic, wild/domestic, has led us dangerously off course. The well-established dualism of Man/Nature is not symmetrical; on the contrary, it is based on the dominance of one species over others. To overcome these antagonisms, we need “to construct the apparatus for new perceptions, infrastructures of speculative sensibility, open to the unknown” (Manghi 2021, 35). The *post-humanist approach*, *queer theory* and *queer ecology* (Gandy 2011), the *more-than-human city*, and Donna Haraway’s the concept of *Humusity* are theories and perspectives that invite us to explore the hybridity, mixtures, and the mystery of “the inclusion of all in the same world” (Coccia E. 2022). They also

⁵ For a more in-depth look at this topic, see “Debra Solomon: Multispecies Urbanism” in Landezine, <https://landezine.com/debra-solomon-multispecies-urbanism/>. Last viewed 12/11/2025.

pose uncomfortable questions, such as: “despite all the talk of sustainability, what chance do we have of leaving a habitable environment for our descendants of different species?” (Lowenthaupt Tsing A. 2021).

A focus on urban biodiversity involves exploring which ethical and aesthetic ideas about nature human populations are actually willing to embrace, and with which non-human communities and entities they can learn to coexist in urban areas undergoing transformation. It is not so much a matter of asking what place to reserve for nature in the city: as the American landscape architect Anne Whiston Spirn argued very well as early as the 1980s (Whiston Spirn 1984), cities are in some ways already part of nature. This seemingly provocative statement rests on a clear interpretation: the biochemical and biophysical processes that govern energy exchanges, air movement, the hydrological cycle, and soil erosion can manifest and act, with varying intensity and outcomes, both in cities and in vast natural open spaces. *The Granite Garden* aims to dismantle one of the most common oppositional dichotomies—that of urban versus natural—and to shed light on the workings of an ecological mindset that has very little to do with today’s reassuring *green* rhetoric. Landscapes, gardens, and open spaces are shaped and molded by human action and imagination as well as by the elements, plants, animals, erosion processes, and geological movements; they can change slowly and imperceptibly or suddenly and violently. This is why “landscape architects have been exploring and discussing what it means to design with nature for over a century”, Whiston Spirn further explains, urging designers and planners to use terms like “natural” or “ecological” consciously when referring to the nature of their work. She suggests that it is necessary to adopt an informed critical stance on the concept of Nature - or rather, on the “Nature of Nature” in question - if we wish to facilitate an appropriate updating of the tools of landscape architecture and urban planning and design (Whiston Spirn A 1995, 29).

5. Expanding the Scope: towards Landscape-based Solutions

With the aim of contributing to the ongoing debate, I propose shifting from the concept of NbS to that of *Landscape-based Solutions*, a design framework that I have placed at the center of some recent applied research projects. In essence, it is a question of always considering the *Landscape approach* (Koh 2013) to NbS: this means outlining solutions informed by a trans-scalar vision, through iterative planning and design processes that take into account the ecological and cultural characteristics of the sites and/or areas of intervention, whether it be a portion of a city, a system of local open spaces, or specific urban greening projects.

Referring to *Landscape-based Solutions* means explicitly adopting distinctly trans-scalar visions that bridge territorial networks and the micro-scale, and addressing the issue of urban regeneration “through design forms that reframe the focus on ecology and the environment” (Russo 2013, 218). Landscape is, in fact, a cross-sectoral, multi-dimensional, and communicative field: “it points to innovative paths for planning and design, helping to regenerate the concept of sustainability, which - due to its centrality but also to the pervasive use of the term - requires constant redefinition and new focuses” (Russo 2013, 218).

Landscape-based Solutions combine themes and approaches specific to ecological planning and design with the ‘desperate’ need for beauty, pleasantness, and meaning in the places where we live, within a perspective of territorial governance that leverages issues such as, among others, multispecies coexistence, coevolution, and multiculturalism.

