

# Urban climate in the South American coastal cities of Guayaquil, Lima, Antofagasta, and Valparaíso, and its impacts on the energy efficiency of buildings

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Sustainable urbanization remains one of the central challenges for South America. Cities of this region are expanding very fast and this impressive urban growth has a significant impact on the environment, on energy consumption, and on public health. This chapter explores the urban heat island (UHI) effect on the climate of Guayaquil, Lima, Antofagasta, and Valparaíso. These four cities are important urban centers on the Pacific coast of South America. The UHI effect is simulated by using the Urban Weather Generator tool (UWG), a coupled atmospheric-building simulation model that uses urban form parameters to transform rural weather files into urban weather files. Urban form parameters considered in the analysis are the built-up ratio, the facade ratio and the green area ratio, obtained for 24 one-hectare random samples and running a principal component analysis and a k-mean cluster to group them. Simulation results show the presence of a UHI effect that varies between 2 and 5 °C during the night and a more dispersed situation during the day.

Valparaíso and Guayaquil seem to have higher UHI than Lima and Antofagasta, probably because of the difference in the temperature ranges (higher maximum temperatures). Some hypotheses regarding the influence of the Pacific Ocean, such as urban form, heat generation in the street, building energy use, impervious materials on the resulting UHI effect are formulated and discussed, along with an estimation of the impact on the built environment looking at energy consumption, comfort felt by users, and vulnerability to heat waves. © Springer Nature Switzerland AG 2019. All rights reserved.

Coastal cities

Energy consumption of buildings

South America

Urban climate

Urban Heat Island