

Framing Green and Blue Infrastructure

Original

Framing Green and Blue Infrastructure / Giudice, Benedetta; Novarina, Gilles; Voghera, Angioletta (THE URBAN BOOK SERIES). - In: Green Infrastructure. Planning Strategies and Environmental Design / Giudice B., Novarina G., Voghera A.. - STAMPA. - Cham : Springer, 2023. - ISBN 978-3-031-28771-8. - pp. 1-11 [10.1007/978-3-031-28772-5_1]

Availability:

This version is available at: 11583/2979052 since: 2023-06-03T21:58:14Z

Publisher:

Springer

Published

DOI:10.1007/978-3-031-28772-5_1

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Green Infrastructure

Planning Strategies and Environmental
Design

 Springer

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Angioletta Voghera
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Editors

Benedetta Giudice
Interuniversity Department of Regional
and Urban Studies and Planning
Politecnico di Torino
Torino, Italy

Gilles Novarina
Laboratoire Architecture Environnement
and Cultures Constructives
École Nationale Supérieure
d'Architecture—Université Grenoble Alpes
Grenoble, France

Angioletta Voghera
Interuniversity Department of Regional
and Urban Studies and Planning
Politecnico di Torino
Torino, Italy

ISSN 2365-757X

ISSN 2365-7588 (electronic)

The Urban Book Series

ISBN 978-3-031-28771-8

ISBN 978-3-031-28772-5 (eBook)

<https://doi.org/10.1007/978-3-031-28772-5>

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Foreword by Stéphane Sadoux

If you run a quick search on any university library catalogue, you will notice an increase in the number of scholarly publications devoted to green and blue infrastructure in recent years. Although this trend is encouraging, the gap in literature is still significant and the publication of this edited volume is a particularly welcome addition to existing material. The COVID-19 pandemic has, sadly, made the content of this book all the more relevant. Where available and accessible, green and blue infrastructure has provided urban populations with outdoor recreational spaces in which they sought to mitigate the stress caused by the pandemic. The past few years have thus served as a powerful reminder that green and blue infrastructure caters for community as much as environmental needs and that their uneven distribution and quality in cities and regions is yet another indicator of social injustice.

That more attention should be paid to the roles and importance of green and blue infrastructure is old news. Calls for action at the supranational level, particularly those led by the United Nations and the European Union, have over the years contributed to fueling debates and raising awareness of populations and policy-makers. The various chapters included in this volume provide detailed and thought-provoking insights into the ways in which a range of stakeholders have sought to act through policies, plans and projects. The case study-based approach provides readers with thorough local and regional investigations showing how objectives, such as those found in the EU's Biodiversity Strategy, are locally translated into context-specific actions.

Water courses and networks of green spaces cut through administrative boundaries. Addressing green and blue infrastructure therefore requires a multiscale approach and this book clearly demonstrates the importance of joint-up thinking, from the local to the supranational levels. The devil is in the detail and authors successfully highlight the complex challenges which policy-makers and practitioners face when they attempt to transcend spatial and indeed sectoral boundaries. This book should also be praised for highlighting the positive outcomes of bottom-up initiatives, which allow local communities to take an active role in the governance of green and blue infrastructure management. Populations' knowledge of the places they live in is priceless and needs to be documented, understood and fed into action. This book stresses the role of academics in this process and the field work carried out by the

authors confirms the relevance of grounded and qualitative research in architecture, urbanism and landscape planning.

This book is a compelling call for the systematic integration of green and blue infrastructure in spatial planning policy and practice. It is also a cruel reminder that new approaches and skills are now required to address the complex and daunting contemporary challenges we face. The inclusion of practitioners' viewpoints in this publication is particularly inspirational and refreshing: these first-hand accounts stress the importance of retrofitting our fragmented and degraded environment.

This collection of multidisciplinary contributions from doctoral, postdoctoral and senior researchers as well as practitioners will undoubtedly be of interest to undergraduate and postgraduate students in architecture, urban, regional and landscape planning, geography, environmental sciences and engineering. The material will also provide policy-makers with much-needed practical knowledge and recommendations. In addition, and perhaps most importantly, it will encourage other scholars and practitioners to further investigate green and blue infrastructure.

Stéphane Sadoux
Director
School of Architecture of Grenoble
Centre of Excellence in Architecture
Environment and Building Culture
Grenoble Alpes University
Grenoble, France

Foreword by Grazia Brunetta

The Green and Blue Infrastructure Projects in Spatial Planning as a Key Component for Adaptation to Climate Change

In recent decades, we have been witnessing on a planetary scale a weak or almost zero response capacity of the cities and territories to the events caused by the ongoing systemic dynamics of climate change. The significant effects of climate change are the result of the increasingly high temporal frequency of extreme natural phenomena and the greater vulnerability of soils, the result of the intense and growing dynamics of urbanization and the consequent fragmentation of natural environments. The process of fragmentation of natural environments due to anthropic causes is the primary cause of biodiversity loss, generating ecological losses and environmental and landscape challenges. The drastic loss of biodiversity is a consequence of the development model pursued up to now—strongly polarized on urban areas and primarily based on the intensive and extensive exploitation of natural resources—still supported today by a growing urbanization dynamic on a global scale. The United Nations estimates that 65% of the world’s population (about 6 billion people) will be concentrated in thirty mega-cities which will consume 75% of the planet’s resources, producing a widespread loss of biodiversity by 2050.

