



Implementing the Ecological Transition: Green Infrastructure and Ecosystem Services as Key Factors for Urban Planning Innovative Paradigms

Gabriella Pultrone^(✉) 

Mediterranea University of Reggio Calabria, Via Melissari 25, 89124 Reggio Calabria, Italy
gabriella.pultrone@unirc.it

Abstract. The paper proposes some reflections resulting from the author’s ongoing research activities on Green Infrastructure and Ecosystem Services, which, when integrated into urban planning, can improve the supply of goods and services for the well-being of society, by incorporating the ability to adapt to current risks and future climate change, reducing the ecological footprint and ecological debts, while improving resilience, health, and quality of life, and leaving no one behind, in line with the UN 2030 Agenda. Despite the relevance of the topic and the critical feature of the “time factor” in addressing a climate crisis requiring urgent responses and far-sighted policy choices, and the numerous international documents and commitments, scientific advances have not yet produced adequate operational impacts, which are fully integrated and widespread in policies, strategies, and actions at a local level, in order to move towards the necessary ecological transition in the perspective of integral ecology. Nevertheless, in the EU scenario, there are many interesting experiences aimed at an ecological transition that goes beyond the technological and energy transition and concerns foremost the climate issue and the exit from the fossil fuel system, but also the dramatic loss of biodiversity, conflicts over access and use of resources, the international geopolitical instability, and profound economic and social inequalities. In this ongoing process, cities are drivers of innovation and, through the selected case studies proposed later in this paper, it is possible to highlight the lessons learned in terms of critical and/or success factors; identify some guidelines to adapt possible solutions to the specific issues to be addressed in different contexts; suggest future research and in-depth perspectives.

Keywords: Ecosystem Services · Ecological Transition · Green Infrastructure

1 Background and Challenges to Guide the Green Transition

According to the United Nations, the urban population is expected to increase by almost 600 million by 2030, reaching a total of 5.2 billion and representing 60% of the world’s population (<https://population.un.org/wup/>). Urban areas occupy less than 1% of the Earth’s surface but are home to more than half of its population. They are ecosystems

© The Author(s) 2025

F. Moraci et al. (Eds.): NMP 2024, LNNS 1272, pp. 138–150, 2025.

https://doi.org/10.1007/978-3-031-82927-7_9

representing a radical transformation of the natural areas, whose condition profoundly positively or negatively affects the quality of life. As a matter of fact, on the one hand, functioning ecosystems help to clean the air and water, to cool urban heat islands and to support our well-being; they offer opportunities for rest and play, and can host a surprising amount of biodiversity. On the other hand, they can be highly degraded due to bad planning, urban sprawl that devours natural habitats and fertile agricultural land, sealing soils leaving little space for green infrastructure, waste and emissions from industry, traffic and homes that pollute waterways, soil, and air. Therefore, the restoration of urban ecosystems requires awareness and commitment on the part of citizens and decision-makers, who should increasingly place green and blue infrastructure (GBI) at the centre of urban planning, in accordance with international commitments, whose implementation a local commitment, which makes cities and territories protagonists and promoters of the green revolution and ecological transition.

This is why the concept of Green Infrastructure (GI) has the potential to promote planning and implementation of multifunctional green and blue spaces that tackle several urban sustainability issues. GI is widely understood as a network of physical features providing ecological, economic, and social benefits to society through Nature-Based Solutions (NBSs). GI is closely linked to the quality of the soil, in which a multitude of organisms operate providing us with food, biomass, fibres and raw materials; regulate the cycles of water, carbon and nutrients; and make life possible on earth [1, 2]. Soil is a vital, limited, non-renewable and irreplaceable resource, as well as an essential basis of the economy, society and the environment, as it produces food; increases our resilience to climate change, extreme weather events, droughts and floods; supports our well-being; stores carbon; has a greater capacity to absorb, conserve and filter water; and provides vital services, such as safe and nutritious food and biomass for the non-food sectors of the bioeconomy [3, 4]. In this context, urban and territorial regeneration is often proposed as a useful tool for avoiding land consumption, and certainly represents a priority for rethinking, in the direction of an increasingly indispensable and urgent ecological transition, the order of a more and more fragile world poorly equipped to face the great challenges posed by climate change and the widespread environmental and landscape degradation. In order to be sustainable, regeneration should intervene on what already exists, without causing the loss of portions of soil that are not yet artificial and should be considered as limited and non-renewable resources, as precious assets for the community, to be enhanced in their natural functions also through the above-mentioned regeneration initiatives.

