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Through and beyond the Poli(s)crisis: Guiding the Eco-Social Transition in UE

Gabriella Pultrone
Department of Architecture and Territory - dArTe, Mediterranea University of Reggio Calabria, IT

Highlights

- Poli(s)crisis is an extraordinary opportunity to trigger innovation and planning processes towards the care for our "Common Home", social justice, intra- and inter-generational equity.
- Cities have a decisive role both as a sphere of concentration and amplification of the crisis and as a privileged sphere of experimentation and acceleration of the eco-social transition.
- Nature-Based Solutions (NBSs) must be part of integrated and inclusive planning aimed to overcome the traditional planning approach based only on quantitative standards.
- NBS can break down silos at the institutional level and trigger planning, management and project actions from a multi- and trans-scale territorial perspective and multi-level governance.

Abstract

The word crisis indicates a polysemic concept that has become pervasive following the Covid-19 emergency. If it is essential to know how to manage emergencies, it is undoubtedly a priority to increase the resilience of cities, territories, and communities with innovative projects for a fair and sustainable future beyond crises, to adequately face the priority challenge of climate change. The ongoing polychrisis (health, economic, ecological, political, social, cultural, spiritual) can therefore be considered a driver that has triggered an acceleration in the process of ecological, social, energy and digital transition at the heart of EU policies.
The word poli(s)crisis, instead of the literal translation polychrisis, highlights the central and decisive dual role of cities as a sphere of concentration and amplification of the crisis and, at the same time, a privileged sphere of experimentation and acceleration of the aforementioned multiple transition process underway. Indeed, internationally, many cities are rethinking urban space promoting inclusive planning and the importance of Nature-Based Solutions (NBSs) that can increase environmental value across the urban-rural continuum with an integrated approach. Therefore, referring to some case studies in the EU panorama, the article aims to highlight the inevitable need to pursue the goals of eco-social transition by integrating NBSs into multi-level planning and regeneration strategies.

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Email: gabriella.pultrone@unirc.it
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1. The Crisis as an Unmissable Opportunity and Driver of Sustainable Innovation

The word ‘crisis’ indicates a polysemic concept that has become pervasive in the wake of the Covid-19 health emergency. In essence, we live in a permanent state of crisis in which the moments of difficulty of specific sectors and areas, apparently distant and distinct from each other, intersect in a profound way, leading to a process of progressive social and cultural change.

In fact, the Covid-19 pandemic itself has turned into a ‘syndrome’ insofar as its spread has led not only to a targeted fight against the specific infectious agent, but also to a set of environmental, social, and economic problems that have generated heavy repercussions on the world's population, mainly concentrated in urban areas, and on the planet’s ecosystems.

In contemporary territories, it is happening more and more often that different types of crises occur simultaneously, making the resolution of difficult urban conditions complex as different risks overlap, involving social, economic, environmental, health and liveability issues (https://www.urban-bynature.eu/).

These are the most recent developments of a multiple crisis or polychrisis, the overcoming of which entails strong changes that, in many ways, may imply the launch of processes and opportunities for rebirth and improvement starting right from the cities, cause and, at the same time, solution to global challenges, thanks to the polis’ ability to choose and govern (Colloca, 2010; Pultrone, in press, 2020a, 2021). If, on the one hand, it is essential to know how to manage emergencies, on the other, it is a priority to increase the resilience of cities and territories with innovative planning for a future beyond the crisis, fair and sustainable for all in harmony with nature (Pope Francis, 2015). The word poli(s)crisis of the title, instead of the literal translation polychrisis, highlights the central and decisive dual role of cities as a sphere of concentration and amplification of the crisis and, at the same time, a privileged sphere of experimentation and acceleration of the aforementioned multiple transition process underway, both at a global level and at the heart of EU policies (IPCC, 2022; Pultrone, 2018; UN-Habitat 2020, 2021, 2022).

Internationally, an increasing number of local and regional governments are undertaking ambitious transitions towards sustainability. Climate adaptation, climate mitigation and biodiversity protection are key pathways in this regard, including the implementation of nature-based solutions and green infrastructure in urban areas (Cavalli & Pultrone, 2020; Colding et alii, 2020; McQuaid et alii, 2021). However, these efforts and their impacts are rarely evenly distributed among all settlements. Marginalised and vulnerable communities disproportionately live in less safe, resilient, and green neighbourhoods and are more exposed to human and natural hazards, such as pollution, flooding, heat, and noise. These communities also face additional barriers (e.g., financial and spatial) to accessing environmental public goods (e.g., low-carbon and affordable energy, biodiversity, clean water and air). Finally, they are those most at risk of exclusion from green gentrification. The real challenge is to innovate to achieve the goals of ecological transition in urban regeneration, safety, and sustainable development of the built environment, as well as to meet housing needs, ensuring conditions of inclusiveness and social equity.

The Synthesis Report of the IPCC Sixth Assessment Report (AR6) brings together the latest climate knowledge and integrates the main findings of the Intergovernmental Panel on Climate Change’s (IPCC) Sixth Assessment Cycle, which includes three Working Group reports and three Special Reports. It is broken down into three sections that cover the current state of climate knowledge, the impacts of and risks from climate change, and the measures available to adapt to and mitigate climate change. 2030 is a key date for measuring the world’s success or failure in aligning with its climate commitments and meeting the target of staying under 1.5°C (2.7°F); hence, the decisions made in the next few years will shape the future of life on earth for millennia and every degree of warming matters in determining the quality of that life (IPCC, 2022).

This challenge has been taken up by the EU through the goals of the policies aimed at supporting cities to design sustainability interventions that benefit all residents, ensuring accessibility and equitable enjoyment of environmental public goods in line with residents’ right to place and to a clean and healthy environment (European Commission, 2015).

Indeed, these transitions are tackled at several policy levels, but cities appear the drivers of sustainable development in EU. Cities are places where all the global challenges are coming together and

where new solutions can be tried and tested by requiring an integrated, place-based, and participatory approach (Pultrone, 2019 e 2020b).

That is why in the 2014-2020 programming period, the EU Cohesion policy has a strong sustainable urban development dimension, and, for the current period 2021-2027 – which will mobilise substantial investments in urban areas –, the urban dimension of Cohesion policy has been even strengthened being its five Policy Objectives focused on Smarter, Greener, More Connected and More Social Europe as well as a Europe closer to Citizens (EUI, 2022).

