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BOOK OF ABSTRACTS

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Ecosystem services and green infrastructure for resilient cities

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A methodology to characterize a green infrastructure (GI) in urban and metropolitan (U/M) areas is identified which supports the supply of multiple ecosystem services (ESs), while also ensuring ecological connectivity among U/M landscape patches, to provide policy makers with recommendations to improve the quality of a GI. Multifunctionality relates to functions that the U/M landscape performs or should support (Hansen and Pauleit, 2014), whereas connectivity concerns the identification of ecological corridors (ECs), i.e., connected patches of habitats that support wildlife movement (D'Ambrogi and Nazzini, 2013). Building upon previous studies (Isola et al., 2022) and in-depth analyses of environmental, landscape and socio-cultural contexts, a set of criteria for defining the landscape suitability to support a GI and a set of criteria for identifying ECs will be selected.

The first set of criteria accounts for the functions that a GI should perform and will be assessed through environmental indicators identified based on previous studies (Lai et al., 2018, 2021) that model and spatially assess provision of the following ESs: preserving levels of habitat quality suitable to support life cycles of wild plants and animals; micro and regional climate regulation through mitigation of land surface temperature; agricultural crop production and harvested wood; preservation of endangered species or habitats and areas relevant for conservation purposes; maintenance of elements that are attractive for nature-based recreation; maintenance of landscape characters that support local identity, cultural heritage, and tourism. Accordingly, the concept of cultural ESs can support the relevance of tangible and intangible heritage to urban regeneration.

The second set of criteria accounts for aspects that characterize ECs. Each criterion and/or indicator will be mapped through geographical analyses and techniques. Once nodes and ECs are identified, the suitability of ECs to be part of the GI will be assessed. The deliverables offered by the activities could be as follows: a detailed report on the implementation of the methodological framework aimed at identifying the GIs located in U/M contexts, e.g., within the metropolitan area of Cagliari, and a spatially explicit (GIS-based) representation of such taxonomies and of the determinants of the spatial layout of the ESs supply and of the characteristics of the ECs.

Secondly, correlations between the spatial taxonomies of impacts generated by climate-related risks (e.g., heat waves and islands and/or air pollution) are detected and analyzed within the metropolitan area of Cagliari, to assess how the multifunctional supply of ESs by the GI can contribute to mitigating climate-related impacts. Among such key ESs are carbon capture and storage capacity (CCSC) or heat regulation in U/M areas. Detailed analysis of the correlations between the identified taxonomies will be performed, as well as an environmental analysis of their characteristics and distinctive features. Within Spoke TS1, WP3 of the RETURN project, this activity is included under Task 5.3.4 ("Integrated multi-risk urban impact assessment and forecasting at variable scale") as "Modeling ecosystem services contribution to multi-risk mitigation in human settlements" (5.3.4.4) and, as such, it feeds into deliverable DV 5.3.4, concerning the definition of "Multi-hazard impact and risk modelling and rapid forecasting methodology".

Moreover, such methodological approach, whereby spatial modeling and inferential analysis are coupled, will be integrated into the planning tools at the U/M level, taking into account the influence of ESs on human well-being. For this reason, setting up protocols to incorporate cultural ESs into the spatial planning, while avoiding the application of undifferentiated parameters disconnected from the local identity, is fundamental.

This will lead to identifying place-specific policy recommendations to improve the environmental quality of the GI identified in the metropolitan area of Cagliari, and, consequently, its resilience against climate-related hazards and risks.

Within Spoke TS1, WP4 of the RETURN project, the deliverable of this research-action process will be a Guidelines Handbook that identifies the technical development of the logical framework of a Strategic environmental assessment (SEA) process aimed at generating a U/M Masterplan based on a strategic and operational structure aimed at substantially increasing the U/M quality of life through the system of ESs delivered by a U/M GI. The SEA process (recall activity "implementation of the strategic environmental assessment approach in order to increase the quality of urban life based on the enhancement of services provided by urban ecosystems") will develop from a strategic device inspired by the New European Bauhaus initiative, in line with deliverable DV 5.4.4 (Concept guidelines, design proposals and assessment protocols to monitor urban integrated resilience in compliance with NEB – New European Bauhaus principles) of Task 5.4.3 (Green transition towards resilient and regenerative urban eco-districts) of WP4 (Mitigation and adaptation for more resilient and livable cities) of Spoke TS1 (Urban and metropolitan settlements), WP4, of the RETURN project.

Figure 1 provides a graphical representation of how the proposed activities contribute to DV 5.3.4 and DV 5.4.4.