It is necessary to carry out new knowledge paradigms for urban projects and territorial actions oriented toward the regeneration of biodiversity. However, it should be considered that since the early 1990s, with the introduction of the Habitats Directive (92/43/EEC), the goal of conservation of biological diversity has established itself as a priority theme in community planning actions, in order to promote environmental conservation policies aimed at enhancing and protecting ecological resources and the landscape. Should be mentioned here of the first pioneering agreements on biodiversity promoted by the Council of Europe, such as the *European Network of Biogenetic Reserves* (1992),¹ followed by a package of global agreements—*Rio Convention on*

¹ CoE 1992. European network of Biogenetic Reserves. Strasbourg.

Biological Diversity (1992),² *IUCN Caracas Action Plan on Parks and Protected Areas* (1992),³ *Pan-European Strategy for Biological and Landscape Diversity of the Council of Europe* (1996)⁴—which gave impetus to the launch of a political debate and initial objectives shared internationally. In that decade of activity, the first theoretical considerations and experimentations were promoted to direct the *ecological network* project in spatial planning at the different scales of action. Among the promising innovations in terms of local spatial planning practices of green and blue infrastructures (GBI), in the national context, it should be mentioned here the ecological approaches introduced in the 1990s in some urban plans and the multi-disciplinary research promoted by the *National Institute of Urban Planning* and by the *National Environmental Protection Agency* to define the first national guidelines for the design of ecological infrastructures on a local scale.⁵ In this perspective, the pioneering experiences of the urban plans of Faenza and Reggio Emilia should be recalled here for having introduced an ecological approach to the design of a continuous and open system of urban green areas with the aim of restoring an ecological balance in urbanized areas, and to regenerate the environmental resources in the collective urban spaces.⁶

Today, on this issue, there are various and consolidated international references which, in response to the climate crisis, promote the project of ecological regeneration in urban and regional policies. Among all, specific references for spatial planning are the *Paris Agreement on Climate Change* (2015),⁷ the *New Urban Agenda* (2016)⁸ and the *2030 Agenda for Sustainable Development*⁹ with the Sustainable Development Goals 15 (life on the land) eight (water) 11 (human settlements), and 13 (climate action) and the recent *Nationally Determined Contributions Report* (NDCs—2022)¹⁰ which analyzes the urban content of one hundred and ninety-three national strategies for adaptation to climate change. The NDCs Report clearly shows that there is a lot of work to do on the ecosystem and biodiversity issue, as only 26% of the adaptation actions introduced in national policies concern the recovery of biodiversity in urban projects.

In this perspective for action, the book presents a review of proposals on the GBI project in an attempt to overcome the operational difficulties and the sectoral nature that has always characterized the approaches and experiences of ecological heritage projects. As noted by the authors, the concept of GBI in spatial planning is

² UN 1992. Convention on Biological Diversity. Rio de Janeiro.

³ IUCN 1992. Caracas Action Plan on Parks and Protected Areas. Caracas.

⁴ CoE 1996. Pan-European Strategy for Biological and Landscape Diversity. Strasbourg.

⁵ APAT-INU 2003. Gestione delle aree di collegamento ecologico funzionale. Manuale n. 26. Roma. ISBN: 88-448-0111-6.

⁶ See: *Plan of Faenza* (1998), and *Plan of Reggio Emilia* (1999).

⁷ UNFCCC 2015. Paris Agreement on Climate Change. Paris.

⁸ UN 2016. New Urban Agenda. Habitat III: Quito 17–20 October.

⁹ UN 2015 2030 Agenda for Sustainable Development. New York 25–27 September.

¹⁰ UNFCCC 2022. Nationally Determined Contributions under the Paris Agreement. Synthesis report by the secretariat. Sharm el-Sheikh Climate Change Conference, November.

an “old wine in new bottles,” implemented with great weakness in urban design, that returns to being topical today. In the era of the Anthropocene, the GBIs become key components of the urban project for adaptation to climate change and regeneration of the terrestrial ecosystem in national and international strategies. The project of the GBIs requires an intersectoral and transcultural spatial planning approach capable of overcoming the mere regulatory vision of territorial and urban plans, with the aim to implement a strategy and a project through forms of co-planning and multiscale governance. On these aspects, the book presents good practices and innovation experiences in the fields of territorial planning and urban design, focusing attention on the necessary elements of innovation to implement the concept of GBIs as a socio-ecological part of a path toward the sustainability of development processes. But as the volume shows in the third part, these practices need to be operationalized in order to become the engine of new urban projects capable of integrating the objectives of recovering ecological diversity in the processes of transformation. This new ecological vision for regenerating cities and territories is a promising work perspective, but it is still to be implemented in regional planning and design at different scales toward an ecological and socio-cultural transition path aimed at promoting sustainability, quality and liveability of development by 2030.

