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The governance of peri-urban green infrastructures in the perspective of sustainable development. A comparison in Europe

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ABSTRACT: The paper analyses the governance models of six peri-urban green infrastructures (GIs) in Europe to reflect on GIs as *critical loci* to operationalize the sometimes naïve and rhetorical aim of sustainable development. In the study, the case of "Corona Verde", the green belt around the City of Turin (Italy), is compared with other peri-urban GIs to discuss the potential of territorial governance for the construction of objective-led deliberative arenas as promoted by the UN 2030 Agenda for Sustainable Development. As a result, the hypothesis that peri-urban GIs are the most appropriate territorial systems to organise and manage a viable system of sustainability objectives is discussed and reframed. Although limited in scope and data, original traits of this study are the development of a territorial benchmarking comparing governance models rather than territories and the operationalisation of the *governance for sustainability* in terms of a continuous negotiation between the socio-ecological actors of a given territorial system.

KEYWORDS: peri-urban green infrastructure, territorial governance, sustainable development, regional planning, Corona Verde, Turin.

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1. INTRODUCTION

After the adoption of the UN 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change, the international governance for sustainable development shifted from a hierarchical system of sectoral regulatory mechanisms to the agreement on a shared system of objectives and the recurring monitoring of a related set of outcome variables (Jacquet & Jamieson, 2016; Kanie et al., 2019). With the global diffusion of the 17 sustainable development goals (SDGs), the traditional system of rules, controls, and sanctions characterising the international policy discourse on sustainability lost significance in favor of a new "goals and results" approach characterised by (Jacquet & Jamieson, 2016):

- deliberative arenas and open negotiation procedures (Bäckstrand, 2006);
- shared responsibility between the public and the private actors (Abbott, 2012);
- follow-up, review, and institutional learning processes (Steele, 2011);
- informal procedures of "good reputation" and "naming and shaming" mechanisms.

From the United Nations (UN) perspective, the "goals and results" approach promoted with the SDGs is more efficient because it enables a more extensive mobilisation towards sustainability, open to all sectors of society at every territorial scale. Also, this new approach aims to increase the coherence among the actions proposed in the name of sustainability (Kanie et al., 2019; Nilsson et al., 2016).

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Recently, the 2023 UN High-level Political Forum (HLPF) on sustainable development reaffirmed the statements already expressed by the 2019 SDG Summit of New York (24 - 25 September, 2019) asking for (https://sustainabledevelopment.un.org/content/documents/25200SDG_Summary.pdf):

- global action to secure the leadership, the solutions, and the resources to support the transition toward sustainability;
- local action to embed this transition (which is green and digital, but also institutional) in the policies, the budgets, and the planning and regulatory frameworks of the different countries or governments;
- people action pushed by stakeholders, activists, and members of civil society to create grass-rooted movements pushing for change.

The local level, in particular, emerges as the *critical locus* of pro-sustainability actions because the SDGs are relevant to local jurisdictions, and the change they produce is more tangible at small scales (Annan-Aggrey et al., 2022). "Local and regional governments (LRGs) lead territories and local communities' development paths; they deliver essential public services and act as catalysts for transformative change" (UN-Habitat, 2024). They are tiers of governance closest to local communities, better understanding their needs and priorities and addressing policymaking. At the same time, however, the local scale might be too small when addressing the sustainability of the natural ecosystems (Dente, 2004; Dematteis, 2018). Moreover, actions for the sustainability of the global environment must combine local visions with a shared agenda of goals and results and a common strategy to be effective (UN-Habitat, 2024).

National and regional governments adhering to the UN 2030 Agenda are thus pushed to translate the 17 SDGs into a set of objectives supported by the local communities (Slack, 2014). From a theoretical point of view, this approach implies that sustainable development as a universal target does not exist. Instead, it is the localized outcome of a process of continuous negotiation among views, needs, priorities, solutions, and trade-offs (Krueger & Agyeman, 2005; MacGillivray & Franklin, 2015).

Consistent with these premises, for the effectiveness of the UN agenda, it is essential to:

- territorialise the UN SDGs properly, i.e., translate the global agenda into a system of local agendas, reflecting the local community's assets and aspirations for sustainability.
- experiment with innovative solutions of territorial governance to construct community-based views on sustainable development in a participated and dialectic way.

However, the UN agenda does not explain how to select and prioritize among the SDGs. According to Bosselmann et al. (2008), territorial governance can turn the abstract - sometimes naïve and rhetorical - concept of sustainability into a concrete and practical issue. Also, it can combine into a coherent framework of action the "hard" regulatory decisions for the protection of the natural environment (water, soil, biodiversity, climate) and the "soft" negotiation of diverging development issues expressed by the stakeholders (Haughton & Allmendinger, 2008).

A central question is identifying the proper *critical locus* (Annan-Aggrey et al., 2022) to operationalise sustainable development in a coherent and viable system of objectives and results. To the best of our knowledge, although the literature that deals with the territorialisation of the SDGs is vast, the very nature of the territorial system where to implement the governance solutions that fed the sustainability of the development should be more well-developed. According to UN-Habitat, "SDG localization is transforming the SDGs into reality at the local level, in coherence with national frameworks and communities' priorities. Localization means collaboration among all stakeholders and coordination across sectors and spheres of governance. It is a two-way process where the local meets the national and the global, and vice-versa" (2024). Coherently, the UN-Habitat develops a partnership-based approach that helps local governments translate the objective of sustainable development into a practical system of goals and variables throughout all stages of planning, policymaking, project development, and monitoring. Critical components of this extensive approach are multilevel governance, multi-stakeholder collaboration, development effectiveness, and the principle of leaving no one and no place behind. However, UN-Habitat focuses only on urban places.