Moreover, beyond Cohesion policy, activities implemented by the European Urban Initiative (EUI) will contribute to many EU and/or inter-governmental policies, strategic initiatives and programmes, more or less directly connected with the six EU strategic objectives: the European Green Deal, the Digital Future, the Economy that works for people, the Promotion and strengthening of our European way of life, the Role of Europe globally, the Giving of a new push for European democracy as well as the Recovery plan for Europe, which is a response to the COVID-19 pandemic, with its temporary recovery instrument NextGenerationEU (NGEU). In this context, the EU’s twin transition aimed at greening and digitalisation of our societies will be of particular importance for the EUI as local governments have important roles in these two domains and can implement ambitious measures for a more sustainable future (EUI: 7).

Finally, worth mentioning are two new tools introduced in 2022 and formalised through initiatives of the European Commission: Local Green Deals (100 Intelligent Cities Challenge) and Climate City Contracts (100 Climate Neutral and Smart Cities by 2030 Mission). Though there exist precise distinctions between them, both tools involve different types of actors in the city development process (https://iclei-europe.org/publications-tools/?c=-search&uid=Cv3FONcp).

In the light of the above, cities are rethinking urban space, not only from a health perspective, but also from an ecological one, recognising the need to promote inclusive planning and to consider regional dimensions, alongside the importance of NBSs that, with an integrated approach, can increase resilience and environmental value.

In this direction, within the framework of ICLEI-Local Governments for Sustainability – the global network of more than 2500 local and regional governments committed to sustainable urban development and active in 125+ countries – ICLEI Europe has been working with the European Economic and Social Committee, the Committee of the Regions, the cities of Bristol and Antwerp, and the European Research Executive Agency of the European Commission to develop a set of principles for sustainable and just cities (https://iclei-europe.org/). The initiative aims to influence EU-level policy making on sustainable urban development from the perspective of justice, inclusion, diversity, and equity, with the vision of bringing together organisations engaged in the fruitful intersection of urban sustainability and justice, with the intention of speaking with one voice and acting in line with the following 9 Principles for Just and Sustainable Cities, building on the work of the 3-year UrbanA project funded by the European Commission and led by a consortium of seven partners (https://urban-arena.eu/about/): 1) Integrate justice into sustainable urban development; 2) Embrace alternative economic models; 3) Formulate policies with and for all citizens; 4) Build transformative capacities; 5) Integrate diversity, equity and inclusion into urban planning; 6) Strengthen communities; 7) Enable universal access to the environment; 8) Maximize wellbeing within planetary boundaries; 9) Put digitalisation at the service of all (https://sustainablejustcities.eu/principles).

In a time of climate change emergency, for contemporary urban planning, the enhancement of natural elements, combined with local and wide area green networks as a response to ecological and environmental issues, is a priority aspect (Pogliani, 2022; Pultrone, in press).

With reference to some case studies considered significant in the context of EU-funded projects, the article, as part of the author's ongoing research activities, aims to highlight how it is possible to pursue the objectives of the multiple transition thanks to the planning, development and management of Nature Based Solutions (henceforth NBSs). Their integration into multilevel planning strategies and urban and spatial regeneration interventions allows for the jointly profitable articulation of the needs of quality of life, health, inclusion, and social equity, in harmony with nature. They constitute a solid base of knowledge and experimentation capable of nurturing further research and innovation to address a challenge that requires a trans- and multi-level approach.

2. NBSs to Increase Progressive Resilience in the EU Panorama between Policies, Strategies, and Projects

It is well known that the UN Agenda 2030 and the EU objectives for 2030 place the ecological transition at the basis of a new development model which aims to reduce polluting emissions, prevent, and combat land instability, and minimize impact of production activities on the environment, in order to improve the quality of life and environmental safety, as well as to promote a more sustainable economy for future generations. According to the World Cities Report 2020, unplanned and unmanaged urbanization poses a threat to environmental sustainability, due to urban sprawl, irreversible land use changes and biodiversity loss, resource-intensive consumption patterns and energy and high levels of pollution and carbon emissions. However, if well planned and managed, it offers opportunities to address global challenges at the local level, and contribute to environmental value through energy innovation, sustainable settlement patterns, changes in behaviour and lifestyles, and efficient use of resources (UN-Habitat, 2020 and 2021).
That is also what the latest World Cities Report (UN-Habitat, 2022) reiterates, when it proposes to provide greater clarity and understanding of the future of cities based on existing trends, challenges, and opportunities to suggest ways cities can be better prepared to face a wide range of shocks and move towards a sustainable urban future. Thus, it offers the opportunity to anticipate change and the course of action as well as to become more aware of the different scenarios or possibilities of the urban future. Within this framework, adaptation and resilience are intrinsically linked to the need to ensure a more equitable and inclusive urban future to address the related challenges of climate change and biodiversity, and to explore how alternative urban futures could be developed.
Ultimately, cities have no choice but to adapt to climate change and, since their well-being involves multiple dynamic processes (economic transactions, social interactions, resource use) and a diverse set of actors, resilience planning must also consider the physical and institutional context of urban planning.
The possibility of facing the challenge of climate change and the risks deriving from it undoubtedly depend on nature, which provides all kinds of essential services (clean air and water, food and pollination, support for tourism and leisure activities, contribution to physical and mental health among its main functions) and, at the same time, in the case of healthy ecosystems, protects us from floods, landslides, fires or extreme heat. However,

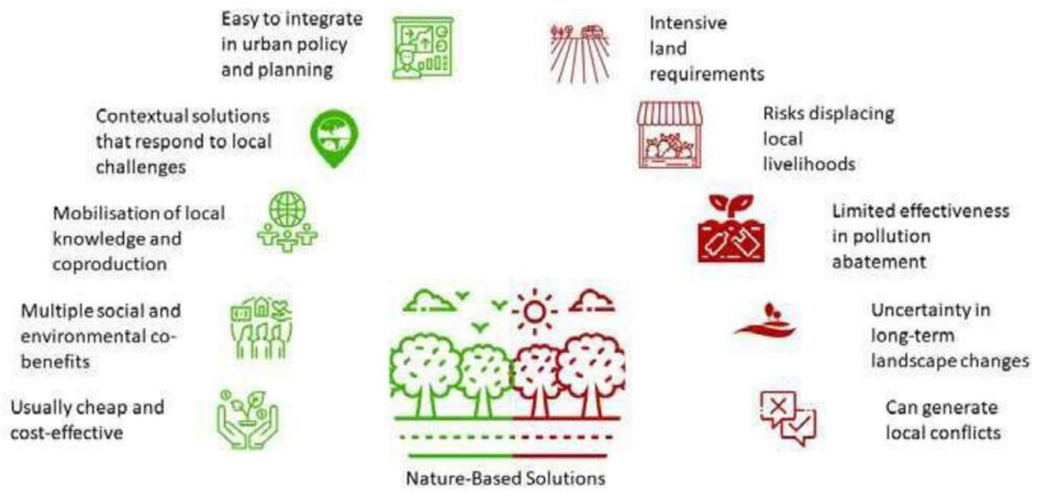

Figure 1: Benefits and limitations of NBSs solutions as outlined in the latest World Cities Report. *Source: UN-Habitat, 2022:167.*

