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A modeling approach to address building energy consumption and thermal comfort under urban climate change

Nadège Blond[1], **Florentin Breton**[1], Alice Micolier[2], and Maxence Mendez[2]
[1]Université de Strasbourg, CNRS, LIVE Laboratoire Image Ville Environnement, UMR 7362, 67000 Strasbourg, France (nadege.blond@live-cnrs.unistra.fr)
[2]Octopus Lab, La Madeleine, France (alice@octopuslab.fr)

The urban environment and climate change are essential factors to consider for applications involving urban planning and human health. Although these factors influence estimations of energy consumption and thermal comfort, buildings in France are still generally designed and renovated without accounting for these specific conditions but by considering present rural weather conditions. The first objective of this study is to develop an approach to explore building design and renovation choices while accounting for the urban environment and climate change. The second objective is to find which design and renovation choices are relevant to improve thermal comfort and reduce energy consumption (and therefore GHG emissions).

First, we use observations and simulations of weather conditions in several cities of France (representing different climatic zones), for the present and future climate (2050), to analyze urban conditions and estimate energy consumption. Second, we run building simulations for rural and urban situations, and for present and future climate conditions, to investigate the effect of the urban environment and climate change on the operation of buildings, and the effect of building scenarios on the urban climate.