Grazia Brunetta
Interuniversity Department of Regional
and Urban Studies and Planning
Politecnico di Torino
Turin, Italy

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Chapter 1

Framing Green and Blue Infrastructure



Benedetta Giudice, Gilles Novarina, and Angioletta Voghera

Abstract Green and blue infrastructure (GBI) is increasingly popular in international literature and cultural debates. Indeed, international opinion agrees that GBI is a strategic planning and design tool to face current and upcoming societal challenges. However, goals and practical applications are not fixed and differ based on disciplinary approaches and geographical areas. Thus, the chapter attempts to provide a systematic frame on the current cultural debate on GBI, presenting the diverse contributions deriving from planning and design practices, from vast scale strategies to local projects.

Keywords Green and blue infrastructure · Sustainability · Resilience · Urban and regional planning · Urban and landscape design

1.1 Urban Challenges in the Post-pandemic Era

European urban areas are home to over two-thirds of the population, with a level of urbanisation that is expected to increase to approximately 83.7% in 2050. Most European cities are often characterised by a high concentration of economic activities and wealth, but they are increasingly vulnerable to pandemics, environmental and economic crises, social disaggregation, and climate change related impacts. Additionally, there is a growing concern about biodiversity loss and its implications on health, well-being, climate, economy, degradation of nature, and social inequality (Anguelovski et al. 2018). Ecosystem degradation erodes nature's ability to support

B. Giudice (✉) · A. Voghera

Interuniversity Department of Regional and Urban Studies and Planning, R3C—Responsible Risk Resilience Centre, CED PPN, Politecnico di Torino, Viale Mattioli, 39, 10125 Torino, TO, Italy
e-mail: benedetta.giudice@polito.it

A. Voghera

e-mail: angioletta.voghera@polito.it

G. Novarina

Laboratoire Architecture Environnement & Cultures Constructives, Université Grenoble Alpes - École Nationale Supérieure d'Architecture, Grenoble, France
e-mail: novarina.g@grenoble.archi.fr

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B. Giudice et al. (eds.), *Green Infrastructure*, The Urban Book Series,
https://doi.org/10.1007/978-3-031-28772-5_1

human societies, as ecosystems provide a wide range of services (MEA 2005; TEEB 2010).

Biodiversity loss emphasises the effects of other current crises: climate, economic, and COVID-19. It is essential to start from biodiversity as a strategic component of natural processes providing ecosystems with the possibility to develop the vital functions for social direct or indirect benefits (De Groot 1992), interpreted in terms of ecosystem services (ES) provided to humans (Science for Environment Policy 2015). There is a scientific consensus that without biodiversity, many natural processes (such as climate regulation, limitation of urban heat islands, water and air purification, maintenance of soil fertility, reproduction of species, etc.) and human activities (such as agriculture, fishing, and outdoor recreation) would be impossible (Hooper et al. 2005). In this view, it is urgent to rethink urban planning and design approaches to restore biodiversity as defined in the EU Biodiversity Strategy 2030 within the European Green Deal.

Moreover, the Biodiversity Strategy 2030 calls for a comprehensive change to benefit people, climate and nature. It highlights the role of interconnected protected areas (PAs), green areas, ecological networks, green infrastructure (GI) and green and blue infrastructure (GBI). This interconnection allows for controlling biodiversity loss, enforcing ecosystems, connecting diverse natural and semi-natural areas, and delivering “a wide range of ecosystem services”, maintaining and enhancing at least 15% of degraded ecosystems (EC 2013). Urban and peri-urban PAs and other green areas (such as gardens, yards, vacant lots, pocket parks, and wastelands) are all components of a connected and coherent network able to sustain biodiversity (Trzyna 2014; UNEP-WCMC and IUCN 2021). This multi-scale network must be integrated into the landscape, territorial policies, and urban planning to enhance ecological reticularity and ecosystem functionality (Barabási and Bonabeau 2003). Moreover, due to their multifunctionality, PAs and other green spaces play an important social role, bringing people closer to nature (Hockings et al. 2020). Biodiversity loss emphasises the effects of ongoing crises (e.g. COVID-19, economic and climate), making it essential to start with biodiversity as a strategic component of planning and design at diverse territorial scales, even in the light of interdependencies between humans and nature.

In this process, the pandemic event of COVID-19 represents a turning point from different perspectives, impacting economic development, everyday life, habits, planning, and design practices. Current national, EU, and international strategies (such as Biodiversity Strategy 2030, Green Deal, Next Generation EU and the various national plans such as the Italian *Piano Nazionale di Ripresa e Resilienza* and the French *Plan National de Reprise et de Résilience*) stress the attention on urban green spaces as one of the main elements determining the quality of life and ecosystem health (Noszczyk et al. 2022). In response to these impacts, planning and design practices are even more forced to rethink the urban project in an ecologically oriented way, restarting from natural and ecological assets.