the scale of the consequences of climate change is not evenly distributed because people and places that are already affected by geographical and social inequalities are also more exposed to climate-induced shocks and risks. The strengthening of resilience to the challenges is linked to the functioning of the Socio-Ecological Systems (SES), i.e., the complex interactions that exist between ecological systems and human systems, as it depends on the ability to generate ecosystem services. The resilience of an SES must, therefore, not be understood only as the ability to adapt to change, but also, and above all, as a transformative ability to seize the opportunities that a perturbation can bring to create a new and better system when the current system becomes unsustainable (Walker et al., 2004). With reference to urban, social, environmental and economic challenges, resilience must therefore be understood as the ability of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow regardless of the type of chronic stress and acute shock they experience (http://www.blueap.eu/site/cosa-sono-i-sistemi-socio-ecologici-e-perche-parlarne-in-relazione-alla-resilienza/). Indeed, the transition to a climate-neutral society, as defined in the EU Green Deal (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_it), requires profound, rapid, and systemic changes that will increase the burden of even the most vulnerable. In the face of unprecedented climate and biodiversity emergencies – with increasingly limited time available and the dangerous approach to irreversible and possibly cascading tipping points, as highlighted by the IPCC (2022) – the opportunities for timely actions are numerous but require a change of pace and paradigm. The EU underlines the need for a green and fair transition at all levels and the "no one is left behind" approach, already at the heart of many Urban Innovative Actions (UIA) projects, is reaffirmed in the new European Urban Initiative, through the recent first Innovative Actions Call focused on the New European Bauhaus (https://www.uia-initiative.eu/en/news/building-green-cities-accessible-and-affordable-all).
In this perspective of transformation for cities, the new European Urban Initiative (EUI), building on the experiences of previous programming periods, takes a further step forward to offer coherent support to cities, foster city-led innovation, sharing of urban knowledge, practices and capacity building (https://www.urban-initiative.eu/what-european-urban-initiative).
At the heart of this paradigm shift are undoubtedly NBSs, which are internationally recognised as a key part of climate action and biodiversity and need to be more widely deployed, including through the supportive policy framework offered by the EU Green Deal and related initiatives. NBS is an umbrella concept that encompasses multiple dimensions (strategic, spatial planning, soft engineering and performance) and is based on a broad knowledge base of approaches including ecosystem services, ecosystem-based adaptation, ecosystem-based disaster risk reduction, ecological engineering, blue infrastructure, green infrastructure, blue-green infrastructure, urban forestry, sustainable urban drainage systems, low impact design and other concepts (European Commission, 2019 and 2022).
The term was introduced by the International Union for Conservation of Nature (IUCN) in the early 2000s (https://iclei-europe.org/news/?c=-search&uid=cOl6JOlz) to identify actions that protect, manage and restore nature while simultaneously generating wider benefits for human well-being and biodiversity, as recognised in the European Commission's definition. In fact, defined as "Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience" (https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en), NBSs bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions". Over the past decade, growing evidence has emerged of the potential of NBS to address pressing environmental and social challenges, but more importantly, cost-effective solutions have been identified for public health, food security, social cohesion, and even potential economic benefits, such as new economic and employment opportunities (European Commission, 2022).
In this framework, they represent an integrated approach to deliver environmental value across the urban-rural continuum, considering that, before human interconnections, from transport to the internet, our planet is strongly interconnected by its most important terrestrial ecosystems, such as natural forests, which provide carbon sequestration, climate stability and protection from the most virulent infections. However, there are some problematic aspects to the use of NBS in urban

environments, as there are knowledge gaps regarding the effectiveness of solutions to address different types of environmental challenges, the involvement of various stakeholders and implementation challenges related to overlapping regulations and integration with existing infrastructure (Figure 1).
Furthermore, as NBSs and green and blue infrastructure interventions should be considered long-term investments, it is crucial that they are integrated into local development strategies concerning regulations, transport policies, sustainability strategies and biodiversity (Hansen et al., 2016).
Indeed, the aforementioned ICLEI Europe works with local governments to create and implement NBS projects and initiatives precisely because, in addition to their ability to promote human and environmental health and biodiversity, they are recognized for their vital role in a nature-positive economy, which goes beyond its pure monetary contributions to society, as highlighted in the specific report of the European Commission (2022).

