

Access to Green Public Spaces in Warsaw. Spatial and Statistical Analysis.

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SUMMARY

Green spaces within cities are recognized as an essential component of the urban environment. In general, they are composed of street plantation, lawns, parks, gardens, forests, green roofs, so called semi-natural vegetation. Urban greenery provides valuable ecosystem services, plays an irreplaceable role in the enhancement of the urban environment, and is perceived as an indicator of the relative wealth of a neighbourhood. Improving availability of public green spaces in cities is considered in the United Nations Sustainable Development Goals (SDG), target 11.7, which aims to achieve 'By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities'

The purpose of paper is to show a spatially comprehensive view of greenness in Warsaw, the capital of Poland following a consistent approach aligned with the requirements of the 2030 Agenda for Sustainable Development. Warsaw, with a population about 1.7 million is visited by 8,3 million tourists, and as many as 200 thousand of temporary residents, faces some challenges related to protect an environment and improve quality of life. Based on topographic data we show that Warsaw is one of the few European capital cities where green areas comprise not only parks, gardens and other green leisure areas but also forests and a nature reserve. Forests take 52.39 sq. km and account for a 42% percentage of urban greenery. Together with the tree-cover area they constitute 13.6% of the total surface of Warsaw. In total, green areas occupied 25 % of the city area. By the means of spatial statistics, i.e.; Global Moran's I, the ANN analysis we shown that the spatial distribution of green areas in Warsaw is irregular, clustered, and not spatially autocorrelated. Parks, lush gardens are mainly located in the central districts of the city, whereas forests and bushes dominate in the outskirts. OLS regression demonstrations that the urban greenery area significantly depends on the area of district ($R^2=0.96$). The relationship between the area of urban greenery and the number of inhabitants depends on the location of a district. For districts located close to the

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central part of Warsaw, Pearson's r amounts to 0.96, while for the fringe – as much as 0.26. The uneven pattern of spatial distribution of urban green space is also highline by the percentage share of green area in the total acreage of the districts, and green urban ration that varies from 2.0 to 63.0%. Green space allocation per capita is 121.7 sq. m, however, varies significantly between the districts, from 3 to 602. The greenery in Warsaw is well-accessible to inhabitants. 74% of residential built-up area is located within 1 km from recreation and leisure parks, and 90% within 2 km. More than 7% residential buildings are in the near vicinity (up to 100 m) of parks and gardens, 47% - not farther than 500 m. The study results provide a reference to urban planners as well as local authorities for future urban greening practices, are helpful for people searching for apartment buying or renting.

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