1. Leggere e interpretare il paesaggio

1.1 Ambiti di paesaggio

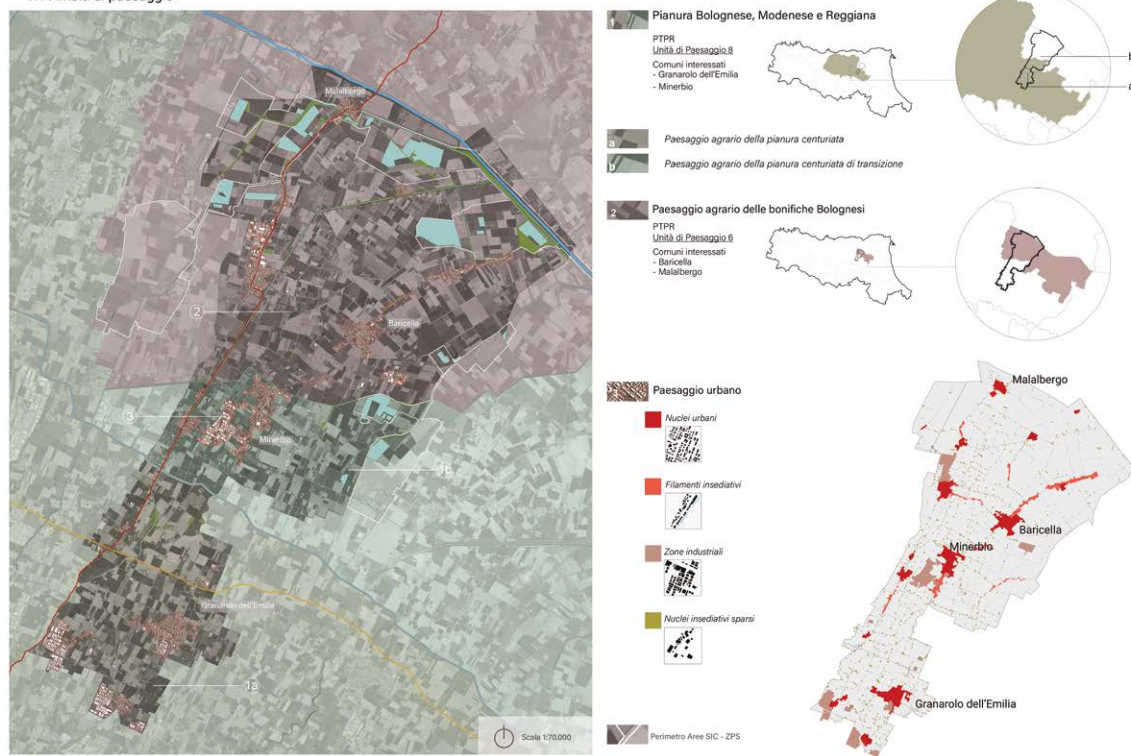


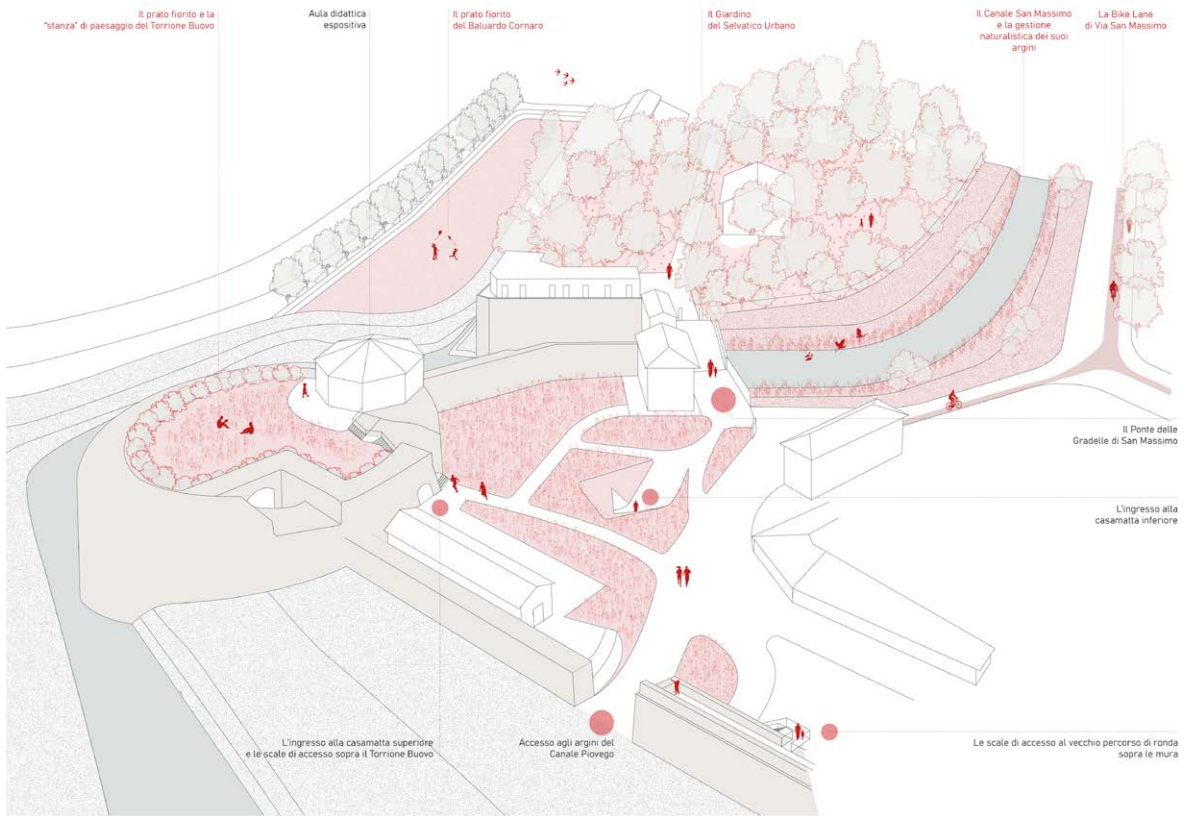
Fig. 3 – Landscape Units: a Landscape interpretation of the Municipal territories. Union of Municipalities of Terre di Pianura, Metropolitan Area of Bologna, Italy. Map developed within the framework of the NATU.RE.R applied research coordinated by Anna Lambertini and, conducted thanks to a collaboration agreement between the UNIFI Department of Architecture and Regione Emilia Romagna. Graphic design: Simone Cortonicchi.

