Chapter 1
Challenges for Contemporary Spatial Planning in Italy. Towards a New Paradigm

Andrea Arcidiacono and Silvia Ronchi

Abstract The new environmental, ecological and social emergencies affecting the contemporary city and territory of the "Anthropocene era" have increasingly intense impacts on human well-being and quality of urban life. Emergencies, closely related to regional anthropisation processes, concern issues of adaptation to climate change, risk prevention and food security. Responding to these challenges requires a shift in strategies and urban design models. In Italy, traditional planning models still prevail, mainly oriented towards governing processes of urban growth and improving regional infrastructures, which strongly affect the availability of natural resources. Even recent planning experiences, focused mostly on the governance of urban redevelopment processes, have been unable to reduce the persisting intensity of urbanisation processes or trigger broader regeneration effects within the increasingly less efficient and less liveable urban fabrics of the built-up city. Nowadays, it is necessary to redefine the territorial governance agenda and experiment with a new urban planning paradigm which can address the re-urbanisation of the contemporary city in an ecologically oriented and socially cohesive perspective, guaranteeing the well-being and the quality of citizens' lives through a robust reconstruction of the urban natural capital.

Keywords Planning perspective · Urbanisation and land take limitation · Climate change adaptation · Ecosystem services · Green and blue infrastructures · Nature-based solutions · Resilient regeneration · Human well-being · Contemporary cities

A. Arcidiacono (✉) · S. Ronchi
Department of Architecture and Urban Studies, Politecnico di Milano, Milano, Italy
e-mail: andrea.arcidiacono@polimi.it

A. Arcidiacono, S. Ronchi (eds.), *Ecosystem Services and Green Infrastructure*,
Cities and Nature, https://doi.org/10.1007/978-3-030-54345-7_1

1.1 Introduction

In recent decades, the intensity of anthropisation processes has had an irreversible impact on the availability of natural resources (water, soil, and air) with direct effects on the production of food and raw materials, on hydrogeological stability, and, more generally, on climate change.

In about a century, commonly known as "Anthropocene," which began with the late nineteenth-century modern era, human action has started to produce radical and irreversible changes on the biophysical composition of our planet (Crutzen 1998, 2005). Anthropisation processes are among the most significant determinants of the planet's environmental and ecological crisis (UN 2019a). If the process of growth continues at its current intensity, urban areas will contain about 70% of the world population by 2050, and the land occupied by cities in the developing world will triple (UN 2019b).

The physical features and environmental conditions of these urban conglomerations are profoundly different in various areas of the planet. In Europe, the urbanisation process is more advanced than in other regions of the Earth. In Italy, over 70% of the population already lives in urbanised areas with similar structure – compact central urban areas with important historical features; dense and compact expansion fabrics from late nineteenth-century and early twentieth-century development with a mix of residential, productive and craft activities; large peripheral and peri-urban mono-functional areas, where large industrial settlements and new residential districts stand side by side, developed during the second half of the twentieth century, during the phase of maximum settlement and employment development of European cities. The mass development phase coincided with the maximum intensity of "land take" processes, which are mainly due to the urban transformation of agricultural soils. In Italy, from the 1980s, this long period of urban growth demonstrated more complex and articulated aspects. On the one hand, there was the onset of intensive reconversion processes of large disused urban industrial areas or areas linked to the abandonment and under-utilisation of primary urban services (customs, slaughterhouses, railway yards and, more recently, barracks). On the other hand, the going on of urban growth, which despite being apparently less intense compared to the dynamics of the decades of post-War mass expansion, started to increasingly affect peri-urban and suburban areas connoted by the ever-increasing spread of low-density settlements determining a huge peri-urbanisation process as one of the most unsustainable forms of urban development. In a situation of weakness and substantial inadequacy of the intermediate levels of territorial government (provincial and supra-local initially, and now metropolitan authorities), sprawl processes have provoked peri-urban growth through intense land take and soil sealing with high landscape fragmentation. This is due to the prevalence of a horizontal growth of settlement characterised by low-density housing models and high land occupation (Brueckner 2001; EEA 2006), and the consequent emergence of a mobility system based on the use of individual vehicles, necessary because of a lack of connection between public transport planning with regional development strategies; and

simultaneously supported by the spreading of a capillary road network. Sprawling urban development caused diffuse anthropisation of rural environments which were characterised by high landscape value and significant production capacity, and it profoundly affected the continuity and quality of ecological and environmental connectivity of the peri-urban area.

This urban development dynamic was underestimated by Italian urban planners who believed that the new season of "urban transformation," focused on the reuse and redevelopment of large abandoned urban areas, would marginalise expansive growth. During the 1990s and for a large part of the first decade of the 2000s, in Europe and Italy, the reuse of abandoned and underused sites located in central urban areas has coexisted with the strengthening of new land take phenomena. In Italy, over about 30 years (1989–2018), more than 7700 km^2 of agricultural and natural soils have been urbanised (ISPRA 2016, 2018), with an annual average of more than 260 km^2 (almost one and a half times the extension of the city of Milan and roughly double its urbanised area). This intense land take process led the country to have an anthropised surface area of more than 7.5% of its territory (ISPRA 2018). This phenomenon was not only due to the prevalence of low-density scattered settlement patterns and the spread of new types of production and work activities (shopping malls and logistics hubs) but mainly to the persistence of economic and real estate pressure produced by the incidence of the urban rent.

