

Reducing urban heat island effects to improve urban comfort and balance energy consumption in Bucharest (Romania)

Dan Constantinescu (1), Cristina Victoria Ochinciuc (2), Sorin Cheval (3), Ionuț Comșa (4), Igor Sîrodov (5), Radu Andone (2), Gabriela Caracas (1), Cerasella Crăciun (2), Alexandru Dumitrescu (3), Mihaela Georgescu (2), Ioan Ianoș (5), Cristina Merciu (5), Dan Moraru (1), Ana Opreș (2), Mirela Paraschiv (5), Sonia Raetchi (2), Irina Saghin (5), Andrei Schwab (5), and Natașa Tătui-Văidianu (5)

(1) Nemetschek, Bucharest, Romania, (2) University of Architecture and Urbanism "Ion Mincu", Bucharest, Romania, (3) National Meteorological Administration, Bucharest, Romania, (4) eSolutions Grup, Bucharest, Romania, (5) University of Bucharest, Interdisciplinary Centre for Advanced Researches on Territorial Dynamics

Corresponding author: Dr. Sorin Cheval, sorin.cheval@icub.unibuc.ro

In the recent decades, extreme temperature events and derived hazards are frequent and trigger noteworthy impacts in Romania, especially over the large urban areas. The cities produce significant disturbances of many elements of the regional climate, and generates adverse effects such as Urban Heat Islands (UHI). This presentation condenses the outputs of an ongoing research project (REDBHI) developed through (2013-2017) focused on developing a methodology for monitoring and forecasting indoor climate and energy challenges related to the intensity of UHI of Bucharest (Romania), based on relevant urban climate zones (UCZs). Multi-criteria correlations between the UHI and architectural, urban and landscape variables were determined, and the vulnerability of buildings expressed in the form of transfer function between indoor micro-climate and outdoor urban environment. The vulnerability of civil buildings was determined in relation with the potential for amplifying the thermal hazards intensity through the anthropogenic influence. The project REDBHI aims at developing innovative and original products, with direct applicability, which can be used in any urban settlement and have market potential with regards to energy design and consulting. The concrete innovative outcomes consist of a) localization of the Bucharest UCZs according to the UHI intensity, identifying reference buildings and sub-zones according to urban anthropic factors and landscape pattern; b) typology of representative buildings with regards to energy consumption and CO₂ emitted as a result of building exploitation; c) 3D modelling of the reference buildings and of the thermal/energy reaction to severe climatic conditions d) empirical validation of the dynamic thermal/energy analysis; d) development of an pilot virtual studio capable to simulate climate alerts, analyse scenarios and suggest measures to mitigate the UHI effects, and disseminate the outcomes for educational purposes; e) compendium of technical solutions for mitigating the UHI impacts and sustainable reconfiguration of urban settlements, comprising packages of architectural and urban and landscape planning solutions. This study was funded by the Romanian Programme Partnership in Priority Domains, PN – II – PCCA – 2013 – 4 – 0509 - Reducing UHI effects to improve urban comfort and balance energy consumption in Bucharest (REDBHI).