In this evolving framework, GBI is a socio-ecological system strategically planned and designed for sustainability and resilience (Voghera and Giudice 2019), aimed at managing a large variety of ES (Hansen and Pauleit 2014) and playing a crucial role in

halting biodiversity loss. It can sustain the interrelation between “diversity (biodiversity), redundancy (ecological variability), cycles of adaptation (multiple equilibrium states), and interaction between spatial scales (hierarchy) and temporal (activation of different times responses)” (De Lotto et al. 2017, p. 780). Various studies underline the need for carefully planning, distributing, and designing a multifunctional and multi-scale GBI, integrating green (soils) and blue (water) spaces that can improve biodiversity values, the related ecological functionality, and socio-economic values.

1.2 Green (and Blue) Infrastructure as a Responsive Approach

Given the current situation of the COVID-19 pandemic emergency, GBI has become an urgent topic of the contemporary cultural, planning, and design approaches. Even though it is recognised as “planning and design-related measures” for urban resilience (Sharifi 2020), it still appears poorly developed in research and everyday practices. Given this gap, the book aims to develop an integrated approach connecting cultural and environmental features with planning and design dimensions, investigating both academic and practitioners’ perspectives emphasising public policy innovation.

Rooted in the tradition of the twentieth century city since the earliest hygiene-based urban reflections (e.g. parks and gardens system by Jean-Claude Nicolas Forestier, public parks and parkways by Frederick Law Olmsted, garden city experience), GBI provides consolidated assets that refer to an environmental approach in spatial and landscape planning (“old wine in new bottles”, Davies et al. 2006, p. 6). Later on, the American greenways movement relaunched the idea of creating a system of parks and parkways that integrated “corridors of private and public recreation lands and waters and to provide people with access to open spaces close to where they live, and to link together the rural and urban spaces in the American landscape” (Americans Outdoors 1987).

Nowadays, it is powerfully invoked as operative support in developing the resilient, sustainable, safe, inclusive, and climate-responsive contemporary city (Mell 2009). Furthermore, it has a key role in the ecologically and landscape-oriented design of public spaces (see Andreas Kipar interview) and is considered a fundamental element for urban regeneration strategies (see interviews with Magali Volkwein and Sébastien Roussel and Carlo Gasparrini).

GI appears to have several conceptualisations focused mainly on “(1) a greenspace planning, (2) an urban ecology concept, and (3) a water/stormwater management concept” (Matsler et al. 2021, p. 2). With regard to the first aspect, GBI tends to be an “integrated system” (Landscape Institute 2009) of green spaces that bring plenty of benefits, focusing on landscape multifunctionality (Lovell and Taylor 2013). It is thus configured as a system that links landscapes and ecological networks, penetrating the tissues of the consolidated city. This system also insists on urban metabolism based on resource recycling, identity reappropriation and care for the landscape

commons. It implies a design action that brings into play different scales of landscape design, considering building materials, eco-friendly public spaces, water cycle, vegetation performance, slow mobility systems, and settlement types. Furthermore, it also entails different forms of inclusive and innovative governance to activate green and circular economies.

The multidimensional and transcalar strategy of GBI grounds the design of cities and territories in landscape quality to trigger urban regeneration by redesigning vacant lands and open spaces (Secchi 1986; Lanzani 2015). This paradigm shift needs to move out of “sectoriality” and integrate ecological, environmental and landscape issues into the territorial project, according to a model now consolidated in theoretical elaboration, emerging practices, and international policies. These reflections fall under the second conceptualisation related to urban ecology.

The third conceptualisation is quite a narrow vision of GBI, and it needs to be further deepened to include the already mentioned characteristic of multifunctionality. Indeed, EU policies define GBI as a “strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services” (EC 2013). This definition led many researchers to deal with multifunctionality. In this context, GBI can be considered a producer of multiple benefits (Ahern 2011; Hansen and Pauleit 2014; Lovell and Taylor 2013) for health and life quality. The international literature highlights that the several benefits and services supplied to urban environments by GBI contribute to climate change mitigation and adaptation (Demuzere et al. 2014). Additionally, the multifunctionality of GBI can mitigate the urban heat island effect, flood risk, and ecosystem resilience (Sussams et al. 2015).

Furthermore, the concept of GI “differs from conventional approaches to open space planning because it looks at conservation values and actions in concert with land development, growth management and built infrastructure planning” (Benedict and McMahon 2002, p. 5). Here, the inclusion of a sustainable development perspective in addition to a preservative one is evident. The various connotations given to GBI in the different disciplinary approaches configure GBI as a “boundary object” (Brand and Jax 2007).

GBI can be used to enforce ES (Arcidiacono and Ronchi 2021) through its integration into the landscape and regional planning (Voghera and Giudice 2021; Giudice et al. 2021), dealing with a multifunctional approach in planning and design (Austin 2014), or it can be a policy itself (Gasparrini 2015; Clergeau and Blanc 2013) implementing the EU biodiversity strategy for 2030, the COP 10 decision X/2 Strategic Plan for Biodiversity 2011–2020.

