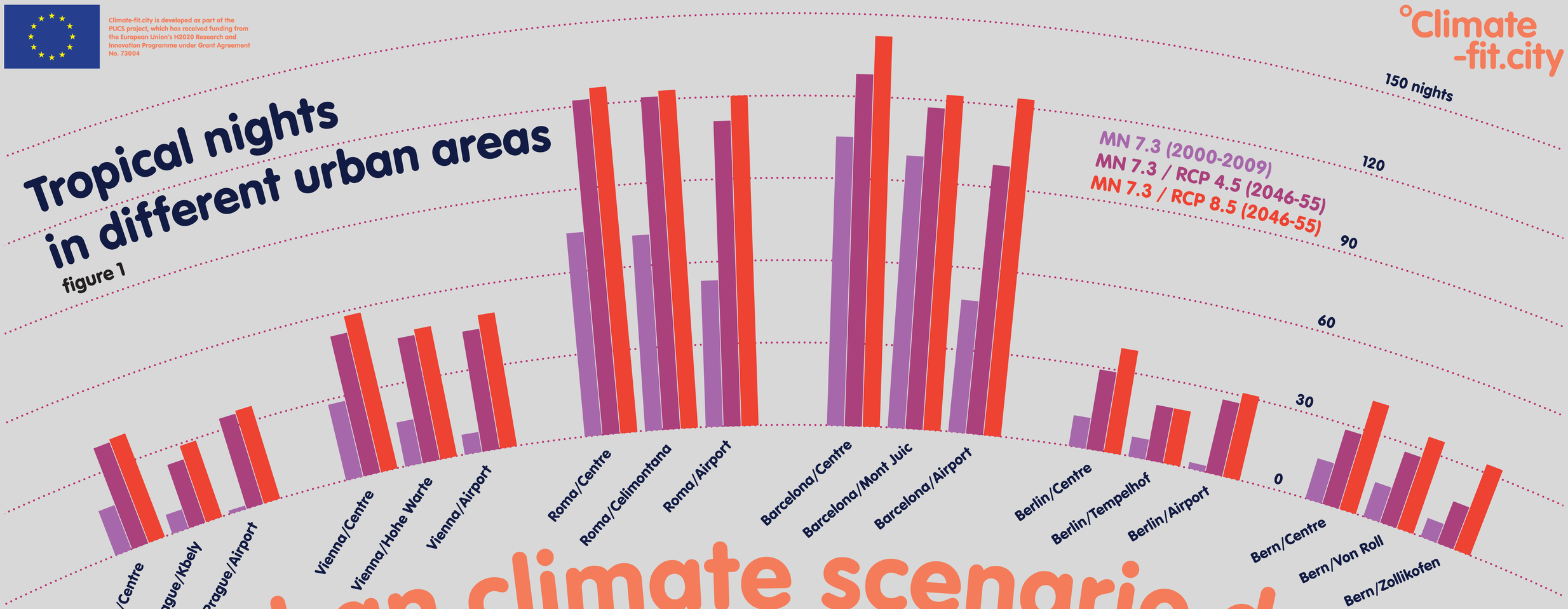
Climate-fit.city is developed as part of the PUCS project, which has received funding from the European Union's H2020 Research and Innovation Programme under Grant Agreement No. 73004