In contrast, sustainable development should balance urban and rural issues by mixing socio-economic and environmental perspectives. Assuming that sustainable development can only exist in the form of a territorialised agenda and a multilevel negotiation process, identifying the territorial borders of this

governance system, the *locus* where to plan and implement pro-sustainability actions assumes a dramatic role. However, to our knowledge, few studies have been devoted to identifying the proper geographical scale and extension, the borders, and the constituent territorial features of this *locus*. The paper aims to fill this gap, hypothesising that the territorial systems involved in the governance of the peri-urban green infrastructures (GIs) are the most appropriate systems to organise a coherent and viable system of sustainability objectives. As we will discuss, they assume the form of a socio-ecological locus wide enough to include all the stakeholders, assets, processes, and relationships relevant to constructing a place-based agenda for sustainability.

The structure of the article is as follows. Section 2 reports on the technical and scientific debate on the management of peri-urban green areas, identifying in the green belt model the antecedent of current GI discourse. Section 3 discusses the main opportunities and challenges in the governance of peri-urban GIs. Section 4 illustrates the data and method assumed in the paper to develop a comparative analysis of peri-urban GIs in Europe. Section 5 presents the results of the benchmarking developed on the case studies of: Corona Verde and Parco Agricolo del Sud di Milano in Italy; ReihnMain Regionalpark and Grüner Ring in Germany; Regionalpark DreiAnger in Austria; and Parques e Palacios de Sintra-World Heritage Unesco in Portugal.

2. THE PLANNING AND THE GOVERNANCE OF THE PERI-URBAN GREEN SPACE: FROM THE GREEN BELTS TO THE GREEN INFRASTRUCTURES

In the technical and scientific debate that initially focussed on the management of the green areas bordering the cities, we can identify two distinct planning strategies: the "season" of the peripheral p*ublic housing* suburbs and the "season" of the peri-urban greenbelts. The former approach interprets the peri-urban green space as a "virgin" territory apt to satisfy the needs of the expanding urban housing market. The latter approach interprets it as a vital space needing protection and safeguarding of the quality of its natural ecosystems and landscapes. Thus, it considers the planning of peri-urban green areas as a critical public policy tool to contain urban sprawl (Senes et al., 2016). In the 1990s, these visions were substituted by a different approach influenced by the novel concept of the peri-urban green infrastructure.

Greenbelt policies first appeared in the United Kingdom in the 1930s, inspired by Ebenezer Howard's proposal for a land management policy addressed explicitly to the fringe area separating the town from the countryside. Her priority was to contain the rapid processes of urbanization that characterised the urban centres of the time and to safeguard the natural landscapes, habitats, and rural activities localised in the urban hinterland (Amati, 2016; Sturzaker & Mell, 2017). Between the 1930s and the 1960s, greenbelts became essential components of the international planning language diffused in Russia (Moscow), France (Paris), Italy (Rome), Holland (Randstad Holland), Germany (Berlin, Frankfurt), and Austria (Vienna) (Amati, 2016). In the 1990s, greenbelt policies for the planning and managing of peri-urban green areas were applied worldwide and in the United States planners introduced the term green infrastructure (GI) to stress their new "holistic" approach, combining environmental protection, loisir and economic growth (Grădinaru & Hersperger 2019). The large-scale protected areas, public natural parks, and gardens surrounding the urban core were no longer intended as bulwarks against the urban sprawl but essential assets for the urban and regional economy. Some experts describe this shift as the starting point of a novel generation of policies, characterised by a diversified system of aims and solutions (Thomas & Littlewood, 2010; Breiling & Ruland, 2016). Concerning the geographical scale of intervention, the authorities promoting this new type of greenbelts are urban and regional; concerning the tools, they rely on strict regulatory frameworks as well as participative approaches combining the primary intent of nature safeguarding with recreation and tourism (Mace, 2018).

In Europe, GI has been extensively advocated by the European Union through a series of strategies and reports since the 2000s and the 2010s (European Commission, 2010; European Commission, 2013; Mazza et al., 2011). With the diffusion of the GI as a key planning principle to manage the land use system towards the objectives of ecological restoration and habitat protection - in the United States, the term GI was first used in the 1990s (Grădinaru & Hersperger, 2019) -, planners and policymakers started prefigurating the natural and semi-natural areas around cities as a new urban-rural market (EPA, 2015; Macdonald et al., 2020, 2021; Mace, 2018), designed and managed to provide a wide range of ecosystem

services, while enhancing biodiversity (EC, 2019) and providing overall socioeconomic benefits (Dreiseitl & Wanschura, 2016).

Green infrastructures are more than the simple scaling of the green belt concept. They include natural systems such as water bodies and large green vegetation systems, green vegetative equipments, and small-scale nature-based solutions (NBS) in the urban fabric (i.e., green roofs, green walls, wildlife overpassing).

At the peri-urban scale, the recognised main benefits of GIs are of four types (Natural England and the Campaign to Protect Rural England, 2010):

- the provision of ecosystem services;
- the mitigation and adaptation to climate change;
- a stricter ecological integration between the city and the countryside;
- the promotion of economic competitiveness and local identity.

Compared to greenbelts, GIs require a more complex approach since they provide a more comprehensive set of regulating, provisioning (EEA, 2011), and cultural ecosystem services (Röhring & Gailing, 2005). Green infrastructures contribute to protecting nature, mitigating and adapting to a changing climate, producing energy, increase the quality of life and social cohesion (URBES project). From the perspective of urban planners and local administrators, for example, urban forests and green corridors contrast the fragmentation of the natural habitats and the loss of biodiversity while providing the local community with healthier living conditions and novel job opportunities in tourism and green economy.