3. Inter-Connecting Nature: Work in Progress to Address the Multiple Transition with an Integrated Approach

The reference to the significant case studies here proposed – projects and experiences already implemented and/or still in progress – is useful in terms of methodology and of possible operational declinations, with the aim to identify the most relevant aspects and prospects for innovative research and experimentation to guide multiple transitions in the light of a complex and dynamic, constantly evolving framework.
Among them, The Urban Nature Atlas, within the H2020 NATURVATION project, includes more than 1,000 examples of NBSs from over 100 EU cities and the number of projects is constantly increasing (https://www.naturvation.eu/). Each of them is aimed at proposing a relation to a specific problem, such as for example the sustainable management of water resources, heat islands or floods, and, at the same time, proposes integrated solutions to increase urban and/or territorial adaptation and resilience to climate change, within an ecosystem vision.
Connecting Nature is another very interesting project. Funded by the Horizon 2020 Research and Innovation Programme of the European Union, it was launched on 1 June 2017 and developed over five years.
Within all the case studies of the project – which are summarized for a complete overview in the table below, elaborated by the author on the basis of the information available on the project website (https://connectingnature.eu/cities) and as a step of her ongoing research activities –, opportunities are identified to provide NBSs that can help tackle major urban challenges, e.g., climate change, by offering numerous possible benefits, such as increasing biodiversity, producing energy, promoting social cohesion and reducing health inequalities.
Project implementation can contribute to the urban planning goal of creating more inviting and walkable cities and neighbourhoods that promote social cohesion and interaction, community engagement, well-being, a greater “sense of place” and sustainable economic development.
With reference to the above-mentioned overall framework – in relation to which, the subsequent research advances further systematisation for the purposes of a more structured comparison on key issues, challenges, proposed solutions – three cases are focused on below (Malaga, Poznań, Glasgow), since they summarise and include the main emerging issues common to all of the ten cities.
NBSs for water management involve the use of ecosystem services to improve water quantity and quality and increase resilience to climate change, such as in the case study within the H2020 CONNECTING Nature project “Green - Blue: Sustainable Urban Drainage Project” in Málaga, a Spanish city that experiences episodes of heavy rain and flooding every year, causing severe damage to the city and its surroundings.
As an adaptation measure, a pilot project on sustainable urban drainage was launched in 2018 by a local university in collaboration with local companies specialising in sustainable design and architecture, landscaping and gardening. This helped local stakeholders visualise the potential of Green Urban Design (GUD) in the field of integrated water management at an urban scale, also thanks to the work of the Universidad Laboral students who have implemented a series of Sustainable Urban Drainage Systems (SUDS) techniques to solve specific flooding problems in a local playground (https://cordis.europa.eu/article/id/421853-nature-based-solutions/it; https://connectingnature.eu/transforming-cities-enhancing-well-be-

Table 1: Connecting nature cities network _Exemplar projects at a glance.

	City (Country) ***Population*** ***Location (Environment/ Geography))***	***Main Features (Economy/Society/Assets)***	***Project Title/ NBSs Exemplar Main Aspects***	***Brief Description***
1	**GLASGOW (GB)** 626,000 On the River Clyde in Scotland’s West Central Lowlands.	Tertiary sector industries (financial and business services, communications, biosciences, creative industries, healthcare, higher education, retail and tourism). Presence of grand buildings from the industrial era, luscious green parks, and numerous attractions along the waterfront.	*THE OPEN SPACE STRATEGY* (OOS) The OOS Vision sets out that, by 2050, there will be a network of good quality, well-distributed, multi-functional open spaces, and connecting infrastructure. In conjunction with the City’s Strategic Plan, Economic Strategy and City Development Plan, the OOS will seek to provide, and encourage spaces which can facilitate enterprises, where possible.	It focuses on the delivery and implementation of the emerging Open Space Strategy (OSS) and its accompanying Local Context Analyses (LCAs). The exemplar sets out an approach to co-ordinate the various open space responsibilities to ensure well-managed, well-located, and well-connected open spaces that operate as part of a wider green network.
2	**GENK (B)** 66,000 80 km from Brussels and on the border with the Netherlands, the city is connected to Antwerp and Liège (essential for the development of local industries) through the Albert canal.	Until 1988, the coal industry was another very important driver of the city’s economy. 54% of the inhabitants of Genk are of foreign origin from about 107 different nationalities, mostly Italians, Turkish, and Dutch.	STIEMER EXEMPLAR The Stiemer is a blue-tinted thoroughfare that has largely lost contact with its valley. In many places, the Stiemer valley is completely enclosed by buildings and under the pressure of urbanisation, while still containing many ecologically valuable elements and being protected as a nature reserve managed by the NGO Natuurpunt. The Valley has enormous potential to be an integral part of Genk’s climate resilience and to intertwine green zones with built-up areas to form an attractive whole by multifunctional organization of residual spaces and forming an urban park in the sustainable Genk of the future. The masterplanning process uses an integrated approach with a strong participatory character. Thematic groups are formed in which different (governmental) stakeholders actively participate in order to formulate a shared vision and define collective projects.	Stiemer Valley’s exemplary NBS includes a green city line – as eco-social link/connector between neighborhoods, nature reserves and strategic places in the city – for walking and cycling, promoting the use of sustainable transport between the different neighborhoods and strategic sites of the city, for citizens, commuters and tourists, in order to integrate movement into people’s daily routines. The park is an example of how communities can adapt and collaborate across different cultural barriers, and use cultural diversity as an innovation resource for place-making interventions. This aspect has great relevance to the current pressures Europe is facing from large-scale migration and how it can transform the current ‘fear’ narrative into a ‘hopeful’ narrative in innovative European cities.
3	**POZNAŃ (PL)** 550,000 On the Warta River in west-central Poland, in the Greater Poland region.	Important academic site, with about 130,000 students and the third largest Polish university. The city has often topped rankings for very high quality of education and a very high standard of living. It also ranks highly in safety and healthcare quality.	SOCIAL GARDEN EXEMPLAR The Poznań NBS exemplar aims at multiplication of small-scale nature-based solutions interventions in the city with special focus on those areas that are densely urbanised and inhabited by citizens who have limited access to greenery. Such an “up-scaling approach” will extend the network of green infrastructure in Poznań and also complement the green wedges which run through the city, from north to south and from east to west, creating a natural network.	A nature-based urban green network will ensure accessibility and availability of green and blue spaces to citizens across the city and contribute to protection from flooding by a cumulative water retention capacity. Such nature-based solution exemplars are challenging for Poznań given its large-scale, the balance it needs to strike as multi-functional and yet integrated to the existing urban structure and functions of the city.
4	**A CORUÑA (E)** 244,000 Seaside port located in the Golfo Ártabro, on the Atlantic Ocean.	Diverse economy, ranging from port activities to tourism, and home to the headquarters of several major multi-nationals. Built on over two thousand years of architectural heritage on a popular seafront.	URBAN GARDENS GREEN NETWORK A Coruña is an extremely compact city, surrounded by the ocean and densely populated. Scarcity of space has pushed buildings upwards, resulting in fewer open green areas, low biodiversity and a high rate of soil sealing in the city centre, which, in turn, can lead to heat stress and episodes surface water flow. The NBS is about urban gardening and the creation of a network of urban gardens that connect green areas and provide multiple environmental, economic and social benefits.	Creation of a network of urban gardens connecting different initiatives across the city. It will be expanded to include new community gardens and the governance model will be reoriented from a top-down city-led model towards a bottom-up community-led approach.