Land take and soil sealing remain among the leading causes of soil degradation processes across Europe (Ronchi et al. 2019): with direct impacts on the reduction and deterioration of one of the primary natural resources, that provides fundamental ecosystem services for quality of human life and well-being; with effects on food production, air quality, water regulation, hydrogeological stability and more generally on climate change. These effects influence the salubrity of our cities and the health of citizens, who are increasingly exposed to diseases linked to the intensity of urbanisation phenomena and soil sealing. The effects of heatwaves in central Europe are one of the main causes of death during the four summer months (EEA 2016; Geneletti et al. 2020); the record temperatures registered in different parts of Europe in 2013, 2014 and 2015 led to an exceptional increase of mortality (Gasparrini et al. 2015). In 2015, the summer heatwave caused more than 3000 deaths in France (EEA 2017). In the last 20 years, the European Commission has widely reported the risks and impacts connected to the persistence of soil sealing and land take processes in Europe and has outlined the main strategies to be implemented to limit the intensity of these phenomena (European Commission 2002, 2006a, 2012) towards the goal of "no net land take" by 2050 (European Commission 2016). Nevertheless, the European Commission has failed to approve the Soil Framework Directive (European Commission 2006b). This act would have strengthened the legislative action of the Member States (Ronchi et al. 2019), but it was withdrawn in 2014 at the wishes of some of the leading Member States. The reasons for the opposition include the subsidiarity and proportionality principles, the estimated costs, the administrative burden and existing national legislation on soil that was not considered as aligned with the incoming proposal (Glæsner et al. 2014).

Many European States activated public policies and legislative measures to reduce land take and soil sealing and support urban regeneration for new environmental and social liveability, acting both on quantitative limitation and on fiscal policies. In Italy, throughout the first decade of the 2000s, the national annual average of land take intensity exceeded 60 hectares per day (ISPRA 2016). This trend was more intense in some regions, such as Lombardy and Veneto, often with a significant impact on landscapes of outstanding environmental value. In recent years, land take processes, while remaining intense, registered a considerable reduction. In 2018, the annual average was less than 15 hectares per day, with an overall increase in artificial surface areas of 51 km^2 compared to a total amount of national urbanised area of 23,033 km^2 (ISPRA 2019). This reduction was not so much attributable to national or regional legislative measures, which are still absent or not yet implemented. All national Governments that have, since 2010, sought to approve, with differing determination, a draft law to limit land take and to incentivise urban regeneration, failed. Regionally, new legislations approved in recent years have been partly contradictory and only partially applied in planning tools. Instead, the land take process decrease was mainly the global effect of the economic crisis that also affected the construction sector and the real estate market. However, in the face of a factual reduction of urbanisation processes, urban plans in Italy continue to propose a development model still mainly oriented to urban growth dynamics, which are incoherent with demographic and employment trends – an approach purely based upon speculative real estate and financial logics that will perpetuate for a long time a new land take process (Arcidiacono 2015). This planning model is still far from dealing effectively with the current environmental and ecological emergencies. These are issues directly concerning the definition of innovative strategies in urban planning, oriented towards the construction of adaptive and resilient actions able to respond to increasingly intense territorial risks and reduce the ongoing effects of climate change.

1.2 New Priorities for Urban Planning: Redefining the "Common Interest"

Despite the intense land take processes, in Italy, it seems still arduous to approve a legislative reform that supports spatial planning aimed at addressing land take reduction and promoting urban regeneration interventions – a framework law that defines principles and planning priorities for a resilient approach in the designing of the contemporary city and to contrast climate change through adaptive planning solutions (Arcidiacono 2015). The planning models currently used in Italy are still traditional, driven by logics of urban and infrastructures growth, often divorced from demographic or employment requirements. Development strategies and choices are made by the administrative municipal level, within a planning system in which diverse territorial planning levels (provincial, metropolitan and regional)

have never had the strength or efficacy to guide, coordinate or influence decisions on local land-use planning. Nowadays, the forecasted urban transformations that threaten soil and ecosystem services are defined in local urban plans. The adoption of supra-local scale can reduce and mitigate these impacts where the design of environmental and ecological networks and the construction of green belts can be effectively and coherently planned, and the future development decisions calibrated according to the actual forecast of population and employment growth.

Quantitative limitation of land take must be introduced, applying legislative acts, planning and land-use conformation tools at the most appropriate territorial levels, and continuing to monitor the extent and the intensity of the processes. Nevertheless, mapping the land take process or introducing normative rules for its quantitative restriction is not sufficient; it is fundamental to introduce a qualitative assessment approach that considers not only the amount of soil surface loss but also soil quality and the ecosystem services provision to evaluate and select appropriate design strategies aiming to enhance ecosystem capacity and related benefits, which are crucial for quality of life and human well-being (Millennium Ecosystem Assessment 2005). The soil ecosystem services directly concern air quality, water filtering and regulation, food production, landscape quality, cultural and aesthetic historical values, and deeply affect climate change and environmental risks that are increasingly impactful and perceivable in urban contexts. Anthropisation and soil sealing due to urbanisation processes involve a reduction, and often a zeroing, of ecosystem services provision, with significant impacts on citizens' quality of life and health conditions (Dodge et al. 2012; Shekhar et al. 2019). In urban and peri-urban areas, where the contribution of regulating ecosystem services is most relevant, the quality and improvement of health and well-being conditions are connected to the physical and morphological features of the built environment, and the availability and condition of natural and green open spaces (WHO 2019).

