

Call for an MSc student in Environmental Studies 2020-21

Multilayered resilience through Green Infrastructure

Research context: Green infrastructure (GI) is increasingly promoted as nature-based solution to address urban challenges, not least in the context of building resilience to climate change (Kabisch et al., 2016). Lately urban GI strategies have started to stronger consider multifunctionality and to maximize the provision of ecosystem services (Raymond et al., 2017). However, there are trade-offs between the provision of different ecosystem services based on the configuration and type of the GI (Turlerboom et al., 2018). An efficient GI strategy to enhance 'multilayered resilience' must thus not aim for maximizing all ES but prioritize those that are most needed in a particular location, considering various layers of vulnerability, such as, food vulnerability, air quality, and heat risk. Yet, to date a spatially differentiated understanding of social vulnerabilities, defining ES needs, is widely lacking in urban GI planning (cf. Langemeyer et al., 2020).

The overarching goal of this thesis will be to examine social vulnerabilities and their spatial distribution as a foundation to enhance urban resilience through GI. Differentiating social vulnerabilities across urban systems requires the holistic understanding of core interacting social, environmental and technical properties and their spatial distribution in the cityscape. However, vulnerabilities might be perceived differently and can be given different priorities in a particular context or with regard to different stakeholders (such as differences in income or ages of the population); this limits the usefulness of a rigid aggregation and calls for the development of a flexible (but robust) vulnerability index that allows combining different priorities for a certain type of vulnerability? for an integrated and effective GI strategy towards multilayered urban resilience.

Description and objectives of the MSc thesis: The MSc thesis will be embedded in the ERC-project URBAG (Gara Villalba) and focus on the Metropolitan Area of Barcelona / Oslo. The specific objectives are:

- (1) Review of the literature in order to develop vulnerability indicators under consideration of social, environmental and technical properties of urban system.
- (2) Map various layers of vulnerability, including s food vulnerability, air quality, and heat risk (including energy poverty, demographic variables, heat models etc.) across the cityscape.
- (3) Propose a flexible, spatial vulnerability index that allows for the incorporation of diverse social priorities to inform GI strategies towards multilayered urban resilience.

Requisites of the student: Solid skills in ArcGIS and/or QGIS are required.

Technical details: The thesis will be supervised by Dr Gara Villalba (ICTA) and Dr Johannes Langemeyer (ICTA). We expect that a revised version of the MSc Thesis could be submitted to a peer-reviewed journal for publication.

If you are interested on writing your MSc thesis on this topic, please contact
gara.villalba@uab.cat; johannes.langemeyer@uab.cat

Literature:

- Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., ... & Zaunberger, K. (2016). Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecology and Society*, 21(2).
- Langemeyer, J., Wedgwood, D., McPhearson, T., Baró, F., Madsen, A. L., & Barton, D. (2020). Creating urban green infrastructure where it is needed – A spatial ecosystem service-based decision analysis of green roofs in Barcelona. *Science of The Total Environment*, 707, 135487.
- Raymond, C. M., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Nita, M. R., ... & Calfapietra, C. (2017). A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environmental Science & Policy*, 77, 15-24.
- Turkelboom, F., Leone, M., Jacobs, S., Kelemen, E., García-Llorente, M., Baró, F., ... & Thoonen, M. (2018). When we cannot have it all: Ecosystem services trade-offs in the context of spatial planning. *Ecosystem services*, 29, 566-578.