5	**BURGAS (BG)** 200,000 Perched on the coast of the Black Sea.	University town with a very young population. Other activities include oil refinery, timber, and tourism. Features include beaches, sea garden, a municipal sea shuttle connecting the city with close-by islands and three lakes.	RESTORATION OF THE PARK OF ST TERESA The exemplar addresses the following main challenges: flooding, particularly heavy rains in winter; some disused and unattractive urban areas; engagement with young population. The proposed NBS aims to reduce particulate matter, which is a serious problem in the city; reduce overheating in some parts of the city, city squares and pedestrian zones; change the mindset of policy makers, architects, town planners, construction companies convincing them that NBSs are investments in the future of the city.	Restoring of the *Park of St Teresa* located in the heart of the city, beside densely populated residential areas, next to the city bus station, sports centre, and city hospital. Largely neglected since its creation in the 1950s, the park is unused and derelict. Its restoration is expected to protect biodiversity while providing social, economic and environmental opportunities.
6	**IOANNINA (GR)** 112,000 500 metres above sea level, on the western shore of lake Pamvotis.	With coastline to the west and mountain to the east, Ioannina has a unique architectural and cultural heritage with influences from the Byzantine, Greek and Ottoman empires. Historically, this region offered opportunities for physical activities (running, tennis) and access to nature.	PIRSINELA PARK It is the largest area of existing green space (almost 250.000 m2). However, in the last fifteen years, the park – located in the urban boundaries of the city – has been totally abandoned and neglected. Challenges addressed: Poor quality of the lake Pamvotis; high levels of unemployment and poverty; heat stress and water challenges. Main pillars of the project vision: a clean and green lakefront; higher levels of environmentally focused employment.	The Municipality of Ioannina will plan and implement urban green interventions for the reuse and growth of *Pirsinela Park*, according to the following timeline. *5 years' time*: affection and love for place through increasing green spaces; stronger connection with the water and lake area based on a cleaner waterway. *10 years' time*: green-tech innovation is being embedded into action-based learning for young children.
7	**MALAGA (E)** 570,000 Costa del Sol of the Mediterranean, about 100 kilometres east of the Strait of Gibraltar and about 130 km north of the African coast.	The most important economic sectors of Málaga are tourism, construction and technology services. The port of Malaga has undergone profound renovations in recent years; among other attractions, it now hosts the Centre Pompidou Málaga, opened in 2015, a branch of the Centre Georges Pompidou in Paris.	LAGUNILLAS *Lagunillas* – an old neighbourhood very close to both the historic city centre and the university – has been largely overlooked in terms of development and has many derelict and vacant spaces often walled up and covered with (amazing) graffiti. There is strong resistance to gentrification of the area. Main challenge: diversify Malaga's economy (decrease the dependency on tourism and construction). Main pillars of the project vision: urban life is beautiful, and people look forward to bringing their family up in Malaga; Malaga develops into a business hub for nature-based solutions.	Working with the community, the City of Malaga intends to reopen some of the derelict spaces to create a network of pocket parks and encourage citizens to use the characteristic balconies of the area to create green corridors connecting the pocket parks with the larger green areas around the University and the city centre area. According to a deadline in three steps, the following main aspects are included: *5 years' time*: funding for NBSs is provided through the specific fund "Social finance ecosystem"; new parks and green playgrounds are developed in deprived, and yet high-quality, environments neighbourhoods. *10 years' time:* biodiversity becomes an integral part of urban planning; the university in Malaga offers a new programme in Green Infrastructure; a new rainwater capture system drastically diminishes the need for freshwater and sewage treatments; climate-change adaptation measures allow most houses along the beach to stay above water. *15 years' time*: the city hall creates a new position: "nature-based solution city maker", overseeing many aspects of social and economic development in close cooperation with communities; Malaga is a globally relevant hub in the NBS business.

8	**NICOSIA (CY)** 238, 547 The capital city of Cyprus is in the centre of the island and has a subtropical semi-arid climate.	It has a vibrant financial industry and has attracted many international businesses and tech companies.	URBAN NETWORK OF LINKED OPEN AND GREEN SPACES WITH THE NATIONAL FOREST PARK OF ATHALASSA. Challenges addressed: connecting existing planning strategies; fragmented responsibilities, since local authorities have too few responsibilities regarding land use and mobility planning and management; absence of metropolitan authorities (land use – mobility – economic development).	The parks and green spaces will be connected by an integrated bicycle and pedestrian network. The identification of many small unused open spaces throughout the city has led to the creation of an *Adopt a Park Initiative* targeted at encouraging large corporates to engage with nature-based enterprises to design, implement and manage small scale pocket parks for enjoyment by employees and the city's citizens alike. Main relevant aspects according to a deadline in three steps. *5 years' time*: more of Nicosia's municipalities start using green municipal waste to produce energy for the heating of the public buildings; development of strategic mobility plans putting land use and economic development at the heart of transport projects; soft modes of transport (cycling and walking) are becoming more and more popular. *10 years' time:* schools play an active role for engaging kids with NBSs; NBSs are mainstream and models for achieving NBS are fully embedded in urban planning. *15 years' time:* GHG emissions caused by transport system are reduced by 50%.
9	**SARAJEVO (BIH)** 275,000 (city) 643,000 (metro area) Within the greater Sarajevo valley of Bosnia, it is surrounded by the Dinaric Alps and situated along the Miljacka River.	The city's economy is a mix of manufacturing, administration, and tourism. The city contains a colourful centre with an eclectic collection of architecture and rich modern history.	URBAN GARDEN IN A STATE-RUN CHILDREN'S HOME Challenges addressed: Poor quality of the river; Urban poverty. Main pillars of the project vision: healthy multifunctional green spaces; green focused local businesses. Main pillar of the vision: the National Forest Park of Athalassa as a European reference for how a Natural Area is exploited combining Green Infrastructure and urban development.	Creation of an urban garden in a state-run *Children's Home* which is located next door to a Centre for Healthy Ageing. A core feature of the exemplar is to promote and encourage intergenerational learning through the joint design, management, and maintenance of the garden. If successful, the Municipality intends to roll out the model in similar settings across the city. Main relevant aspects according to a deadline in two steps. *5 years' time:* clean drinking water; better understanding of flooding challenges; healthier conditions for collaboration within the city. *10 years' time:* seriously reduced pollution from vehicles; the river water is clean enough to swim in.
10	**PAVLOS MELAS (GR)** 100,000 Named after a Greek hero of the Macedonian struggle, it is situated in the region of Thessaloniki in Central Macedonia.	The city organises several festivals and has a vibrant local cultural scene. It is characterised by a mix of urban and peri-urban settlements.	TRANSITION OF A FORMER MILITARY CAMP IN THE CITY CENTRE INTO A METROPOLITAN PARK. Challenges addressed: incorporate knowledge on ecology and urban planning into the conception of new parks and ecosystems; prevent forest fires; the city is among the 17 Municipalities with the highest percentage of unemployment in Greece. Main pillars of the vision: The new Metropolitan Park will be created with the active participation of the local population; the city's brownfield will be turned into hotspots for biodiversity; the new environmental features of the city also provide opportunities for businesses, creating jobs and economic welfare.	Largely disused since 2006, the Military Camp nowadays represents an 'Urban Gap' contributing to the deprivation of the area. To reverse the situation, the Municipality has focused on a strategic regeneration planning based on different steps and procedures, with increased dialogue and cooperation of key stakeholders. The Phase 1 will concentrate on the restoration of the Parks green spaces with the sustainable reuse of the many buildings being the focus of the Phase 2 restoration.

