The role of regions and cities towards a climate-neutral economy (SDG 13)

Metropolitan regions release higher carbon emissions per electricity generated compared to other regions.

The dramatic increase in the energy required for cooling buildings, due to rising global temperatures, has been very unequal within countries over the last five decades. During the last 50 years, the annual cooling degree days (or CDD, a measure for how long outside air temperature was above 22°C) have on average increased by almost 25% in OECD cities and their commuting zones (functional urban areas or FUAs). Over the last decade, the 10% of FUAs with the highest average cooling needs were in Mexico, Colombia and the United States. These three countries have also recorded the largest differences across FUAs in terms of changes over time in CDD between 1970 and 2018. For example, in Mexico, Mexicali's average annual cooling needs increased from 700 to 1 400 CDD, while Villahermosa experienced a reduction of 320 CDD. In Europe, the cooling needs have increased in all cities and their commuting zones, although at a stronger pace in some southern regions. For example, in the metropolitan areas of Seville (Spain), Athens (Greece) and Taranto (Italy), the cooling needs have risen by more than 215 CDD since 1970 – an increase of 70%, 170% and 250% respectively (Figure 3.5, Figure 3.8-Figure 3.9).

In order to move towards a climate-neutral economy and halt global warming, regions and cities have an important role to play, including in the energy supply sector, which accounts for the largest share of global greenhouse gas (GHG) emissions (IPCC, 2014) due to its high reliance on fossil fuels. Since much energy use (in transport for example) needs to be electrified, progress in moving to zero-carbon electricity generation needs to be particularly rapid. Yet, the transition to zero-carbon electricity production remains very unequal across OECD regions.

In OECD countries, metropolitan regions have higher carbon emissions in electricity production than other regions. They emit 65% of the CO_2 associated with electricity generation but produce only 57% of electricity. On the other hand, regions far from metropolitan areas are more efficient than metropolitan regions, generating 27% of the electricity and accounting for only 21% of the CO_2. With an average of 285 tonnes of CO_2 per gigawatt-hour (GWh) of electricity generated, regions far from metropolitan areas release 34% fewer tonnes of CO_2 per GWh than metropolitan regions (Figure 3.6 and Figure 3.7, panel A).

Available data suggest that carbon efficiency in electricity production is also very unequal across OECD large regions. For the same amount of electricity production, high-carbon-intensive regions release, on average, 23 times more tons of CO_2 than low-carbon-intensive regions within each country (Figure 3.7, panel B). Behind such stark inequalities in carbon efficiency is the shift towards renewable sources for electricity production (see next section). The province of Quebec, the largest electricity producer in Canada, is among the most carbon-efficient regions in the OECD. In that region, which generates 94% of its electricity using hydropower, producing 1 GWh of electricity releases 30 tonnes of CO_2, significantly below the OECD average of 380 tonnes of CO_2 per GWh. On the other hand, the Canadian province of Alberta produces around 70% less electricity and has an emission intensity about 20 times higher than in Quebec. In the United States, the state of Washington emits an average of 110 tonnes of CO_2 per GWh of electricity production, which represents only 14% of the emissions per GWh in West Virginia (United States), a state that produces only 55% of the electricity of Washington. In France, the average emission intensity is among the lowest in OECD countries (80 tonnes of CO_2 per GWh) – due to its reliance on nuclear power. However, electricity production in Pays de la Loire (France) still releases 600 tonnes of CO_2 per GWh (Figure 3.10-Figure 3.11).

Definition

CDD measures how much (in degrees) and for how long (in days) outside air temperature was higher than 22°C (degrees Celsius). More precisely, annual CDD are the sum over a year of the differences between the threshold temperature (22°C) and the daily mean outdoor air temperature when the building needs to be cooled.

CO_2-equivalent emissions from electricity generation: GHG emissions are calculated using the Intergovernmental Panel on Climate Change (IPCC) estimates on GHG emissions of electricity supply technologies. It corresponds to the lifecycle emissions.

See methods in Annex C.

Sources

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See country metadata in Annex B.

