

Hong Kong study raises alert for further increase in city's temperature

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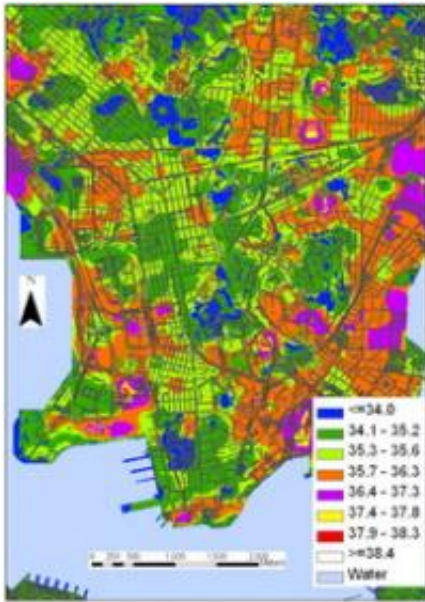


Projected daytime temperature map of Kowloon in 2039

The temperature in the inner urban areas of Hong Kong is predicted to rise by two to three Celsius degree in 30 years' time, according to the latest scientific study by researchers at the Department of Land Surveying and Geo-Informatics (LSGI) of The Hong Kong Polytechnic University (PolyU).

The study was done by PolyU Professor Janet Nichol and her research student Mr To Pui-hang, together with Chinese University's Professor

Edward Ng Yan-yung, using [remote sensing technology](#) and [satellite images](#). They have mapped the distribution of temperatures for both daytime and nighttime over Hong Kong at decadal intervals up to 2039, taking into consideration the [temperature change](#) due to greenhouse-induced warming as well as the impact of urbanization. The latter is known as the [Urban Heat Island](#) (UHI) effect.

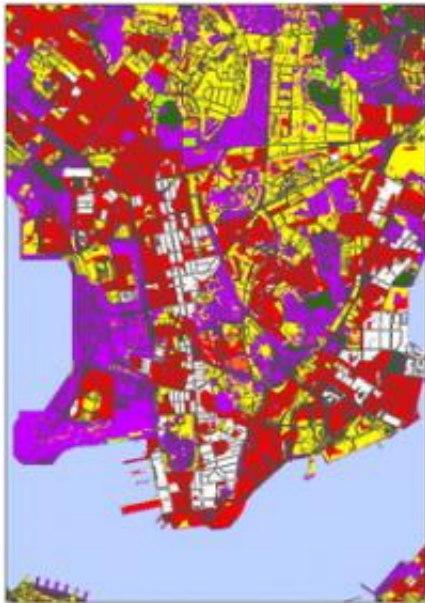


Daytime temperature map of Kowloon in 2009

Professor Janet Nichol said the UHI effect means an urban area is significantly warmer than its rural surroundings. The [temperature difference](#) is usually larger at night and in winter. There are several causes leading to UHI. These include high-rise buildings which block [thermal radiation](#) at night, materials with thermal bulk properties such as asphalt and concrete, and the lack of vegetation in [urban areas](#). With its densely populated urban area, Hong Kong provides a typical example of the UHI effect.

While [temperature](#) projections for the city carried out by the Hong Kong Observatory have reflected the expected temperature change due to greenhouse-induced warming, they have failed to address the direct effects of urban development. In contrast, PolyU research has examined temperature changes due to both global warming and urbanization effects independently.

"Urbanization is an additional factor in causing [temperature rise](#), and if current trends are continued, temperatures could increase much faster in the future," said Professor Nichol.



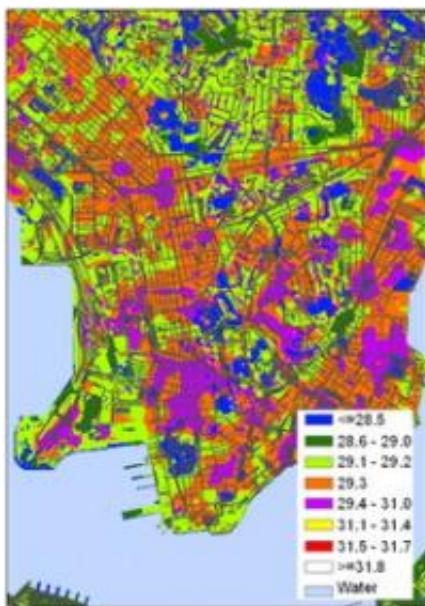
Projected nighttime temperature map of Kowloon in 2039

Given no further urbanization, the annual mean temperature in Hong Kong will rise by 3.0 to 6.0 Celsius degrees by 2100 (according to a study of the Hong Kong Observatory in 2007). However, the mean temperature is predicted to rise by 3.7 to 6.8 Celsius degrees within the

same period with a constant urbanization rate as before. The impact of urbanization effect or UHI magnitude is estimated at 0.08 Celsius degrees per decade.

In predicting future rise in temperature, Professor Nichol has made use of satellite images for baseline air temperature mapping, global climate models for the projection of greenhouse-induced warming, and plot ratio to reflect the degree of urbanization. She also noted that air temperature is more sensitive to the density rather than the height of buildings, though the latter cannot be fully neglected.

The study found that in 2039 (please compare Figure 1 and Figure 2) most urban areas in Hong Kong would have a two to three Celsius degree increase in daytime [air temperature](#), indicated by the original dark green areas changed to yellow. This indicates an average increase of temperature on a summer day in urban districts, from currently 35 Celsius degrees to just less than 38 Celsius degrees in 2039.



Nighttime temperature map of Kowloon in 2008

Moreover, over the next three decades night time temperatures in the centre of Kowloon are expected to show at least an increase by two Celsius degrees, reaching over 31.5 degrees at night. This means that most urban districts in the city that are currently "comfortable" at night will become "uncomfortable" by 2039. As a result, those people who cannot afford air conditioners will suffer heat stress both during the day and at night.

Professor Janet Nichol also urged city planners to take into consideration the wind speed requirements for residential buildings in urban areas so as to achieve a more favourable living environment for city dwellers. This is called "sustainable urbanization".

Provided by Hong Kong Polytechnic University

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