

Quantifying the Climate Regulation Potential of Green Infrastructure by Urban Simulations and Greening Scenarios

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Over the past decades, intense urbanization processes have generated a severe contraction of green and open spaces in cities, decreasing the potential of urban environments to mitigate the climate changes negative effects of climate changes. Urban heat island and global warming represent hazards for human health and land as the urban population continues to grow, an increasing number of people will be exposed to heat island illness. Green Infrastructure represents the main providers of ecosystem services in cities and plays a relevant role, among the many services, in the regulation of the urban microclimate and mitigation of Urban Heat Island effect.

The amount, localization and spatial configuration of green infrastructure are key factors for planners and designers aiming at maximizing the climate regulation potential and therefore extending the related benefits to the higher number of residents and city users. Different factors and constraints influence the potential of the cooling effects of green infrastructure and the way these effects can benefit both the elements of urban environment (i.e. streets, sidewalks, squares, parks) and people that makes a daily uses of these elements.

This paper investigates on these factors by proposing a method to quantify the potential benefits and beneficiaries of new scenarios of green infrastructure on climate regulation. First, scenarios are identified and simulated by the use of UMEP model; second, the potential beneficiaries are quantified with GIS density analysis of the most relevant urban functions and services. The case study focuses on the city of Catania in southern Italy, which is characterized by a hot, dry Mediterranean climate and has recently experienced intensified periods of extreme heat.

Results show that the green infrastructure should be located in public areas that are mostly used and that cooling benefits, although limited in space, can be extended to different parts of the public space during the daytime. Built on results obtained in the case study analysed, the paper also proposes some general planning criteria for the localization of new urban greenery to be used in different urban contexts.

Author Biography

Daniele La Rosa, (PhD in Urban and Regional Planning) is Associate Professor of Urban and Environmental Planning at the Department Civil Engineering and Architecture of the University of Catania (Italy). He teaches spatial planning and Ecosystem Services for urban design in Building Engineering MSc course at the University of Catania. His research interests include sustainable urban planning, Ecosystem Services, GIS applications for urban and landscape planning, environmental indicators, Environmental Strategic Assessment, Land Use science and landscape studies. He is author of more than 100 publications on the above mentioned topics.