CLIMATE-RESILIENT DESIGN AND URBAN REGENERATION
UCCRN ARC3-2 Methodology and experimental applications

Mattia Leone (1), Jeffrey Raven (2), Enza Tersigni (1)

(1) Università degli Studi di Napoli Federico II, Department of Architecture, Napoli, Italy [mattia.leone@unina.it, enza.tersigni@unina.it]
(2) New York Institute of Technology, New York, USA [jraven@nyit.edu]

INTRODUCTION

Climate change impacts are already visible today, with extreme heat and precipitation events increasingly growing in frequency and intensity worldwide. Urban climate must be a key consideration in the planning and design of contemporary cities. City Officials in charge of the implementation of complex urban regeneration processes deal with a multiplicity of priorities, also as expression of local community needs, often not directly or explicitly related to climate resiliency principles, but that can be efficiently addressed through climate-resilient design principles.

MAIN GOALS

The research carried out within the ARC3-2 Urban Planning and Design working group of the UCCRN wants to consolidate - in an international multi-disciplinary and knowledge exchange perspective - design and research methods, reaffirming the need of a coordinated global approach to the resilient regeneration of urban areas in different parts of the world, enhancing local specificities within a shared framework about scientific problem definition, intervention strategies and priorities of action. The networking activities carried out within the Research Project SIMMCITIES_NA, carried out at the Department of Architecture of the University of Naples Federico II (2016-2018), aim at the development of a climate-resilient design toolkit incorporating original analysis methodologies, specific process workflows and design support tools in order to measure the multiple benefits of applying climate-adaptive and community-driven strategies to the local scale, verifying the applicability through experimental findings in the context of urban regeneration interventions promoted by the Municipality of Naples, with particular reference to the Urban Recovery Plan of the District of Ponticelli, in the eastern suburbs of the city.

METHODOLOGY

The proposed design method, based on the principles and methodology developed by the UCCRN ARC3.2 Urban Planning and Urban Design working group, is process-oriented and focuses on sequential and iterative design steps implemented through a multi-disciplinary and multiscale approach.

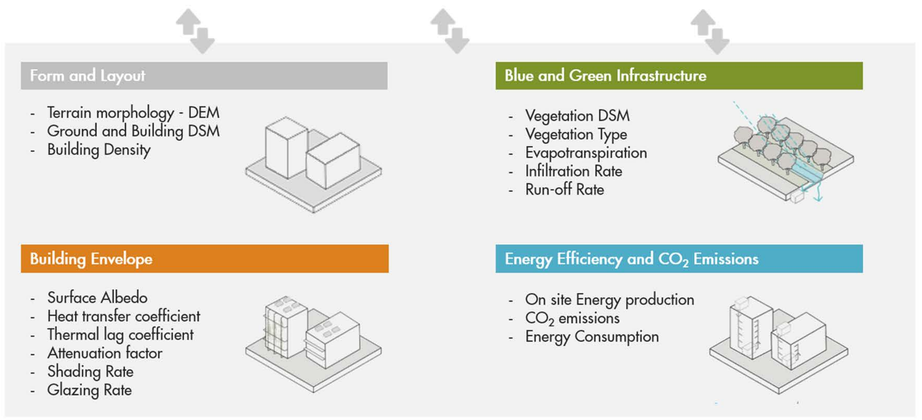
Climate Analysis Mapping provide a critical first step in identifying urban zones subject to the greatest impacts associated with rising temperatures, increasing precipitation and extreme weather events, providing downscaled climate projections as preliminary information to orient evidence-based design guidelines.

Site surveys and Public Space Evaluation allow to couple urban climate considerations with insights about needs and expectations of local community, whose priorities in terms of urban regeneration and building/open spaces retrofitting are often more related to a general improvement of housing and public services, to increase neighbourhood liveability, sustainable mobility and social inclusion.