For this reason, *Landscape-based Solutions* are figurative: they transform the territory of plans into systems of places and spaces experienced through the gaze, explored hand-to-hand.

To define these, it is necessary to incorporate certain key themes into the knowledge-based and diagnostic framework of biodiversity and green planning tools (such as the Green Plans developed in accordance with the initial guidelines of Italian Law 10/2013 or the Urban Nature Plans outlined in the *European Biodiversity Strategy*), including:

- the definition of landscape unit delineated at the local level, which implies a significant change in the scale of interpretation, representation, and assessment, consistent with what has been outlined at the regional level;
- a survey of open spaces, conducted on the basis of classes and subclasses that are not tied to the functionalist and sectoral approach still underlying the definition of various categories of urban green space in land-use planning;
- a survey of plant structures and the various vegetation patterns (tree, shrub and herbaceous layers) present in the territory that characterize the quality, configuration, and functioning of landscapes;
- a map of urban soil characteristics;
- a map of different habitat.

Landscape-based Solutions indicate that, at all scales of intervention (spatial and temporal), every planning decision and every transformation project should be landscape-sensitive, dealing with the system of open spaces. And thus engag-



ing with the various contexts (in the broadest sense of the term) and the diverse evolutionary dynamics, paying attention to issues of an ecological-environmental, historical-cultural, socio-symbolic, aesthetic, and visual-figurative nature.

Because if biomass, carbon, the number of plants to be planted, and the amount of new urban green space were to be the only reference indicators, then one place would be just as good as another, all parts of the territory would be equal from the perspective of quantifying ecosystem services, and all open spaces (regardless of their specific historical, socio-symbolic, or relational value, irrespective of their suitability for use, their geographical location, or their unique characteristics) would be equivalent. If, on the other hand, we speak of landscape quality - in the broad sense that the term *landscape* can express far beyond the clichés and lazy interpretations of reductive cognitive and interpretive models - then a different approach is needed.

References

- Brevini, Franco. 2013. *L'invenzione della natura selvaggia. Storia di un'idea dal XVIII secolo ad oggi*. Torino: Bollati Boringhieri.
- Clément, Gilles. 2005. *Manifesto del Terzo Paesaggio*. Macerata: Quodlibet.
- Coccia, Emanuele. 2018. *La vita delle piante. Metafisica della mescolanza*. Bologna: Il Mulino.
- Corrado, Maurizio, e Anna Lambertini, a cura di. 2011. *Atlante delle nature urbane. Centouno voci per i paesaggi quotidiani*. Bologna: Editrice Compositori.

