Cold cities less sustainable than warm cities, research suggests

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(Phys.org) —Living in colder climates in the US is more energy demanding than living in warmer climates. This is according to Dr Michael Sivak at the University of Michigan, who has published new research today, 28 March, in *Environmental Research Letters*.

Dr Sivak has calculated that climate control in the coldest large metropolitan area in the country – Minneapolis – is about three-and-a-half times more energy demanding than in the warmest large metropolitan area – Miami.

Dr Sivak calculated this difference in energy demand using three parameters: the number of heating or cooling degree days in each area; the efficiencies of heating and cooling appliances; and the efficiencies of power-generating plants.

Not included in the analysis were the energy used to extract fuels from the ground, the losses during energy transmission, and energy costs.

"It has been taken for a fact that living in the warm regions of the US is less sustainable than living in the cold regions, based partly on the perceived energy needs for climate control; however, the present findings suggest a re-examination of the relative sustainability of living in warm versus cold climates."

Heating degree days (HDDs) and cooling degree days (CDDs) are climatological measures that are designed to reflect the demand for

energy needed to heat or cool a building. They are calculated by comparing the mean daily outdoor temperature with 18°C.

A day with a mean temperature of 10°C would have 8 HDDs and no CDDs, as the temperature is 8°C below 18°C. Analogously, a day with a mean temperature of 23°C would have 5 CDDs and no HDDs.

Based on a previous study, Dr Sivak showed that Minneapolis has 4376 heating degree days a year compared to 2423 cooling degree days in Miami.

In the study, Dr Sivak used a single measure for the efficiency of heating and cooling appliances, as most are currently rated using different measures so they cannot be directly compared. His calculations showed that a typical air conditioner is about four times more energy efficient than a typical furnace.

"In simple terms, it takes less energy to cool a room down by one degree than it does to heat it up by one degree," said Dr Sivak.

Grouping together climatology, the efficiency of heating and cooling appliances, and the efficiency of power-generating plants, Dr Sivak showed that Minneapolis was substantially more energy demanding than Miami.

"In the US, the energy consumption for air conditioning is of general concern but the required energy to heat is often taken for granted. Focus should also be turned to the opposite end of the scale – living in cold climates such as in Minneapolis, Milwaukee, Rochester, Buffalo and Chicago is more energy demanding, and therefore less sustainable from this point of view, than living in warm climates such as in Miami, Phoenix, Tampa, Orlando and Las Vegas," Dr Sivak concluded.

More information: Air conditioning versus heating: climate control is more energy demanding in Minneapolis than in Miami, Michael Sivak 2013 *Environ. Res. Lett.* 8 014050 iopscience.iop.org/1748-9326/8/1/014050/article

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