A radical update of the traditional urban planning paradigm is needed for designing the contemporary city to face with these emerging pressure conditions and the urgency to provide adaptive and resilient responses to climate change (Arcidiacono et al. 2018a); an innovation of spatial planning model that places ecological and environmental issues at the centre of the design and planning action to conserve and strengthen the provision of those ecosystem services on which life quality and inhabitants' well-being depend. This perspective requires a full-fledged update of the "common and public goals" for urban planning. Fifty years after the Henri Lefebvre essay on the "Right to the city" (Lefevre 1968), the needs, rights and desires of citizens have changed, including social and distributive equality terms and requirements of wellness and liveability of cities. In Italy, "Planning standards" (introduced into the Italian legislation at the end of the 1960s, with Inter-Ministerial decree no. 1444/68) have traditionally guaranteed adequate conditions of local welfare, introducing a mandatory minimum supplies of public spaces (parks and socialisation spaces) and services (school, health and cultural), as availability and spatial configuration, to provide an acceptable level of urban liveability (Giaimo 2019). Today, these facilities are still fundamental for structuring the fixed capital of the "public city." A large part of Italian cities' quality of life depends upon assigning

different functions and values to urban spaces, indiscriminately offering minimum supplies of public areas and services to everyone, despite the issues of the social division of the space not being addressed. However, it becomes inevitable to expand and redefine the boundaries of urban plan's "common and public interest", introducing notions of social, ecological and environmental performances, related to the complex and widespread forms of the contemporary city. A process of urban planning innovation that poses articulated challenges requires different levels of experimentation (Ronchi et al. 2020). On the one hand, this involves redefining the spatial plan and urban structure framework around the design of public space, and environmental and usage networks of the contemporary city (e.g. green and blue infrastructures); on the other hand, this involves introducing qualitative and performance parameters and indicators, which should be adequate to verify the sustainability of the plan's strategies in a perspective of adaptation and resilience (Schewenius et al. 2014) to environmental changes, complexity of physical and social contexts and new demand for welfare. These performance standards are relevant for updating the traditional urban plan features and contents to be renewed in its processes and tools, but remaining stable in its goals, to protect everyone's interests and defend the quality of spaces where people live.

1.3 Ecosystem Services for Supporting a New Spatial Planning Paradigm

The new environmental and ecological emergencies require redefinition the concept of "common and public interest" in a broader categorisation of services provided to citizens for their well-being, and in a qualitative perspective of performance and resilience in defining land uses. According to this, the introduction of a different planning paradigm finds a relevant contribution from the ecosystem services approach.

The increasing relevance and dissemination of ecosystem functions and services in environmental and soil science researches (Burkhard et al. 2012, 2013; Haase et al. 2014b) can provide an effective contribution to spatial and landscape planning, at reconfiguring the plan's environmental and ecological structure, at selecting land-use strategies for defining regeneration and re-urbanisation solutions for the contemporary city and landscape (Cortinovis and Geneletti 2019). The mapping and evaluation of ecosystem services (Maes et al. 2016), defined in literature as multiple benefits provided by ecosystems to humanity (Millenium Ecosystem Assessment 2005; Haines-Young and Potschin 2013), have become an increasingly accurate and investigated research subject. This approach can constitute a fundamental contribution to improving the decision-making processes for spatial planning. The measurement and monitoring of ecosystem services can facilitate a comparative and dynamic assessment of the effects determined by alternative scenarios of transformation and development of land use on urban quality and support the identification of multiple

common performance objectives in deciding "where to put things" (Polasky et al. 2008). In this way, the ecosystem approach acts as a model to interpret and address the collective contemporary city "needs," as it assumes the perspective of beneficiaries, who are the service recipients, within an updated planning of the public city and local welfare, which can respond to the growing demand for well-being and urban equality, in quantitative and performance terms. The potential of this approach intersects with the need to make public decision-makers and citizens increasingly aware of the role played by ecosystem services (Saarikoski et al. 2018; Grêt-Regamey et al. 2017) orienting urban planning strategies (Hansen et al. 2015; Cortinovis and Geneletti 2018) towards a dimension of sustainability and resilience of the territory to climate change (McPhearson et al. 2014, 2015). In this perspective, the actions to reduce land take and soil sealing, concerning the protection and appreciation of the ecosystem, are more effective and not only about quantitative parameters but introducing assessment criteria which consider soil quality and ecosystem functions (Polasky et al. 2011). To achieve an ecosystem dimensioning of the urban plan for different land-use transformation scenarios (Geneletti 2013), the knowledge of soil quality is essential to define the land-use planning choices and identify adequate mitigation or compensatory actions and finally to exclude the soil transformability when the ecosystem values cannot be restored. Compensatory measures based upon quantitative criteria (following the principle for which the same amount of urbanised land must be re-naturalised) appear inadequate or even counterproductive where the aim is not to have, indifferently, new green spaces, but maintain ecosystems and related benefits and restore the degraded one.

The integration between the mapping and evaluation of ecosystem services, and the definition of urban planning strategies and decisions, require a truly "transdisciplinary" approach (Costanza 2008). This approach can recompose the fragmentation of the sector-based analytical contributions and overcome the traditional subordination of specialist scientific disciplines (environmental, ecological, agronomic, geological and pedological) in the spatial planning process. In this co-design model, the different areas of expertise cooperate to define spatial planning and development strategies, objectives and actions by verifying and assessing its impacts and benefits on soil functions and values using adequate criteria and indicators. The Strategic Environmental Assessment (SEA) can acquire a new role becoming a tool that, by mapping and evaluating ecosystem functions and services (Geneletti 2016; Ronchi et al. 2020), can guide and monitor planning strategies, affect its objectives, actions and tools, define regulatory and performance devices, which oriented public and private interventions to pursue common interest and well-being.