°Climate -fit.city

Tropical nights in different urban areas

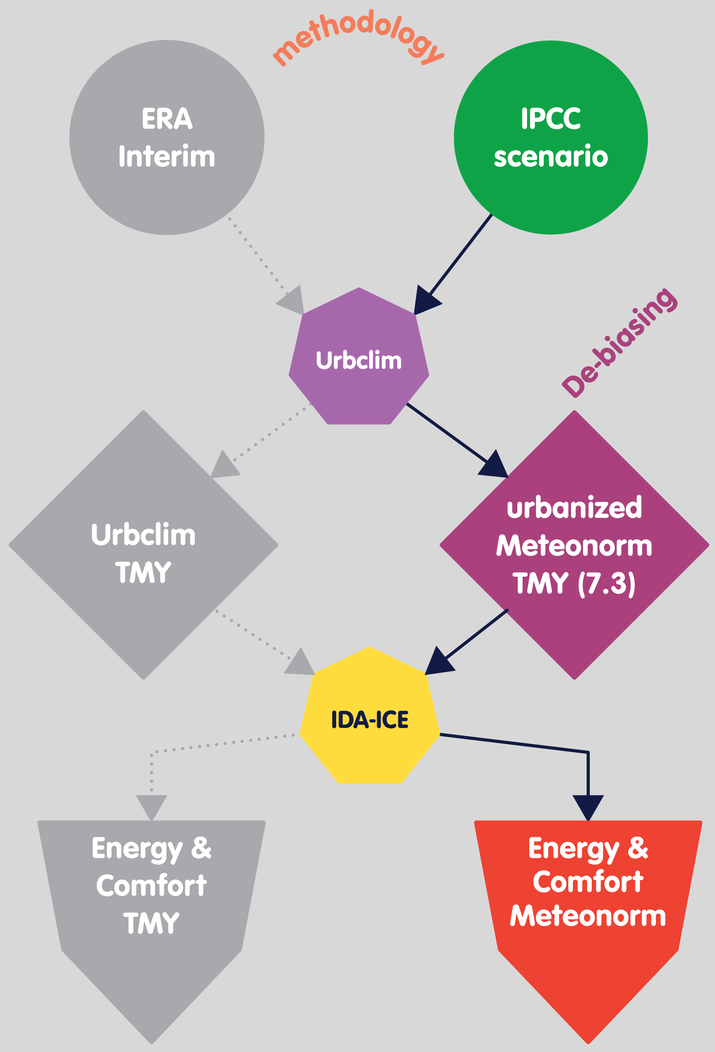
figure 1



Urban climate scenario data for European Cities

Objective – Climate change and the urban heat effect are expected to have a large influence on the energy consumption and thermal comfort of buildings. However, using meteorological data which incorporates effects of climate change and characteristics of cities is not currently a standard practice in building simulation. By default, data of nearby meteorological stations often outside cities are used. This may lead to important discrepancies between simulation results and actual energy consumption and/or indoor climate data for buildings in urban areas.

Methodology – These effects are analysed within building energy part of H2020 climate-fit.city project. First, adapted urban and future meteorological data modelled using the UrbClim model (http://www.urban-climate.be) based on reanalysis data (ERA5/Interim) and standard meteorological data were compared. Second, these data were included within the Meteonorm software (version 7.3.3, www.meteonorm.com). This was carried out for current climates as well as for future scenarios (RCP 4.5 and 8.5, 2050) for seven cities in Europe (Barcelona, Bern, Berlin, Bremen, Prague, Rome and Vienna). Like this Meteonorm includes a combination of urban and future climates accessible in a user friendly tool.

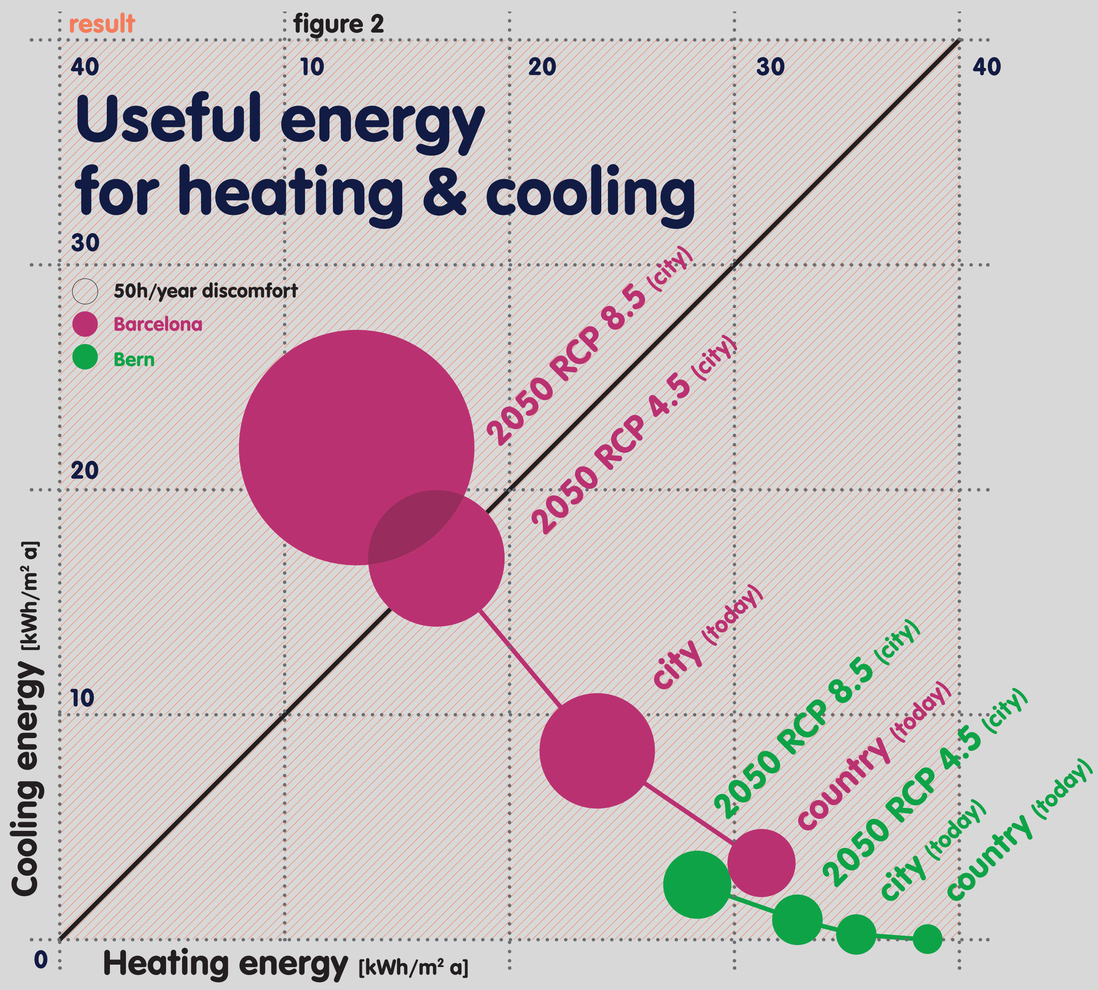


In a third step the urbanized TMY data sets generated by Meteonorm were used to simulate energy consumption, peak loads and indoor climate conditions with models of several typical buildings. In this comparison we show a simulation for a multi-family house for current and future climates. The whole-year simulation runs were compared to the reference scenario – the standard TMY (available in Bern and Vienna). Heating loads and thermal comfort levels were modelled with IDA-ICE building simulation software (www.equa.se/de/ida-ice) (Fig. 2&3).