Territorial level

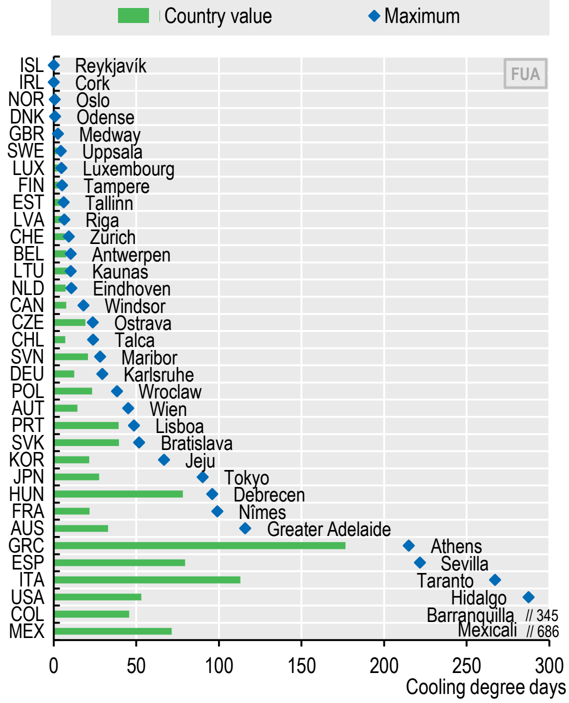
Figure 3.5,Figure 3.8-Figure 3.9: FUAs.

Figure 3.6-Figure 3.7 panel A: Small regions (TL3).

Figure 3.7, panel B: Large regions (TL2).

3.5. Increase in cooling needs in cities and their commuting zones, 1970-2018

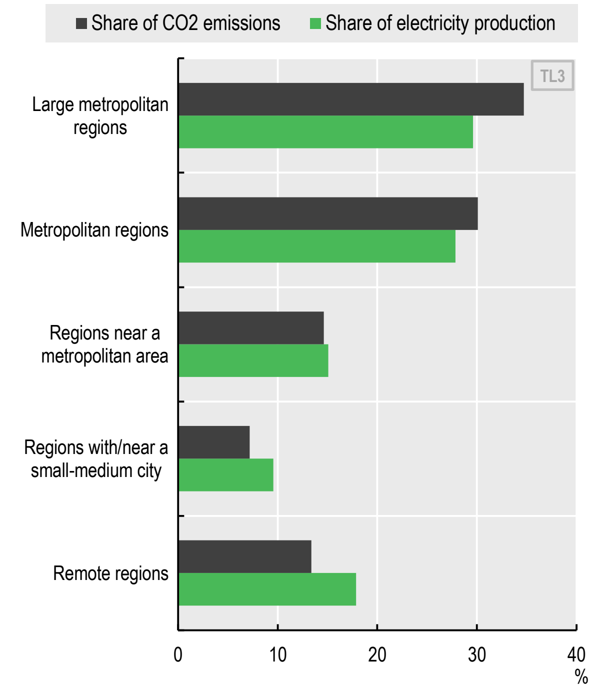
CDD needed over the year to maintain an indoor temperature of 22°C, FUAs



StatLink https://doi.org/10.1787/888934190115

3.6. Contribution to total CO_2 emissions from electricity production, 2017

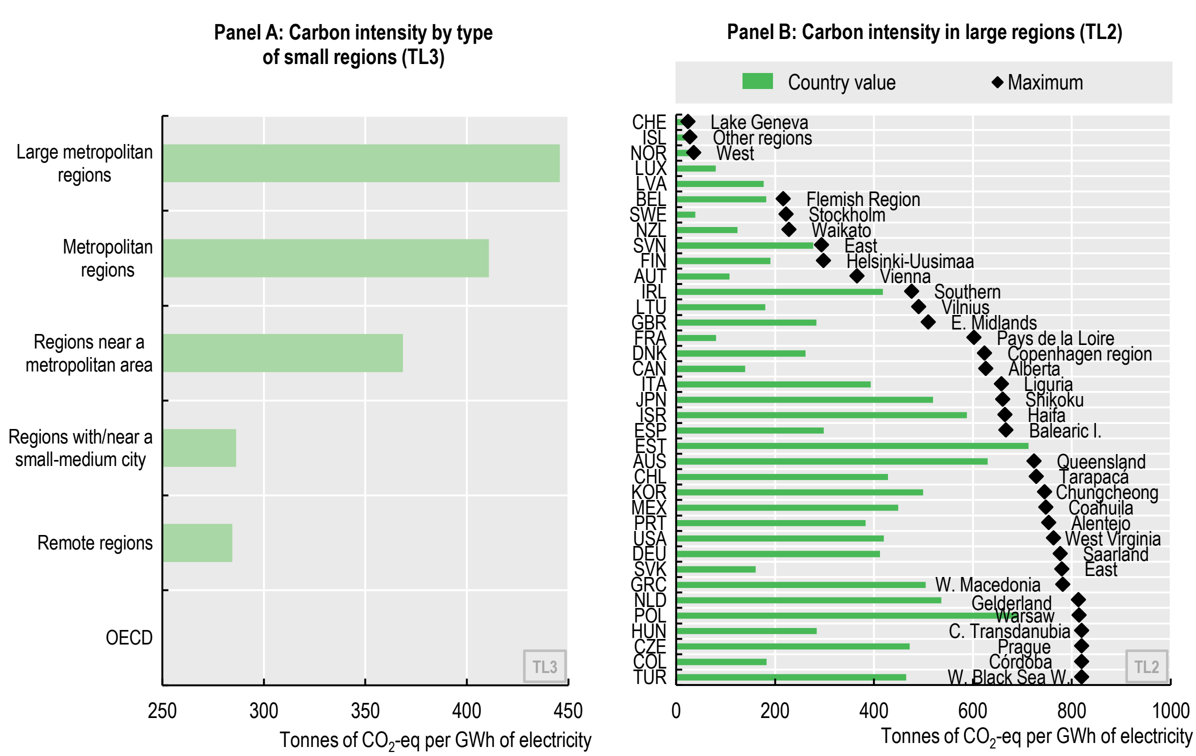
By type of region, weighted averages of small regions (TL3)



