



POLITECNICO
DI TORINO

Honors thesis

MASTER COURSE OF
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Abstract

The thermoigrometric comfort in schoolyard renovation projects: pedagogical, social and environmental implications. Two case studies in the Lingotto district of Turin.

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Most of the schoolyards simply corresponds to the external space of the building: an anonymous and unorganised environment, for recreation and free movement. Large surfaces made of asphalt and concrete, few and neglected green areas represents the most common situations. The design of the outdoor space strongly influences the microclimate and the urban heat island, with negative effects on the users' thermoigrometric comfort. Children, playing in the schoolground, are particularly exposed to the thermal stress, which affects their energetic balance, their behaviour, their physical activity level and their cognitive processes.

In the last few years, the interest on the quality of public open spaces has increased, particularly of educational ones. Due to their widespread presence on the urban area, schoolyards could represent precious resources not only for schools but also for the community and the environment. In this perspective, several initiatives were promoted, among which the *Schoolyard to Playground* project in New York and *Les cours d'écoles Oasis* in Paris, that are converting the schoolyards in resilient oasis, open to the neighbourhood after the schooltime.

The thesis is linked to the renovation policy of the educational system of Turin, thanks to the collaboration with the *Laboratorio Città Sostenibile* and the attendance of the workshop *Spazi innovativi per l'apprendimento*.

The thermal comfort and the users' needs guided the process of schoolyard requalification, giving a method replicable also in other contexts. In particular, this methodology was applied to two schools in the Lingotto district of the city of Turin: the elementary C. Collodi and the secondary P. Calamandrei. The institutes, selected together with *Laboratorio Città Sostenibile*, are part of the European project ProGiReg, whose aim is the use of nature-based solutions to requalify the post-industrial areas.

The evaluation followed two complementary and parallel approaches, whose results guided the requalification project. First of all, a quantitative analysis was conducted, focused on the microclimatic conditions and the users' thermal comfort, through thermographic survey, ENVI_MET simulations and the calculation of the thermal comfort index PET. Moreover, a qualitative analysis was executed, centred on the environmental perception and the users' needs, based on a participative process with students and teachers, through questionnaires, drawings and design activities.

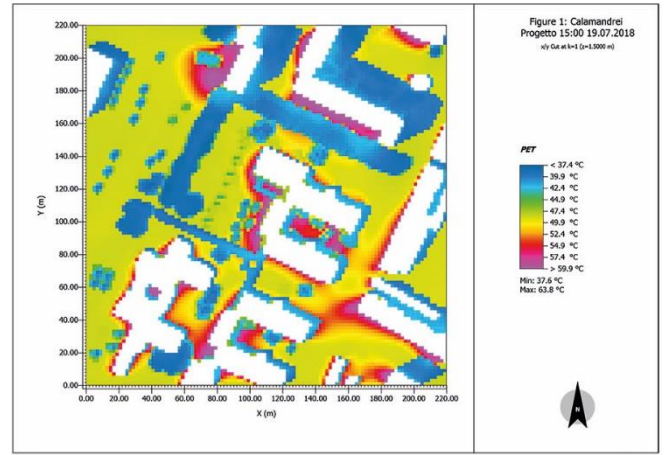
Connected to the microclimatic mitigation, the following strategies were adapted: the increase of natural surfaces and vegetation, installation of artificial shelters and use of cool pavements instead of impervious materials with low albedo.

From a thermoigrometric point of view, the trees are the best solution, because they intercept the direct solar radiation and decrease the air temperature through the evapotranspiration, reducing the PET of over 10°C during extreme summer conditions.

