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The green infrastructure in Barcelona is still very insufficient to have positive effects on the environment quality and wellness

Moving towards a more urbanized world implies rethinking the effect that our infrastructures have on the environment. This PhD dissertation by Francesc Baró, winner of the “Ciències Ambientals 2016” prize, critically examines the role and contribution of green infrastructure to cope with diverse urban challenges such as air pollution, greenhouse emissions, heat stress or opportunities for outdoor recreation.

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In an increasingly urban planet, many cities and their inhabitants are facing multiple pressing threats within their borders, including heat stress, pollution and growing disconnection with the biosphere. Improving sustainability, resilience and livability in urban areas should be thus a major goal on the policy agenda, from local to global authorities. The operationalization of the ecosystem services framework, building on the concepts of ‘green infrastructure’ and ‘nature-based solutions’, is claimed by a mounting number of policy-makers, practitioners and scientists as the way forward to address many of these urban challenges. However, the extent to which urban green infrastructure can offer relevant solutions to these challenges is rarely considered in ecosystem service assessments, and therefore unknown to decision-makers.

This dissertation critically examines the role and contribution of green infrastructure to cope with diverse urban challenges (with a focus on air pollution, greenhouse emissions, heat stress and opportunities for outdoor recreation) at different spatial scales. Building on the ecosystem services cascade model, an operational framework is proposed and applied across four original research chapters to inform planning and management decisions on the basis of the relationships between the green infrastructure's capacity to deliver ecosystem services, the actual provision or use of these services (flow), and the amount of services demanded by the urban population. Identification of unsatisfied demand, i.e., the mismatch between ecosystem service flow and demand, is a main focus of the assessments since it expresses the limits of urban green infrastructure in relation to the considered challenges. The dissertation uses and refines a variety of methodological approaches for modeling and mapping the capacity, flow and demand of urban ecosystem services (e.g., i-Tree and ESTIMAP tools). The spatial scope of the research carried out within the assessment framework of this dissertation principally encompasses the urban area of Barcelona, Spain, considering both the local or city scale (Barcelona municipality) and the metropolitan or regional scale (Barcelona metropolitan region).

Results from the research indicate that the contribution of ecosystem services provided by urban green infrastructure to cope with urban problems is often limited (e.g., its impact on air quality or carbon offsetting was lower than 3% considering total carbon emissions and air pollution in all case studies) and/or uncertain at the city and metropolitan scales. In addition, the positive impact of green infrastructure on environmental quality and human wellbeing is usually challenged by ecosystem disservices (e.g., biogenic emissions), trade-offs (e.g., provisioning versus regulating services) or spatial mismatches between service supply and demand (e.g., air purification and outdoor recreation capacities of large metropolitan green infrastructure blocks are too far from demand sites).

On the basis of these findings, several implications for urban/landscape planning, management and decision-making are drawn, including: (1) the prioritization of abatement policies on the pressures generating a demand for certain ecosystem services (e.g., air purification and carbon sequestration); (2) combining land sharing strategies in urban and agricultural land in order to increase their multifunctionality and resilience and, concurrently, assure the conservation of large patches of multifunctional periurban forest areas; (3) development of new green spaces in compact urban cores using innovative strategies (e.g., rooftop gardens); and (4) consideration of ecosystem services trade-offs and disservices in planning and management. Finally, I contend that urban green infrastructure planning and management requires a holistic approach, considering the whole range of ecosystem services potentially provided by different types of green infrastructure and the interactions between them, together with the different spatial scales at which these ecosystem services can be relevant for the resilience, sustainability and livability of urban areas. This calls for a strong multi-scale and multi-disciplinary institutional coordination between all the authorities dealing with urban and environmental policy and for the harmonization of planning and management instruments in a multi-level governance approach.

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References

"Urban Green Infrastructure: Modeling and mapping ecosystem services for sustainable planning and management in and around cities", PhD dissertation by Francesc Baró advised by Erik Gómez-Baggethun and Dagmar Haase, read in Espai Montseny i Espai Pirineu of the Institut de Ciència i Tecnologia Ambientals in Universitat Autònoma de Barcelona.Soon available at http://www.tesisenred.net/.

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