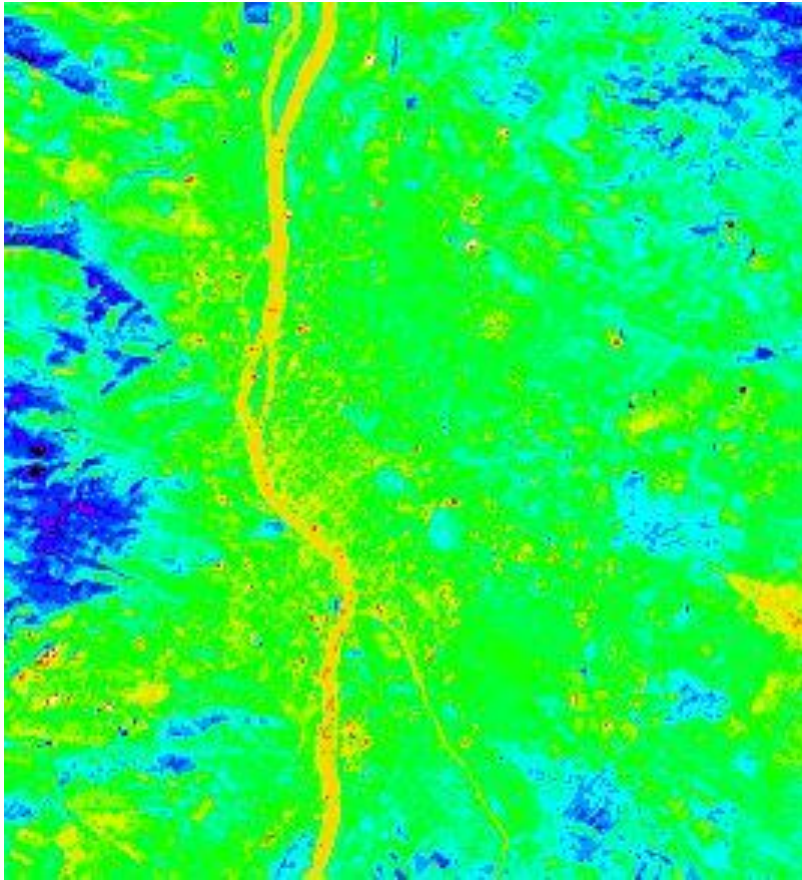


Identifying urban surface temperatures from thermal infrared satellite images



Thermal infrared satellite image shot on 2nd February 2003



The flight strip of the Ferihegy airport in winter case

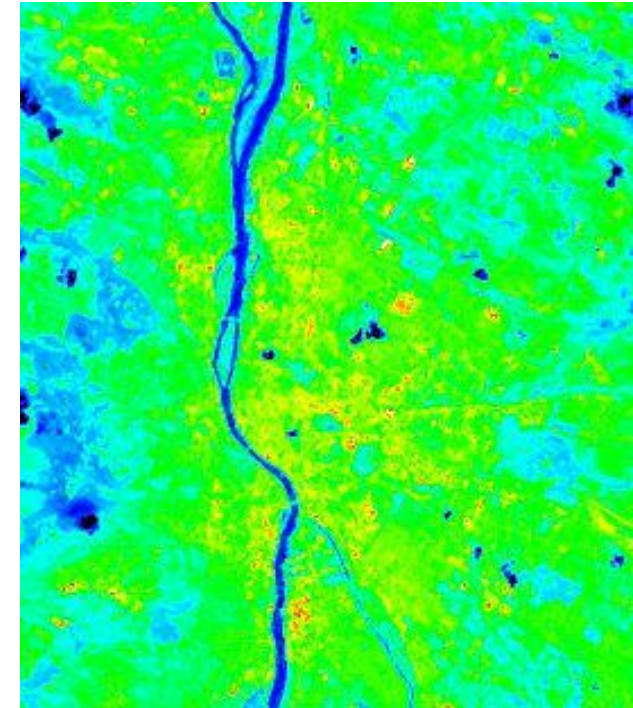
DATA SOURCES

1st data source:

Thermal infrared satellite images made by the ASTER sensor, spatial resolution 90 m
(<https://LPDAAC.usgs.gov>)

Surface kinetic temperature, not ordinary meteorological temperature!

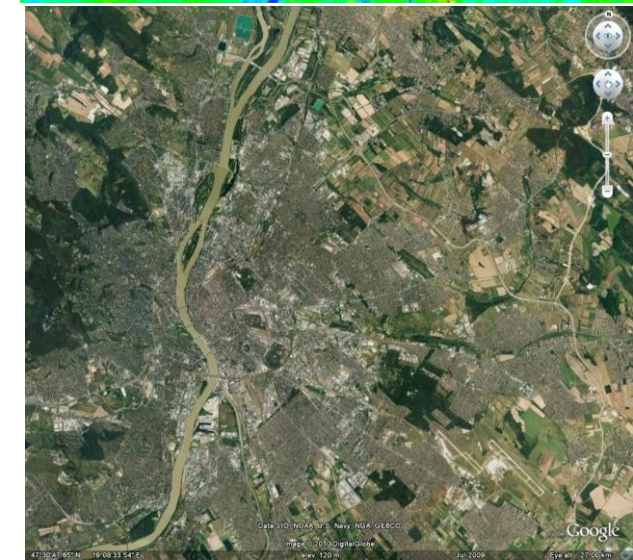
Three pictures: 6th July 2001, 4th May 2002, 2nd February 2003.



