Abstract ICLEI: The cooling effect of small blue urban spaces is negligible

Blue spaces in urban environments such as rivers, ponds, canals and fountains are often regarded as measures that effectively reduce the risks of urban heat. Therefore, urban planners and designers like to integrate blue infrastructures in their climate resilient urban designs. However, the cooling effect of blue spaces in cities depends very much on the characteristics of the water body in relation to their urban environment, and on the meteorological conditions. In practice, the cooling effect of water bodies in cities may be small. Since many urban professionals are still unfamiliar with the ambiguous cooling effect of urban water, we would like to explain in our presentation that the cooling potential of small water bodies in cities is generally negligible and not a good adaptation measure to reduce urban heat. This will be illustrated by results of recent research studies and relevant findings reported in scientific literature.

In a first study, we investigated the thermal effect of different types of water bodies in Amsterdam using micrometeorological measurements. The thermal effect was evaluated in terms of air temperature and the physiological equivalent temperature (PET). This thermal comfort index takes into account effects of air temperature and humidity, radiation and wind speed on human thermal sensation. During five hot summer days, we measured the effect of a pond, a fountain, a canal, and two rivers. The results indicate that the thermal effect is small. Water sometimes seems to cool and sometimes seems to warm the environment near the water body (ranging between -4 °C to 5 °C PET ). The thermal effect on air temperature is generally 1 °C cooling. We also collected nearly 1000 questionnaires to assess the thermal perception of the environment near water bodies. These results show that urban spaces near urban water bodies are not perceived as cooler or more comfortable than impervious reference sites.

In a second project, we assessed the thermal effect of canals, ditches and ponds with the microclimatic simulation model Envi-met. This research is part of the REALCOOL project, in which design prototypes for really cooling urban water bodies are developed. Simulations were performed for a typically hot daytime and a nighttime situation (3 pm and 5 am). The results show a small or negligible cooling effect during daytime of about 1 °C in PET and 0.5 °C in air temperature. During nighttime, the cooling effect is virtually absent.

In a third project, long time-series of observed water temperatures of rivers and canals in Amsterdam were analyzed and compared with air temperatures. This analysis reveals that the water temperature in Amsterdam exceeds the air temperature for nearly 80% of the summer period, and implies that water can deliver cooling over only a small period of the summer and might rather contribute to warming the environment.

We compared these effects to what is known from other studies and concluded that the cooling potential of small water bodies in cities is generally negligible and not a good adaptation measure to create cool urban spaces. We therefore advise urban designers and planners to be careful in using blue spaces to reduce urban heat.

In discussions with urban professionals from municipalities we noticed that this conclusion is not easily accepted, since water in urban areas is generally believed to have a cooling effect. We expect to also have a discussion on this after the presentation, in which we will consider other forms of urban water (water sprays, tangible water, or a combination of water and shading from trees) that might have a more efficient cooling potential.