

Supplementary Materials:

Sustainability as a function of an area: application of multi-criteria evaluation in assessing the effectiveness of nature-based solutions

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The meteorological condition during heatwaves in August 2019.

In the last decade of August 2019, the city of Wrocław was hit by a heat wave caused by stable advection of polar-continental air from the E, SE and S sectors, which started on August 23, 2021 and was controlled by the high-pressure system over Central Europe and Scandinavia. The period of very hot days, with maximum temperature exceeding 30 °C and T min above 15 °C, began on August 26, 2019 and lasted until the end of the month. The average daily wind speed for this period did not exceed 2 m/s, and the calm frequency was 12.5% on average per day. The radiative weather was dominant, with a slight convective cloudiness during the day and relative sunshine duration at the level of 70 % (exception - August 29, 2021, with a development of significant cloud cover in the afternoon and evening hours).

Relative humidity during analysed heat wave ranged from 30 % during the day to 100 % at night, and daily averages of this value ranged from 65 to 75 %. The daily average water vapour content was 17 - 20 hPa, with an average water vapour deficit of 11 - 13 hPa. The maximum values of the water vapour deficit during the day were above 30 hPa, the measured values of evaporation were on average 2.1 mm per day. On August 27, 2021 which has been analysed in this study, the prevailing meteorological conditions were typical for the discussed period (Table S1.).

All data are public available via <https://opendata.meteo.uni.wroc.pl/>.

Table S1. The meteorological conditions during heatwaves in August 2019

Variables		20.08	21.08	22.08	23.08	24.08	25.08	26.08	27.08	28.08	29.08	30.08	31.08
Pavg [hPa]		1006.8	1012.6	1013.7	1012.2	1009.7	1007.8	1006.5	1005.6	1002.9	1003.7	1007.6	1003.9
V [m/s]	avg	1.3	1.4	1.5	1.3	1.9	1.8	1.4	1.3	1.5	1.0	1.0	1.7
	max	8.0	6.6	6.6	5.0	6.6	5.5	9.4	5.2	6.0	8.8	5.8	6.2
Wind direction		N	NW	E	ENE	E	ENE	E	E	S	S	E	E
Calm freq. [%]		14.9	17.1	20.6	14.2	1.0	0.7	9.0	13.2	11.3	15.6	22.3	3.8
T [°C]	avg	19.2	16.1	17.1	20.0	21.6	22.0	23.6	23.5	24.5	23.3	23.1	23.2
	max	25.7	21.8	23.4	26.8	28.7	29.9	32.4	31.1	32.0	33.0	31.0	31.5
	min	14.3	11.4	10.4	11.5	14.2	14.8	15.7	17.2	18.6	16.9	17.1	16.0
T ₀	avg	19.8	17.2	17.9	21.8	23.6	24.1	26.3	25.5	26.4	24.9	24.8	25.1

[°C]	max	31.1	28.4	30.1	35.8	39.0	41.8	43.7	41.0	42.3	44.1	41.3	40.6
	min	13.4	11.1	10.1	10.8	13.0	13.5	14.5	15.6	17.4	15.4	15.6	14.4
R [mm]		1.1	32.6	2.1	0	0	0	0	0	0	0	2.4	0
RH [%]	avg	76.5	85.2	74.4	64.5	61.5	59.6	66.1	69.1	67.4	74.9	69.6	64.8
	max	100.0	100.0	100.0	100.0	99.8	90.9	100.0	100.0	100.0	100.0	100.0	100.0
	min	35.3	46.6	40.1	34.1	33.6	31.2	29.2	32.7	30.3	28.3	31.8	30.6
e [hPa]	avg	16.0	15.2	13.8	14.2	14.9	14.7	17.8	18.6	19.3	20.0	18.2	16.8
	max	19.8	18.5	17.0	17.1	17.0	17.4	22.1	21.3	22.5	26.2	22.5	21.3
	min	11.2	12.0	11.4	11.5	12.7	12.5	13.7	14.4	14.2	13.6	13.9	13.7
Ev [mm]		0.8	1.3	0.6	1.6	2.1	2.7	2.4	2.4	2.1	2.2	1.8	1.9
SD [h]		2.4	4.2	7.6	10.0	12.3	11.1	12.6	10.9	10.1	8.1	10.8	12.4
SD [%]		16.4	29.3	53.2	70.3	87.0	78.9	90.1	77.8	72.6	59.0	78.6	90.5
It sum [kWh/m²]		2.8	2.8	4.6	5.2	5.9	5.2	5.6	5.0	4.9	4.4	4.9	5.5

P – atmospheric pressure, V – wind speed, T – air temperature at 2 m a.g.l., T₀ – surface temperature, R – sum of precipitation, RH – relative humidity, e – vapour pressure, Ev – evapotranspiration, SD – sunshine duration, It – solar radiation, avg – daily mean, max – maximum value for given day, min – minimum value for given day