Together with ecosystem-based solutions, GBI-based planning is recognised as a relevant approach to addressing climate change in the EU strategy on adaptation. Indeed, GBI discourses are also strictly connected to disaster risk management and its relationship with the environment (we refer primarily to the Sendai Framework for Disaster Risk Reduction 2015–2030). The topic is also strategically relevant to implementing some of the UN Sustainable Development Goals: no. 3 “Good health and well-being”, no. 11 “Sustainable cities and communities”, no. 13 “Climate Action”, no. 14 “Life below water”, no. 15 “Life on land”. To fulfil these

objectives, GBI development requires “both the conservation of existing biodiversity-rich ecosystems in good condition and the restoration of degraded ecosystems” (EC 2019, p. 2). In addition, it is also necessary to create a new GBI to valorise and create landscapes and values (as interpreted by the European Landscape Convention, CoE 2000). However, there is an increasing need to further integrate GBI synergistically and organically into ordinary and sectorial planning tools at different scales (e.g. river basin management plans and rural development programmes) and into voluntary agreements between regional and local authorities (for example, French *Contrats Verts et Bleus* and Italian *Contratti di Fiume*). Indeed, most of the spatial planning tools (above all, the ones developed at the local scale) don’t include GBI as a “standard part” (EC 2019). Only a few countries, such as France, have decided to integrate GBI as a specific recognised part of their spatial planning tools (from regional strategy to local plan).

In particular, the book frames GBI within the conceptual contexts of sustainability and resilience. This background takes the cue from former research led by two of the proposing editors (Voghera and Giudice) and published in *Sustainability* in 2019. These contexts are also strictly connected to the social-ecological systems approach (on this issue, the work by the Stockholm Resilience Centre is exemplary). Existing literature on GBI, social-ecological systems, resilience, and sustainability show how GBI mainly applies to stormwater management (Ahern 2013), but it can contribute to providing other benefits, such as better air and water quality (Demuzere et al. 2014), urban heat island mitigation (Tzoulas et al. 2007), improved communities values and reduced social vulnerability (Meerow and Newell 2017), greater access to green space (Meerow and Newell 2017), increased landscape connectivity (Zhang et al. 2019), and control of land take (Giudice 2021). Nevertheless, if the role in promoting ecological resilience is consolidated and shared, scientific positions split consensus on its social impact (Anguelovski et al. 2019).

Another essential element of GBI is its multiscale governance. Despite the absence of an organic and robust structure and reference framework for deploying GBI, many attempts and progresses at different levels have been made to achieve this deployment worldwide. Existing plans and projects often consider GBI only at a specific scale: some projects consider the elements of GBI only at a local scale of intervention without relating them to the surrounding areas. Nevertheless, on the one hand, some Italian experiences attempted to develop a GBI at the municipal level, connecting it with the surroundings and giving connectivity. On the other hand, France established a multilevel planning system in the early 2010s integrating the regional territorial scheme, metropolitan strategy, and local plan. GBI management remains an open issue, which requires focused research and cooperation between policymakers, private stakeholders, and non-governmental organisations.

1.3 Objectives and Contents of the Book

The description of GBI shows how the topic is still fundamental when speaking of ongoing ecological, social, and economic transformations. GBI represents indeed not only a relevant strategy and policy to promote ecological-related issues but it is recognised that it can potentially have economic and social benefits. With this book, we want to fill this gap by presenting various experiences that show how multifaceted the topic of GBI is and how it can be applied in practical case studies. The first point deals with the necessity to overcome the prevalence of ecological-related issues, including social and economic ones, while the second point allows for evaluating the operationalisation of GBI. To do this, the book discusses the emerging approaches within planning and urban design: not only ecological solutions but also architectural and social ones that contribute to the overall regeneration of territories. This research mainly focuses on French and Italian contexts but also provides some insights from experiences developed worldwide. The choice of France and Italy is not casual. On the one hand, France has developed a national strategy, the so-called *Trame Verte et Bleue* (see Fournier and Bonnefond chapter; Devillers & Associés interview), to integrate GBI into regional and local planning practices and urban design. On the other hand, Italy is attempting to build a GBI framework by reinforcing its role in the latest Regional Landscape Plans and raising awareness of the Italian National Strategy for Climate Change Adaptation. Other case studies come from England, Portugal, Spain, and the USA in order to put into perspective the French and Italian cases at the international level.

The chapters of this book highlight the innovations introduced by different GBI approaches in the field of territorial planning (part I) and urban design (part II).

The discussion involves experts in different sectors giving their opinion on some issues or presenting how they included the concepts of GBI in their projects and how this integration modifies their approaches to planning, urban project, and public spaces design. From this perspective, we interviewed planners, architects, and landscape architects (part III: Carlo Gasparini Planning Studio, Studio Land, and Devillers et Associés). These interviews help to develop the link between the design conception and action (implementation and management). Interviewees are all involved in new planning and design forms, putting the GBI project at the centre. Interviews focused on different aspects based on each interviewee's background and field of experience. Considering the existing literature on this topic, we are trying to develop a multi-disciplinary approach which overarches the entire GBI building process, from planning scopes to the design phase, including management and implementation actions.