Among the most significant impacts linked to the increasing urbanisation and the densification of urban areas, the reduction in the availability of public green spaces takes on a central role in the definition of liveable cities, not only in environmental terms (*i.e.*, contributing to biodiversity, to the improvement of air quality, to climate mitigation, and to water infiltration), but also in terms of social cohesion, interaction, equity, and equality. Hence, the theme of the implementation of public green areas, especially in expanding urban contexts, has been addressed both at a global and national level through the adoption of numerous and various thematic strategies, also linked to the UN 2030 Agenda and the *One Health* approach (<https://www.who.int/news-room/questions-and-answers/item/one-health>).

Thanks also to the *European Strategy for Biodiversity towards 2020*, Ecosystem services (ES) are increasingly at the centre of innovative planning practices that take into due consideration the benefits deriving from the natural component. Many studies have analysed the relationships between the provision of ES and the characteristics of green areas and of settlements in urban contexts, where those identified as the most relevant were heat mitigation, carbon capture and storage and runoff control, with particular reference to flood-related events. In general, the results show that there is ample space to improve the performance of ecosystem services based on fine-tuning measures involving building and population density and vegetation cover [5]. In this direction, the *Nature Restoration Law*, approved by the European Council last November 9, 2023, is one of the four pillars of the European 2030 biodiversity strategy. It promotes biodiversity and climate action across Europe, beyond the introduction of regulatory tools for the prevention and protection of human health, and the integration of the environmental policies in force. As part of the *European Green Deal*, the objective is the restoration of ecosystems and the strengthening of biodiversity to ensure the well-being of current and future generations. Thus, it is possible to create advantages for both biodiversity and the rebalancing of the territory, to fight the climate crisis and to pursue a more effective conservation of the natural capital and the ecosystem services it produces, favouring adaptation and mitigation policies. Therefore, it provides an important reference for urban planning, considering the provisions about the absolute limitation of any loss of green areas within cities, as well as the other objectives aimed at directing and supporting policies for urban renaturation and forestation. GI become a central element in the redefinition of urban planning strategies, through actions to restore and enhance ecosystem services, with an approach increasingly oriented towards a qualitative and performance evaluation of the ecological functions of urban soils, together with the use of NBSs, which reconfigure the urban planning project in an ecological sense.

The mapping and biophysical and economic evaluation of ES is the starting point for the definition of territorial governance policies, which, at the territorial scale, are aimed at the protection of agroforestry ecosystems, while, at the local scale, are aimed at the containment and good use of the soil resource. Thus, the assessment of the effects of the different choices becomes essential and involves the estimation of the costs and benefits associated with different land use scenarios and/or protection policies and guidelines specific to the territorial and urban planning tools, trying to integrate the programmatic framework and regulations of higher administrative levels and to implement synergistic urban planning actions at different scales.

In the light of the above, the paper proposes some reflections resulting from the author's ongoing research activities on green infrastructure and ecosystem services which, when integrated into urban planning and design, can improve the supply of goods and services for the well-being of society by incorporating the ability to adapt to both current risks and future climate change, reducing the ecological footprint and ecological debts, while improving resilience, health, and quality of life [6–9]. Despite the relevance of the topic and the critical feature of the “time factor” in addressing a climate crisis, which requires urgent responses and far-sighted policy choices, the numerous international documents and commitments, and scientific advances have not yet produced adequate operational impacts, fully integrated and widespread in policies,

strategies, and actions at local level, towards the necessary ecological transition in the perspective of integral ecology.

Nevertheless, there are many interesting experiences aimed at an ecological transition that goes beyond the technological and energy transition and concerns foremost the climate issue, as shown in the second paragraph.