StatLink https://doi.org/10.1787/888934190134

3.7. Carbon intensity in electricity production, 2017

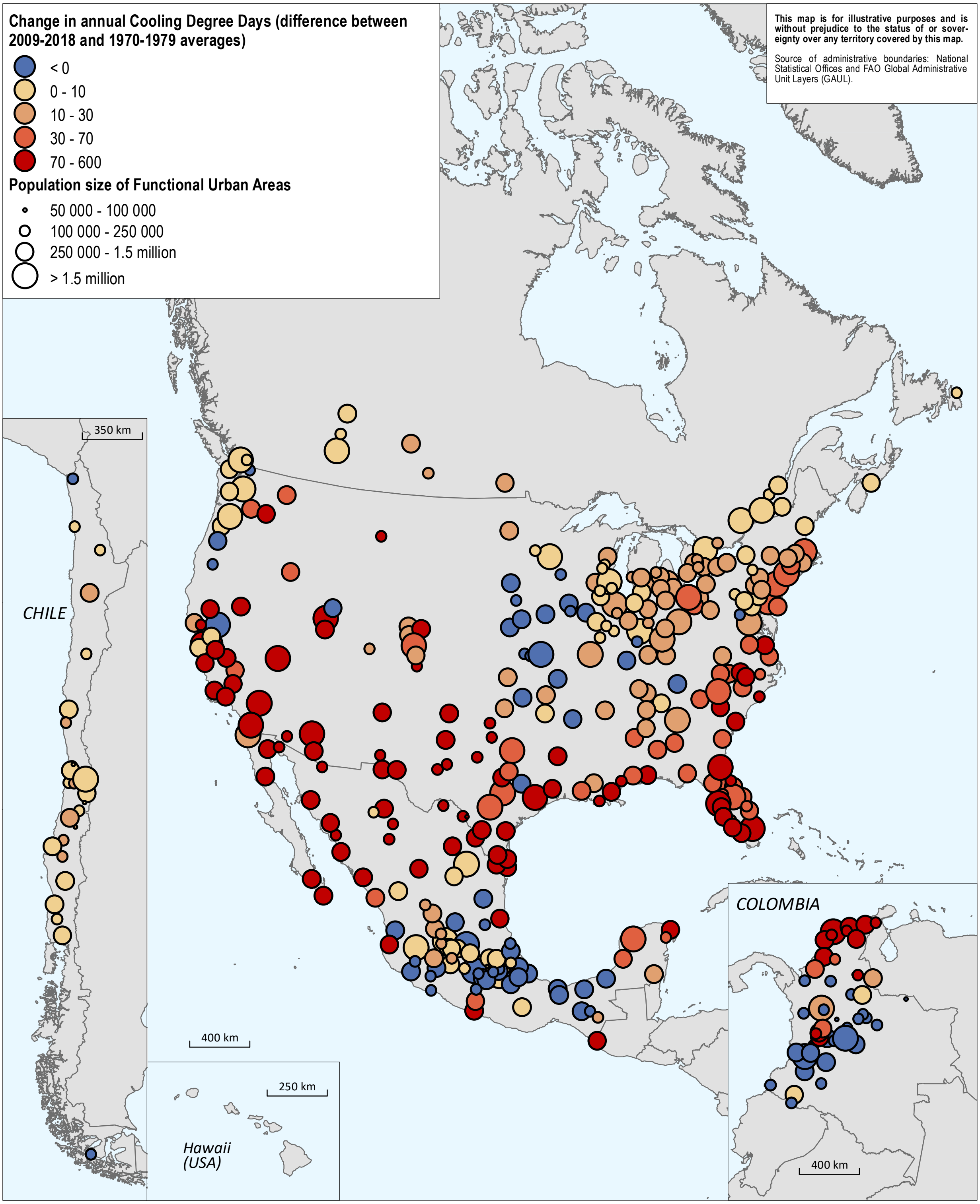
Tonnes of CO2 emissions per gigawatt GWhhour of electricity generated



