

## **Trees cool the land surface temperature of cities by up to 12°C**

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The cooling effect of trees reduces the surface temperature of European cities in the summer by up to 12°C in some regions. In contrast, green spaces without trees have a negligible effect, according to a study that strengthens the case for tree planting to help cities adapt to global warming.

Jonas Schwaab at ETH Zurich in Switzerland and his colleagues used land surface temperature data collected by satellites to compare the temperature differences between areas covered by trees, treeless urban green spaces, such as parks, and urban fabric such as roads and buildings. They analysed 293 cities from across Europe.

The land surface temperature measured by satellites isn't the same as the air temperature, which is more closely linked to what humans would feel, says Schwaab. "Usually, the air temperature difference between tree-covered areas and built-up areas would be much smaller than the land surface temperature differences," he says.

The team found that tree-covered areas in cities have a much lower land surface temperature compared with surrounding areas. The differences were between 8°C and 12°C in central Europe and between 0°C and 4°C in southern Europe.

The cooling effect of trees comes largely from shading and transpiration, which is when water within the tree is released as water vapour through their leaves. This process takes heat energy from the surrounding environment for evaporation, lowering the surrounding temperature.

In the warmer climate of southern Europe, the soil is typically drier, so the cooling effect of transpiration is lower than in regions further north, says Schwaab.

The team also found that the cooling provided by treeless green spaces is negligible, and in some instances green areas without trees can even be warmer than the surrounding urban areas.

Extreme heat is a growing problem for cities in Europe and elsewhere as the planet gets hotter. The findings show that trees can have a big impact on cities across Europe, but since the size of their effects varies, heat mitigation strategies should be tailored to suit each region, says Schwaab.

"[This study] provides an important guide to urban practitioners for deploying urban trees as an effective urban heat mitigation strategy," says Zhihua Wang at Arizona State University.

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