2 EU Cities as Players of the Transition: Work in Progress

As mentioned above, cities must tackle global challenges, above all those linked to climate, pollution, and energy consumption, in order to increase the capacity of the urban environment to deal with the effects of these alterations, which, more or less directly, also manifest themselves in terms of socio-spatial inequity and injustice in the distribution and access to resources and services. According to the ESPON Policy Brief “Green infrastructure in urban areas” [10], between 2006 and 2012, many cities throughout Europe lost green spaces, mainly because of unsustainable urbanisation. At the same time, however, they have the means to counteract the degradation and loss of natural capital and the ecosystem services provided by this capital. As a matter of fact, local authorities, responsible for planning and investing in urban infrastructure, can make important choices concerning the nature of infrastructure construction, renewal, or expansion, and can promote greener, more sustainable cities. A GI-based approach to spatial planning is needed, which not only connects different elements of the nature, but also goes beyond ecological and political boundaries for connecting sectoral policies. Therefore, this section is focused on some significant case studies to understand how GI, ES and NBS are used and what is still needed to improve planning decisions. In fact, case studies in the field of planning show that plans, programmes or policies can trigger virtuous transformations, or bring with them risks when concretely implemented (Campbell, 2003). Naturally, the analysis is not exhaustive as it shows a selected part of ongoing research to be further developed. Yet, the first conclusive considerations already outline both the lessons learned, in terms of critical and/or success factors, and the possible future research perspectives. In this regard, the ESPON GRETA project (*Green infrastructure: Enhancing biodiversity and ecosystem services for territorial development*) is of particular interest, since it has implemented a territorial model of potential green infrastructure in European cities, carrying out an assessment of the green infrastructure in urban spaces, including all available green and blue areas. The most relevant land cover/use dataset for this analysis of cities and their immediate hinterland (peri-urban space) is the Urban Atlas layer provided by the European Copernicus programme. The data complements city statistics collected by Eurostat in the framework of the Urban Audit Programme, where cities are represented on three spatial levels: the *core city*, a local administrative unit (LAU), in which the majority of the population lives in an urban centre of at least 50,000 inhabitants; the *functional urban area* (FUA), which adds the commuter area to the city; the *greater city*, which approximates the urban centre when this stretches far beyond the administrative city boundaries. To provide an overview of the state of urban green infrastructure, the following parameters and indicators were calculated and mapped: share of green urban areas (GUA) within the core city (which represents the level of the city); the entire FUA (which represents the entire reference

unit); the FUA without the core city (which represents only the peri-urban space; all values are expressed in %); and the ratio between the share of GUA within the core city and the share of GUA within the entire FUA (ratio without units). The project aims to support European, national, regional and urban authorities to better understand how to create, manage and improve green infrastructure in urban areas using an integrated approach. The need arises from the fact that, despite the numerous good practices of spatial planning systems that incorporate a GI approach, there are still uncertainties in practice regarding the scales and phases of the process.

The analysis of GI policies and planning in Europe leads to the definition of good practice as the implementation of tools and/or actions in a way that allows us to perceive the optimal increase in connectivity and multifunctionality in green spaces. The 25 case studies identified allow describing the ways in which modern tools, policies, and processes for implementing GI development are used by the local or regional authorities, and the ways in which local and regional authorities interact with private sector actors and local stakeholders for the successful implementation and management of GI. Table 1 sums up 11 significant selected examples, from which the identification of some key policy messages arises.

A first analysis of possible innovative models of governance and territorial planning of GI in European cities shows that the most effective actions on the adaptive capacity of urban systems concern the management of natural capital, especially in the context of more or less densely built spaces (public and private), and require tools and solutions that use urban greenery, soil permeability, the management of theoretical waters and also sustainable mobility [12]. This is the case of Lisbon (see ID 1 in Table 1), which has also applied the city's biodiversity index; took part in the MAES urban pilot project (mapping and evaluation of ecosystem services) almost ten years ago; and played the role of citizen laboratory in the EnRoute project of the EU Joint Research Centre.

Furthermore, the other ten examples in Table 1 refer to integrated, multi-scale and multi-sectoral activities through the articulation of planning tools (Basque Country ID 10); inter-institutional collaboration in spatial planning (Finnish cities-ID 2, in Poznań-ID 3, London-ID 7); multi-actor collaborative approach involving companies and/or associations (Bologna-ID 4, Amsterdam-ID 8, Ljubljana-ID 6); incentives for families (Bratislava-ID 5); and implementation of green infrastructure solutions in built-up environments (Malmö -ID 9) and coastal cities (The Netherlands-ID 11).

