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## Effect of city and climate change on weather conditions, building thermal comfort and energy consumption: application to Strasbourg region

**Florentin Breton**<sup>1,2</sup>, Alice Micolier<sup>3</sup>, Makram Abdellatif<sup>3</sup>, Maxence Mendez<sup>3</sup>, and Nadège Blond<sup>1</sup>

<sup>1</sup>Laboratoire Image Ville Environnement, Université de Strasbourg, France

<sup>2</sup>École nationale du génie de l'eau et de l'environnement de Strasbourg, France.

<sup>3</sup>Octopus Lab, La Madeleine, France

Weather conditions play a large role in thermal comfort and energy consumption, such as during a cold spell (body hypothermia and building heating) or a heatwave (body overheating and building air conditioning). These weather conditions can be modified by urban factors and climate change, such as higher temperatures in city-center and in future periods. However, weather conditions used for building design and renovation are often taken for convenience from past data near airports. The present study aims to determine weather conditions with urban factors and climate change, as well as thermal comfort and energy needs for several building types in different environments. Measurements and simulations are combined to provide weather conditions and building estimations for different locations (rural, periurban, urban), seasonal cases (winter, summer, heatwave) and periods (recent past, mid-century, end-century). A first application of the approach is presented over the city of Strasbourg (France).

We find that the urban case has higher temperature, reduced windspeed and relative humidity, less energy for winter heating and less summer thermal comfort than the periurban than the rural case. Climate change leads to higher temperature and lower relative humidity, and to less summer thermal comfort especially during a heatwave and for older buildings. The combined effect of city, heatwave and climate change on outdoor air temperature reaches 8 to 11 degrees, and similarly for the indoor air temperature of very old buildings but 5 to 7 degrees for recent (well-insulated) buildings. This approach may support building renovation strategies and analyses of population vulnerability. The perspectives include the application to other regions, a comparison of urban climate models, and an investigation of urban scenarios.