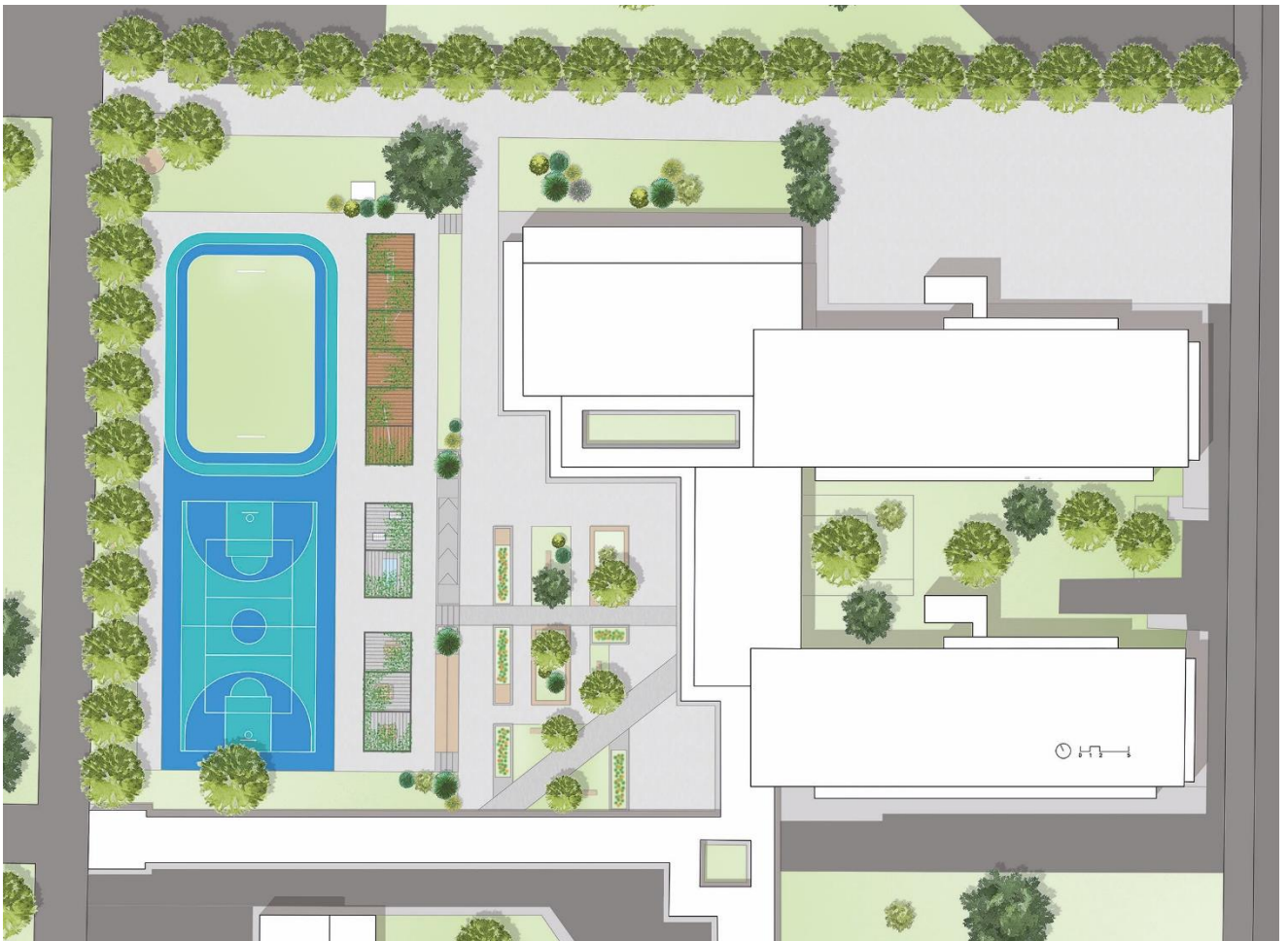
The design proposals respond to the users' needs: multifunctional and adaptable spaces that promote playing, sports activities, exploration and aggregation, providing also private areas for breaks and relax.



Calamandrei secondary school
Poster made by a group of students



Calamandrei secondary school
Thermal Comfort index PET - ENVI_MET



Calamandrei secondary school- Project
The design proposal includes sports, horticulture, socialization and relax areas.

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