



## 'Greenery is good for the urban climate and for the well-being of the residents'

'People feel cooler when they see vegetation'

**Wiebke Klemm has studied city-dwellers' heat perception. One of the conclusions of her research: green contributes to the thermal comfort of city-dwellers. In fact, just seeing greenery makes that people feel cooler. More urban green helps combat heat stress. That does not necessarily mean great big new parks, small additions are also welcome. The more, the better. The cumulative effect ensures that every little bit will help.**

If we do not take any action, cities will only heat up. "Cities are already warmer than their surrounding areas," says Wiebke Klemm, researcher at Wageningen University and Knowledge for Climate participant. "This means that the likelihood of heat stress in cities is increasing. Cities develop; they expand and become more compact. So the number of buildings and paved surfaces increase, resulting in the retention of heat for a longer period of time. This not only affects the urban climate, but also the health and well-being of the residents." People who sleep under a flat roof do not sleep as well during a heat wave. People who sleep poorly do not perform as well, while their performance is already negatively affected by the heat. "Particularly older people and young children are vulnerable," notes Wiebke Klemm.

## Carrier bike

For her research, she carried out a study in three large cities (Utrecht, Arnhem and Rotterdam), largely concentrating on taking measurements in the microclimate and collecting data. In all three cities, she asked about 180 people from every age group and district what kind of urban space they preferred on warm days. For her research, she went with students through the city of Utrecht on two carrier bikes equipped with measuring equipment to gather information about the heat in a city.

In a city like Rotterdam, the temperature difference between the city and its surrounding areas is sometimes as high as 8°C during hot spells, as shown by measurements taken by her fellow researcher, Bert Heusinkveld. But significant differences can also be recorded within a city during a heat wave. There, the greenest spaces are also the coolest. The places in a city that hardly have any greenery, but where buildings and asphalt dominate, are the hottest.

The interviews revealed that city-dwellers mostly escape to a city's green space during a heat wave. Wiebke Klemm: "That is where they feel most comfortable. This applies to all three cities where we interviewed people. Parks are favourite places; it is clear that people prefer them to paved areas and places where there is water." Their choice is understandable; city-dwellers simply want to be where it is the coolest. "The measurements taken with the carrier bike confirm this. It's on average 1°C cooler in the parks than in the city centre."

## Psychological aspects

It sounds obvious. "Indeed," says Wiebke Klemm. "Many people say to me 'Surely, we have known this for a very long time!' And this has now been borne out by my research of Dutch climatic conditions and backed up with figures. There also appears to be a psychological aspect: people do not feel the heat as much when they see greenery. "In general, people are aware of their thermal comfort," said the researcher. "They try to cool off when it gets too hot. They try to adapt, for example, by walking on the shady side of a street or by sitting under a tree. Needs vary. Many older people know exactly which benches to sit on in a park, because they know they are in the shade. Young people know where they can enjoy the evening sun the longest in a park."

In Rotterdam, the Kralingse Bos stands out from the other parks as the best place to escape the heat in the city. "People



Pocket gardens Coolsingel



Start action 'Paving out, plants in'

from all parts of town go there," said Wiebke Klemm. The quality of the park is of overriding importance here. "Many people want to relax on hot, summery days. Some people look for a cool place in the shade while others prefer a sunny spot next to water. The Kralingse Bos offers both and is therefore very popular. The Kralingse Bos can also be easily reached. That's important, as people are often pressed for time."

Creating new, extensive green recreation areas is one of the recommendations of her research. "But cities do not always have room for this," the researcher explains. "You could also think of providing good or better access to major parks. You could create small green spaces, such as pocket parks, which can make a real difference." The greenery in a city helps to improve the urban climate, she stresses: The greener, the cooler. Minor elements also contribute to this. The effect is a cumulative one. Green roofs lower the surface temperature. At street level, trees help to improve the thermal comfort of pedestrians. My research shows that there is a difference in mean radiant temperature of 4°C between streets with trees and ones without."

## Climbing plants

It is also possible to take advantage of the psychological effect of greenery at street level. Just seeing the greenery improves your perception of heat. "This is also the case with plants growing up the outside wall, or in front of buildings or in the front garden. It only takes one climbing plant to improve one's perception of thermal comfort. Every resident can contribute to this, not only in the city. This can then have all kinds of auxiliary benefits, such as promoting social cohesion, when the residents in a street collectively undertake to make

their neighbourhood greener. And greenery improves the biodiversity and the appeal of the living environment. It is a win-win situation for everyone."



**Wiebke Klemm**

is a doctoral candidate in landscape architecture at Wageningen University. She is an experienced researcher and designer in the area of the urban landscape.

## How an urban climate can be influenced

The basic assumption of the book "Weather conditions in cities", published by nai010 publishers last year, is that designers can do a great deal to make a city more livable. In her book, landscape architect and urban designer, Sandra Lenzholzer, gives designers practical tips for taking urban climate into account in urban design, and for influencing the urban climate at city and micro-level.

At city level, this concerns laying out parks, whereby parks with trees cool down the environment during the day and parks with open grass fields cool the environment down at night, or creating ventilation between different parts of town and avoiding barriers.

For the micro-level, a roughly 100-page catalogue of possible measures has been included, classified according to changes relating to temperature, wind, precipitation and perception. To prevent heat stress, plant-covered pergolas can be placed in front of buildings, or trained trees can be used to shade buildings. Climbing plants, trained plants or fruit trees on outside walls are also quite effective in stopping walls from heating up as much: this can

sometimes make a difference of up to 30° C. "Green outside walls often add a distinctive touch to the architecture", writes Lenzholzer. Attachable constructions of foliage or green boundary partitions could be used to shade buildings.

Trees are also effective in providing shade and making a city more pleasant at the micro-level. The book includes lists of all kinds of trees that can provide the greatest amount of shade, -thereby lowering the air temperature- or that are moderately to extremely drought-tolerant. Trees can be planted anywhere: in gardens, squares and parks, but also in parking places to provide shade.

Designers can also use materials that absorb less heat. Wood is an attractive alternative. This also applies to paving: asphalt absorbs most of the heat and increases heat



Shadow in the Zuiderpark

stress. It therefore makes sense to replace asphalt with light and porous materials wherever possible. Good results have also been achieved by combining water and greenery. Water storage reservoirs can also have a cooling effect, for example on a flat roof: an old method which, according to Lenzholzer "could have new life blown into it."