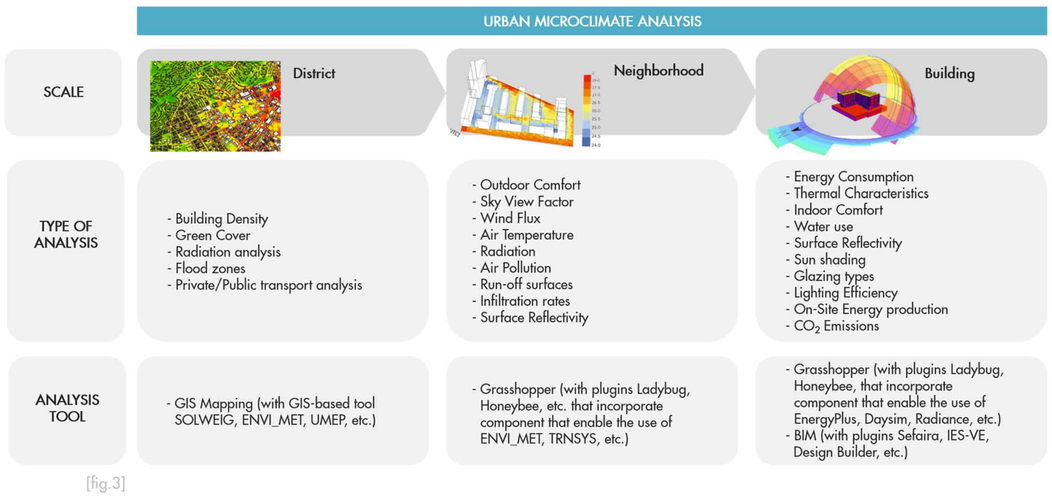
Planning and Design Intervention phase is grounded on a critical review of the collected information to identify the relevant synergies and trade-offs in relation to the planned initiatives in the areas, as envisaged by local authorities in the mid- to long-term. Zoning regulations and building codes frame the boundaries of the design and technical options to be assessed, and the most appropriate strategies targeted for future development.

Post-Intervention Evaluation is intended as a sequence of activities aimed at assessing the benefits of the proposed solutions in terms of microclimatic, energy and environmental performance, as well as of compliance with community priorities.

[fig.1]



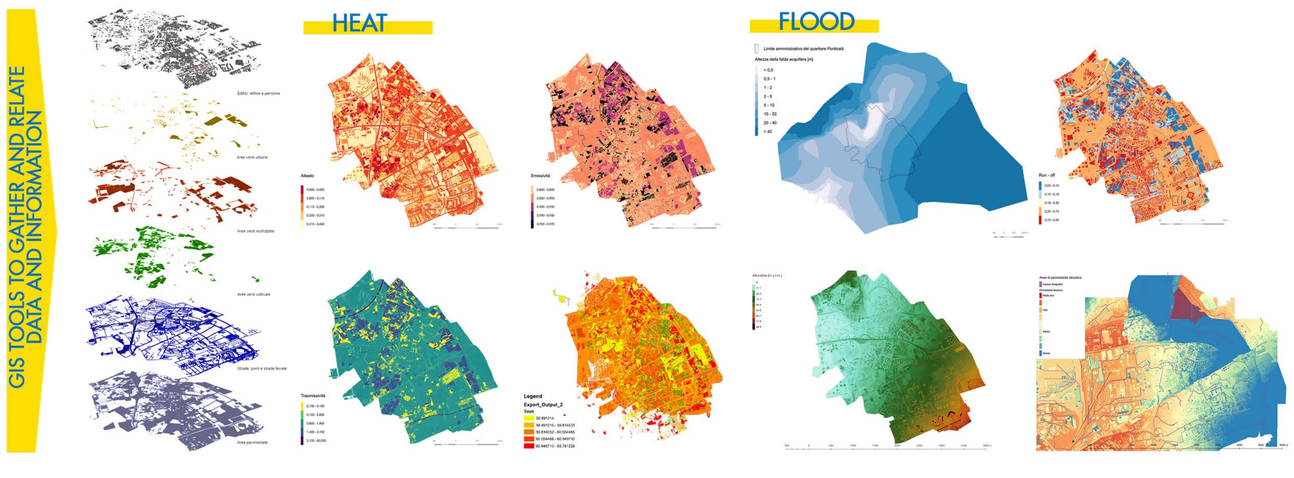
[fig.2]

