Development and application of mitigation and adaptation strategies and measures for counteracting the global Urban Heat Islands phenomenon (UHI)

Termin: 2011-05-01 - 2014-04-30

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Akronim: UHI
Program: Program Operacyjny Europa Środkowa
Partner wiodący: Regional Agency of Environmental Protection in Emilia-Romagna, Włochy
Partner zagraniczny: Regional Agency for Environment Protection in Emilia-Romagna
Instytucja zamawiająca: Komisja Europejska
Numer projektu: 3CE292P3
Oficjalna strona projektu



The urban heat island (UHI) is a microclimatic phenomenon that occurs in the metropolitan areas. It consists in a significant increasing of the temperature in the urban area respect to the surrounding peri-urban and rural neighborhoods. This phenomenon is known and studied since eighties and is caused by:

- physical characteristics of the surfaces: because of the thermal and radioactive proprieties of the materials composing urban surfaces, such as concrete and asphalt, that absorb rather than reflecting solar radiations;
- lack of natural evaporative surfaces (vegetation) that, in rural areas, contribute to maintain a stable energy balance;
- augmentation of the vertical surface that both provide an increased surface absorbing and reflecting solar radiation as well as block winds that could contribute to the lowering of the temperature (canyon effect);
- human activities that mainly consists in heat produced by heating and cooling plants, industrial activities, vehicles, etc.

The intensity of UHI phenomenon rises proportionally to the dimension and population of the urban area; consequently, it is doomed to become more severe in the coming years due to the constant growing of number of people living in urban areas and has a strong and immediate effect on the health of people living in cities. The UHI effects are directly related to the climate change phenomena as well.

The UHI project, starting from a deep analysis of the phenomenon carried out with traditional micrometeorology techniques and remote sensing techniques, is designed to both develop mitigation and risk prevention and management strategies.

The general objective of the project is to trigger the elaboration of policies and practical actions to reduce the impact of UHI phenomenon. This is an issue common to all large urban agglomerations in Central Europe area.

Project aims are: 1) to establish a transnational attention for the prevention, adaptation and mitigation of the risks arising from this micro-climate phenomenon, 2) to tackle UHI issue moving European policies towards a more responsible use of our environment. This will be done addressing global warming impact on urban environment and citizen life. Outcomes will be on the one hand rules and policies for planning new urbanizations less exposed to UHI phenomenon and on the other hand action

plans to mitigate the impact of UH on citizens' health.

Project output actions will bring CE cities towards more sustainable urbanization model: they'll be less exposed to UHI phenomenon, so improving life quality but also decreasing energy costs (for summer cooling) and health care system ones (for sensible populations). UHI project helps CE's cities to set measures to become attractive places to invest in and to live in.

UHI project is carried out in 8 most relevant metropolitan areas and MEGAs (Mega Urban Regions) of Central Europe cooperation programme: the metropolitan cluster of Bologna – Modena (IT) and the urban corridor of Venice – Padua (IT), the cities of Wien (AT), Stuttgart (D), Lodz & Warsaw (PL), Ljubljana (SI), Budapest (HU) and Prague (CZ).

Web pages

The UHI AtlasDecision Support System

Articles

- Bio-thermal conditions of some housing estates in Warsaw 1
- Bio-thermal conditions of some housing estates in Warsaw 2
- The influence of spatial organization on bio-thermal conditions of urban areas
- Zmiany klimatu, miejska wyspa ciepła i choroby alergiczne (in polish)

Promotion materials

- Biuletyn nr 1/2012 (in polish)
- Biuletyn nr 2/2013 (in polish)
- Folder Miejska Wyspa Ciepła w Warszawie (in polish)
- Folder Urban Heat Island in Warsaw (in english)
- Miejska Wyspa Ciepła w Warszawie - Informator (in polish)

Lectures

Seminar 03.10.2012

- Informacja o założeniach i celach projektu UHI (in polish)
- Warunki powstawania i zróżnicowanie miejskiej wyspy ciepła w Warszawie (in polish)
- Wpływ zagospodarowania osiedli mieszkaniowych na warunki klimatu lokalnego (in polish)
- Wpływ zjawiska miejskiej wyspy ciepła na zdrowie (in polish)

Seminar 28.05.2014

- Ogólnie informacje o projekcie UHI i jego wynikach (in polish)
- Sieć monitoringu miejskiej wyspy ciepła w Warszawie. Zróżnicowanie mikroklimatyczne wybranych osiedli (in polish)
- Wpływ zjawiska miejskiej wyspy ciepła na zdrowie (in polish)
- Profil alergenowości szaty roślinnej terenów pilotażowych projektu UHI (in polish)
- Rozwój urbanistyczny Warszawy – plany i rzeczywistość (in polish)
- Miejska wyspa ciepła, a rozwiązania architektoniczno-urbanistyczne (in polish)

In press

- I w Warszawie jest miejska wyspa ciepła (PAP – in polish)
- Naukowcy potwierdzają: Centrum Warszawy wyspą gorąca (GW – in polish)