The attention paid to these aspects derives from the fact that, with reference to the main outcomes of the project, the first three categories of the thirteen most frequent barriers and challenges in the implementation of GI are the following: lack of a strategic vision, of common objectives and integrated planning; lack of long-term experience; and financial incentives. In general, the following key policy messages are highlighted to identify areas where measures are needed to protect green spaces from disappearing and to implement green (and blue) infrastructure: continuous monitoring of GI development; a strategic vision widely shared by policymakers and planners and implemented through an integrated planning process embedding different sector policies and different levels of governance. An integrated approach must establish connections between different natural elements in the geophysical area, between nature and people's quality of life, across ecological and political boundaries, and between policy sectors, given the growing

Table 1. Selected examples of integration of urban GI into policies, plans, and projects. Author's elaboration from ESPON GRETA *Green Infrastructure: Enhancing Biodiversity and Ecosystem Services for Territorial Development* [11]

ID	Country	Case Study/Best Practice/ Project Title	Main aspects/Goals
1	Portugal	Urban strategy for biodiversity in Lisbon	Counteract habitat fragmentation and climate change by increasing soil permeability and mitigating the "heat island" effect
2	Finland	Integrating conservation of urban GI into spatial planning policy in Finnish cities	Integrate urban GI conservation into national planning policy in a coherent way. The Finnish Ministry of the Environment coordinates the process of developing national urban parks, established to preserve the beauty of the cultural landscape, to maintain ecological corridors, biodiversity and cultural and natural heritage in urban areas
3	Poland	Pooling of public funding to introduce NBSs in Poznań	Innovative collaboration between the City Hall, the Project Coordination, the Urban Regeneration Office and the Department of Education to introduce NBSs in the gardens of state-run preschools in the densely populated city centre area and encourage them to remove hard surface seals, introduce more biodiversity and create natural gardens linked to other green urban corridors
4	Italy	Carbon footprint compensation scheme to finance tree planting in Bologna	Through the Green Areas Inner-city Agreement (GAIA), an outcome of a LIFE project, companies can calculate their carbon footprint and compensate for it (voluntarily) by making donations towards tree planting

(continued)

Table 1. (continued)

ID	Country	Case Study/Best Practice/ Project Title	Main aspects/Goals
5	Slovakia	Scheme for the purchase of rainwater management installations in Bratislava	As part of the <i>Bratislava Turn Green</i> project (Bratislava goes green), the Municipality encourages families to contribute to protecting the city from pluvial flooding through a subsidy scheme for the purchase of stormwater management systems. Most of successful applicants have installed rainwater catchment tanks, created rain gardens, replaced impermeable surfaces with permeable materials or installed green roofs
6	Slovenia	“Beyond a construction site” - community-based gardening in Ljubljana	In 2010, the cultural association <i>Obrat</i> , in collaboration with the cultural organization <i>Bunker</i> , approached the municipality (owner of the site) to gain temporary lease of land consisting of a derelict construction site and transform it, with the help of residents, into an attractive community space intended for urban gardens, socialization, education, and culture
7	United Kingdom	Integrated planning for GI in London	The <i>Olympic Park</i> in London, intended to host the Olympic Games and Paralympics in 2012, provides a valuable and high-profile example of how GI is designed in the Lower Lea Valley brownfield site, within a dense and complex urban area, thanks to a framework clear strategy and high-level political commitment, which acknowledges the importance of establishing specific targets for biodiversity at the start of the process

(continued)

Table 1. (continued)

ID	Country	Case Study/Best Practice/ Project Title	Main aspects/Goals
8	The Netherland	Collaborative multi-actor approach to greening the city of Amsterdam	Creation of the <i>Amsterdam Rainproof platform</i> by the water supply company <i>Waternet</i> , in collaboration with citizens, public employees, and entrepreneurs. It raises awareness among urban residents and policy makers of the consequences of soil sealing and contributes to addressing the challenge of flooding caused by stormwater, encouraging people to consider the possibility of extreme precipitation when designing homes, gardens, streets, and parks. A group of social entrepreneurs, <i>Roof Doctors</i> , introduced the concept of <i>polder roofs</i> , which transform unused roofs into places intended for the development of nature, recreation, water storage and food and energy production
9	Sweden	Green space factor for implementing green and blue infrastructure in built-up environments in Malmö	Malmö municipal authorities have developed a formula for developing greener housing blocks, including the green space factor in many projects and as part of the local authority's environmental building practice. Developers need to compensate every surface they want to seal with something else that is green or blue. The tool measures the way ecosystem services are produced and emphasizes the assessment of the reduction of noise and air pollution and water purification

