Pavement-Watering as a Way of Adapting Paris to Increasing Heat-Wave Frequency and Intensity

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CONTEXT
Paris Urban Heat Island (UHI)

After 2050, every other summer will be equivalent to 2003...

Average summertime temperature in France

UHI intensity is significantly amplified by heat-waves :

\[ \Delta T = +10^\circ C \]

PAVEMENT-WATERING FOR EMERGENCY COOLING

Principle

\[ T_{\text{Max}} > 31^\circ C\]

\[ T_{\text{Min}} > 21^\circ C\]

Evaporation

Advection

Weather Station Design

Heat storage

Heat release

Temperature, Humidity, Heat Flux (5 cm depth)

Globe Temperature, 658 m height

Temperature, Heat Flux, 8 cm depth

ΔT = -13°C

Moy = 24.0

ΔT = -100 to -150 W/m²

ΔT = -0.8°C

ΔT_{UTC} = -1.5°C

CITY-WIDE WATERING?

Water Consumption

Optimal watering rate: 2.2 mm/day

25 km² of roads and sidewalks

56 000 m³/day

i.e. 25 L/day per capita

1/2 shower

Influence of Materials

Optimal Watering Frequency

Asphalt

Sidewalk

Asphalt

Road

10-20 mins

30 mins

Influence of Orientation

Watered Area

Control Area