Recently, the methods and experiments to assess ecosystem services are increasingly accurate and refined (Haase et al. 2014a; Burkhard et al. 2013; Crossman et al. 2013). The more complex challenge is to raise awareness among public decision-makers and citizens of the approach's potential (Gret-Regamey et al. 2017; Costanza et al. 2017), to achieve effective integration between methodologies of classification and evaluation of ecosystem services, and spatial and landscape planning models (Albert et al. 2016; Gómez-Baggethun and Barton, 2013; Grêt-Regamey et al. 2017). The potential of ecosystem analysis in a transdisciplinary integration process

with spatial planning is significant at the different planning scales, where the ex ante assessment capacity of the ecosystem functionality becomes an opportunity for protection and conservation and their enhancement.

There is still the risk that studies and research, which provide detailed and articulated classifications and functionalities of ecosystem services, remain limited to the scientific field of research without influencing experiments of new sustainable planning models resilient to climate change. Evaluating ecosystem services may appear to be a low-priority activity with substantial rhetorical value in evoking ecological innovation applied to spatial planning, but in reality unable to effect planning or influence land-use regulations (Cortinovis and Geneletti 2018).

Internationally, urban and landscape planning experiences are becoming more frequent, at the local and regional scales, where there is an explicit relationship between assessment of ecosystem services and definition of land uses (Hansen et al. 2015). These are practices where methodologies have been trialled during decision-making processes (Saarikoski et al. 2018; Cortinovis and Geneletti 2018; Ronchi et al. 2020) to define strategies of urban and landscape planning objectives (Mascarenhas et al. 2014; Haase et al. 2014b), aimed at increasing the multiple benefits provided by ecosystem services, in terms of air quality, water drainage and run-off mitigation, microclimate regulation and pollution reduction (Gómez-Baggethun and Barton 2013; Rall et al. 2015).

In Italy, the experiences assessing ecosystem services integrated directly into the spatial planning process (and Strategic environmental assessment), conditioning its decisions and directly affecting forecasts of soil transformability, are still partial, even if awareness of this approach is increasing (Geneletti et al. 2020). This volume collects some of the most significant experiences in Italy. One limit may be due to the difficulty of communicating to citizens and decision-makers the importance of ecosystem services for the quality of human life (Porter and Kramer 2011) and urban well-being, and the direct relationships with the decisions on land use, which rarely leads them to be considered in policy and planning decisions (Costanza et al. 1997, 2017). It may be helpful to quantify these services in the "market" terms (TEEB 2008, Gómez-Baggethun et al. 2010). The role they play is so essential for human well-being that it is difficult to attribute an economic value (de Groot et al. 2002), but even though there are risks associated with the "monetisation of nature" (Costanza 2006; Gómez-Baggethun and Ruiz-Pérez 2011), research on the economic valuation of ecosystem services has contributed to making the value they have for global and local economies more intelligible. These can be used "freely" by citizens and economic stakeholders (Costanza et al. 1997).

1.4 Green and Blue Infrastructure and Nature-Based Solutions (NBS) for the Resilient Regeneration of the Contemporary City

Recently, Green and Blue Infrastructure (GBI) (European Commission 2013a, b) has played an increasingly significant role in practices and processes of urban and landscape planning (Benedict and McMahon 2000; EEA 2014; Lafortezza et al. 2013) by redefining spatial planning paradigms in a resilient and ecologically oriented way. They have made a planning contribution in the usable ecological reconfiguration of the contemporary city and region. In the document, "An Action Plan for nature, people and economy" (European Commission 2017), the European Commission identified Green Infrastructure as the best management and protection tool for European natural capital sites as priorities to rescue threatened habitats and species in Europe, while pursuing an objective of restoring at least 15% of the degraded ecosystems and maintaining the ecosystems and their services. GBI may not appear a new solution in urban planning and might be seen as "old wine in new bottles" (Davies et al. 2006, Von Christian et al. 2012), if considered design of networks of open spaces with ecological connotations. They are a relevant and fruitful field of experimentation in the re-urbanisation of the contemporary city in a resilient and adaptive dimension (Ahern 2007), which responds to multiple differentiated functions referring to the soil characters and the design scale of the project.

While restoring the methodological and planning tradition of Ecological networks which guarantee biodiversity and connections between highly natural areas (Bennet and Mulongoy 2006), GBI supersedes and re-orientates the concept of network, in the multifunctional and multi-scale perspective (Arcidiacono et al. 2018b). "GBI is 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 (…). In addition to providing a key tool to halt and reverse the loss of biodiversity, this network of green and blue spaces provides simultaneously a multiplicity of benefits in a cost-efficient way. The delivery of those benefits is maximised if planned at a strategic level" (European Commission 2013b). GBI is mooted as a planning tool for the conservation and protection of rural and natural systems' landscape values, supporting land take restriction measures while becoming the spatial design of reference for the implementation and consistency check of nature-based solutions (NBS), or "living solutions inspired and supported by the use of natural processes and structures which are designed to address various environmental challenges in an efficient and adaptable manner, while simultaneously providing economic, social, and environmental benefits" (European Commission 2015; Maes and Jacobs 2017). GBI is a tool to increase the quantity and quality of natural resources within the city's central and peri-urban fabrics (European Commission 2013b), where regulating ecosystem services are precious and fragile, from within a project that integrates systems of natural areas and water resources with slow mobility networks, energy and digital infrastructures, building systems of spatial, social and value relationships, cohesive and inclusive, supporting widespread regeneration