(continued)

Table 1. (continued)

ID	Country	Case Study/Best Practice/ Project Title	Main aspects/Goals
10	Spain	GI considerations for climate change adaptation in regional spatial planning guidelines, Basque Country	The Basque Country has a robust spatial and urban planning system that is integrated, multi-scale and multi-sectoral thanks to the various existing planning instruments; it uses operative governance mechanisms; it includes complementary competence distribution between public administrations (regional, provincial, local); it is characterised by a territorial management culture; it includes strong consideration of natural capital protection and GI enhancement, with substantial activities in the field of NBSs and key complementary activities, <i>e.g.</i> , consideration of health in urban design
11	The Netherlands	Soft engineering for coastal management in the Netherlands	The annual Dutch Delta program aims to ensure the sustainability and robustness of flood risk management and freshwater supplies beyond 2050, setting new flood protection and territorial adaptation standards. In recent years, the dike system used to protect land has provided the opportunity to implement NBSs, together with smart land management. The Delta program has demonstrated that sustainable coastal soft engineering solutions for coastal zone protection include a combination of beach nourishment, dune replenishment and the planting of vegetation to stabilize the newly replenished beach and dune

interrelationships between places and the need for proactive and strategic planning that goes beyond administrative boundaries. In light of the above, Strategic Environmental Assessment (SEA) is considered as a policy tool to incorporate green infrastructure into strategies, plans and programmes, which could help to establish a common framework

across EU states, strengthen strategic thinking and the centrality of ecosystem services, thus increasing territorial resilience.

Equally fundamental is to take into account the synergies and trade-offs between ecosystem service and to be aware of these relationships in order to prioritize their effects based on the best available knowledge. As a matter of fact, ecosystem services often appear in packages that, under certain circumstances, reinforce each other (*i.e.*, they are in synergy with each other), while, in other cases, they can influence each other negatively (*i.e.*, there are compromises between them).

Another aspect of undoubted importance, which cannot be addressed here but is worth of further specific research, concerns the cost-effectiveness ratio and the feasibility of the various interventions, in relation to their scale of governance.

In a nutshell, adequate methods to assess urban ecosystem services at the right scale and resolution while also accounting for the multi-functionality of urban green infrastructure are still needed. On the other hand, future urban plans would benefit from a further appropriation of the ecosystem service approach by practitioners and decision-makers [13–16]. Acknowledging the whole range of urban ecosystem services, defining strategic objectives related to their provision, and explicitly identifying demand and beneficiaries could increase awareness of the values at stake, ensure long-term commitment in the implementation phase, and strengthen planning arguments against any conflicting interests.

3 Discussion and Conclusions. Beyond Transition

From the path outlined so far, the interdisciplinary nature of the issues relating to GI and SE, and their potential for planning purposes in the ongoing ecological transition process has emerged as a fertile ground for future research. The World Cities Report 2022 “Envisaging the Future of Cities” [17] aims to provide greater clarity and insights into the future of cities based on existing trends, challenges, and opportunities, as well as disruptive conditions, and suggests ways in which cities can be resilient, because they are better prepared to face a wide range of shocks and transition towards sustainable urban futures. That is why, informed preparation is essential, which offers the opportunity to anticipate change, correct the line of action, and become more aware of the different scenarios or possibilities that the future of cities offers, in a vision that should embody the “new social contract” in the form of universal basic income, universal health coverage, universal housing and basic services for all.

Another aspect worthy of attention is that, if, on the one hand, the “green transition” aims to achieve sustainability and tackle climate change and environmental degradation, on the other, the growing importance of digital technologies is transforming societies and economies. Moreover, through the “digital transition”, technologies should be oriented towards sustainability, prosperity and the empowerment of citizens and businesses. Successfully managing the twin transitions, green and digital, is the cornerstone for offering a sustainable environment and a more equitable and competitive future but, to unlock their potential and prevent negative effects, they must be achieved together with proactive and integrated management [18].

