'Heat island' effect could double climate change costs for world's cities

May 29 2017

The downtown Dallas, Texas (USA) skyline from a levee along the Trinity River. Facing southeast. Credit: drumguy8800/Wikipedia

Overheated cities face climate change costs at least twice as big as the rest of the world because of the 'urban heat island' effect, new research shows.

The study by an international team of economists of all the world's major cities is the first to quantify the potentially devastating combined impact of global and local climate change on urban economies.

The analysis of 1,692 cities, published today (Monday 29 May 2017) in

the journal *Nature Climate Change*, shows that the total economic costs of climate change for cities this century could be 2.6 times higher when heat island effects are taken into account than when they are not.

For the worst-off city, losses could reach 10.9 per cent of GDP by the end of the century, compared with a global average of 5.6 per cent.

The urban heat island occurs when natural surfaces, such as vegetation and water, are replaced by heat-trapping concrete and asphalt, and is exacerbated by heat from cars, air conditioners and so on. This effect is expected to add a further two degrees to global warming estimates for the most populated cities by 2050.

Higher temperatures damage the economy in a number of ways - more energy is used for cooling, air is more polluted, water quality decreases and workers are less productive, to name a few.

The authors - from the University of Sussex in the UK, Universidad Nacional Autónoma de México and Vrije University Amsterdam - say their new research is significant because so much emphasis is placed on tackling global climate change, while they show that local interventions are as, if not more, important.

Professor Richard S.J. Tol MAE, Professor of Economics at the University of Sussex, said: "Any hard-won victories over climate change on a global scale could be wiped out by the effects of uncontrolled urban heat islands.

"We show that city-level adaptation strategies to limit local warming have important economic net benefits for almost all cities around the world."

Although cities cover only around one per cent of the Earth's surface,

they produce about 80 per cent of Gross World Product, consume about 78 per cent of the world's energy and are home to over half of the world's population.

Measures that could limit the high economic and health costs of rising urban temperatures are therefore a major priority for policy makers.

The research team carried out a cost-benefit analysis of different local policies for combating the urban heat island, such as cool pavements - designed to reflect more sunlight and absorb less heat - cool and green roofs and expanding vegetation in cities.

The cheapest measure, according to this modelling, is a moderate-scale installation of cool pavements and roofs. Changing 20 per cent of a city's roofs and half of its pavements to 'cool' forms could save up to 12 times what they cost to install and maintain, and reduce air temperatures by about 0.8 degrees.

Doing this on a larger scale would produce even bigger benefits but the vastly increased costs mean that the cost-benefit ratio is smaller.

The research has important implications for future climate policy decisions - the positive impacts of such local interventions are amplified when global efforts are also having an effect, the study shows. Professor Tol said: "It is clear that we have until now underestimated the dramatic impact that local policies could make in reducing urban warming.

"However, this doesn't have to be an either/or scenario.

"In fact, the largest benefits for reducing the impacts of climate change are attained when both global and local measures are implemented together.

"And even when global efforts fail, we show that local policies can still have a positive impact, making them at least a useful insurance for bad climate outcomes on the international stage."

More information: A global economic assessment of city policies to reduce climate change impacts, *Nature Climate Change* (2017). nature.com/articles/doi:10.1038/nclimate3301

Provided by University of Sussex

Citation: 'Heat island' effect could double climate change costs for world's cities (2017, May 29) retrieved 25 April 2024 from https://phys.org/news/2017-05-island-effect-climate-world-cities.html

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