Furthermore, GIs can work as *living labs* where stakeholders negotiate the sustainability-related trade-offs and conflicts accompanying green space planning (Nowak et al., 2006; Röhring & Gailing, 2005). For example, Barò et al. (2014) warn policymakers not to consider afforestation as an intervention that is always positive for the air quality and the local climate because it increases the green cover. Empirical evidence shows that the results depend significantly on the features of the area chosen for the intervention and the type of vegetation (Pugh et al., 2012; Vos et al., 2013). Similarly, Blum (2017) underlies that the planning option of transforming natural parks and fields into equipped green areas is favourable for leisure, nature accessibility, and local development, whereas the preservation of the wilderness of the green areas is more efficient in safeguarding ecosystems and biodiversity. In order to achieve the objective of greener sustainable development, GIs thus need a wider complex management framework based on the participation of local stakeholders, policymakers, technicians, and the proactive commitment of citizens (Breiling & Ruland, 2016). Moreover, since the green spaces between the city and the countryside are strategic policy resources for the development of the broader metropolitan and regional systems, an additional constituent factor is adopting a multilevel approach to GIs territorial governance.

3. OPPORTUNITIES AND CHALLENGES IN THE GOVERNANCE OF PERI-URBAN GREEN INFRASTRUCTURES

The shift from greenbelts to peri-urban green infrastructures can also be a late manifestation of the process of metro-regionalization that has affected a more and more numerous group of cities in Europe since the 1980s (Kovács et al., 2019), determining the intensification and expansion of the functional relationships connecting the urban core with its hinterland. In Italy, evidence of this metro-regionalization of the largest metropoles comes from the continuous enlargement, from 1981 to 2011, of the borders of their local labor systems (Rota & Ferlaino). In France, the recognition of the extended mobility flows, and the exchanges of goods and services generated by the urban core has pushed toward a more integrated, holistic, and sustainable approach to urban governance exemplified, for instance, by the establishment, in 2015, of the new "collectivité territoriale" of the Métropole de Lyon.

In the literature, the governance concept identifies a flexible system of participatory approaches and solutions that helps the public and private actors to collaborate and pursue objectives of different natures (Stoker, 1998). It is also the continuous process by which the local actors recompose the interests at stake and coordinate their actions towards a common goal. From a territorial perspective, territorial governance includes both the regulatory decisions by central and local institutions and the informal

public-private agreements between stakeholders and it can also take the form of a discourse (Macdonald et al., 2020, 2021).

On the one hand, larger metropolitan governance systems allow a more comprehensive and coherent approach to the processes that affect the sustainability of the ecosystems and human well-being (mobility, production, consumption, and waste management). On the other hand, the metro-regional upscaling leads to a multiplication of objectives and institutional levels involved in urban planning. The broadening of the functions attributed to the peri-urban green areas, for instance, increases the objectives and processes needing negotiation among stakeholders (Kortelainen, 2010; Macdonald et al., 2020, 2021).

The larger the area of interest, the larger the number of actors (institutional entities, consortia, unions, pacts) to be consulted and involved in decisions. In such a situation, innovative solutions of territorial governance can play a fundamental role in "collectivizing" within a larger community, the quest for the sophisticated skills requested to manage the new emerging "metro rural" region (Dematteis, 2018). Territorial governance can help the construction and management of peri-urban green infrastructures from several perspectives:

- the display of the scale and area of intervention. Enlarging the system's boundaries suitable for managing the green space multiplies the territorial administrative units and decision centers asking for involvement. This "hyper-territorialization" is a primary challenge of vertical and horizontal coordination (Lella & Rota, 2018; Hoyler, Freytag & Mager, 2006);
- the identification of the interests in play and the relevant stakeholders. Territorial governance is an open and participative process involving all the actors with a specific interest or commitment to the object of the public policy. Also, it favors the coordination across spheres of government, stakeholders, and sectors of society (Soriani, 2015);
- the management of conflicts and trade-offs. The metropolisation of the intervention area also implies a wider variety of green areas to manage (Davies et al., 2006). Besides natural parks and protected areas, peri-urban GIs also include farmland, wetlands, and other blue-green spaces such as private gardens, artificial channels and walking/cycling trails, enlarging the interests and priorities involved. Multilevel territorial governance is a critical tool for the practical management of the trade-offs (between environmental, economic, and social priorities) and equity issues of the planning of green space (ESPON, 2018);
- the prefiguration of resources for future financing (EPA, 2015). More than in the past, the economic and financial sustainability of the processes managed via territorial governance strategies emerges as a fundamental requirement and dimension of assessment;
- the integration of the "ordinary" green planning within other planning tools and the strategic planning for development and sustainability. Multilevel territorial governance is a critical tool for the localization of the UN 2030 agenda, i.e. - as mentioned in section 1 -, the translation of the SDGs into a practical system of local goals and variables coherent with national frameworks and communities' priorities (UN-Habitat, 2024).

At the same time, further investigation is needed to understand how territorial governance can meet all these challenges altogether (Macdonald et al., 2021). For example, governance solutions to the hyper-territorialization and the containment of the urban sprawl can range from the so-called "soft spaces of governance", i.e. debating arenas characterized by informality, flexibility, and grassroots participation (Zimmerbauer & Paasi, 2019), to formalized laws and agencies for territorial planning and development (Lucas, 2016). In soft governance, participant-based collaborative practices, goodwill, and self-organization (Jessop, 2000) are used to overcome the lack of coordination between levels of government (Storper, 2014). Conversely, designated agencies may increase further the fragmentation of the decision centers (Macdonald et al., 2020; Freund, 2003; Nelles, 2012).