In a broader sense, the biggest supporting factor in GI implementation is a strategic vision that is widely shared by policymakers and planners and is implemented through

an integrated planning process that embeds different sector policies and different levels of governance [9]. It is clear that GI should not be promoted as a sectoral element, but with the awareness that it contributes also to improve strategic thinking, ecological processes and their benefits, positioning itself as a planning criterion relevant to a more resilient territorial development. Spatial planning is, by its very nature, an inter-sectoral discipline, which includes various thematic issues to achieve balanced territorial development. Therefore, it presents an optimal predisposition to integrate the planning, implementation, and management of GI. There are many possible ways and tools by which local authorities can facilitate the implementation of GI by private stakeholders like infrastructure builders and homeowners through regulatory and planning tools. For example, zoning regulations can mandate that new residential neighbourhoods include a certain percentage of green space, or existing regulatory requirements can be leveraged to allow investment in NBSs rather than grey solutions. Equally interesting is the robust climate strategy approved by the Basque Country, which includes explicit actions to integrate adaptation into territorial planning and to deploy resources towards resilient urban development. In particular, the development of substantive information on climate risks and impacts (climate projections, flood risk maps, urban heat island studies, local vulnerabilities) has been crucial to enable cutting-edge operational consideration of climate adaptation in territorial and urban planning tools. Another fertile input for theoretical reflection and applied research is the relationship between ES and urban planning standards, as an integrated and multifunctional approach to standards could provide answers to multiple issues, such as hydraulic risk, air, water and soil pollution, loss of biodiversity. In a nutshell, the future research on the topics of GI, ES and NBS, could aim to:

- Create place-specific planning and implementation strategies that contribute to sustainable landscape development through the simultaneous achievement of social objectives, maintenance of biodiversity and provision of important ES
- Explore how the ES concept could be used to facilitate knowledge co-production and cooperation between different actors
- Learn from planning experiments and empirical applications of case studies and make recommendations on how ES could be applied in planning tools to improve knowledge, facilitate cooperation and influence decision-making.

Finally, it should be reminded that ecological transition is an “umbrella” concept, an expression of a new lexicon, essentially intended as a technological change, that is, a set of actions for a sustainable economy to encourage the transition from a system based on non-renewable energy sources (fossil capitalism) to a virtuous model centred on the use of green sources (only green economy, green capitalism) [19]. However, to address the ongoing emergencies, a radical and deeper change in social and economic behaviour is needed to lead to the collective and individual “conversion” to new lifestyles, to the recognition that our “common home” must be protected and cared for [20]. Therefore, beyond a “transition”, which contemplates the dominance of technology, and risks being only apparent, a “conversion” is necessary, which incorporates the landscape and the protection of biodiversity as founding elements for an unprecedented balance between humanity and nature for a new less anthropocentric planet.

Acknowledgements. This research work is the result of the research activities conducted within the following PNRR research project funded by the European Union – NextGenerationEU: “Pilot Project 4.6.1 “Climate adaptation plans for the reduction of the ecological footprint and ecological debt, aimed at improving the conservation and transformation response in terms of resilience and quality of life in the Calabrian and Lucanian urban and territorial systems” (Goal 4.6 - Planning for Climate Change to boost cultural and natural heritage: demand-oriented ecosystem services based on enabling ICT and AI technologies - Tech4You Innovation Ecosystem), Finanziato dall’Unione Europea - Next Generation EU, Missione 4 Componente 2 - CUP C33C22000290006 (ECS_00000009).

