



The Surface Urban Heat Island of Modena, Italy: a multi-temporal analyses using remote sensing open data.

Tommaso Barbieri, Francesca Despini, and Sergio Teggi

University of Modena and Reggio Emilia, DIEF, Department of Engineering, Italy (tommaso.barbieridief@unimore.it)

Global warming is one of the most discussed topic today, both in the scientific community and in the popular debates. Urbanization is one of the anthropic causes of global warming with an increasing trend. One of the consequence of Urbanization of the city is the so-called Urban Heat Island (UHI), namely, urban areas with significantly higher atmospheric temperature than surrounding rural areas.

In this study a multi-temporal analyses has been done on the Modena district, Italy. Landsat-8 images have been elaborated, implementing the Semi-Automatic Classification Plugin for QGIS, in order to obtain the Land Surface Temperature (LST) values and the Normalized Difference Vegetation Index (NDVI).

For every pixel, LST and NDVI values were extrapolated from each areas in which cities are normally divided (countryside, suburbs and city centre). The study has investigated the presence of the Surface Urban Heat Island (SUHI), and his trend from 2014 until 2017.

The study underlined an average variation of 2.2 °C of the LST values between City Centre and Countryside. The results have showed the presence of SUHI during hot seasons and the opposite phenomenon during cold seasons. Some critical areas of the city, corresponding to industrial zones, with high LST values were also found. NDVI maps were useful to identify the vegetation land covering and to correlate it with the LST values.

This study confirmed that high values of LST correspond to low values of NDVI (bare soil or artificial covering). In case of the image acquired on 2014-04-07, for every area of the municipalities a good correlation was obtained: R2 of 0.84 for the City Centre, of 0.71 for the Suburbs, of 0.63 for the Countryside.

The study has shown that is possible to observe the SUHI phenomenon also in a little city and that can be investigated using a free and accessible methodology. The methodology has shown how cities can use remote sensing to respond to climate change, providing a useful instrument for urban planning.