4. METHOD

The empirical analysis proposed in this study consists of a benchmarking analysis of the governance of a selection of peri-urban green infrastructure in Europe to investigate whether GIs are territorial systems appropriate to organise and manage a viable set of pro-sustainability objectives.

Benchmarking consists of comparing a given organization (which can also be a territorial system such as a city or a region) with a selection of similar entities. It aims to assess relative strengths and weaknesses while getting tips and lessons from the competitors (Lundvall & Tomlinson, 2001). Also, it is used as a tool to improve regional foresight (Koellreuter, 2002) because the learning process resulting from benchmarking can lead to a greater awareness of the objectives and the directions to follow. According to the European Commission (EC, 2006), in a condition of high uncertainty and competition, systematic territorial benchmarking helps to push growth and empowerment while avoiding the *self-referentiality trap* (Purcell & Brown, 2005).

This study, looking at existing approaches to compare urban development politics (Kantor & Savitch, 2005; Willi et al., 2018), proposes a benchmarking of the different territorial agreements and actions implemented to develop a peri-urban green infrastructure. Compared to traditional territorial benchmarking, a different selection of variables and criteria is thus needed. More than the economic, social and environmental dimensions of territories, the analysis will focus on the institutional and organisational involvement of administrative entities, economic actors, third-sector associations and civil society in the planning of the green infrastructure.

For this reason, it is not necessary to provide an extended sample of cases or to construct rankings or classifications. Instead, selecting relevant solutions for GI governance in a reasonably similar institutional and socio-economic context is essential. As a first step, the scientific literature and the reports of international projects (especially ESPON projects and EU Interreg Alcotra initiatives) dealing with European GI have been reviewed to identify comparable experiences in Europe. As a result, the paper identifies the six case studies, listed in Table 1.

Table 1. The peri-urban GIs considered in the benchmarking.

Green Infrastructure	Country	Government Levels	References
Corona Verde	Italy	Municipality of Torino & Metropolitan City of Torino	Barbero (2022); IRES Piemonte (2021); Cassatella (2013); https://www.coronaverde.it/wp/; https://www.regione.piemonte.it/web/temi/ambiente-territorio/ambiente/corona-verde
ReihnMain Regionalpark	Germany	Municipality of Frankfurt & Metropolitan Region Frankfurt/Rhein-Main	Dettmar (2012); Husung & Lieser (1996); Macdonald, et al. (2020, 2021); Monstadt & Meilinger (2020); Regionalpark Ballungsraum RheinMain (2019); Siedentop, Fina, & Krehl (2016); https://www.regionalpark-rheinmain.de/;
Grüner Ring Leipzig	Germany	Municipality of Lipsia & Lander Leipzig and Nordsachsen	Leipzig (2019); https://gruenerring-leipzig.de/; https://una.city/nbs/leipzig/parkbogen-ost-green-belt-project
Regionalpark DreiAnger	Austria	Municipality of Vienna & Stadtregion Wien-Gerasdorf	Breiling & Ruland (2016); Stadt Wien (2005, 2019); Terada, Yokohari & Amemiya (2008); https://www.gerasdorf-wien.gv.at/Regionalpark_DreiAnger
Parques e Palacios de Sintra-World Heritage Unesco	Portugal	Municipality of Sintra	Magalhães et al. (2007); MAPF (2004); PSML (2014); Rautenstrauch, L. (2015); Ribeiro & Barão (2006); https://whc.unesco.org/en/list/723/
Parco Agricolo del Sud di Milano	Italy	Municipality of Milano & Metropolitan City of Milano	Regione Lombardia (2015); Di Marino & Lapintie (2018); Quaglia & Geissler (2017); Sanesi at al. (2017); https://www.cittametropolitana.mi.it/parco_agricolo_sud_milano/index1.html

Source: Author's elaboration.

The variables for the benchmarking were also identified based on the literature and clustered according to seven categories:

- Origin and evolution. The procedural and sequential nature of green planning in Europe (Castagnoli, 2019) suggests for an evolutionary approach to the analysis of the governance of GIs.
- Territorial characteristics affecting the genesis and governance. This category includes:
  - the extension of the region considered for the management of the GI;

- the administrative and functional partitions intercepted by this region;
- the share of urbanised, agricultural, and blu-green areas distinguished among rivers and other water bodies, forests and wooded areas, paths, and other open spaces, etc.;
- the extension of green protected areas;
- the local demography (i.e., residents and growth rates);
- the local economy (i.e., productive specialisations);
- the local insitutional system (i.e., networks, projects, habits);

- Vision and mission. It is about analysing the rationale, the objectives and the primary services expected by the GI.
- Governance architectures. They are the practical "hard" and "soft" solutions adopted to manage the GI, from institutionalised regulatory agreements, such as plans, programs, agendas, pilot projects in charge of administrative entities, purpose agencies or consortia, to informal collaborative mechanisms, such as incentives and participative platforms.
- Financial resources. It is about estimating, for each case study, the total yearly revenue at the disposal of the governance of the GI, distinguishing between public loans, private contributions and market revenue.
- Partnerships and projects. It is about verifying the presence of development projects that affect the GI. In the last decades, it has been relatively frequent the assumption of GI projects as case studies in international projects. Furthermore, it is quite frequent that the area of interest of the GI intercepts other project areas.
- Monitoring and results. Where possible, information on the results of the green infrastructure project (containment of the urban sprawl, protection of nature and landscape, tourist attractiveness, ecosystem services) are collected and compared.