Data source: elaboration by author

ing-innovating-nature-based-solutions-0). The dissemination of the progress made in recent years and the need to transfer the knowledge and results obtained are a fundamental step for outcomes that have concrete spillover effects on the territories of reference, also from an economic and social point of view.

In Poland, the main challenge of Poznań – a city of 550,000 inhabitants, of which 130,000 are students, located on the Warta River – is that, although it has a well-developed green infrastructure system, this is lacking in densely built-up neighbourhoods in historical areas. Alongside this are the challenges of the effects of climate change, such as heat waves and episodic (often sudden) flooding due to heavy rain. The high rate of soil sealing in densely built-up residential areas in the city centre has led to unfavourable thermal and moisture conditions and limits the potential for water retention. The creation of small parks and urban gardens on derelict, abandoned or neglected land contributes to a more equitable distribution of greenery in the city, mitigates heat island stress within residential areas, improves the water retention potential of the area, and minimises pressure on drainage infrastructure. The solution aims at the multiplication of small-scale natural solution interventions in the city with a focus on those densely urbanised areas inhabited by citizens who have limited access to greenery. This approach will lead to extend the green infrastructure network and will also complement the green wedges running through the city, from north to south and from east to west, creating a natural network, also contributing to large-scale flood protection (Figure 2). Cooperation between the different stakeholders is necessary in the process of designing new ways to use these green areas, which are owned by public institutions and must be partly open to a wider group of users than normal (Poznań Municipality, 2017).

As part of this programme, a series of social gardens (open gardens) were created throughout the city. For each of these gardens, the community was involved in the design, construction, and management of the spaces. The aim of this initiative was to free up new public spaces, using underused spaces, such as kindergarten areas, parts of city parks and residential areas, as public play and socialising spaces. This provides added value both to the operators in the area, e.g., the kindergarten (due to increased resources and activities), and to the local community (due to the freeing up of additional public open spaces). The pilot actions have been very successful, and the experimentation has been extended and is spreading throughout the city with the implementation of other community garden projects (https://connectingnature.eu/oppla-case-study/19387).

More generally, in this country, as elsewhere, there has been a significant change in the main aspects relating to the traditional prevalence of hierarchical models of governance and forms of participation. Gradual processes of adaptation and emerging forms of urban policy reflect the tensions between new and more traditional forms of governance and economic, environmental and social goals. This trend can also be seen in the proposed case studies focused on NBSs, although it is more evident in smart city (SC) initiatives, where there are more inclusive, effective and democratic forms of local governance, tending to go beyond the Exclusive focus on socially oriented technological solutions, with strategies offering room for innovation and increased citizens and civil society participation. The ongoing institutional change has actually taken place in terms of participatory governance, digitization in service delivery, responding to social needs and linking SC agendas to wider urban development goals (Masik, Sagan, Scott, 2021). As for the conception of Polish urban management and spatial planning, it is noted that the local government ordinance is the main local strategic legislative document, which takes care of territorial order and sustainable development through the study of the directions of territory development and through planning tools. Furthermore, since the local community can participate in the process of preparing local acts, information from the local society has the possibility to be used to make the right decisions and become the basis of evidence-based urban planning at the local level with greater effectiveness of results (Feltynowski, 2015).

Returning to the most relevant aspects of the case study under consideration, the potential impacts/benefits are multiple, interconnected and mutually reinforcing with reference to the following key aspects, which, however, can also be found in the experiences of the other cities belonging to the network:

- public health and wellbeing, as people are reconnected with nature to increase mental and physical wellbeing;
- social justice/cohesion, in that spaces for gathering and strengthening social ties are qualitatively increased;
- management of green spaces, which can undoubtedly improve biodiversity/nature conservation;
- management of public space, as the quality of public space is improved and its diversity is increased;
- resilience to climate change, due to the contribution to sustainable urban drainage and reduction of the urban heat island;
- potential for economic opportunities and green jobs, due to increased management opportunities;
- education: for the ability to increase environmental awareness and practical awareness of the challenges of sustainable development.

In essence, NBSs offer a greater possibility of providing lasting and tangible benefits among different social groups, in a range of environmental, economic and cultural contexts, as well as in stark contrast to the ways in which conventional solutions are designed, constructed and operated over time, although significant challenges and unknowns, in terms of (co)design, operation, maintenance and organisational mode of implementation, still remain open (https://connectingnature.eu/city-pozna%C5%84-social-gardens-exemplar).