Results – Figure 2 shows the useful energy needed for heating and cooling for Barcelona and Bern for a building (up-to-date standard) outside the city („country"), the city centre and two future scenarios in the city (2050). It condenses the results of the comparison of the building simulation. Figure 3 shows the maximum load for heating and cooling. In Barcelona cooling energy is by 2050 with both scenarios higher than heating (they are above the diagonal line). The sum of cooling and heating are more or less constant for Barcelona. In Berne the sum is getting somewhat smaller (the gradient of a line between the bullets is lower than -1). With RCP 8.5 the situation in Berne is by 2050 similar to today's climate at the airport of Barcelona. This figure shows also the urgent need of using adapted data: standard meteo data from historic periods at airports will induce big errors regarding the modelled needs.

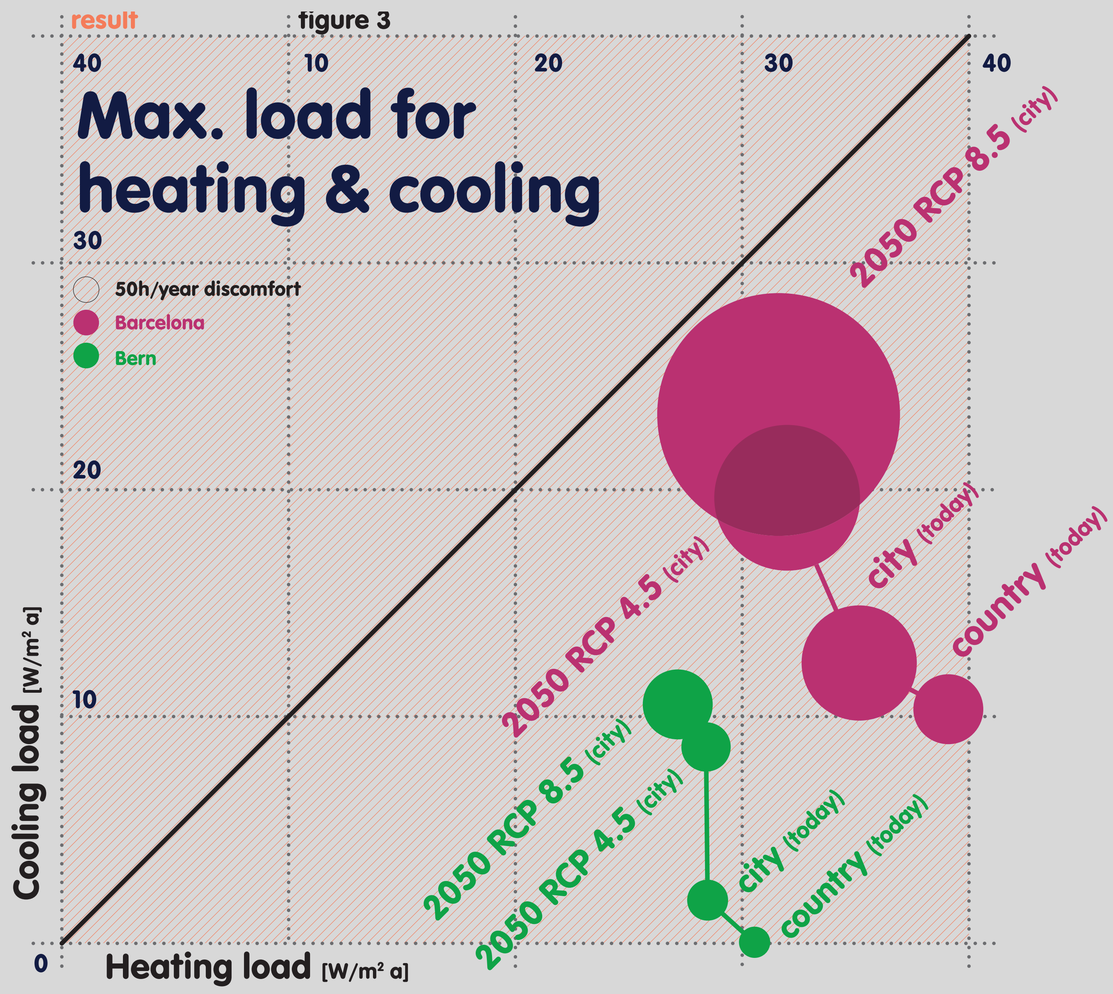
result figure 2

Useful energy for heating & cooling



result figure 3

Max. load for heating & cooling



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