



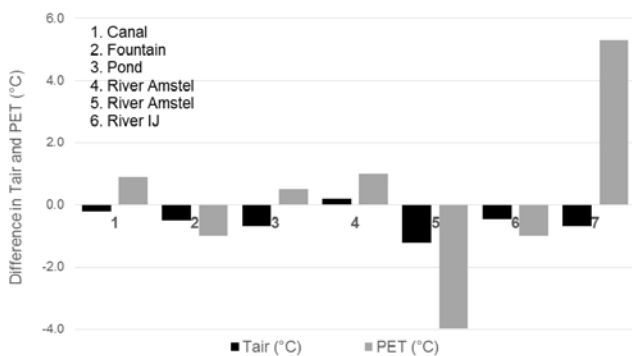
The cooling effect of small blue urban spaces is negligible

Lisette Klok - Cor Jacobs - Jeroen Kluck - João Cortesão - Sanda Lenzholzer
 e.j.klok@hva.nl | +31 6 211 57673

Urban blue spaces are often regarded as adaptation measures that effectively reduce urban heat and improve the pedestrian thermal comfort. Therefore, urban design professionals often integrate blue spaces in climate resilient designs but...

do blue spaces really cool the urban environment? 4 perspectives

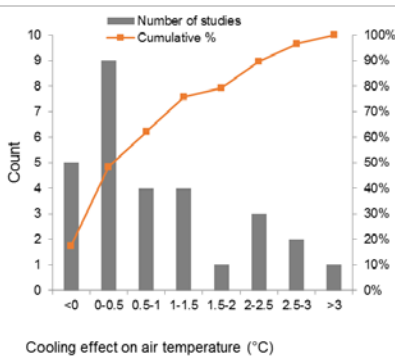
#2. METEOROLOGICAL MEASUREMENTS



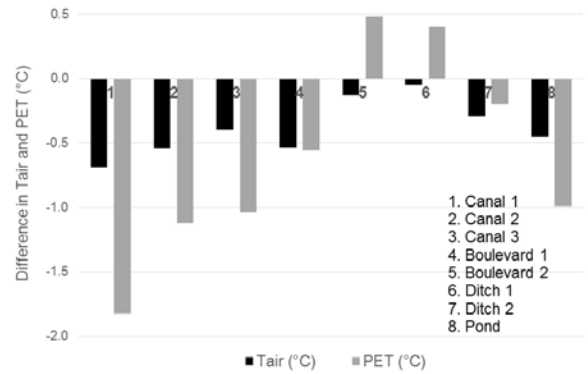
During seven hot summer days, the cooling effects of a canal, a fountain, a pond, and two rivers in Amsterdam were measured. The measurements indicate that during daytime the air temperature near the water bodies is generally 1 °C lower than a comparable situation without water. Differences in PET¹ range between -4 and 5 °C, indicating that the thermal conditions near the water bodies are sometimes slightly more comfortable and sometimes more uncomfortable.

#4. LITERATURE

An analysis of 29 scientific papers reporting cooling effects of rivers, ponds and lakes, resulted in a typical cooling effect of less than 1.5°C for air temperature (maxima may be larger). Only few studies report PET¹, showing inconsistent results from cooling to warming effects.

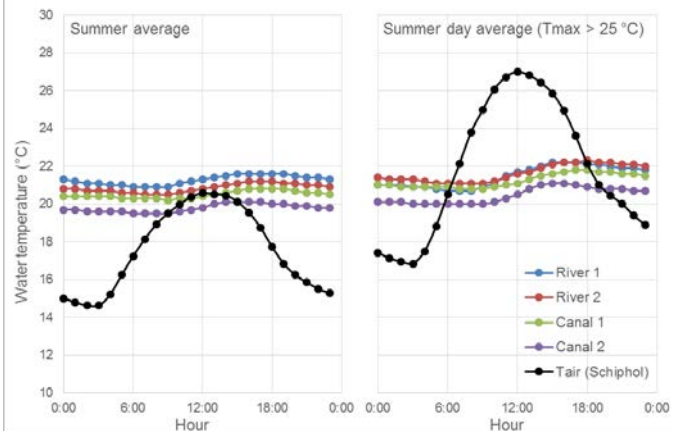


#1. METEOROLOGICAL SIMULATIONS



Micrometeorological simulations with Envi-met were performed to evaluate the cooling effect of eight design prototypes of Dutch urban water bodies for a hot summer day. The results in the figure above show a small or negligible cooling effect during daytime (3p.m.) – about 0.5 °C in air temperature and 1 °C in PET¹ at 1.5m above the water surface – by reference to a situation without water. During nighttime (not shown), a thermal effect of the water is virtually absent.

#3. OBSERVED WATER TEMPERATURES



Four time-series of observed water temperatures of rivers and canals in Amsterdam and air temperatures at Schiphol indicate that during summer, the water temperature generally exceeds the air temperature all day. Rivers and canals might in fact contribute to warming the environment and can deliver cooling over only a small period during the hottest days.

¹ PET (physiological equivalent temperature) is a thermal comfort index, taking into account the effects of air temperature, humidity, radiation and wind speed on human thermal sensation.

Conclusion: The cooling effects of small water bodies in cities are generally negligible.

Advise: Urban designers need to carefully weigh the use of blue spaces to reduce urban heat. Water sprays, the combination of water, shading and ventilation, and tangible water can be effective cooling measures.