Sources of data have been national, regional and local political documents addressed to the peri-urban GI (strategic plans, above all), as well as scientific studies, marketing materials, presentations, and brochures. Moreover, in the case of Turin, the participation in the TOPMETRO project by the Piedmont Region and the Metropolitan City of Turin (Cabodi, Rota, & Talamini, 2021; Barbero, 2022), allowed to integrate the information collected via desk analysis with the opinions of six local and regional experts, interviewed between February and May 2020.

5. RESULTS OF THE BENCHMARKING

5.1. The sample

The analysis of the cases selected for the benchmarking (Turin, Frankfurt, Vienna, Leipzig, Sintra and Milan) highlighted a substantial heterogeneity of situations. As the photos that follow also show, significant differences from a territorial point of view are captured both in the socio-economic structure of the concerned regions and in the size, shape and connotation of the green areas (Figures 1-6).

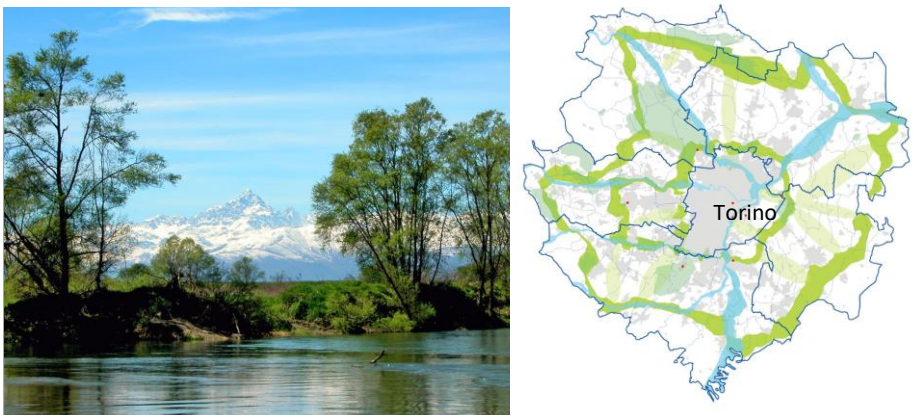

Figure 1. Corona Verde (Metropolitan City of Turin).
Source: Photo: https://www.regione.piemonte.it/web/temi/ambiente-territorio/ambiente/corona-verde.
Map: http://www.ecowebtown.it/n_15/15_pa_10.html

Figure 2. ReihnMain Regionalpark (Frankfurt am Main).
Source: Photo: https://www.regionalpark-rheinmain.de/;
Map: https://www.regionalpark-rheinmain.de/portfolio-item/regionalpark-freizeitkarte-rundroute/

Figure 3. Grüner Ring (Leipzig).
Source: Photo and map: https://www.leipzig.de/

Figure 4. Regionalpark DreiAnger (Vienna).
Source: Photo and map: https://www.wien.gv.at/

Figure 5. Cultural Landscape of Sintra (Sintra).
Source: Photo: https://pixabay.com/it/photos/sintra-portogallo-castello-torre-4287725/;
Map: https://www.visitportugal.com/it/content/sintra-itinerario-accessibile

Figure 6. Parco Agricolo Sud Milano (Metropolitan City of Milan)
Source: Photo: https://www.parks.it/parco.sud.milano/iti.php; Map:
https://www.parks.it/parco.sud.milano/pdf/Mappa.itinerari.pdf

For example, in the case of Sintra, the project territory is only 946 hectares, while in the case of the Rhein-Main Regional Park in Frankfurt, there are 446,300 hectares. As regards the population and the political role of the territories, the GIs of Vienna (capital of Austria) and Frankfurt (global economic and financial centre) emerges over the rest of the sample. Land use is also different. In Vienna, the urbanised land occupies 42% of the area of the administrative units involved in the planning of the GI (the City of Vienna and Stadtregion Wien-Gerasdorf); in the other cases, the urbanised land does not overcome the 15%, while non-agricultural green areas range from 16% to 22%. Among the common elements, there is a relevant presence of protected areas (SIC, ZPS, regional and national parks but also UNESCO World Heritage Sites) and water bodies. In the case of Leipzig, in particular, there is a vast system of "blueways" that includes rivers and naturalised quarry lakes.

Regarding the form of the green areas, contrary to what one might imagine, the index of landscape fragmentation calculated by the European Environment Agency (EEA, 2020) for the period 2009-2015 shows that all the cases are affected by relevant fragmentation. Only Turin and Sintra could preserve quite well the spatial continuity of the peri-urban green areas thanks to the local natural barriers of the hill and the Po River, in the case of Turin, and the Atlantic Ocean, in the case of Sintra.

The information and data collected are then analysed according to a set of emerging shared challenges, such as: i. the horizontal, vertical and territorial coordination of the actors; ii. the integration with other plans and projects; iii. the construction of a common territorial identity; iv. the identification of financing models to make governance economically sustainable.

5.2. Coordination of stakeholders

5.2.1. Horizontal governance

It refers to experiences of collaborative governance between two or more equal-level territorial bodies. In the case of Vienna, this aim has been successfully pursued since 2006 via the Stadt Umland Management (SUM), which is a collaborative platform for the co-planning of the metro region Stadtregion Wien/Niederösterreich. One of the objectives of the SUM is to develop the green belt around Vienna further. The strong cooperation between the municipality of Vienna the Länder of Vienna and Lower Austria and almost 60 other entities enabled by the SUM compensates for the lack of an inter-municipal planning body (Kovács et al., 2019). The GRL-Grüner Ring Leipzig unit for the management of the green areas around Leipzig provides another example of horizontal governance (Breiling & Ruland, 2016). Initially created as a voluntary association with equal votes for all the members, it then resulted in an agreement between the City of Leipzig, 13 surrounding municipalities and the counties of "Leipziger Land" and "Delitzsch". Decisions emerge by consensus by the semi-annual City-Region-Conference, which is the body inside the GRL grouping the institutional actors to discuss the projects proposed by the working groups and eventual modifications to the purpose agreement at the basis of the GRL itself.