StatLink https://doi.org/10.1787/888934190153

3.8. Change in cooling needs in cities and their commuting zones: Americas, 1970-2018

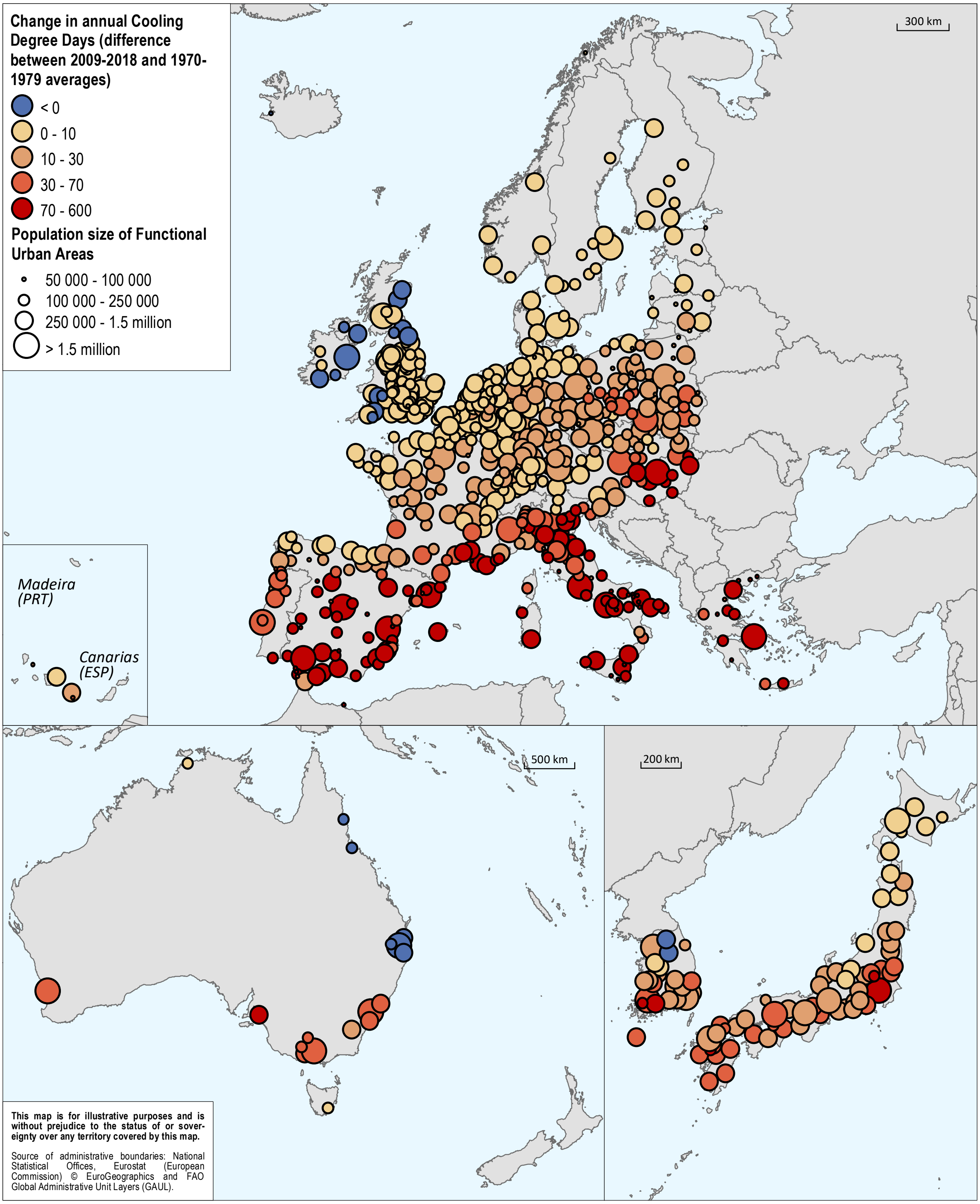
CDD needed over the year to maintain an indoor temperature of 22°C, FUAs