References

1. European Commission: EU Soil Strategy 2030. Healthy soils for the benefit of people, food, nature and climate. COM(2021) 699 final (2021)
2. Pileri P.: L’intelligenza del suolo. Piccolo atlante per salvare dal cemento l’ecosistema più fragile, AltraEconomia, Milano (2022)
3. European Commission: Proposal for a Directive of the European Parliament and of the Council on Soil Monitoring and Resilience (Soil Monitoring Law). COM(2023) 416 final
4. Neonato, F., Tomasinelli, F., Colaninno, B.: Oro verde. Quanto vale la natura in città, Il Verde Editoriale, Milano (2019)
5. Lai, S., Zoppi, C.: Factors affecting the supply of urban regulating ecosystem services. Empirical estimates from Cagliari, Italy. *TeMA – J. Land Use, Mobility Environ.* (2), 7–32 (2023). <https://doi.org/10.6093/1970-9870/10194>
6. Pultrone, G.: The ecological challenge as an opportunity and input for innovative strategies of integrated planning. In: Della Spina L Calabrò F Bevilacqua C. *New Metropolitan Perspectives. Local Knowledge and Innovation Dynamics towards Territory Attractiveness through the Implementation of Horizon/E2020/Agenda2030*, pp. 691–698. Springer (2019)
7. Pultrone, G.: Performance-based planning for sustainable cities. innovative approaches and practices in Italy. In: Bevilacqua, C., Calabrò, F., Della Spina, L. (Eds.), *New Metropolitan Perspectives Knowledge Dynamics and Innovation-driven Policies Towards Urban and Regional Transition*, 2, pp. 430–439. Springer Nature (2020)
8. Pultrone, G.: The city challenges and the new frontiers of urban planning. *TeMA – J. Land Use Mobility Environ.* **16**(1), 27–45 (2023). <https://doi.org/10.6093/1970-9870/9392>
9. Pultrone, G.: Through and beyond the Poli(s)crisis: guiding the eco-social transition in UE. *UPLand-J. Urban Plann. Landscape Environ. Des.* **7**(1), 61–76 (2023). <https://doi.org/10.6093/2531-9906/10417>
10. ESPON: POLICY BRIEF. Green infrastructure in urban areas. ESPON EGTC, Luxembourg (2020). <https://www.espon.eu/green-infrastructure-urban-areas>. Accessed 19 Jan 2024
11. ESPON GRETA. Green Infrastructure: Enhancing Biodiversity and Ecosystem Services for Territorial Development. ESPON MSP-LSI (2019). <https://www.espon.eu/green-infrastucture>. Accessed 19 Jan 2024
12. Giaimo, C., Salata, S.: Rigenerazione urbana e buon uso del suolo: mappare e valutare i servizi ecosistemici alla scala locale. Esperienze dal Progetto Life Sam4cp. In: *Background Papers. Rapporto sulle città 2017. Mind the gap. Il distacco tra politiche e città. Rivista online di Urban@it - 1/2017* (2017)
13. Milligan, Z.E.E.: Enabling the integration of ecosystem service-based approaches into planning organizations: municipal natural asset management. A thesis presented to the University of Waterloo in fulfilment of the thesis requirement for the degree of Master of Environmental Studies in Planning. Waterloo, Ontario, Canada (2019)

14. Zhang, S., Muñoz, R.F.: Assessing and mapping ecosystem services to support urban green infrastructure: the case of Barcelona. Spain. *Cities* **92**, 59–70 (2019)
15. Cortinovis, C., Geneletti, D.: Ecosystem services in urban plans: what is there, and what is still needed for better decisions. *Land Use Policy*, January 2018, **70**, 298–312 (2018)
16. Visintin, F., Navone, A., Niccolini F. (Eds.): *La contabilizzazione e valorizzazione dei servizi ecosistemici e del capitale naturale nelle aree marine protette. Metodologie e prospettive di governance. Il caso Tavolara Punta Coda Cavallo*, Franco Angeli, Milano (2021)
17. UN-Habitat: *World Cities Report 2022. Envisaging the Future of Cities*. UN-Habitat, Nairobi (2021). <https://unhabitat.org/wcr/>. Accessed 19 Jan 2024
18. Muench, S., Stoermer, E., Jensen, K., Asikainen, T., Salvi, M., Scapolo, F.: *Towards a Green and Digital Future*. Publications Office of the European Union, Luxembourg (2022)
19. Cavallo, R.: *Le Parole della Transizione Ecologica, Un lessico per l'economia circolare*. Ed. Ambiente, Milano (2021)
20. Papa Francesco: *Lettera enciclica Laudato si' del Santo Padre Francesco sulla cura della casa comune* (2015). https://www.vatican.va/content/francesco/it/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html. Accessed 19 Jan 2024

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