5.2.2. Vertical governance

This type of governance distinguishes for the involvement in the planning and management of the green infrastructure of a more or less hierarchically nested system of territorial levels. The involvement of actors at different scales is common in all the experiences analysed, including Corona Verde (CV). In the case of Turin, however, the superordinate coordinating unit called "Cabina di Regia" acts more as a "meeting place" between institutional representatives (the Piedmont Region, the Metropolitan City of Turin, six leading Municipalities and the Park Authorities) rather than as a deliberative arena. Differently, the Regional Rural Park of the nearby city of Milano (PASM) presents a "hard governance" structure established by regional legislation. In PASM the management function is entrusted to the Metropolitan City of Milan. In contrast, the Park Regulation assigns the administrative function to the Board of Directors, assisted by the Assembly of Auditors, the Agricultural Technical Committee and the Landscape Commission. In this case, the governance is characterised by a nested hierarchy of competences, from the Region to the Municipalities. The case of Frankfurt is instead emblematic of a failed matching of the many different authorities with jurisdiction on the territories of the green infrastructure. In particular, Macdonald et al. (2019) complain that, in the transition from the initial greenbelt (GrünGürtel) to the Regionalpark RheinMain, the planning of the green peri-urban areas did not adopt effective vertical governance based on a strong authority with a public mandate. The risk, in the perspective of these authors, is the reduction of the Regionalpark to a patchwork of localised initiatives assigned to urban municipalities.

5.2.3. Territorial governance

This type of governance implies the active involvement of a large casuistry of non-institutional local actors such as businessmen, volunteers and "common" citizens and, similarly to the types mentioned above, is present in all the analysed cases. It follows that the territorial governance of GI typically assumes different configurations according to the regional and urban context. In Portugal, for example, the Sintra Cultural Landscape Opinion Council acts as an advisory body supervising the scientific and civil participation of the local community in the development of a sustainable cultural landscape. As an organ of the World Heritage Office, its deliberations are not binding but solely consultative and informative. Nevertheless, it develops a significant action of monitoring the management of the UNESCO area. In Austria, instead, the DreiAnger Regional Park sees the neighbouring municipalities of Vienna and Gerasdorf effectively collaborating on the development of a shared landscape plan entitled "Green Space Connection Bisamberg - Gerasdorf - Norbert-Scheed-Wald". The planning process was characterised by active participation, coordinated communication and integrated actions (walks, inspections, shared decisions). A variety of experts from local development planning, nature protection, agriculture, mobility, water conservation and environmental remediation discussed the Plan. The citizens made significant

contributions by conveying ideas, desires and visions as "daily experts". This approach created a broad basis of the consensus that was fundamental for the subsequent implementation of the interventions. In the case of the Leipzig Green Ring (GRL), the Regional Action Plan (RHK) decided not to subdivide the territory of the GI into sub-areas but to create transversal thematic working groups formed by public and private actors to territorialise the sustainable development into projects promoted by the GI. Also, thanks to the participation of many non-institutional actors, the Leipzig Green Ring is widely recognised as a successful case study for the networking and the building of supra-regional development scenarios. In the case of Frankfurt, an interesting example of a collaborative agreement between the Regionalpark RheinMain and the local territorial actors is represented by the initiative "Farmyard Havens", a network of farmers involved by the Park to provide the visitors of the Park with local agricultural products and other services, such as: bicycle rental, self-harvest of fruit and vegetables, and information. The involvement of farmers is also pursued by the PASM. However, as observed by Sanesi et al. (2017), in this case, the interest in a larger involvement of citizens in the development and planning of green infrastructure remained quite incomplete.

5.3. Integration with other plans and projects

The integration between the governance of peri-urban green and the "ordinary" management tools of the urban and regional territory is probably the most significant challenge that characterises all the cases analysed in the benchmarking. The complexity of the task depends on the one hand on the missed juxtaposition of the borders of the GI with those of the local administrative and functional partitions and the multidimensionality of the concerned tasks; on the other hand, the changes occurred in the last few decades in the political approach to the green and in the availability of public funding have severely tested the settings initially given to the governance of the GI. This is evident in the case of the Rhine-Main park, which assumes the form of an over-extended greenbelt, aiming at bringing within the regional planning a vast set of functions that includes: the conservation of nature, the establishment of regional ecological corridors, the defense and enhancement of the landscape, and the promotion of new services related to wellness, culture and multifunctional agriculture (Gailing, 2007). From the perspective of the Rhine-Main park, this aim is to be realised via project-oriented territorial strategies. In Germany, however, the regional authorities responsible for green protection and planning have no mandate to the construction of the regional greenbelt.

On the contrary, the agency specifically created to develop the GI has no planning powers and few resources. Also, the management of the park was entrusted to six inter-municipal implementation bodies that granted increasing freedoms to the Municipalities to pursue their projects. Municipalities, therefore, emerge as the real protagonists of the construction of the GI.