processes of existing fabrics. Networks of spaces, waters, landscape, urban and agricultural, green areas and places of waste and abandonment interact and penetrate the building fabrics to the core and bring a different contribution to the urban metabolism. This contribution is based upon recycling and optimising resources and social re-appropriation of shared assets. Systems of areas are managed by multilevel governance processes, in which urban planning intersects with spontaneous planning actions, as the "tactical urbanism" (Lyndon and Garcia 2015), which can construct and reinforce local community identity (European Commission 2015).

Designing GBI, open areas and spaces become planning places and components, which identify and differentiate NBS based on ecosystem values, within an overall frame based on the re-composition and ecological and social regeneration of the urban structure. A network of areas, in the urban and peri-urban area, denoted by a specific landscape dimension and ecosystem condition which provide support for city's naturalness reconstruction strategies and impact regulation on soil biological cycles, verifying its permeability and porosity ratios (European Commission 2013b; Maes et al. 2014).

GBI is a supporting structure, which is designed based upon the mapping and evaluation of functionalities and ecosystem services which allow to assess and verify planning decisions and strategies. It is a planning perspective which overturns the traditional quantitative and functional urban planning approach. It introduces a performance dimension at setting performative criteria and design guidelines, to be adapted to physical and social local contexts, to which anchoring the methods of evaluation and control of urban regeneration processes and restriction of land take.

GBI becomes a strategic and spatial "backbone" in public–private negotiation processes, by guiding transformation and regeneration proposals towards updated objectives of collective and public interest – no longer just increasing the supply of areas and services but achieving new ecological performance, which can conserve and enhance the precious and threatened regulating ecosystem services within the city's built-up fabrics.

GBI's multi-scale dimension constitutes its primary potential in territory's spatial structuring. At the landscape scale, it provides a priority structure for planning strategies, which protect the landscape's ecological and natural values, and develops territorial use systems that resiliently and adaptively support guidelines and devices to protect and sustain landscape development and provide the re-composition and regeneration of degraded areas. At the urban scale, it provides a framework for defining and selecting NBS, for the updated and informed design of the public city and local welfare, appropriate to the evolution of social demand and the concept of urban living quality, which is capable of responding to the recent requirements of collective interest and urban well-being based on a resilient and adaptive configuration of urban and spatial structures.

In this sense, GBI faces the reduction of land take through a planning and design perspective by:

- Coordinating the regulatory restrictions of land-use transformations within a landscape networks design

- Protecting and enhancing the ecological porosity of the consolidated urban fabrics
- Conditioning and articulating the implementation of a general strategy aimed at the densification of the existing city using solutions that do not compromise the supply and quality of existing urban open spaces (even private)
- Addressing the regeneration of abandonment and disused places with active measures towards bringing new naturalness and permeability of the soil inside the built-up city and responding resiliently to climate change pressures

1.5 Conclusions

Nowadays, it is imperative to innovate spatial planning paradigm so that it can address new challenges in the design of the contemporary city, in sustainable and resilience perspective of land-use transformation to climate changes. A model must be found that reduces the use of natural resources, primarily soil, through awareness of the values of services that the ecosystem provides and the multiple benefits that they produce for human well-being. The ecosystem approach constitutes an important model, but there are still several critical issues.

While the ES debate is widespread in the academic discourse, in the literature and scientific research, there is a lack of awareness by public decision-makers on the importance of ecosystem services for urban quality and collective well-being. This need for greater awareness is related to urban planning goals towards redefining and expanding the collective interest concerns, where ecosystem services directly affect the quality of life and well-being of citizens.

The second element of weakness concerns the limited integration of the ecosystem approach into spatial planning; until today, the experiences are limited and sector-based. It seems necessary to assume a transdisciplinary perspective in redefining the urban planning paradigm, in which the different technical disciplines co-participate in setting planning decisions. Planners require greater awareness of the contribution that the ecosystem assessment can provide to the redefinition of the spatial plan for re-urbanising the contemporary city in a flexible and ecologically oriented manner which can respond to the challenges imposed by climate change. In defining spatial and landscape planning strategies that favour the regeneration of the existing city over new land take of agricultural and natural soils, it is essential that the "porosity" of urban fabrics is increased, to conserve open spaces and existing greenery and improving the urban natural capital. The densification of the built-up city becomes an agreeable objective only if practised through regeneration (environmental and social) and the partial re-naturalisation of already urbanised and soil sealed areas, where the transformation of land use must contribute to the pursuit of new ecological and environmental goals. Many recent urban redevelopment projects, implemented in European and Italian cities, have achieved results of renewal and real estate development of areas using greenwashing strategies but have been ineffective in increasing ecosystem quality and social cohesion of open

spaces – despite being frequently supported by rhetoric of the ecological city and environmental sustainability.

A third critical "knot to untangle" concerns the scale of ES in terms of the relation between ES mapping and evaluating and spatial planning strategies. Mismatches between the scales at which ES are delivered, demanded and governed are recognised as being one of the most important causes of failures in natural resource management and a critical issue in ES adoption for spatial planning. Investigations on "scale definition" insist that ES assessment must consider the ecological processes that ensure the provision of goods and services, and the relevant application level which is central to any ES evaluation and analysis of environmental changes.

