



## Climate change and energy demand for heating and cooling of buildings in Finland

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Energy demand for heating and cooling of buildings is affected by several climatic variables, such as outdoor air temperature and humidity, direct and diffuse solar radiation, and wind speed. In Finland the most influential variables are air temperature in all seasons together with solar radiation in summer. The human-induced climate change is expected to affect these variables and hence alter the energy demand of buildings.

For more than two decades, the year 1979 has been used as a reference year to assess the annual energy demand of buildings in Finland. Very recently, however, a new reference year has been selected separately for southern, central and northern Finland based on 3-hourly weather observations at representative weather stations in 1980-2009. The new reference years consist of 12 test months having “typical” weather conditions, not necessarily from the same calendar year. The first goal of this study is to briefly describe the selection method and to compare the new test years with the older one.

Because of the unequivocal warming of the climate system, it is relevant to ask how long it will take until the new reference years do not any more represent typical weather conditions prevailing in Finland. Based on multi-model climate model simulations, the annual mean temperature in Finland is projected to increase by about 3°C by the 2050s, compared to 1971-2000. The second topic of this study addresses the projected changes in the relevant climatic variables and how these changes are expected to influence the energy demand for heating and cooling of buildings.

Scenarios for future energy demand reference years have been constructed based on 3-hourly observations and multi-model mean climate scenarios of monthly mean changes in climate. This process has required special methods to be tailored for the various climatic variables.