In the case of Leipzig, the relationship with the planning tools at regional and municipal scale is regulated by a chapter of the Regional Action Plan stating that the development of projects and measures for the implementation of the GI has to be carried out with the active participation of the member Municipalities and the proactive collaboration of the different departments of the City of Leipzig. In this way, the coherence with the objectives of the local, regional, landscape and sectoral planning was also checked. The overlap between different levels of planning that results from the transversal approach of the Action Plan, moreover, is not seen as a weakness, but as the possibility of creating synergies between the various plan tools. However, the fact remains that the GRL Action Plan does not replace the contents of sectoral or urban planning (regional and municipal). As regards the relationship between plans and programs, the Cultural Landscape of Sintra, as a UNESCO site, is considered in all the levels of the spatial planning established by the Portuguese legislation. In particular, specific attention to the planning of the GI of Sintra is given by: i) the Strategic Plan of Sintra released in 2015 (Ribeiro & Barão, 2006); ii) the Green Plan of Sintra released in 2008 (Magalhães, 2007); iii) the initiatives of the Local Action Group (LAG) "Association for Sustainable Development of the Saloia Region"; iv) the Regional plan for forest planning of the Lisbon metropolitan area (MAPF, 2004; PSML, 2014).

The case of Milan is emblematic of the visions for the future that arise from the peri-urban green infrastructure. In 2015, the Metropolitan City of Milan signed the Territorial Development Framework

Agreement (AQST) "Milano Metropoli Rurale" promoted by the Lombardy Region. With this subscription, the Metropolitan City brings PASM back into the interest of the AQST. The agreement unites and confirms the commitment of public and private entities in the consolidation of the rural matrix of the metropolitan area of Milan. The agreement also recognises the role of integrated rural systems and multifunctional agriculture in the containment of land consumption, the provision of ecosystem services, and the construction of new relationships between urban and rural realities. The Territorial Government Plan of the City of Milan approved in 2019, on the other hand, stated the intention to strengthen the metropolitan agricultural space through the enhancement of its productive/market dimension, as well as through the protection of the landscape, the protection of waters and biodiversity, the conservation of traditional cultures and knowledge, and the management of open not urbanised spaces.

5.4. Building a common territorial identity

Regarding the territorial identity, the experiences analysed can be divided into three groups: i) cases always enjoying a strong territorial identity and self-recognition by of the local stakeholders; ii) cases enjoying partial recognition, relating to specific elements of the green infrastructure; iii) cases still "struggling" to build their imaginary. The first group comprises the GI of Sintra and Vienna. Sintra, in particular, benefitted from a unique combination of parks and gardens, which was recognised by UNESCO as a World Heritage site, and the work done by the PSML agency, together with the Heritage Office and the Council of Opinion, in communicating the principles of the Cultural Landscape of Sintra. The origin of the imaginary of the GI of Vienna, instead, can be traced back to the 1905 citizens' mobilisation for the safeguard of the Wienerwald (a historic vast wooded area out of Vienna). An imaginary that was later reinforced by the construction of the Rundumadum pedestrian route, connecting the five areas forming the Viennese forest and meadows belt (Wienerwald, Bisamberg, Marchfeld, Donauraum, and Terrassenlandschaft). The second group includes the case of Frankfurt, where the shifting of green planning from the urban scale (Grüngurtel) to the regional one (Regionalpark RheinMain) determined a weakening of the image of the GI. In particular, some identity elements were missing at the regional scale, such as: i) the landscape quality of the cycle-pedestrian paths, ii) the integration with the urban environment, iii) the presence of artistic installations, iv) the offer of recreational and educational services, v) the programming of a calendar of events. In Leipzig too, a pedestrian circuit reinforces the identity of the GI. However, the success of the image of the Green Ring of Leipzig is mainly due to the choice to open the governance to non-institutional actors and to the capacity of the Grüner Ring Leipzig (GRL) to take part in international events, such as the Conference of regional parks and green rings of Germany (KORG) and the World Waterways Conference.

The third group involves the GIs of Torino and Milano, both characterised by the incapacity to build an overall territorial identity. In Corona Verde, this incapacity relates from one side to the choices to organise the governance around institutional entities only and to divide the territory of the Gi into six groups of Municipalities. From another side, it is the result of the exclusively public nature of the governance and some relevant problems of accessibility and maintenance of the cycle path that constitutes the backbone of the GI. In the case of Milan, the attempt of the Lombardy Region and the Metropolitan City to specialise the GI on the issue of peri-urban agriculture was undermined by the location of the PASM detached from the rest of the metropolitan green areas, by the many delays in the implementation of the envisaged tools and by a substantial inability to create a system between the urban green and the protected and rural spaces around Milan.

5.5. Identification of funding models

Almost all the GIs rely on direct forms of public funding, which can be either local (as in Vienna, Leipzig and Sintra) or metropolitan/regional (as in Turin and Milan) and range from economic subsidies to the provision of services. The green infrastructure of Frankfurt is the only one perceiving for some years a substantial sponsorship by a private actor (i.e. the local airport management company. However, the methods of public funding are very diversified. They range from Municipalities' transfers to European

(Structural Funds as in the case of Turin) and international (Unesco) funding. In the case of municipalities, also, it is not unusual that the contribution is not of an economic type (money transfers through the payment of membership fees as in the case of Frankfurt), rather it assumes the form of a provision of service (as in the cases of Vienna, Sintra and Leipzig). As to the management of funding, the Grüner Ring Leipzig (GRL) delegates this responsibility to the Office for urban green and water management of the City of Leipzig: a solution that allows GRL to avoid additional charges and facilitates the collection of additional funding, too. The maintenance of Sintra's heritage and landscape assets is instead under the responsibility of the public company Parques de Sintra-Monte da Lua (PSML). Apart from receiving the initial capital, this company financially relies primarily on revenues generated from the sale of tickets, from the fees for shops and catering outlets and the rental of event facilities. Revenues also happen in the South Agricultural Park of Milan in the form of payments for mortgages and equipment, services, concessions or penalties.Nevertheless, these entries are limited, and they can partially support the management and governance process. For these purposes, the financing most widely used is that of financial interventions by the regional government, the State and, above all, the European Union (EU). EU funds mainly have been the primary source of financing for both the governance and the realisation of the projects designed to implement the GI. It happened in Torino, the case of Corona Verde. It also happened in Leipzig, with the functioning of the GRL fuelled by the ERDF and LEADER initiatives. Today, increasingly scarce public resources have dramatically increased the level of competition between potential beneficiaries, forcing local authorities to be effective in the construction of proposals and in the ability to combine different sources of funding. The Regional Action Plan (RHK) for the Leipzig Green Ring also offers an interesting lesson from this point of view, imposing coherence between the projects elaborated by the working groups of the Purpose Agreement and the objectives of the European programming 2014-2020.

