Mapping of the potential for Green Infrastructure ecosystem services in the urban development zone of 264 small and medium-sized cities in Poland

Joanna Adamczyk*[1], Renata Giedych[1], Agata Cieszewska[1], Barbara Szulczewska[2]

[1] Warsaw University of Life Sciences - SGGW, Poland
[2] Institute of Urban and Regional Development

The presented study was carried out as part of a project to obtain a multidimensional picture concerning the status, relevance and prospects for using Green Infrastructure (GI) in small and medium-sized cities in Poland. Research on GI is usually carried out in large cities, while there needs to be more interest among researchers in small and medium-sized cities. Our study also shows that GI is only present in single cities in planning documents.

The study aimed to assess the potential for ecosystem services provided by the GI of small and medium-sized cities in Poland. In the general assessment at the level of 256 cities, the Topographic Object Database with the resolution of 1:10 000 (BDOT 10k) was used. The data is widely available and used in many applications, as it comes from the National Spatial Data Infrastructure (NSDI) and was created as part of the European Spatial Data Infrastructure. This initiative of the European Commission was established by the INSPIRE Directive (Directive 2007/2/EC of the European Parliament and of the Council of March 14, 2007).
Despite the apparent level of detail in the BDOT 10k data, it was necessary to provide more detailed information at a local scale in urban development areas. The analysis presented here was carried out for 20 cities, focusing on urban development areas. The aim was to reflect the residents' quality of life perspective and verify the ecosystem services potential in built-up areas.

We used Planet Scope imagery for the study, from which a set of vegetation indices were made. These were tested for their ability to identify medium and tall vegetation in the vicinity of areas with impervious cover, bare soil, and systematically mown grass. The result was a four-stage classification of the areas accompanying the development into those covered with multi-layered medium and high vegetation, single-layered high or medium vegetation, and grass not covered with vegetation. The spatial context of the resulting objects was then investigated, allowing their functions to be identified, e.g. residential green spaces, pocket parks in a dense development, and vegetation accompanying single-family housing. The connectivity of these structures was also investigated. The results made it possible to significantly improve the detection of urban green areas and identify their connectivity. Thus, it was possible to make a much more realistic assessment of the inhabitants' quality of life and to infer the state of ZI in the surveyed cities.

Keywords: Green Infrastructure, Planet Scope, ecosystem services