

# Islands in the sun: Heatwave gives cities that sinking feeling

June 25 2019, by Amélie Bottollier-Depois

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Heat haze distorts visibility during a heatwave in Tokyo - a visible phenomenon of how city infrastructure throws off heat

Boffins call it a heat sink—a passive exchanger designed to dissipate heat—but when the sink is an actual city, its concrete and asphalt

sweltering in the heat, it feels more like an oven to those who live and work there.

The phenomenon where cities are hotter than the surrounding countryside is actually known as an [urban heat island](#), and while the effect exists year-round, it is most acutely felt at exactly the worst moment—a heatwave.

## Urban microclimate

In the countryside, vegetation uses sunlight and water from the soil for photosynthesis which in addition to converting carbon dioxide into oxygen, also releases water into the air.

This helps disperse [solar energy](#) and cool the surrounding area.

Meanwhile, in cities, there is not nearly as much vegetation to disperse [heat](#).

Moreover, asphalt and cement absorb solar energy during the day and release it during the night.


The result is the city is hotter than the surrounding countryside, as buildings and streets act as a giant heat sink, and this is most noticeable during heatwaves.

France's national meteorological service has found an average annual difference between Paris and surrounding rural areas on the order of 2 to 3 degrees Celsius (4 - 5 degrees Fahrenheit).

During a heatwave, the difference "can reach close to 10 degrees Celsius", said Meteo-France.

## Urban heat islands

It may be several degrees hotter in towns than in rural areas, especially at night

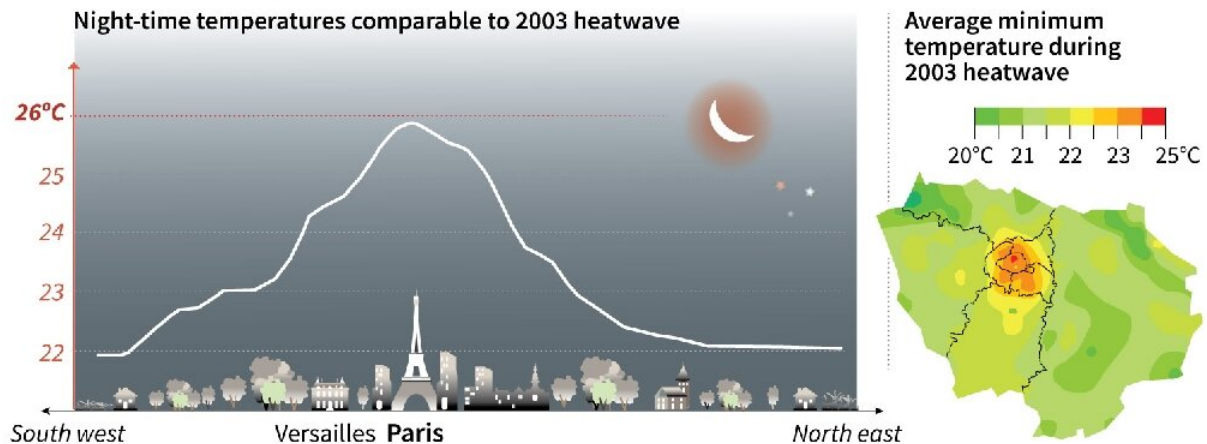
 Most noticeable during heatwaves

**Heat sink exacerbated by:**  
 low vegetation cover in towns

 Construction materials (eg. asphalt, cement) that absorb solar energy during the day and release it at night

 Urban planning and building designs that hinder air circulation

Example from the Paris region



Sources: APC, Météo France

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Description of urban heat sinks, with examples from the 2003 heat wave in the Paris region

During a 2003 heatwave, when the daytime temperature hit 40 degrees C it fell to between 23 and 26 degrees during the night in the areas of the city that are the greenest or got the most breeze. But in the [city centre](#) it fell only to 28 degrees.

This urban microclimate "aggravates the effects felt, in particular during the night, a critical period when normally the human body recuperates," said Aude Lemonsu, who heads up Météo-France's research centre.

These urban heat islands thus magnify the effects of climate change which is expected to increase the number of heatwaves, researchers warn.

## Air conditioning

To the list of factors making cities feel like ovens, there is another one which must be added: air conditioning.

"The more you use air conditioning in buildings, the more you heat the outside air," noted Lemonsu.



Uncool for those outside



The vicious circle of air conditioning is abetted by the design of major cities.

A study published in a March 2018 issue of Physical Review Letters found that the more a city is designed into a square grid pattern, the more it traps heat.

The orientation of buildings can also play a role—letting in more light lets in more heat.

## **Cool down**

While redesigning cities would be difficult and prohibitively costly, there are things that can be done.

Planting more trees and plants can help cool the air locally.



A man waters a vertical garden on a wall of the Shanghai Natural History Museum

"You can even create vegetal walls and roofs to reduce the heat created by buildings, said Amandine Crambes, an urban engineer and planner at France's environment and energy management agency, ADEME.

When buildings are built and renovated the choices made can have considerable consequences.

If the outside temperature is 26 degrees C, the surface of a dark coloured roof can reach 80 degrees, said Crambes.

Meanwhile, the surface of a light coloured roof will be around 45

degrees C as it reflects more sunlight and absorbs less heat, and a roof covered with plants won't rise above 29 C, she said.

Such [cool roofs](#) are gaining traction, and some cities like Los Angeles have even experimented with painting streets white.

Another possibility that can be explored: water.





A street cleaner who sprays water to clean the sidewalk in Paris may also help cool down the temperature

We all know from experience that a shower provides relief from heat.

The city of Paris has been experimenting in recent years to see if watering streets during extreme heat can help reduce temperatures.

"The question of urban resilience is being taken into account more and more," said Crambes, noting that authorities face difficult choices constrained by costs and the interest of different stakeholders, including property owners.

## **A nap in the park**

For cities, it is fast becoming imperative to make the most of the cool islands within the heat islands.

Paris has opened up public parks normally closed at night to allow residents to sleep in the open air when a heatwave makes it difficult to spend a restful night in an apartment without [air conditioning](#).



When temperatures climb in Shanghai, residents are known to sleep on benches along Nanjing East Road, a popular pedestrian street filled with shoppers and tourists during the day

Paris and the central French city of Lyon have created maps showing where people can escape the heat, like air-conditioned museums and pools.

The [city](#) of light has also been working to adapt school courtyards to climate change. Out are stark asphalt squares and in are trees and water fountains.

These courtyards may even be opened to seniors and others at risk to extreme heat if needed.

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