Addressing mismatches requires an adjustment between ES ecological processes at the management and planning scale. The adoption of a multi-scale approach could help overcome or at least reduce this critical issue. Mapping and scale issues must be investigated together for ES implementation in planning and assessment processes, as ES evaluation and mapping are often inadequate or ignored during the decision-making process.

The ES assessment mismatch can be solved (or a suitable compromise found) in the adoption of the landscape scale as a logical setting. This is due to the mixture of historical, social, cultural and environmental aspects and dynamics. A landscape approach goes beyond administrative boundaries to focus on conserving the similarity of the landscape structure. Landscape metrics can help assess the benefiting areas which rely on provisioning areas for the delivery of services.

Another key topic is the importance of including ES consideration in the strategic environmental assessment (SEA), providing a window of opportunity to mainstream ES into decision-making processes and planning formally, and the adoption of an ecological compensation method to redefine and improve proposals for land-uses changes.

A relevant contribution which facilitates experimentation of evaluation and mapping of ecosystem services integration and the construction of a new planning model is related to the development of GBI, as an innovative structure for contemporary planning.

The potential of GBI methodology to provide an innovative approach is becoming increasingly important for planning, where these networks can shape the new framework of the contemporary urban and territorial structure, and systems of open spaces (public and private), urban and peri-urban areas, agricultural and natural soil, are integrated as pieces of an ecologically oriented and socially inclusive recreative and environmental project. GBI permits the experimentation of an across-scale approach to the project, in which the wide-scale design of green networks is downscaled at intercommunal and local levels and can activate forms of governance and social sharing of the local project, within a common perspective of improving the quality of living conditions.

This volume aims to provide a scientific and methodological contribution to the trialling of an innovative method in Italian spatial and landscape planning, through a critical reflection on the opportunities and potential connected to the application of ecosystem services and green and blue infrastructures to spatial planning,

demonstrating innovative national case study while highlighting critical issues that need to be resolved.

References

Ahern J (2007) Green infrastructure for cities. The spatial dimension. In: Novotny V, Brown P (eds) Cities of the future: towards integrated sustainable water and landscape management. IWA Publications, London, pp 267–283

Albert C, Galler C, Hermes J, Neuendorf F, Haaren C, Von LA (2016) Applying ecosystem services indicators in landscape planning and management: the ES-in-planning framework. Ecol Indic 61:100–113. https://doi.org/10.1016/j.ecolind.2015.03.029

Arcidiacono A (2015) Tra il dire e il fare. Consumo di suolo, leggi e piani. In: Moccia FD, Sepe M (eds) Una politica per le città italiane. INU Edizioni, Roma

Arcidiacono A, Giaimo C., Talia M (2018a) Priorità per il progetto urbanistico. Reti ambientali, nuovi standard e rigenerazione urbana. In: Moccia F D, Sepe M (eds), Sviluppare, rigenerare, ricostruire città. Questioni e sfide contemporanee, INU Edizioni, Roma

Arcidiacono A, Salata S, Ronchi S (2018b) Un approccio ecosistemico al progetto delle infrastrutture verdi nella pianificazione paesaggistica. Urbanistica 159:102–114

Benedict MA, McMahon ET (2000) Green infrastructure. Recreation 37:4–7. https://doi.org/10.4135/9781412973816.n70

Bennett G, Mulongoy KJ (2006) Review of experience with ecological networks, corridors and buffer zones. Secretariat of the Convention on Biological Diversity, Technical Series, 23. https://www.cbd.int/doc/publications/cbd-ts-23.pdf

Brueckner J K (2001) Urban sprawl: lessons from urban economics. In: Gale WG, Pack JR (eds) Brookings-Wharton papers on urban affairs. Brookings Institution, Washington DC

Burkhard B, Kroll F, Nedkov S, Müller F (2012) Mapping ecosystem service supply, demand and budgets. Ecol Indic 21:17–29. https://doi.org/10.1016/j.ecolind.2011.06.019

Burkhard B, Crossman N, Nedkov S et al (2013) Mapping and modelling ecosystem services for science, policy and practice. Ecosyst Serv 4:1–3. https://doi.org/10.1016/j.ecoser.2013.04.005

Cortinovis C, Geneletti D (2018) Ecosystem services in urban plans: what is there, and what is still needed for better decisions. Land Use Policy 70:298–312. https://doi.org/10.1016/j.landusepol.2017.10.017

Cortinovis C, Geneletti D (2019) A framework to explore the effects of urban planning decisions on regulating ecosystem services in cities. Ecosyst Serv 38:100946. https://doi.org/10.1016/j.ecoser.2019.100946

Costanza R (2006) Nature: ecosystems without commodifying them. Nature 443:749. https://doi.org/10.1038/443749b

Costanza R (2008) Ecosystem services: multiple classification systems are needed. Biol Conserv 141:350–352. https://doi.org/10.1016/j.biocon.2007.12.020

Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B (1997) The value of the world's ecosystem services and natural capital. Nature 387:253–260. https://doi.org/10.1038/387253a0

Costanza R, de Groot R, Braat L et al (2017) Twenty years of ecosystem services: how far have we come and how far do we still need to go? Ecosyst Serv 28:1–16. https://doi.org/10.1016/j.ecoser.2017.09.008