In the case study of Glasgow, the Open Space Strategy (OSS) Vision foresees, by 2050, a network of good quality, well distributed, multifunctional open spaces and connecting infrastructures, which contribute positively to: the City's liveability, increasing its attractiveness as a place in which to live, work, study and invest; the health and wellbeing of the City's human population and of its flora and fauna; and the long term resilience of the City in relation to the threats, and potential opportuni-

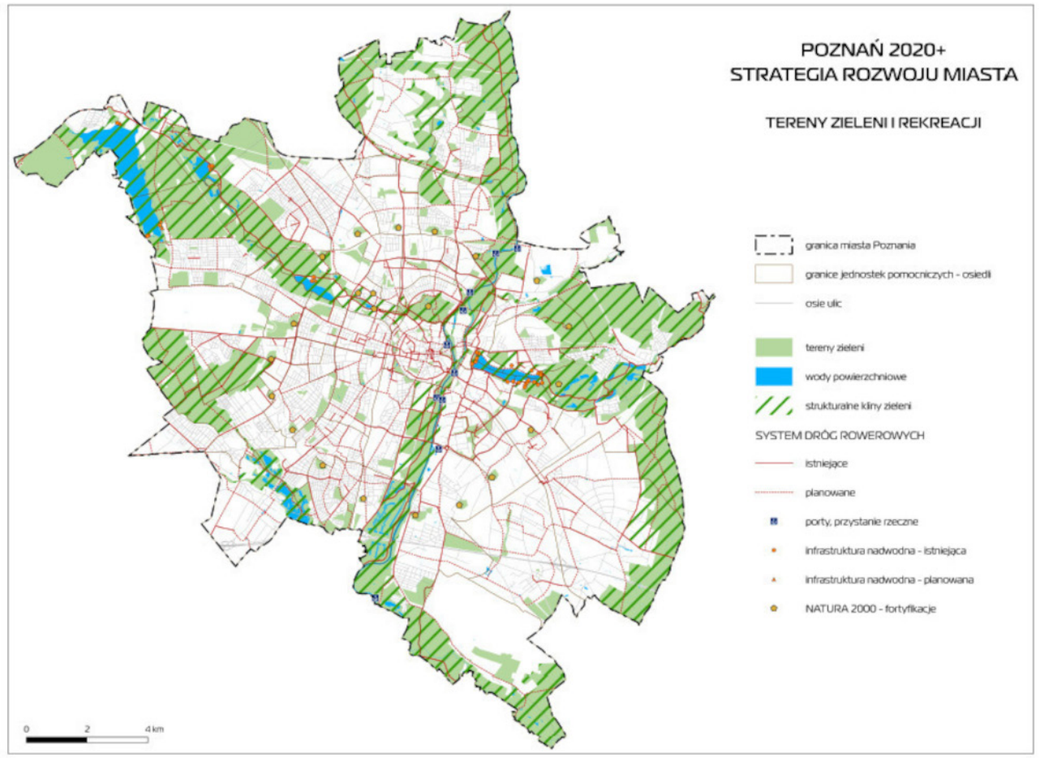

Figure 2: The Areas of greenery and recreation in Poznań. *Source: https://connectingnature.eu/city-pozna%C5%84-social-gardens-Exemplar, from "Development Strategy for the City of Poznań 2020+". (Credits: City of Poznan/ Miasto Poznań).*

ties arising from climate change and other external factors, such as reducing budgets. Communities have access to good quality, multi- functional open spaces that are used by all sectors of society and are within a short walk from home, as well as to a wider, better integrated, network of green, blue (water) and grey (civic) spaces that provide multiple benefits for people and the environment (https://connectingnature.eu/city-glasgow-and-open-space-strategy-exemplar).

In conjunction with the City's Strategic Plan, Economic Strategy and City Development Plan, the OSS also aims to provide, and encourage, spaces which can facilitate enterprise.

Noteworthy, the extensive survey and data analysis aimed at a series of open space standards identified as follows:

- accessibility Standard, aimed at delivering access to a good quality open space, of >0.3ha, within a 400m walk from people's homes;
- quality Standard, to ensure the open spaces used to meet the Accessibility Standard are of good quality in terms of usability and multi-functionality;
- quantity Standard, to ensure there is enough open space, per head of population, in each part of the city. Different quantity standards apply to the inner urban area (where residential population densities are higher) and the outer urban area.

The views of the public and of the communities are critical in establishing current and future needs, as highlighted through the Local Context Analyses (LCAs), processed in two stages. In Phase 1, the main open space problems in each of the 15 local areas of the city are brought into focus (Figure 3). They also contain an initial analysis of the standards of accessibility, quality, and quantity in each area to identify their potentials and shortcomings, together with other basic aspects, such as access to main routes. In Phase 2, which Connecting Nature is focusing on, consideration is given to the open space demands identified through the OSS process and to how best to meet them in a holistic and multifunctional way.

In essence, OSS and LCAs (Phases 1 and 2) allow for the identification of open spaces in each area of the city that could benefit from NBSs, to achieve the city's climate change adaptation goals. They also help provide a greater "sense of place" for local communities by building on the placemaking policy and processes that underpin the city's 2017 development plan and breaking down departmental silos. As a matter of fact, City Council departments must work together to develop OSS and deliver its subsequent planning, management, and project actions.

Lastly, at the conclusion of this review, among the other numerous significant case studies – which, of course, cannot be adequately addressed here, due to space constraints, and for which reference is made in notes and bibliography (Wild, Freitas and Vandewoestijne, 2020) –, worth mentioning is GoGreenRoutes, a €10.5 million EU project of broad scope that promotes a greater connection with nature in Europe, Latin America and China (https://gogreenroutes.eu/). Its multidisciplinary consortium of 40 organisations is integrating participatory approaches and citizen science with Big Data analysis and digital innovation to co-create Urban Well-being Labs in six Cultivating Cities: Burgas (BG), Lahti (FI), Limerick (IE), Tallinn (EE), Umeå (SE) and Versailles (FR). These pioneer cities are implementing NBSs, such as green corridors, linear parks, pocket parks and shared walkways, maximising available public space, to improve the physical and mental health of their residents by enabling more opportunities for social interaction and, at the same time, restoring ecologically valuable spaces. The growth of NBSs communities and mutual learning through relationships and exchange of experiences is facilitated by the dedicated Connecting Nature Enterprise platform (https://connectingnature.eu/cnep).

4. Discussion and (Open) Conclusion

To date, although efforts to achieve a just transition to a net-zero economy have focused on the energy system, the imperative of decent work and social inclusion applies equally to sectors that influence and are influenced by nature. A just socio-ecological transition implies moving to a climate-resilient net-zero economy that offers decent work, social inclusion, and poverty eradication, while simultaneously achieving biodiversity goals. This is in many ways a new and complex area of policy and practice, and while there are opportunities for new progress, there are also several deeply interconnected challenges to overcome (Ronchi, 2021) that require a step and paradigm shift.

