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DOI

[10.5194/icuc12-816](https://doi.org/10.5194/icuc12-816)

Publication date

2025

Document Version

Final published version

Citation (APA)

Peng, Z., Lugten, M., Wuite, F. G. E., Luo, W., & Santucci, D. (2025). *Coping with Urban Heat and Noise: A case study at Schiphol Airport*. Abstract from 12th International Conference on Urban Climate, Rotterdam, Netherlands. <https://doi.org/10.5194/icuc12-816>

Important note

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ICUC12-816, updated on 21 Aug 2025

<https://doi.org/10.5194/icuc12-816>

12th International Conference on Urban Climate
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Coping with Urban Heat and Noise: A case study at Schiphol Airport

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Urban heat stress and noise significantly impact the health and well-being of urban inhabitants. This biometeorological study analyses microclimate, sound, and human perceptions in three vegetative courtyards near Schiphol Airport, Amsterdam. The courtyards operate with sixteen Kestrel heat-stress trackers and six Munisense microphones for year-round microclimate and soundscape monitoring to inform urban design strategies to improve pedestrian thermal and acoustical comfort.

A human measurement campaign was conducted on 23-July-2024, involving 24 student participants (aged 22–28) equipped with skin-temperature sensors (*iButtons*) and heart-rate wristbands (*Polar*). They completed mobile questionnaires on 'right-here-right-now' comfort perceptions during three transect walks following a stop-and-go protocol (3-minute intervals, total duration: 60 minutes). Walks spanned three courtyards: one with a vertical vegetative wall, another with 36 *Tilia × europaea* potted trees, and a third featuring a slanted roof with an overhang. The study examines the interplay between heat, noise, and environmental perceptions across courtyard designs.

Findings suggest overhangs provide significant cooling (UTCI -10°C) and noise reduction due to sound shadowing. Slanted roofs scatter aircraft noise (LAeq -5 dB(A)) but have minimal cooling effects. Green walls diffract sound but reflect short-wave radiation, limiting cooling. Trees intercept solar heat effectively but offer limited aircraft noise reduction due to foliage gaps.

Perceptual analyses indicate the tree courtyard offered optimal thermal (TSV) and acoustical comfort (ASV). A mixed-linear regression analysis tested five hypotheses on TSV, ASV, UTCI, and LAeq. One hypothesis was rejected: heat stress and aircraft noise do not confound acoustical perception. Two were partially supported: thermal and/or acoustical perception may confound acoustical perception. Two were fully supported: aircraft noise can confound thermal perceptions and acoustical perception can confound thermal perception.

The discussions and conclusions present evidence-based design and planning strategies to mitigate environmental stressors and enhance pedestrians' psychological and behavioural adaptations to heat and noise in urban environments.