

Science for Environment Policy

Counteracting the urban heat island effect with effective planning

Climate change is likely to exacerbate the urban heat island (UHI) effect. A new study has therefore examined possible climate change adaptation measures that can alleviate the UHI effect and illustrated how these strategies can be practically applied. While the study provides real-life examples to demonstrate how the measures can be used, it does not include any quantitative assessment of their impacts.

Under the UHI effect, urban air temperatures are higher than those of rural surroundings. It has several possible causes, including the absorption of heat by building materials, street surfaces and air pollution, and the loss of soil and vegetation's cooling effects (through evaporation and shading), as natural surfaces are 'sealed' with paving, tarmac and other impermeable materials. The combination of climate change and the UHI effect may have negative effects on health through heat stress and the stimulation of ground-level ozone, which can cause respiratory problems.

The study places the available adaptation strategies for combating the UHI effect into four categories:

1. **Vegetation strategies**, which consist of establishing urban forests and parks, street trees and green roofs or facades to encourage the cooling effects of plants.
2. **Water strategies**, which consist of ponds, lakes and fountains, as well as green roofs to store water, which absorb heat and cool through evaporation.
3. **Built form strategies** adjust building density or arrangement, such as lowering building height, increase variation in building height, using shading devices and changing the orientation of the street to improve ventilation.
4. **Material strategies** involve using materials that have greater cooling effects through evaporation and heat reflection.

It can be difficult to transfer a large amount of knowledge and evidence about the use of these tools in combination into the urban planning process. However, the study provides examples of how the different UHI strategies have been applied together with the aim of adapting to climate change and reducing the UHI effect in two neighbourhoods in the Netherlands – located in Utrecht and The Hague.

Streets were widened and lowered in these neighbourhoods to improve ventilation, and roofs were coated white to increase reflection of sunlight, as part of built form and material strategies. Vegetation strategies included creating recreational green zones, which can also be used as cycle routes, green facades on buildings and green roofs. Water plans included sustainable water systems to supply trees with enough water to maximise their cooling ability and shallow canals to absorb and discharge heat.

These two plans demonstrate how urban design principles can be applied to address the UHI effect. Since the neighbourhoods were already in need of renovation, these measures were applied as part of this process, but it may be more difficult to convince stakeholders to implement measures if there is not an existing need to replan a neighbourhood.

In order to encourage policymakers to work with design principles, there should be more statistical information on the effects of UHI, and on the strategies to address these, so that targets can be set and evaluated. For example, there needs to be a quantitative (or numerical) definition of actual heat accumulation, of an 'acceptable' level of heat accumulation and the required measures to address heat accumulation, for instance, the amount of green space needed to reduce heat accumulation by a certain amount.



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