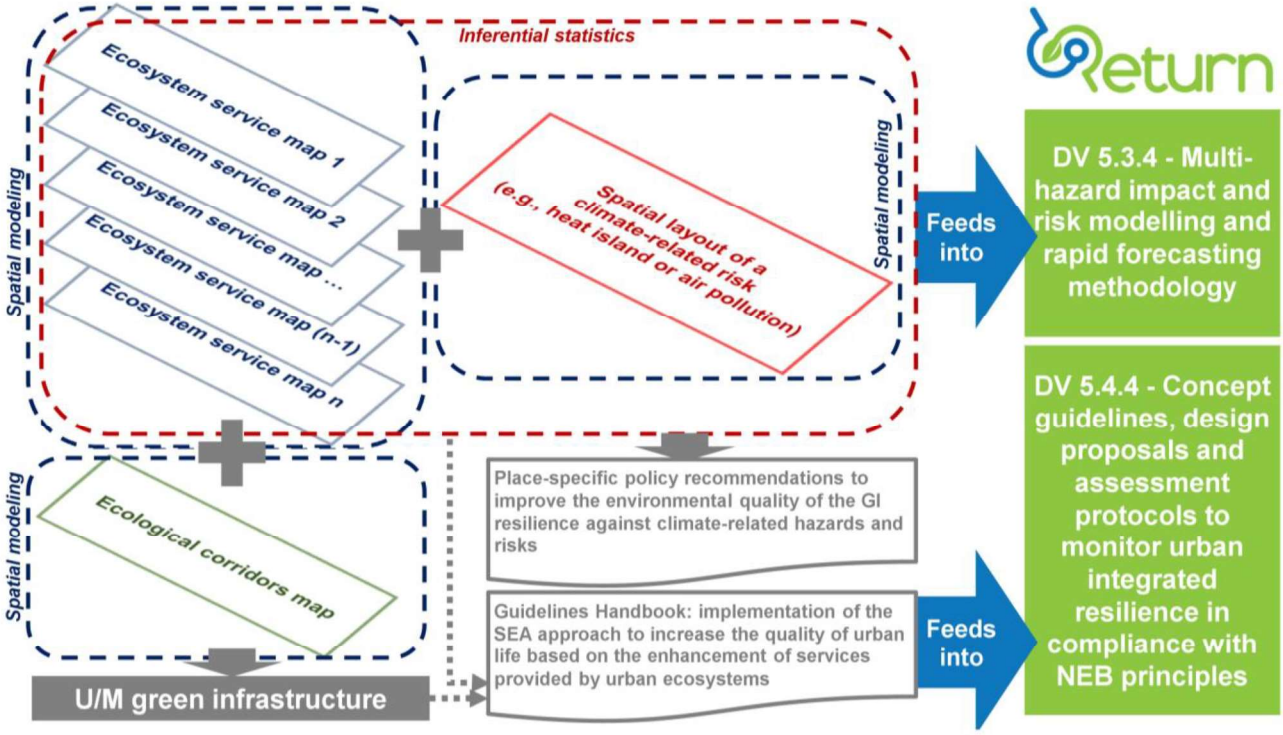

Figure 1 – Overall methodological approach and how it feeds into Deliverables 5.3.4 and 5.4.4.

References

D'Ambrogi S., Nazzini L. (2013). Monitoraggio ISPRA 2012: La rete ecologica nella pianificazione territoriale [ISPRA 2012 Monitoring: the ecological network within spatial planning]. *Reticula*, 3, 1–5. Available online: https://www.isprambiente.gov.it/files/pubblicazioni/periodicitecnici/reticula/Reticula_n3.pdf (accessed on 7 January 2024).

Hansen R., Pauleit S. (2014). From multifunctionality to multiple ecosystem services? A conceptual framework for multifunctionality in green infrastructure planning for urban areas. *AMBIO*, 43, 516–529.

Isola F., Lai S., Leone F., Zoppi C. (2022). Strengthening a regional green infrastructure through improved multifunctionality and connectedness: Policy suggestions from Sardinia, Italy. *Sustainability*, 14, 9788.

Lai S., Leone F., Zoppi C. (2021). Land surface temperature and land cover dynamics. A study related to Sardinia, Italy. *TeMA, Journal of Land Use, Mobility and Environment*, XIII, 3, 329–351.

Lai S., Leone F., Zoppi C. (2018). Implementing green infrastructures beyond protected areas. *Sustainability*, 10, 3544.