

15th CONFERENCE ON SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS



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BOOK OF ABSTRACTS

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Analysing the Future Performance of Italian Residential Buildings: a Study of Climate Change Impacts

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Abstract

Recently, the issue of climate change has received considerable critical attention. According to the fifth assessment report of the intergovernmental panel on climate change, if the emissions continue to rise, the global average temperature will be 2.6-4.8 degrees Celsius higher than the present, by the end of 21st century. Furthermore, climate change projections express that heatwaves will occur as often as each year by the middle of this century as the climate pattern has been disrupted. In this context, there is an increasing concern that a paradigm shift is likely to happen in the future energy performance of the buildings. As the building sector consumes around 40% of the total energy in the world, reducing energy demand is challenging. Considering the long life span of buildings, this study, therefore, sets out to assess the effect of climate change on Italian typical residential buildings. This study can form the basis for future actions toward the resiliency of the built environment.

In this paper, the study of climate change impacts is carried out by sensitivity analysis of the heating and cooling demand and the risk of overheating under different scenarios using the variance-based model. "Representative Concentration Pathways (RCPs)" 4.5 (stabilization) and 8.5 (business as usual) of emission and concentration scenarios according to IPCC fifth assessment report, have been applied in this study. The analysed buildings have been selected from the IEE-TABULA research project. They represent three building sizes (single-family, multifamily and apartment blocks) for the construction period 1946-1960 in Italy. This period was selected because buildings present a higher energy saving potential compared to other construction periods. Energy simulations were carried out using Energy Plus for the near term (from 2021 to 2040) and long term (from 2081 to 2100). The widely used morphing methodology was adapted for creating future weather data using the existing tool, WeatherSift™ for Milan (Italy). The results indicate that occupants will experience a high risk of overheating and building energy use patterns will change. The simulations show decreases in heating energy demand and an intense increase in cooling energy demand, as expected. These results underline the significance of considering future weather for energy performance assessment of buildings. Besides, they point out the urgent need to establish building adaptation measures for climate change.