StatLink https://doi.org/10.1787/888934190172

3.9. Change in cooling needs in cities and their commuting zones: Europe and Asia-Pacific, 1970-2018

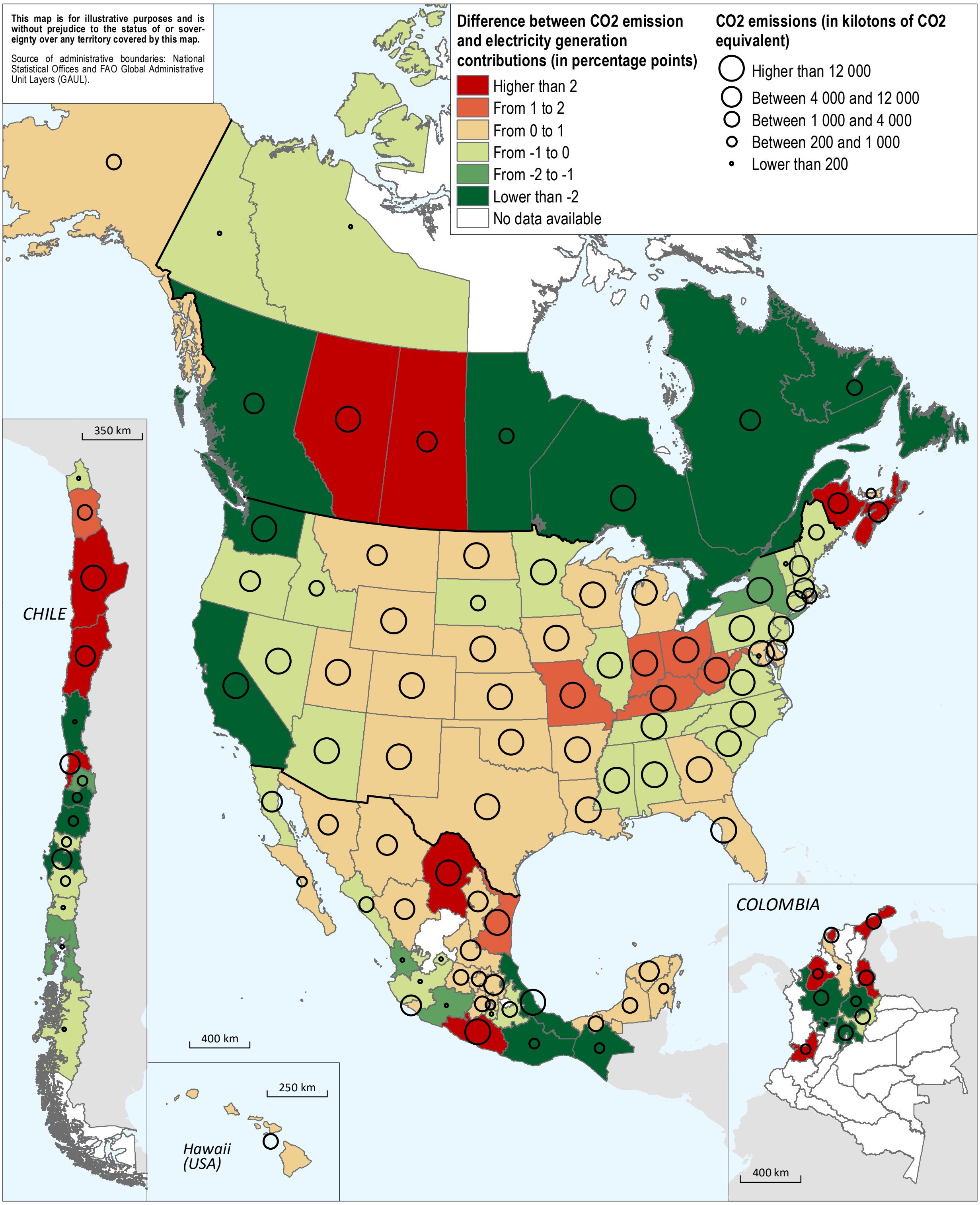
CDD needed over the year to maintain an indoor temperature of 22°C, FUAs