Crossman ND, Burkhard B, Nedkov S et al (2013) A blueprint for mapping and modelling ecosystem services. Ecosyst Serv 4:4–14. https://doi.org/10.1016/j.ecoser.2013.02.001

Crutzen PJ (1998) Changing atmospheric chemistry: causes and consequences for environment and climate. Eur Rev 6:7–23. https://doi.org/10.1017/S1062798700002969

Crutzen P (2005) Benvenuti nell'Antropocene. L'uomo ha cambiato il clima, la Terra entra in una nuova era. Mondadori, Milano

Davies C, MacFarlane R, McGloin C, Roe M (2006). Green infrastructure planning guide, p. 45. [online] URL: http://www.scribd.com/doc/

de Groot R, Wilson MA, Boumans RMJ (2002) A typology for the classification, description and valuation of ecosystem functions, goods and services. Ecol Econ 41:393–408. https://doi.org/10.1016/S0921-8009(02)00089-7

Dodge R, Daly A, Huyton J, Sanders L (2012) The challenge of defining wellbeing. Int J Wellbeing 2:222–235. https://doi.org/10.5502/ijw.v2i3.4

Douglas I, James P (2015) Urban ecology. An introduction. Routledge, New York. ISBN 9780415538954

EEA (European Environment Agency) (2006) Urban sprawl in Europe – the ignored challenge. Report no 10. Publications Office of the European Union, Luxembourg

EEA (European Environment Agency) (2014) Spatial analysis of green infrastructure in Europe. Report no 2. Publications Office of the European Union, Luxembourg

EEA (European Environment Agency) (2016) Extreme temperatures and health, EEA report. Publications Office of the European Union, Luxembourg

EEA (European Environment Agency) (2017) Climate change, impacts and vulnerability in Europe 2016. An indicator-based report, EEA report no 1. Publications Office of the European Union, Luxembourg

European Commission (2002) Towards a thematic strategy for soil protection, COM(2002)

European Commission (2006a) Thematic strategy for soil protection, COM(2006) 231

European Commission (2006b) Proposal for a directive establishing a framework for the protection of soil, COM(2006)

European Commission (2012) Guidelines on best practice to limit, mitigate or compensate soil sealing. Publications Office of the European Union, Luxembourg

European Commission (2013a) 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 {SWD(2013) 155 final}. Bruxelles

European Commission (2013b) Building a green infrastructure for Europe. Publications Office of the European Union, Luxembourg. https://doi.org/10.2779/54125

European Commission (2015) Towards an EU research and innovation policy agenda for nature-based solutions & re-naturing cities. Publications Office of the European Union, Luxembourg

European Commission (2016) FUTURE BRIEF: no net land take by 2050? Produced for the European Commission DG Environment by the Science Communication Unit, Bristol

European Commission (2017) An Action Plan for nature, people and the economy. COM(2017) 198 final. http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/Action_plan_brochure_en.pdf

Gasparrini A, Guo Y, Hashizume M et al (2015) Mortality risk attributable to high and low ambient temperature: a multicountry observational study. Lancet 386:369–375. https://doi.org/10.1016/S0140-6736(14)62114-0

Geneletti D (2013) Assessing the impact of alternative land-use zoning policies on future ecosystem services. Environ Impact Assess Rev 40:25–35. https://doi.org/10.1016/j.eiar.2012.12.003

Geneletti D (2016) Ecosystem services for strategic environmental assessment: concepts and examples. In: Geneletti D (ed) Handbook on biodiversity and ecosystem services in impact assessment. Edward Elgar Publishing, pp 41–61

Geneletti D, Cortinovis C, Zardo L, Adem Esmail B (2020) Planning for ecosystem Services in Cities. Springer Nature Switzerland AG

Giaimo C (ed) (2019) Dopo 50 anni di standard urbanistici in Italia. Verso percorsi di riforma. INU Edizioni, Roma. ISBN:9788876031908

Glæsner N, Helming K, de Vries W (2014) Do current European policies prevent soil threats and support soil functions? Sustainability 6:9538–9563. https://doi.org/10.3390/su6129538

Gómez-Baggethun E, Barton DN (2013) Classifying and valuing ecosystem services for urban planning. Ecol Econ 86:235–245. https://doi.org/10.1016/j.ecolecon.2012.08.019

Gómez-Baggethun E, Ruiz-Pèrez M (2011) Economic valuation and the commodification of ecosystem services. Prog Phys Geogr Earth Environ 35(5):613–628., SageJournals. https://doi.org/10.1177/0309133311421708

Gómez-Baggethun E, de Groot R, Lomas PL, Montes C (2010) The history of ecosystem services in economic theory and practice: from early notions to markets and payment schemes. Ecol Econ 69:1209–1218. https://doi.org/10.1016/j.ecolecon.2009.11.007

Grêt-Regamey A, Sirén E, Brunner SH, Weibel B (2017) Review of decision support tools to operationalize the ecosystem services concept. Ecosyst Serv 26:306–315. https://doi.org/10.1016/j.ecoser.2016.10.012

Haase D, Larondelle N, Andersson E, Artmann M et al (2014a) A quantitative review of urban ecosystem service assessments: concepts, models, and implementation. Ambio 43:413–433. https://doi.org/10.1007/s13280-014-0504-0

Haase D, Frantzeskaki N, Elmqvist T (2014b) Ecosystem services in urban landscapes: practical applications and governance implications. Ambio 43(4):407–412. https://doi.org/10.1007/s13280-014-0503-1