Publikacje

Abstrakty, recenzje, notatki

- Błażejczyk Krzysztof, Kuchcik Magdalena, *Szmyd Jakub*, *Milewski Paweł*: Dynamic of urban heat island in selected housing estate in Warsaw – possibilities of mitigation and adaptation. [w]: IGU 2014 Book of Abstracts. Cracow: IGU, 2014 - 1 s.
- Błażejczyk Krzysztof, Kuchcik Magdalena, Baranowski Jarosław, *Szmyd Jakub*, *Milewski Paweł*, *Błażejczyk Anna*:

Bio-thermal conditions of some housing estates in Warsaw. [w]: Bioclimate 2012, "Bioclimatology of Ecosystems", International Scientific Conference, August 29th-31st 2012, Usti nad Labem, Czech Republic. Conference Proceedings. Eds. V. Kožnarová, S. Sulovská, L. Hájková. Usti nad Labem: Ceska bioklimatologicka spolecnost, 2012 - 2 s.

Artykuły, rozdziały, referaty i inne

- Błażejczyk Krzysztof, Lindner-Cendrowska Katarzyna, *Błażejczyk Anna*: Assessment of heat stress at various outdoor spaces in the city (an example from Warsaw). [w]: Proceedings of the 15th International Conference on Environmental Ergonomics, 2013, 11-15th February, Queenstown, New Zealand,. Eds. J.D. Cotter, S.J.E. Lucas, T. Mundel. Queenstown: International Society for Environmental Ergonomics, 2013 - s. 211-214.
- Lindner-Cendrowska Katarzyna, Błażejczyk Krzysztof: Clothing habits during tourism and leisure activities in urban areas. The case study of Warsaw (Poland). [w]: Proceedings of the 15th International Conference on Environmental Ergonomics, 2013, 11-15th February, Queenstown, New Zealand,. Eds. J.D. Cotter, S.J.E. Lucas, T. Mundel. Queenstown: International Society for Environmental Ergonomics, 2013 - s. 289-291.

Monografie od 2013 roku

- Błażejczyk Krzysztof, Kuchcik Magdalena, *Milewski Paweł*, *Dudek Wojciech*, *Kręcisz Beata*, *Błażejczyk Anna*, *Szmyd Jakub*, *Degórska Bożena*, *Pałczyński Cezary*: Miejska wyspa ciepła w Warszawie. Uwarunkowania klimatyczne i urbanistyczne. Warszawa: Wydawnictwo Akademickie Sedno, 2014 - 171 s.

Mapy, atlasy

- *Milewski Paweł*, Błażejczyk Krzysztof, Kuchcik Magdalena, *Szmyd Jakub*: Miejska wyspa ciepła w Warszawie [7 map]. [w]: Kalejdoskop GIS. T.3. Red. Agnieszka Kalinowska-Szymczak. Warszawa: ESRI Polska, 2014 - s. 106-107.

Artykuły od 2013 roku

- Kuchcik Magdalena, *Dudek Wojciech*, Błażejczyk Krzysztof, *Milewski Paweł*, *Błażejczyk Anna*: Two faces to the greenery on housing estates–mitigating climate but aggravating allergy. A Warsaw case study. - Urban Forestry & Urban Greening 2016, 16 - s. 170-181.
- Błażejczyk Krzysztof, Kuchcik Magdalena, *Błażejczyk Anna*, *Milewski Paweł*, *Szmyd Jakub*: Assessment of urban thermal stress by UTCI – experimental and modelling studies: an example from Poland. - Erde 2014, 145, 1-2 - s. 16-33.
- Błażejczyk Krzysztof, Kuchcik Magdalena, *Milewski Paweł*, *Błażejczyk Anna*, *Szmyd Jakub*: Wyspy ciepła w Warszawie - przyczyny, zasięg i możliwości ograniczenia. - Przegląd Urbanistyczny 2014, 8 - s. 21-25.

Prace popularno-naukowe

- Błażejczyk Krzysztof, Kuchcik Magdalena, *Milewski Paweł*, *Szmyd Jakub*, *Dudek Wojciech*, *Błażejczyk Anna*, *Kręcisz Beata*: Miejska wyspa ciepła w Warszawie - informator. Warszawa: Instytut Geografii i Przestrzennego Zagospodarowania im. Stanisława Leszczyckiego Polskiej Akademii Nauk, 2014 - 32 s.

Rozdziały od 2013 roku

- Błażejczyk Krzysztof, Kuchcik Magdalena, *Dudek Wojciech*, *Kręcisz Beata*, *Błażejczyk Anna*, *Milewski Paweł*, *Szmyd Jakub*, *Pałczyński Cezary*: Urban Heat Island and bioclimatic comfort in Warsaw. [w]: Counteracting Urban Heat Island effects in a global climate change scenario. Ed. Francesco Musco. Cham: Springer International Publishing, 2016 - s. 377-395.