

HEat Robustness In relation To AGEing cities (HERITAGE) Programme

Wim Timmermans¹, Marjolein van Esch², Angèle Reinders³, Gert-Jan Steeneveld⁴, Remko Uijlenhoet⁵

¹ University of Twente, Faculty of Geo-information Science and Earth Observation, Department of Water Resources, Enschede, The Netherlands (NL)

email: w.j.timmermans@utwente.nl, Tel: +31-53-4874488, Fax: +31-53-4874336

² Delft University of Technology, Dept. Urbanism - Environmental Technology and Design, NL

³ Eindhoven University of Technology, Dept. Energy Technology, NL

⁴ Wageningen University, Dept. Meteorology and Air Quality, NL

⁵ Delft University of Technology, Dept. Water Management - Water Resources, NL

Abstract.

Due to ongoing climate change and urbanization, societies face challenges concerning environmental quality, energy management and citizens' health. While many past observational and modelling studies concentrated on understanding urban microclimate and how humans experience this, focus has been on relatively modern infrastructure ("street canyons") regarding modelling and observational efforts which showed less success over historical districts. Many cities have a significant share of aged and historical buildings with unique and different street profiles from modern infrastructure, which raises additional challenges in the energy transition due to low energy-efficiency and restrictions to required interventions.

Our research programme will develop a high-tech sensing and design system aiming at detection, reduction and prevention (by monitoring and design) of heat-stress occurring due to ageing of built environmental settings and buildings in cities, through socio-technical solutions. This integral system will detect and forecast spatiotemporal patterns of heat stress at unprecedented resolutions (1m scale), aiming at technological solutions to reduce and mitigate indoor and outdoor heat stress through developing urban design guidelines and connecting the energy transition, housing demands, repurposing areas, climate adaptation and digitalisation.

The HERITAGE high-tech sensing and design system necessitates a multi-disciplinary research ecosystem approach involving earth observation, urban hydro-meteorology and climatology, urban design and sustainable infrastructural energy systems; i.e. expertise-fields well represented by the consortium. Therefore, parallel to the sensing, long-term research lines are rolled out on robust hydro-meteorological, design and energy solutions, both (sensing and technological solutions) at multiple spatiotemporal scales and forms. Concretely, these research lines fill knowledge gaps in climate policies through innovative techniques for analysis, simulation, development and experimental testing of newly designed (1) multiscale urban heritage canopy layer schemes for climate models (2) multiscale form-microclimatic relationships and (3) sustainable energy systems, all ideally suited for application in aged neighbourhoods and buildings.

Keywords: Urban heat, remote sensing, spatiotemporal modelling, building energy system, urban design

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