2nd data source: Regulation plans of Budapest,
City Structure Plan,
Metropolitan Regulation Framework Plan

3rd data source:

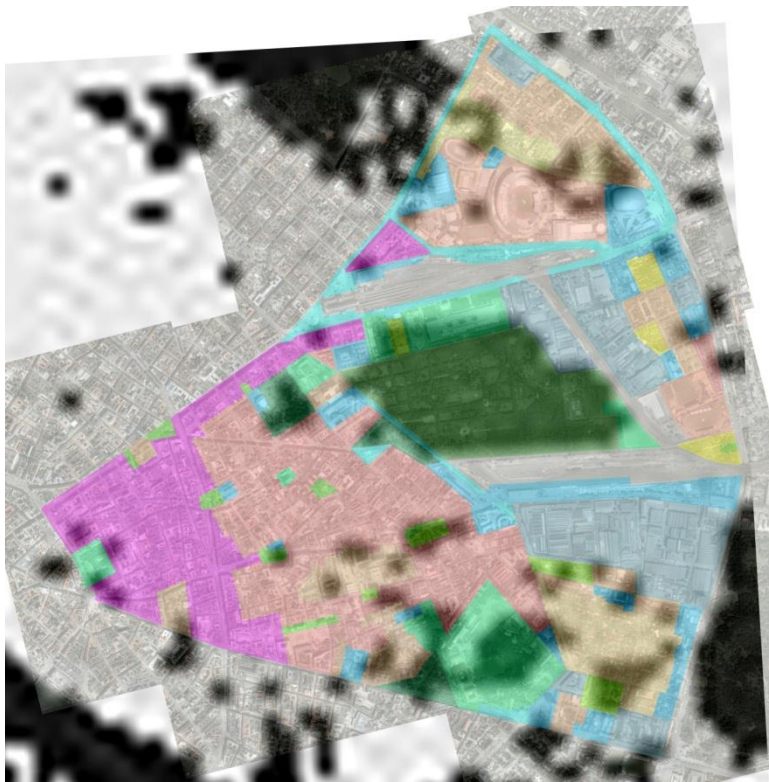
Google Earth Map, ortophotos



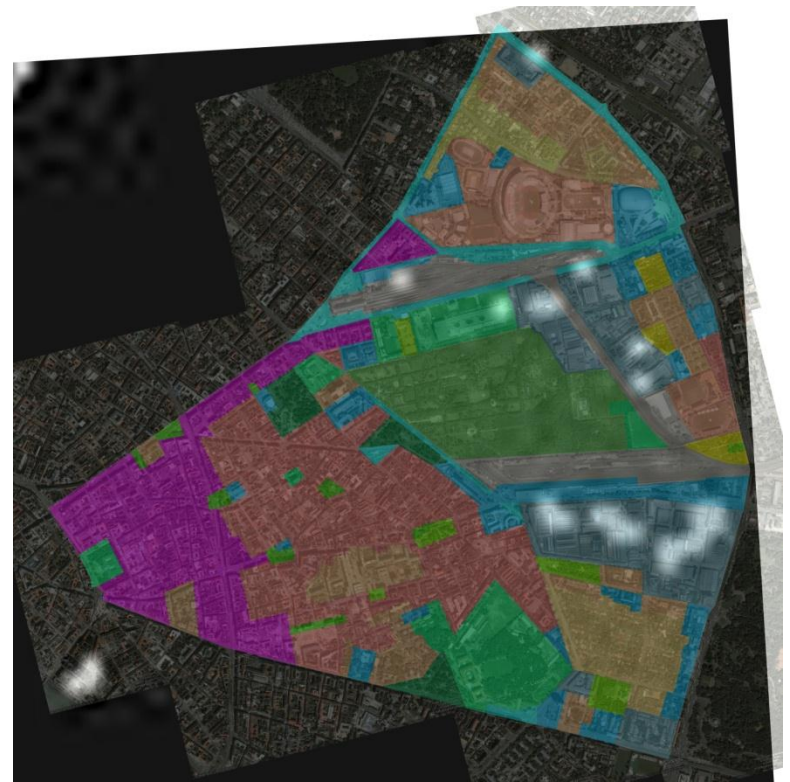
METHOD

Creating „composite” pictures from the Google Earth Map or the orthophotos and from the thermal infrared satellite images.

Given limit (parameter) temperature: dark and light areas represent the hotter and colder zones.