1.3.1 Experiences in Planning and Design

The case studies offer a varied selection of sustainable and resilient practices integrating vast and systemic actions with local design interventions: water connections, “green and blue textures” (as in the River Contract and the French strategy for the ecological and landscape quality of the territory; Voghera 2020) that rely on territorial strategies, free soils, ecological networks and vegetated spaces, networks of PAs, shared urban gardens, urban agriculture, networks of rural landscapes, cultural heritage, energy networks, slow mobility networks, networks of social and cultural associations that attempt to activate circular economies (such as the agricultural experimentation at diverse scale, see the chapter by Ingaramo and Negrello).

In this view, rivers are crucial for biodiversity enhancement (see chapters by D’Ascanio and Palazzo, Verdelli, Fournier and Bonnefond, Seigneuret, and Anastasia). They often undergo a process of trivialisation, which is reflected in the functional dystrophy of the ecosystems that compose them, with the result of making the system increasingly vulnerable, fragile, and costly in terms of remediation and public investment (Santolini 2010). So, it becomes strategic to focus on rivers as an ecological framework for integrating biodiversity in planning and ecological design at different scales (Schindler et al. 2016; see the chapters by Giaimo, Seigneuret and Arcidiacono, Ronchi, Di Martino, and Pristeri). The current situation results challenging for implementing GBI in planning at different scales, and it calls for planning guidance on how, where and when GBI and ES should be managed to enforce biodiversity and deliver multiple benefits to citizens in urban regeneration actions (such as in ecological reticularity strategies and experimentation; see the chapter by La Riccia).

These actions and projects aim at landscape enhancement, identified as the structural dimension of urban design that promotes urban regeneration strategies based on a renewed alliance between historical-cultural and ecological-environmental values. In fact, “greening the city” seems to be the goal shared by all the cases, together with the design of a diverse city as in Milton Keynes’ “urban laboratory” (see Forget chapter). The setting of urban regeneration considers not only nature in the city as “mere context architecture, but a branched and complex connective system that links exterior and interior, historical legacies, environmental dynamics” (Gambino 2007), able to use new technologies for the smart city that can evolve through a collaborative approach.

Based on a participatory process for interpreting people’s aspirations, the GBI in the Loire Valley reimagines the link between landscapes, heritages, and well-being, impacting the economy (Luginbühl 2014) to intervene in the quality of life of the inhabitants (see the chapter by Verdelli).

GBI is providing functional performance and design criteria and rules (Voghera and Giudice 2020) and developing place-specific settings and conforming open spaces, as in the River Contract of the Aniene (see the chapter by D’Ascanio and Palazzo), enhancing the functional taxonomy and considering environmental degradation areas and brownfields, complex cultivation patterns, and in-between spaces

(urban fringe areas, open spaces, ecological network). Affecting the performance in terms of ES provisions, the Iberian GBI case studies (see Anastasia chapter) are significant in terms of water corridors, mobility, and environmental and “cultural” infrastructures, supporting urban regeneration processes for the renewal of underused and vacant areas along the water, located in crucial and strategic urban and metropolitan enclaves through landscape projects and minimal architectural interventions (“confetti”).

These aspects confirm that GBI is a multi-benefit solution that can integrate the transcalar approach from planning to architecture that can host many of the current nature-based solutions for healthy cities (such as green canopies, trees, green roofs, and other solutions; see the chapter by Aimar). A “transversal reticular paradigm” (Gambino 2009), multidimensional and multi-sectoral, capable of enhancing through a short-, medium-, and long-term strategies, the interactions between the different connection networks that cross the territory, linking facts, and actions in a frame of synergies that structures the environmental regeneration of public space and works for a different quality of living. A reticular paradigm that thus crosses practices of recovering open and built assets and soils and offers innovative services to redesign the landscape and build the foundations for a circular economy, based on social capitalisation, efficiency, and competitive recombination of factors of production and that needs (as the French cases also show) resources for operationalisation.

As emerges from the cases discussed, this reticular paradigm bases actions at different scales on multilevel governance and empowerment (e.g. the innovative design solutions at the diverse scales—i.e. interviews examples) to help achieve a new territorial and landscape balance and different habitability and sociality in the landscape. These landscape networks reconfigure systems of spatial, social, ecological, and economic value relations in dynamic ways.

Acknowledgments The text is the result of shared work among the authors. In particular, paragraph 1.1 is attributed to Angioletta Voghera, paragraph 1.2 to Benedetta Giudice and paragraphs 1.3 to Gilles Novarina.

References

- Ahern J (2011) From fail-safe to safe-to-fail: sustainability and resilience in the new urban world. *Landsc Urban Plan* 100:341–343. <https://doi.org/10.1016/j.landurbplan.2011.02.021>
- Ahern J (2013) Urban landscape sustainability and resilience: the promise and challenges of integrating ecology with urban planning and design. *Landscape Ecol* 28:1203–1212. <https://doi.org/10.1007/s10980-012-9799-z>
- Anguelovski I, Connolly J, Brand AL (2018) From landscapes of utopia to the margins of the green urban life. *City* 22(3):417–436. <https://doi.org/10.1080/13604813.2018.1473126>
- Anguelovski I, Irazábal-Zurita C, Connolly JJT (2019) Grabbed urban landscapes: socio-spatial tensions in green infrastructure planning in Medellín. *Int J Urban Reg Res* 43(1):133–156. <https://doi.org/10.1111/1468-2427.12725>
- Arcidiacono A, Ronchi S (2021) Ecosystem services and green infrastructure. Perspectives from spatial planning in Italy. Springer, Cham

