
G.J. Steeneveld, S. Koopmans, B.G. Heusinkveld, R.J. Ronda, L.W.A. van Hove, A.A.M. Holtslag
Meteorology and Air Quality Section, Wageningen University, Wageningen, The Netherlands.

Attention to urban heat islands (UHI) and heat stress during summer episodes has recently increased. The European severe heat waves in 2003 and 2006 underlined that heat stress results in substantial thermal discomfort to citizens and adverse health effects for vulnerable groups (e.g. children, elderly, persons with cardiovascular diseases), especially during long term heat exposure. This study quantifies the climatology, both mean values and variability of the UHI and human comfort (in terms of wet bulb globe temperature) in the Netherlands for urban units ranging from small villages to cities. It is noted that Dutch cities have special features. First water availability is relatively high due to high the ground water level and because many cities are characterized by a network of canals. Second, the Netherlands are located close the coast, thus sea breeze circulations may affect the UHI. Third, the western part of the Netherlands covers one of the most densely populated area in the world. Unfortunately, routine meteorological observations in urban areas are scarce, and often limited to intensive field campaigns. Therefore, long term meteorological observations by hobby meteorologists are utilized to quantify the UHI for Dutch cities with variable size and morphology. We find the mean daily maximum UHI is substantial in all urban areas, ranging between 1.3-3.4 K, and a 95 percentile ranging from 3.1-7.6 K. Also, UHI appears to be better related to population density of the neighborhood than for the city’s total population. Finally a significant relation between increased green vegetation and reduced UHI was established.