4th May 2002, 33 °C

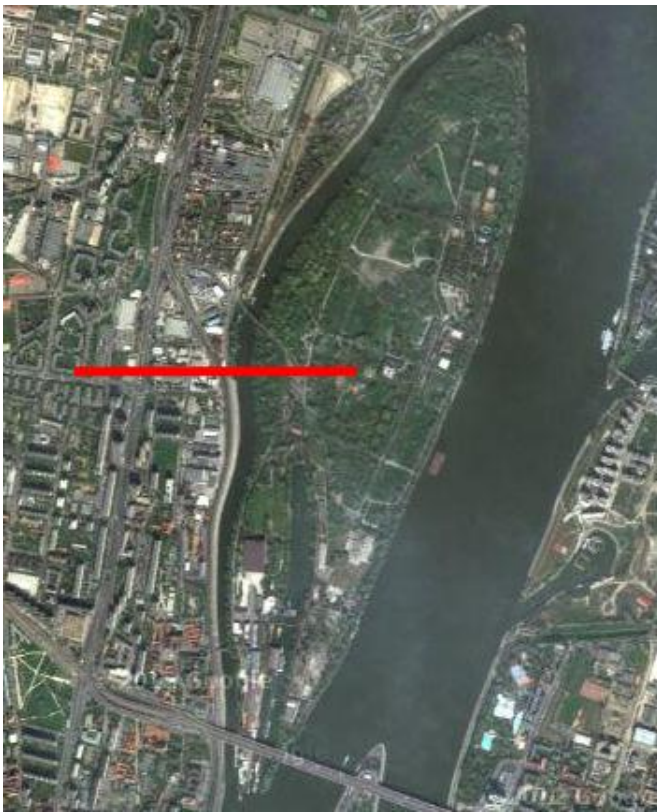


4th May 2002, 41 °C

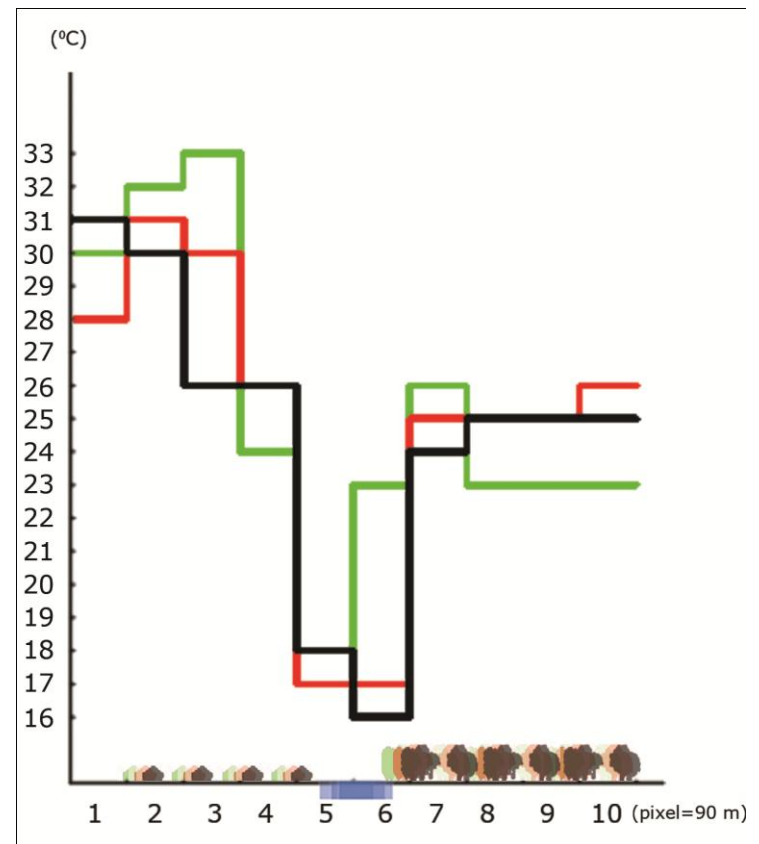
METHOD

Creating so called „thermal cross sections” measuring the surface temperature along a path.

This method makes possible the measuring the thermal transition on the border of different surfaces .



4th May 2002, 33 °C



4th May 2002, 41 °C

RESULTS

The most important results are the following:

In the case of similar sized, heated and similarly intensely used buildings even 12°C (!) surface temperature differences can occur, depending mainly on the quality of the surface covering.

Urban water surfaces are the coolest surfaces in the summer period and in transitional seasons, while the same water surfaces are among the warmest surfaces in the wintertime. This remarkable conditioning effect is significant even in the case of relatively small water surfaces; furthermore the lakeside vegetation can also play an outstanding role in increasing this effect.

Surfaces covered by vegetation are the second most effective surface types (after water bodies) in mitigating the urban heat island. The cooling effect of the vegetation is more complex than in the case of water bodies. It can be stated that the higher the rate of biological activity, the greater the cooling effect.

The different built-up types significantly influence the surface temperature of the urban blocks. When surveying the unbroken row of buildings and neighbouring freestanding buildings, the blocks with unbroken row of buildings proved to be warmer by approx. 3-4°C than those which consist of freestanding buildings.

Thank you for your attention!