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MIASTO Z KLIMATEM

How to adapt cities to climate change with urban greening?

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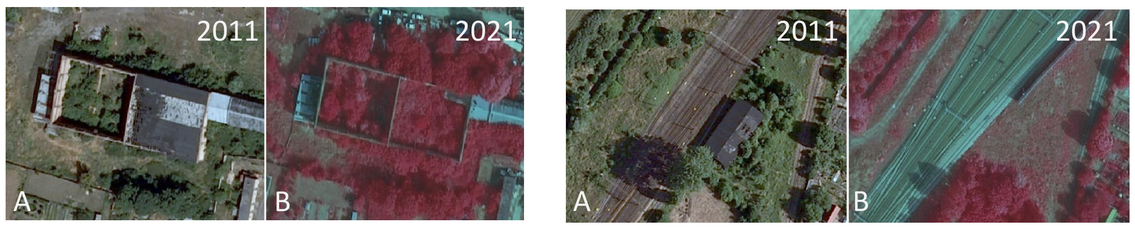
Introduction

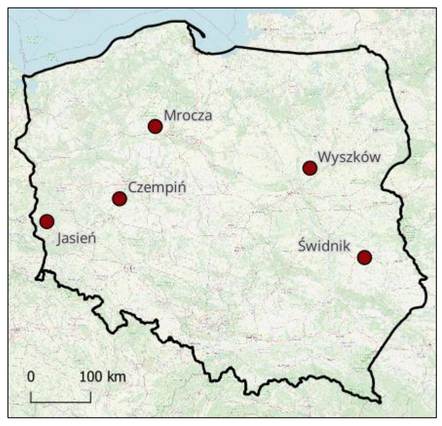
Local inventory is fundamental for an appropriate and rational management of urban greening. It provides decision-makers with information on the qualitative and quantitative state of urban vegetation and its spatial distribution. This is the starting point for further efforts, including the design of green infrastructure. Mapping urban greening is important in the context of strengthening resilience to climate change and improving the life quality of residents. The maps prepared for the cities not only show the current state of urban greenery, but also indicate how has it changed over the last 10 years.



An examples of the change in land use in the analysed cities in recent years. On the left (A) is an orthomosaic in natural colors from 2011, on the right (B) - in color-infrared composition from 2021.

Cities

In "City with climate" project, Forest Research Institute carried out the Urban Green Package. It included extensive analysis for five selected cities. Those cities received complex information on the quantity and quality of urban green resources, its changes over time, and the accessibility of forests.



City	Total Population	Total area [km²]	Population density [people/km²]
Czempiń	4,822	3.6	1 452
Jasień	4,121	4.8	860
Mrocza	4,156	5.0	831
Świdnik	37,396	20.4	1 838
Wyszków	26,349	20.8	1 263

Data and workflow

Remote sensing data

The main idea was to use existing data from publicly available sources. In practise, we mainly relied on airborne laser scanning data (C) and aerial photography (D), as the resolution of satellite imagery (E) was not suitable for detailed detection of urban greenery.

Field works

We began our work with a meeting with city authorities. After consultations, a representative sample of trees were captured, including earlier formulated needs. For every measured tree, an information on the species, diameter at breast height (F), coordinates of tree position (G), tree height and its health status was recorded. In practice, it was sometimes even a challenge to determine the number of tree's trunks (H).

Data processing

The point cloud was processed into a crown height model (I). This was the input for the segmentation algorithm, which generates segments of individual trees and their tree tops (J). An important part of the work was the classification of the orthomosaics. Different land cover classes were assigned. For cities that provided information on the number of residents at a given address, the population distribution aspect was also taken into account. Every city was spatially divided into a basic units of gridded pattern (K), which then served for further statistical analyses.

Results

Urban changes

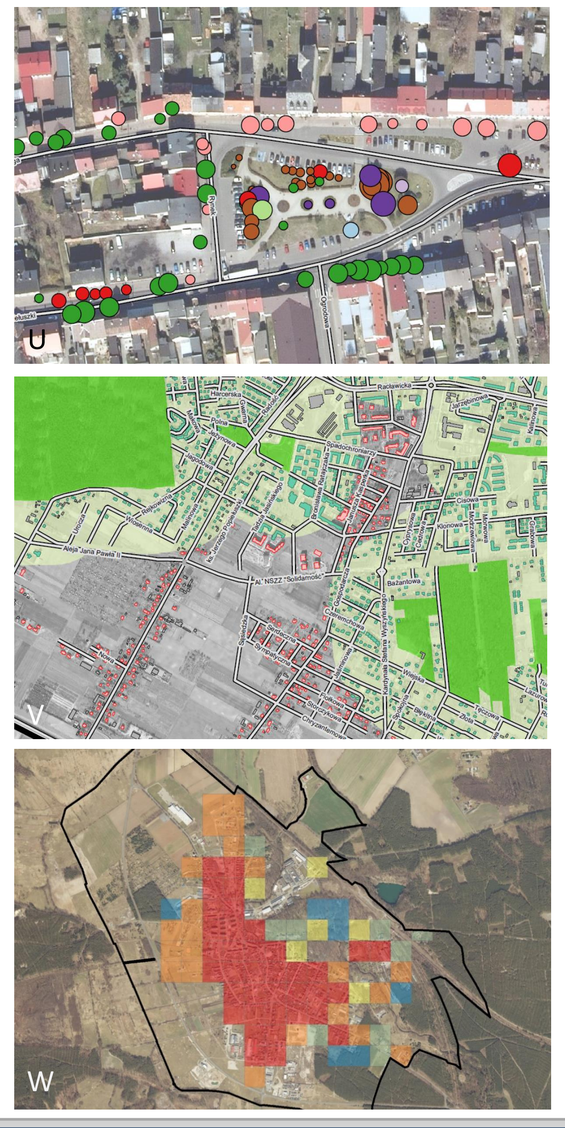
Canopy cover maps acquired at two different points in time, enabled us to detect spots, where vegetation cover has changed. We noted the expansion of single-family houses (L, M), but there were also major investments, such as the construction of the S17 motorway (N, O). We also observed forest succession on unused agricultural land and urban investments (P, R).

Green maps

As a result of our activities, the cities received more than a dozen maps and studies. We provided city authorities with maps of a health status of vegetation (S, T), tree inventory map (U) and accessibility to green areas (V). For cities that provided us with information on the spatial distribution of inhabitants, we were able run per address proximity analyses. We have also prepared a series of additional statistical indicators, that describe the condition of green areas in each city. Moreover, thanks to available remote sensing data, it was possible to survey clusters or even single trees.

Strategy for the future

The results of our statistical analysis not only allowed us to take a detailed look on the current state of urban vegetation, but also allowed us to propose a city-wide strategy. Based on the results of conducted research, we suggested areas for potential trees plantings. The maps provide a starting point for discussions with city residents, about the long-term strategy for urban greenery in their neighborhood. The data provided to the cities can be used by the competent bodies, involved in the maintenance of urban greenery, land management, or urban planning.



The project was carried out with funding from the National Environmental Protection Fund by a consortium of the Institute of Environmental Protection – National Research Institute, the Institute for Ecology of Industrial Areas, the National Centre for Nuclear Research and the Forest Research Institute.

NARODOWY FUNDUSZ OCHRONY ŚRODOWISKA i GOSPODARKI WODNEJ