Politecnico di Torino

Honors Thesis

Master of Science in Sustainable Architecture

Abstract

Urban Morphology and Microclimate.
The case study of the Regio Parco district in Turin

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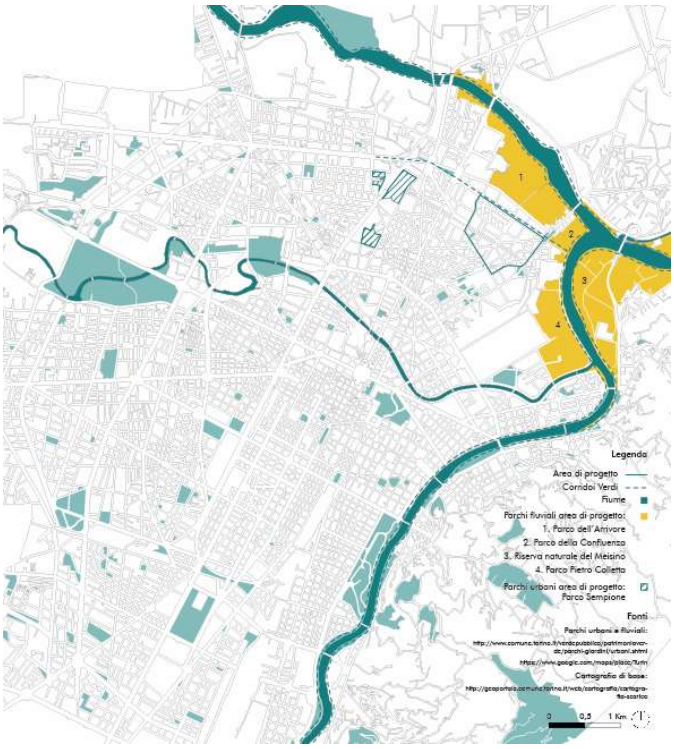
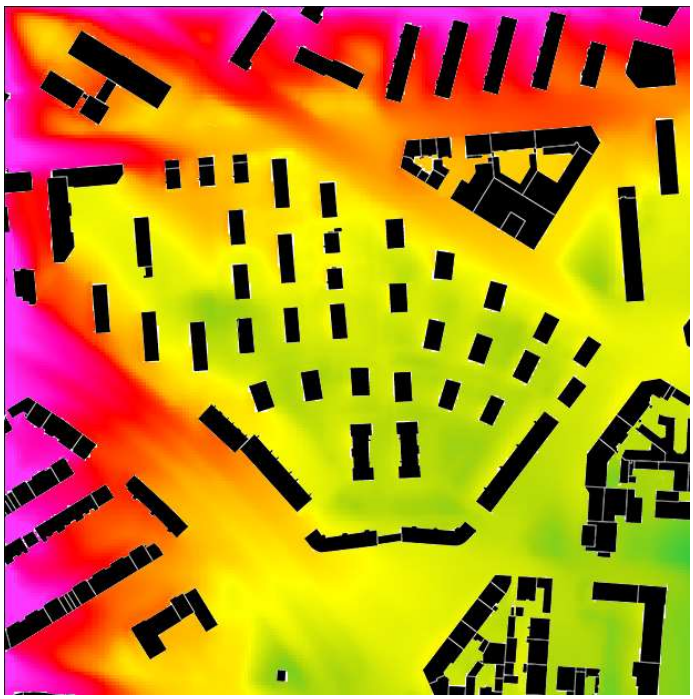
The research investigates some Turin urban morphological fabrics, which are part of the northern area of Turin, precisely in the Regio Parco district, located near the Po river and some of the main green infrastructures. The area is characterized by a widespread presence of public residential buildings, characterized by different types of development of settlements: compact and semi-compact courtyards, terraced houses, and in-line buildings. The goal is to identify morphological fabrics "type" that can promote better external thermal comfort in Turin during the summer, by comparing their impact on the microclimate in a specific context. The thesis research is divided into different methodological phases, consequential to each other, following a first review of the literature and experiences in the European panorama. The first phase coincides with the "scientific background", that is the study of literature as a theoretical study on the thematic choice of which the thesis deals. Also in this phase, some best practices are reported regarding case studies of projects carried out in recent years on the themes of regeneration of urban areas and parks with particular attention to adaptation and mitigation strategies to climate change, and best practices of research projects, where there are theoretical projects, analyzes conducted with the use of the ENVI-met software, etc. The second phase concerns the analysis of the case study. This scale of detail starts with some information on the city of intervention: Turin. After having localized it and briefly framed it from a historical / social point of view, the resident population and its evolution over the last few years, the climate and the effects of climate change it is undergoing and the quality of the air in the different areas of the city. Going down the scale of detail, we move on to the identification of Circumscription VI and its Regio Parco district, on which the specific areas subject to analysis insist which are deepened both from a territorial point of view and from a historical point of view. At this point, four plots have been identified, with different urban morphologies but comparable thanks to the same boundary conditions (similar microclimatic and territorial conditions). In the third phase, the four plots, detailed in depth, were modeled on the Computational Fluid Dynamics software ENVI-met, in order to obtain evaluable and comparable numerical results on their external microclimatic behavior in "extreme" conditions. The output of the models of the four areas highlighted microclimatic characteristics that are sometimes peculiar to the context of analysis, the morphological type, the quantity and quality of vertical and horizontal greenery. Furthermore, the output highlighted the most unfavorable morphology, which will be chosen as the basis in the fourth phase. Here the results obtained in the simulation phase (phase 3) are resumed and a design vision is developed aimed at improving the microclimatic comfort of the area with the worst performance. The intervention aims to mend the city, cut in two by the former railway site for a long time, promoting a "city of 15 minutes", encouraging sustainable mobility through green paths, cycle paths and lanes reserved for public transport. The aim is to create a "green corridor", with different functions along its path, which will also have the task of mitigating the urban microclimate locally.

Keywords:

Urban microclimate, Urban regeneration, Climate mitigation, Adaptation, External thermal comfort, Urban morphology, ENVI-met.



On the left: Turin, the Po River, the main green infrastructure and the location of the case study.
Below: The neighbourhoods of Regio Parco District modelled in ENVI-met.



An example of output concerning the Potential Air Temperature in one of the neighbourhoods modelled.

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