- Austin G (2014) Green infrastructure for landscape planning integrating human and natural systems. Routledge, London
- Barabási AL, Bonabeau E (2003) Scale-free networks. *Sci Am* 288(5):60–69. <https://doi.org/10.1038/scientificamerican0503-60>
- Benedict MA, McMahon ET (2002) Green infrastructure: smart conservation for the 21st century. Sprawl Watch Clearing House, Washington, DC, USA. Available via <http://www.sprawlwatch.org/greeninfrastructure.pdf>. Accessed 9 June 2022
- Brand FS, Jax K (2007) Focusing the meaning(s) of resilience: resilience as a descriptive concept and a boundary object. *Ecol Soc* 12(1):23. Available via <http://www.ecologyandsociety.org/vol12/iss1/art23/>
- Clergeau P, Blanc N (eds) (2013) Trames vertes urbaines. De la recherche scientifique au projet urbain. Éditions du Moniteur, Paris
- Council of Europe (CoE) (2000) European landscape convention. Available via <https://rm.coe.int/16807b6bc7>. Accessed 9 June 2022
- Davies C, MacFarlane R, McGloin C et al (2006) Green infrastructure planning guide. Available via http://www.greeninfrastructurenw.co.uk/resources/North_East_Green_Infrastructure_Planning_Guide.pdf. Accessed 9 June 2022
- De Groot R (1992) Functions of nature, evaluation of nature in environmental planning, management and decision making. Wolters-Noordhoff, Groningen
- De Lotto R, Esopi G, Sturla S (2017) Sustainable policies to improve urban ecosystem resilience. *Int J Sustain Dev Plan* 12(4):780–788. <https://doi.org/10.2495/SDP-V12-N4-780-788>
- Demuzere M, Orru K, Heidrich O et al (2014) Mitigating and adapting to climate change: multi-functional and multi-scale assessment of green urban infrastructure. *J Environ Manag* 146:107–115. <https://doi.org/10.1016/j.jenvman.2014.07.025>
- EC–European Commission (2013) Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions. Green infrastructure (GI)—enhancing Europe’s natural capital, COM/2013/0249 final. European Commission, Brussels. Available via <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52013DC0249&from=EN>. Accessed 9 June 2022
- EC–European Commission (2019) Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Review of progress on implementation of the EU green infrastructure strategy, COM/2019/236 final. Available via <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:236:FIN>. Accessed 9 June 2022
- Gambino R (2007) Parchi, paesaggi, territorio. *Rivista Parchi*, 50
- Gambino R (2009) Parchi e paesaggi d’Europa. Un programma di ricerca territoriale. *Ri-Vista. Res Landscape Archit* 8(2):3–20
- Gasparrini C (2015) In the city on the cities. Listlab, Trento
- Giudice B (2021) Planning and design perspectives for land take containment: an operative framework. Springer, Cham
- Giudice B, Novarina G, Voghera A (2021) The integration of ecological and landscape networks in spatial planning. Perspective of the strategies of two Alpine regions in France and Italy. *Sci Eau & Territoires* 36:8–15. <https://doi.org/10.14758/SET-REVUE.2021.3.01>
- Hansen R, Pauleit S (2014) From multifunctionality to multiple ecosystem services? A conceptual framework for multifunctionality in green infrastructure planning for urban areas. *Ambio* 43:516–529. <https://doi.org/10.1007/s13280-014-0510-2>
- Hockings M, Dudley N, Elliott W et al (2020) Editorial essay: COVID-19 and protected and conserved areas. *Parks* 26(1). <https://doi.org/10.2305/IUCN.CH.2020.PARKS-26-1MH.en>
- Hooper DU, Chapin III FS, Ewel JJ et al (2005) Effects of biodiversity on ecosystem functioning: a consensus of current knowledge. *Ecological Society of America Report, Ecolo Monographs* 75(1):3–35. <https://doi.org/10.1890/04-0922>