Haines-Young R., Potschin M. (2013) Common international classification of ecosystem services (CICES, version 4.3), report to the European Environment Agency, September, pp 1–17

Hansen R, Frantzeskaki N, McPhearson T, Rall E et al (2015) The uptake of the ecosystem services concept in planning discourses of European and American cities. Ecosyst Serv 12:228–246. https://doi.org/10.1016/j.ecoser.2014.11.013

ISPRA (2016) Consumo di suolo, dinamiche territoriali e servizi ecosistemici, Rapporto 2016, Roma

ISPRA (2018) Consumo di suolo, dinamiche territoriali e servizi ecosistemici, Rapporto 2018, Roma

ISPRA (2019) Consumo di suolo, dinamiche territoriali e servizi ecosistemici, Rapporto 2019, Roma

Lafortezza R, Davies C, Sanesi G, Konijnendijk CCC (2013) Green infrastructure as a tool to support spatial planning in European urban regions. iForest – Biogeosci For 6:102–108. https://doi.org/10.3832/ifor0723-006

Lefevre H (1968) Le droit à la Ville. Anthropos, Paris

Lyndon M, Garcia A (eds) (2015) Tactical urbanism. Short-term action for long-term change. Island Press, Washington, DC https://doi.org/10.5822/978-1-61091-567-0

Maes J, Jacobs S (2017) Nature-based solutions for Europe's sustainable development. Conserv Lett 10:121–124. https://doi.org/10.1111/conl.12216

Maes J, Barbosa A, Baranzelli C et al (2014) More green infrastructure is required to maintain ecosystem services under current trends in land-use change in Europe. Landsc Ecol 30:517–534. https://doi.org/10.1007/s10980-014-0083-2

Maes J, Zulian G, Thijssen M, Castell C, Baró F, Ferreira AM, Melo J (2016) Mapping and assessment of ecosystems and their services: urban ecosystems. Publications office of the European Union, Luxembourg

Mascarenhas A, Ramos TB, Haase D et al (2014) Integration of ecosystem services in spatial planning: a survey on regional planner's views. Landsc Ecol 29:1287–1300. https://doi.org/10.1007/s10980-014-0012-4

McPhearson T, Hamstead ZA, Kremer P (2014) Urban ecosystem services for resilience planning and management in New York City. Ambio 43(4):502–515. https://doi.org/10.1007/s13280-014-0509-8

McPhearson T, Andersson E, Elmqvist T, et al (2015) Resilience of and through urban ecosystem services. Ecosyst Serv 12:152–156, Elsevier. https://doi.org/10.1016/j.ecoser.2014.07.012

Millenium Ecosystem Assessment (2005) Ecosystems and human. Well-being: our human planet. Island Press, Washington, DC. ISBN:9781559633864

Polasky S, Nelson E, Camm J et al (2008) Where to put things? Spatial land management to sustain biodiversity and economic returns. Biol Conserv 141:1505–1524. https://doi.org/10.1016/j.biocon.2008.03.022

Polasky S, Nelson E, Pennington D, Johnson KA (2011) The impact of land-use change on ecosystem services, biodiversity and returns to landowners: a case study in the state of Minnesota, pp 219–242. https://doi.org/10.1007/s10640-010-9407-0

Porter ME, Kramer MR (2011) Creating shared value. Harward Business Rev 89(1–2):62–77

Rall EL, Kabisch N, Hansen R (2015) A comparative exploration of uptake and potential application of ecosystem services in urban planning. Ecosyst Serv 16:230–242. https://doi.org/10.1016/j.ecoser.2015.10.005

Ronchi S, Salata S, Arcidiacono A et al (2019) Policy instruments for soil protection among the EU member states: a comparative analysis. Land Use Policy 82:763–780. https://doi.org/10.1016/j.landusepol.2019.01.017

Ronchi S, Arcidiacono A, Pogliani L (2020) Integrating green infrastructure into spatial planning regulations to improve the performance of urban ecosystems. Insights from an Italian case study. Sustain Cities Soc 53:1–12. https://doi.org/10.1016/j.scs.2019.101907

Saarikoski H, Primmer E, Saarela SR et al (2018) Institutional challenges in putting ecosystem service knowledge in practice. Ecosyst Serv 29:579–598. https://doi.org/10.1016/j.ecoser.2017.07.019

Schewenius M, McPhearson T, Elmqvist T (2014) Opportunities for increasing resilience and sustainability of urban social–ecological systems: insights from the URBES and the cities and biodiversity outlook projects. Ambio 43(4):434–444. https://doi.org/10.1007/s13280-014-0505-z

Shekhar H, Schmidt AJ, Wehling HW (2019) Exploring wellbeing in human settlements – a spatial planning perspective. Habitat Int 87:66–74. https://doi.org/10.1016/j.habitatint.2019.04.007

TEEB (2008) The economics of ecosystems and biodiversity: an interim report. European Commission, Brussels

UN (United Nations) (2019a) Global sustainable development report 2019: the future is now – science for achieving sustainable development. United Nations, New York

UN (United Nations) (2019b) World urbanization prospects. The 2018 revision. United Nations, New York

Von Christian A, Von Haaren C, Galler C (2012) Ecosystem services. Old wine in new bottles or an incentive for German landscape planning? Naturschutz und Landschaftsplanung 44(5):142–148

WHO (World Health Organization) (2019) Health, environment & sustainable development goals. New York