StatLink https://doi.org/10.1787/888934190191

3.10. Regions' contribution to the country's CO_2 emissions from electricity production: Americas, 2017

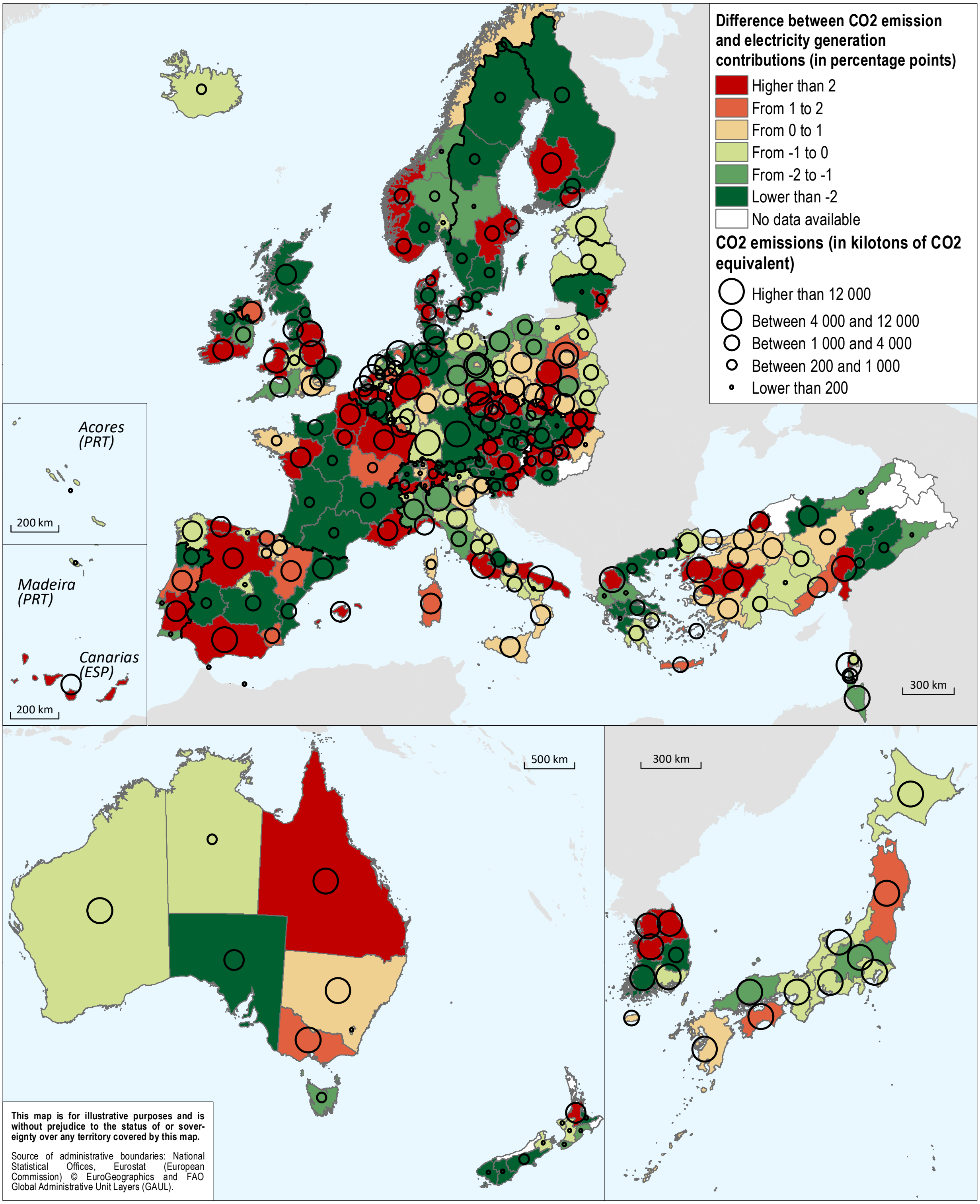
Large regions (TL2)



StatLink https://doi.org/10.1787/888934190210

3.11. Regions' contribution to the country's CO_2 emissions from electricity production: Europe and Asia-Pacific, 2017

Large regions (TL2)



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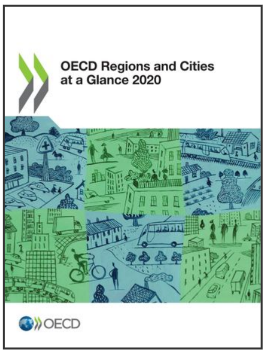

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