

Trees can make or break city weather

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A tree-lined street in the Sunset neighbourhood of Vancouver, the area that was monitored and modelled. Credit: University of British Columbia

Even a single urban tree can help moderate wind speeds and keep pedestrians comfortable as they walk down the street, according to a new University of British Columbia study that also found losing a single tree can increase wind pressure on nearby buildings and drive up heating

costs.

The researchers used remote-sensing laser technology to create a highly detailed computer model of a Vancouver neighbourhood down to every tree, plant and [building](#). They then used computer simulation to determine how different scenarios—no [trees](#), bare trees, and trees in full leaf—affect airflow and heat patterns around individual streets and houses.

"We found that removing all trees can increase wind speed by a factor of two, which would make a noticeable difference to someone walking down the street. For example, a 15 km/h wind speed is pleasant, whereas walking in 30 km/h wind is more challenging," said lead author Marco Giometto, who wrote the paper as a postdoctoral fellow in civil engineering at UBC.

Trees also moderated the impact of [wind pressure](#) on buildings, particularly when it goes through small gaps in and between buildings.

"Wind pressure is responsible for as much as a third of a building's energy consumption. Using our model, we found that removing all the trees around buildings drove up the building's [energy consumption](#) by as much as 10 per cent in winter and 15 per cent in summer," said Giometto.

The researchers compared the simulated scenarios against a decade of measured wind data from a 30-metre-tall research tower operated by UBC in the same Vancouver neighbourhood. They discovered that even bare trees in the winter months can moderate airflow and [wind](#) pressure, contributing to a more comfortable environment.

"Even bare branches play a role. Deciduous trees, which shed their leaves every year, reduce pressure loading on buildings throughout the

year-it's not only evergreens that are important in the city," said Marc Parlange, who supervised the work while a professor of [civil engineering](#) at UBC.

The model, piloted last year, is the first to simulate a real urban neighbourhood in extreme detail, added study co-author and UBC geography professor Andreas Christen.

"Information from such models can improve weather forecasts in order to predict the effects of a storm on a building and pedestrian level," said Christen. "It could also help city planners in designing buildings, streets, and city blocks to maximize people's comfort and limit [wind speed](#) to reduce energy loss."

More information: M.G. Giometto et al, Effects of trees on mean wind, turbulence and momentum exchange within and above a real urban environment, *Advances in Water Resources* (2017). [DOI: 10.1016/j.advwatres.2017.06.018](#)

Provided by University of British Columbia

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