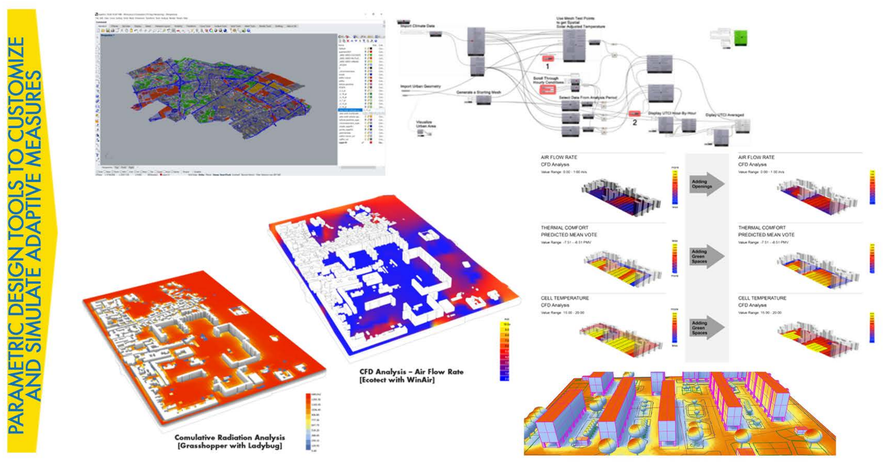


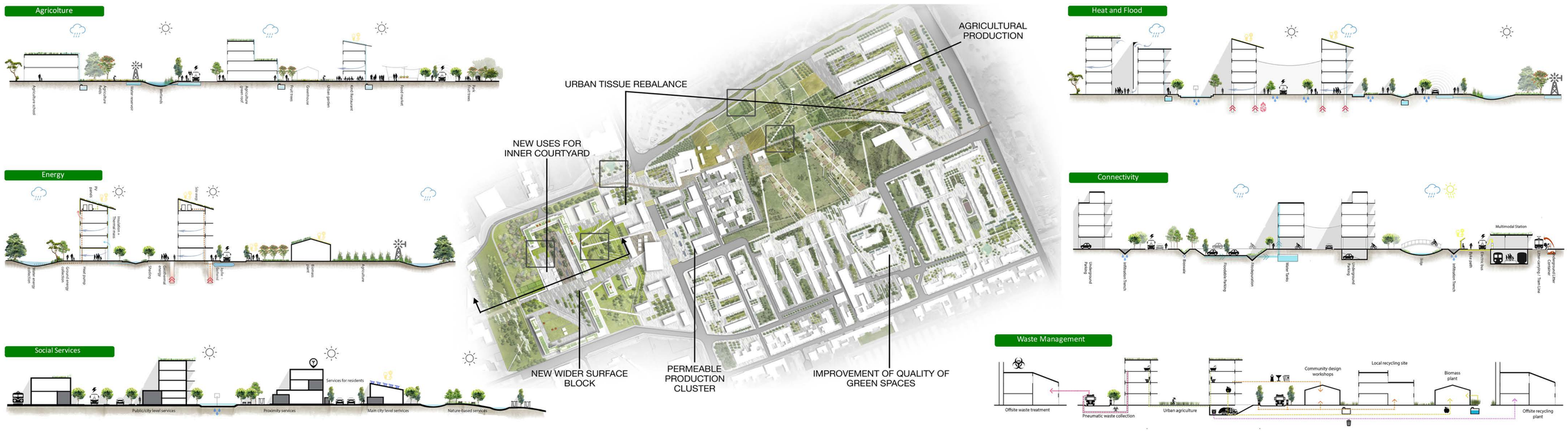
[fig.3]

TOOLS AND DESIGN APPROACH

The tools employed and the spatial resolution is tailored to the intervention scale: GIS tools are used to test district-wide concepts, providing outputs as urban heat hotspots and flood zones, while parametric tools (Rhinoceros/Grasshopper) allow to refine the definition of the main factors that influence the urban microclimate, through which alternative solutions can be evaluated and compared.







CONCLUSIONS

In the field of resilience-based design and climate change adaptation, cross-sectorial collaboration in modelling, metrics and assessments should focus on downscaling information to district/neighbourhood scale, using dynamic and statistical methods to propagate simulation uncertainties across spatial/time scales. Middleware tool should be tested to evaluate and measure the effectiveness of the adaptation strategies in a systemic vision, deepening the interrelations of the impacts at the different microclimate scales district/neighbourhood/building. Design assessment metrics should explore the social, economic, environmental liveability co-benefits of mitigation and adaptation. Participatory approaches should be scaled-up by breaking up the pyramidal structure in favour of a network logic, and by enabling participatory "connection platforms", also exploiting the added value of art and IT domains in social innovation initiatives.