- Landscape Institute (2009) Green infrastructure. an integrated approach to land use. Landscape Institute, London. Available via https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2016/03/Green-Infrastructure_an-integrated-approach-to-land-use.pdf. Accessed 9 June 2022
- Lanzani A (2015), Città territorio urbanistica tra crisi e contrazione. Franco Angeli, Milano
- Lovell ST, Taylor JR (2013) Supplying urban ecosystem services through multifunctional green infrastructure in the United States. *Landscape Ecol* 28:1447–1463. <https://doi.org/10.1007/s10980-013-9912-y>
- Luginbühl Y (2014) Les valeurs du paysage. In: Fifteenth meeting of the Council of Europe: workshops for the implementation of the European Landscape Convention, Ürgüp, Nevşehir, Turkey, 1–2 October 2014, pp 21–26. Available via <https://rm.coe.int/fifteenth-meeting-of-the-workshops-for-the-implementation-of-the-europ/1680934ff8>. Accessed 25 May 2022
- Matsler AM, Meerow S, Mell IC et al (2021) A ‘green’ chameleon: exploring the many disciplinary definitions, goals, and forms of “green infrastructure.” *Landsc Urban Plan* 214:104145. <https://doi.org/10.1016/j.landurbplan.2021.104145>
- MEA—Millennium Ecosystem Assessment (2005) Ecosystems and human well-being: synthesis. Island Press, Washington, DC. Available via <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>. Accessed 14 June 2022
- Meerow S, Newell JP (2017) Spatial planning for multifunctional green infrastructure: growing resilience in Detroit. *Landsc Urban Plan* 159:62–75. <https://doi.org/10.1016/j.landurbplan.2016.10.005>
- Mell IC (2009) Can green infrastructure promote urban sustainability? *Proc Inst Civ Eng Eng Sustain* 162(1):23–34. <https://doi.org/10.1680/ensu.2009.162.1.23>
- Noszczyk T, Gorzelany J, Kukulska-Kozieł A et al (2022) The impact of the COVID-19 pandemic on the importance of urban green spaces to the public. *Land Use Policy* 113:105925. <https://doi.org/10.1016/j.landusepol.2021.105925>
- President’s Commission on Americans Outdoors [Americans Outdoors] (1987) Americans outdoors: the legacy, the challenge. Island Press, Covelo
- Santolini R (2010) Biodiversità, servizi ecosistemici e prospettive nella gestione interamministrativa. In: Ferroni F, Romano B (eds) Biodiversità, consumo di suolo e reti ecologiche. La conservazione della natura nel governo del territorio. WWF Italia, Ministero dell’Università e della Ricerca Scientifica. Cogecstre Ed, pp 76–84
- Schindler S, O’Neill FH, Biró M et al (2016) Multifunctional floodplain management and biodiversity effects: a knowledge synthesis for six European countries. *Biodivers Conserv* 25:1349–1382. <https://doi.org/10.1007/s10531-016-1129-3>
- Science for Environment Policy (2015) Ecosystem services and the environment. In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol. Available via https://ec.europa.eu/environment/integration/research/newsalert/pdf/ecosystem_services_biodiversity_IR11_en.pdf. Accessed 9 June 2022
- Secchi B (1986) Progetto di suolo. *Casabella* 520–521:19–23
- Sharifi A (2020) Urban resilience assessment: mapping knowledge structure and trends. *Sustainability* 12(15):5918. <https://doi.org/10.3390/su12155918>
- Sussams LW, Sheate WR, Eales RP (2015) Green infrastructure as a climate change adaptation policy intervention: muddying the waters or clearing a path to a more secure future? *J Environ Manag* 147:184–193. <https://doi.org/10.1016/j.jenvman.2014.09.003>
- TEEB (2010) The economics of ecosystems and biodiversity ecological and economic foundations. Earthscan, London and Washington. Available via <http://www.teebweb.org/wp-content/uploads/Study%20and%20Reports/Reports/Ecological%20and%20Economic%20Foundations/TEEB%20Ecological%20and%20Economic%20Foundations%20report/TEEB%20Foundations.pdf>. Accessed 14 June 2022
- Trzyna T (2014) Urban protected areas: profiles and best practice guidelines. Best Practice Protected Area Guidelines Series No. 22, Gland, Switzerland: IUCN. Available via <https://portals.iucn.org/library/sites/library/files/documents/PAG-022.pdf>. Accessed 14 June 2022

- Tzoulas K, Korpela K, Venn S et al (2007) Promoting ecosystem and human health in urban areas using green infrastructure: a literature review. *Landsc Urban Plan* 81:167–178. <https://doi.org/10.1016/j.landurbplan.2007.02.001>
- UNEP-WCMC, IUCN (2021) Protected Planet report 2020. UNEP-WCMC and IUCN, Cambridge UK, Gland, Switzerland. Available via <https://livereport.protectedplanet.net>. Accessed 9 June 2022
- Voghera A, Giudice B (2019) Evaluating and planning green infrastructure: a strategic perspective for sustainability and resilience. *Sustainability* 11(10):2726. <https://doi.org/10.3390/su11102726>
- Voghera A (2020) The River agreement in Italy. Resilient planning for the co-evolution of communities and landscapes. *Land Use Policy*, 91:104377. <https://doi.org/10.1016/j.landusepol.2019.104377>
- Voghera A, Giudice B (2020) Defining a social-ecological performance to prioritize compensatory actions for environmental regeneration. The experimentation of the environmental compensation plan. *Sustainable Cities and Society*, 61, 102357. <https://doi.org/10.1016/j.scs.2020.102357>
- Voghera A, Giudice B (2021) Green infrastructure and landscape planning in a sustainable and resilient perspective. In: Arcidiacono A, Ronchi S (eds) *Ecosystem services and green infrastructure. Cities and nature*. Springer, Cham, pp 213–224. https://doi.org/10.1007/978-3-030-54345-7_16
- Zhang Z, Meerow S, Newell JP et al (2019) Enhancing landscape connectivity through multifunctional green infrastructure corridor modeling and design. *Urban for Urban Green* 38:305–317. <https://doi.org/10.1016/j.ufug.2018.10.014>

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