

Researcher shows cool roofs cut energy consumption year-round

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“Put simply, cool roofs cool the globe,” says Concordia engineering professor Hashem Akbari. Credit: Concordia University

As the summer heats up, so do cities. That's true not just for hot places like Los Angeles and Phoenix, but also for cooler capitals like Ottawa and Reykjavik.

Regardless of latitude, urban temperatures are typically several degrees higher than those of nearby suburban and rural areas. The resulting "heat islands" mean increased discomfort, higher air-conditioning bills and

denser smog.

A major culprit? Hot roofs baked by the sun. The solution? Cooling down those roofs by using reflective surfaces—and doing so even if those cities are covered in snow for several months of the year.

A new study published by researchers from Concordia University in Montreal in *Energy and Buildings* confirms that, contrary to the belief that [cool roofs](#) won't work in colder climates, they actually provide net energy—and monetary—savings.

"Using a cool roof on a commercial building in cold climates is typically not suggested based on the presumption that the heating penalties may be higher than the cooling savings," says Hashem Akbari, professor in the Department of Building, Civil and Environmental Engineering and the study's senior author.

"Our research shows that any improvement to a roof that limits the summertime solar heat gain actually results in energy-cost savings for the building owner, as well as a reduction in the building's overall environmental impact."

For the study, Akbari and his co-author, Mirata Hosseini, a Concordia PhD candidate, used modelling software to simulate energy consumption for several prototype office and retail buildings in four cold-climate cities in North America: Anchorage, Milwaukee, Montreal and Toronto.

They found that cool roofs for the simulated buildings resulted in annual energy expenditure savings in all municipalities.

A cool roof on a new, medium-sized office building would save four dollars per 100 square metres in Montreal, \$10 per 100 square metres in Toronto and \$14 per 100 square metres in Milwaukee and Anchorage.

The research also showed that cool roofs can reduce the peak electric demand of the retail buildings by up to five watts per square metre.

"Our study proves that cool roofs for commercial buildings are a net saver of energy in all climates that use air conditioning during the summer," says Akbari.

"In cooler climates, installing cool roofs may even prevent buying an air conditioner altogether. Even in non-air-conditioned buildings, cool roofs improve comfort during hot summer days. And in extreme cases, these roofs may even save lives by reducing the risk of heat stroke."

Many municipalities already prescribe cool roofs in the construction of new buildings and for re-roofing existing buildings. This study proves that those rules should also apply in colder climates. It is Akbari's hope that cool roofs become the global standard.

"On a large scale, cool roofs can moderate the air temperature surrounding a building, decrease greenhouse gas emissions and mitigate the urban heat island effect," he says.

"Put simply, cool roofs cool the globe."

Akbari is organizing and chairing the Fourth International Conference on Countermeasures to Urban Heat Islands, being held May 30 to June 1 in Singapore. At this conference, over 300 scientists, practitioners, and policy makers gather to discuss implementation of heat island mitigation technologies. On top of the list of implementation is developing policies that lead to installing cool roofs on all buildings that are air conditioned.

More information: Mirata Hosseini et al, Effect of cool roofs on commercial buildings energy use in cold climates, *Energy and Buildings* (2016). [DOI: 10.1016/j.enbuild.2015.05.050](https://doi.org/10.1016/j.enbuild.2015.05.050)

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