6. CONCLUSIONS

The benchmarking analysis conducted on the peri-urban GIs of Turin, Frankfurt, Vienna, Leipzig, Milan and Sintra allowed to identify the following issues for successful governance and sustainability:

- organise the various tools (formal and informal) adopted for the management and the development of the green infrastructure into a single governance model: tools that, regardless of their institutional or voluntary nature, must be multilevel and capable of organising a large and heterogeneous set of actors around a complex system of objectives;
- go beyond strategic plans by preferring innovative forms of coordination and flexible groupings of institutions and actors, tailored to the problems and the opportunities to be faced locally;
- provide for superordinate territorial coordination (for example headed by an administrative body or a development agency) in charge of verifying the coherence of the interventions implemented at the territorial level, in a clear framework of competences and relations with the other levels of the government of the territory;
- establish and openly communicate the mechanisms to manage the relationships between the GI interventions and the various policies and territorial plans that intervene in the same area or issues of the green infrastructure;
- plan and organise in the territories of the green infrastructure economic and social functions useful for producing, even in the perception of civil society, the imaginary of a single territory of a metropolitan scale. The range of the options available for this purpose is broad: it is up to the territorial governance of the GI is to identify those most suitable for the specific context;
- construct and convey a strong imaginary of the green infrastructure as a tool for local, sustainable development. The green infrastructure has to be promoted internally (through local initiatives and education/training programmes) and externally (through marketing and communication tools) as a distinctive and qualifying element of the territory;
- plan to achieve the objectives of the GI for successive stages, to be defined either in a territorial (planning for successive batches as in the case of Frankfurt) or a functional way (identifying thematic working groups as in Leipzig). In both cases, the decision has to fit in a framework of

coherence with the regional morphology, the planning initiatives and the economic functions expressed by the territory;

- secure financial sources for the coordination of the GI, as well as for the implementation of territorial interventions (not only public, but also private incentives available through crowdfunding tools, marketing). To this end, planners should involve experts in these issues in the very early stages of the construction of the governance model.

Undoubtedly, the implemented method presents some limitations that are worth considering when assuming these findings. First, benchmarking as a comparative procedure is often criticized due to the arbitrariness and opaqueness that characterize it and the tendency to over-simplify the complexity of reality to reduce it to a set of comparable variables and information. Second, the analysis should have been complemented with the results of a larger sample of critical observers and stakeholders to provide a more precise description of the specificities and analogies of the governance processes in the considered GIs. Nevertheless, the indications obtained from this specific benchmarking are pretty consistent with both the current literature on GI governance, and the analysis already developed on the selected case studies, letting us suppose that the analysis was good at catching - at least - the main trends. Macdonald et al. (2020), for example, emphasise the importance of both horizontal coordination between institutions (e.g. municipalities) in multiple policy areas and vertical coordination between institutions that go beyond the simple respect of rules and directives. Moreover, they insist a lot on the design of the perimeters of action, i.e. the identification of the areas of intervention and territorial coordination between different jurisdictions. Concerning the participation of the private sector, many contributions believe that new entrepreneurial approaches to urban and territorial development issues are necessary. While as regards the functions useful to build a unitary imaginary of the territory of the GI, the options discussed in the literature range from transport to urban renewal, technological and social innovation to higher education and training, from services to people and businesses to the organisation of deliberative arenas open to the participation of all the economic categories and the citizens.

Sustainability as a strategic component of the imaginary and the functioning of the green infrastructure is instead poorly emphasised. The issue of the management of the trade-offs between the ecosystem services produced by the GI, for instance, is utterly absent in the cases analysed. The same happens with the issues of the negotiation of contrasting stakeholders' interests and the coherence with the UN SDGs goals of the initiatives carried out. In this sense, emblematic is the claim for additional dedicated funding devoted to the coordination of stakeholders, while the monitoring and evaluating the sustainability is almost ignored.

This carelessness signals a specific weakness of large-scale green infrastructures, plausibly due to the overwhelming complexity of the objectives assumed in a context of institutional fragmentation and limited decisional power.

Finally, an interesting observation concerns the contextualised (i.e. territorialised) and contested (i.e. imbued with power relations) nature of the governance of GI (Macdonald et al., 2020). It means that the planning of GI should start from the construction and of a shared knowledge framework.

Specifically, from the case of Corona Verde, the interviews conducted with the experts in charge of the project allowed to detect the following list of relevant information:

- what the entities with jurisdiction over the territories of the green infrastructure are, and do they develop institutional relationships;
- how the cooperation takes place and what are the voluntary initiatives of local development in place;
- how the functions are governed, which are the network logics that preside over the management of services and the pursuit of economic objectives;
- which are the leading players (institutional or private, individual or collective) contributing to the objectives of the GI;
- what governance architectures and incentives can be used to build the green infrastructure, according to the institutional and legal framework.

The experience of Corona Verde's successes and failures shows that this information is critical both for the selection of the stakeholders to be involved and for the implementation of the governance model.

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