Fig. 4 – *Landscape-based Solutions* for the active conservation and enhancement of urban biodiversity along the Padua Walls Park System. Designing interpretation developed within the framework of an applied research conducted thanks to a collaboration agreement between the UNIFI Department of Architecture and the Municipality of Padua. (Anna Lambertini and Tessa Matteini scientific coordination, 2025-2026). Graphic design: Cristian Farina.

- Di Stefano, Elisabetta, Valeria Maggiore, e Salvatore Tedesco. 2025. "Estetica e Biodiversità. Esperienza estetica, cura e relazione per ripensare il futuro della Biodiversità." *Itinera* 29: 7-14. <https://doi.org/10.54103/2039-9251/29666>.
- Gandy, Matthew. 2012. "Queer ecology: nature, sexuality, and heterotopic alliances." *Environment and Planning D: Society and Space* 30: 727-47.
- Haraway, Donna Jeanne. 2003. *The Companion Species Manifesto: Dogs, People, and Significant Otherness*. Chicago: Prickly Paradigm Press.
- Koh, Jusuck. 2013. *On a Landscape Approach to Design. An eco-poetic interpretation of landscape*. Wageningen: Landscape Architecture Group of Wageningen University. <https://edepot.wur.nl/258729> (2025-12-23).
- Kowarik, Ingo, e Stefan Körner. 2005. *Wild Urban Woodlands*. Berlin: Springer.
- Kowarik, Ingo. 2023. "Urban biodiversity, ecosystems and the city. Insights from 50 years of the Berlin School of urban ecology." *Landscape and Urban Planning* 240. <https://doi.org/10.1016/j.landurbplan.2023.104877>.
- Lambertini, Anna. 2021. "Prove di resistenza in un pianeta infetto. Riconnettere spazi, corpi, nature." *Rassegna di Architettura e Urbanistica* 163: 55-62.
- Lambertini, Anna. 2022a. "Ibride, cosmopolite, inventive. Nature del 'selvatico urbano'." In *Natur Park Schöneberger Südgelände e la natura urbana berlinese*, a cura di Patrizia Boschiero, Thilo Folkerts, e Luigi Latini, 202-15. Treviso: Antiga/Fondazione Benetton Studi Ricerche.
- Lambertini, Anna. 2022b. "Suoli urbani. Note per una progettazione paesaggistica di profondità." In *Suolo come paesaggio. Nature, attraversamenti e immersioni, nuove topografie*, a cura di Luigi Latini, e Simonetta Zanon, 34-46. Treviso: Antiga/Fondazione Benetton Studi Ricerche.
- Lambertini, Anna, e Maria Gabriella Trovato. 2025. "Diversità e differenze / On diversity and differences." *Ri-Vista. Research for Landscape Architecture* 22, 2: 7-35. <https://doi.org/10.36253/rv-18057>.
- Mace, Georgina M. 2014. "Whose conservation? Changes in the perception and goals of nature conservation require a solid scientific basis." *Science* 345, 6204: 1558-60.
- Manghi, Nicola. 2021. "Stengers Things. Introduzione a un pensiero esigente." In *Nel tempo delle catastrofi. Resistere alla barbarie a venire*, di Isabelle Stengers. Torino: Rosenberg & Sellier.
- Mostafavi, Mohsen, e Gareth Doherty, a cura di. 2011. *Ecological urbanism*. Zurich: Lars Müller.
- Randrup, Thomas B., Arjen Buijs, Cecil C. Konijnendijk, e Tom Wild. 2020. "Moving beyond the Nature-based Solutions discourse: introducing Nature-based Thinking." *Urban Ecosystems* 23, 4: 919-26.
- Schilthuizen, Menno. 2019. *Darwin Comes to Town*. London: Quercus Publishing.
- Tsing, Anna L. 2015. *The Mushroom at the Edge of the World. On the Possibility of Life in Capital Ruins*. Princeton: Princeton University Press.
- Whiston Spirn, Anne. 1984. *The Granite Garden. Urban Nature and Human Design*. New York: Basic Books.
- Whiston Spirn, Anne. 1995. "The Authority of Nature: Conflict, Confusion, and Renewal in Design, Planning, and Ecology." In *Ecology and Design. Framework for Learning*, edited by B.R. Johnson, e Kristin Hill, 29-49.
- World Bank. 2021. *A Catalogue of Nature-Based Solutions for Urban Resilience*. <https://openknowledge.worldbank.org/handle/10986/36507> (2025-12-23).