Within this framework, the demand for NBSs is increasing globally, largely due to the focus on them

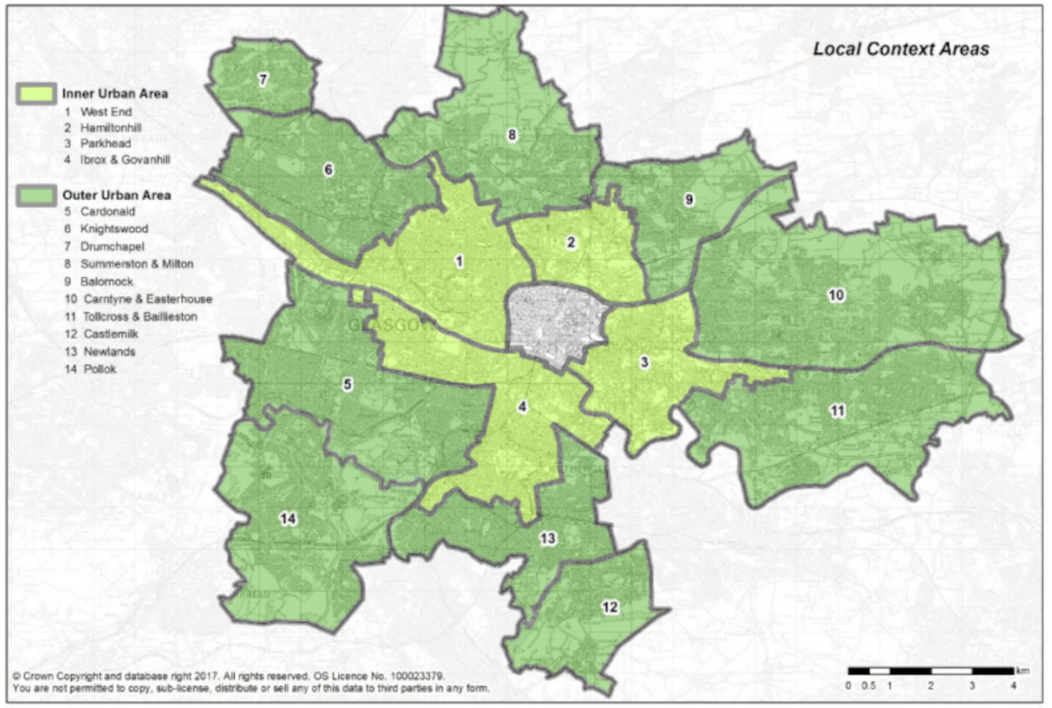

Figure 3: Map of the 15 Local Context Areas which, together, cover the whole of Glasgow. *Source: https://connectingnature.eu/city-glasgow-and-open-space-strategy-exemplar (Credits: Glasgow City Council).*

in international policy, but also due to initiatives by cities and other territorial actors that recognise their potential to generate a multitude of benefits simultaneously, as evidenced by the case studies referred to. Therefore, they should be considered as an integral element of land use, landscape and green building policies at different spatial scales, to address the challenges related to climate change with an integrated approach and increase the territorial resilience. This should be done also taking into account the link between people and place in order to encourage ownership and stewardship (particularly driving entrepreneurship amongst the underprivileged), as well as innovative ways of protection, regeneration and management of open public space and infrastructure (whether blue, grey or green) in a period of austerity in public spending.

As the numerous above-mentioned foreseen and in progress experiences show, the integration of NBSs in programming and planning activities contributes to tackling the challenge of climate change and, more generally, of poli(s)crisis, positively affecting the following urban and territorial aspects: 1) liveability, increasing its attractiveness as a place to live, work, study, and invest; 2) health and well-being of the human population and its flora and fauna in a One Health approach; 3) building long-term resilience in relation to threats and potential opportunities arising from climate change and other external factors, such as budget cuts. Therefore, with a view to the virtuous integration of social and environmental aspects, communities can have access to good quality multifunctional open spaces, used by all the varied social and generational components and located a few steps from home, and to a wider and better integrated network of green, blue (water) and grey (civil) spaces that offer multiple benefits for people and the environment.

In the EU panorama, the Connecting Nature project (which should be concluded in June 2023) is particularly significant in this sense. It sees 10 partner cities of different demographic sizes actively involved, with a population ranging from 66,000 inhabitants in the Belgian Genk to 626,000 in the British Glasgow. These, like all cities and territories on a global level, in fact, must face the challenge of

climate change and the related Poli(s)crisis at a local level, and their success depends on their ability to carry out innovative processes of ecological, social, energy and digital transition.
Their experiences provide useful methodological and operational suggestions for the integration of NBS in urban and territorial planning, to be appropriately adapted in the different EU contexts considering the related regulatory frameworks in force.
Among such suggestions, the following stand out:

- linking and coordinating existing planning strategies and overcoming the fragmentation of responsibilities;
- the integrated approach with a strong participatory character used in the planning process, through the formation of thematic groups in which various (governmental) stakeholders actively participate in order to formulate a shared vision and define collective projects;
- the inclusion of biodiversity as an integral part of urban planning;
- the inclusion of ecological-environmental quality indicators in local urban planning regulations, as in the case of Glasgow, where great attention is paid to the standards – accessibility standards, qualitative standards and quantitative standards – which urban spaces must guarantee in a perspective of equity and socio-spatial justice;
- the integration of existing urban green areas – but also abandoned and neglected areas subject to specific recovery and redevelopment interventions – with the built-up areas to form an attractive whole through the multifunctional organization of the residual spaces and their systematization with the territorial ecological network with an "increasing scale approach", which extends the green infrastructure network, also integrating the green wedges that cross the city, from north to south and from east to west, for the creation of natural networks;
- the role of the university in training a new generation of professionals with skills for transition and with a vision that goes beyond transition.

In essence, the ongoing processes within Connecting Nature help to break down existing departmental silos at the municipal level and create favourable circumstances for integrated work to develop the open space strategy and implement subsequent planning, management and project actions, also from a multi- and trans-scale territorial perspective and multi-level governance. Furthermore, while advances in analysis and knowledge are needed, awareness-raising strategies targeting urban and rural dwellers are equally indispensable for more effective policies.
An open question worthy of further research development stems from the clear need for more and better-quality data on NBSs, their impacts and value chains, as well as the development of technologies to facilitate the rehabilitation of ecological functions. This calls for the use of sensors, drones, IoT (Internet of Things) devices and Geographical Information Systems (GIS) to better understand the prioritisation, positioning and sizing of NBSs in order to derive maximum benefit. Yet, this is another promising segment of research to investigate further potential and developments of the possible virtuous interrelationships between ecological and digital transition (Pultrone, 2022, 2023), which the author is also studying, and goes beyond the aim of this article.

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