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Rethinking urban green space accessibility through a GIS-based perspective in Yerevan, Armenia

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Abstract:

Urban green spaces play a critical role in enhancing environmental quality, public health, and overall urban liveability. However, their benefits depend not only on their presence but also on how easily they can be accessed by residents (Wolch et al., 2014; WHO, 2017). In many rapidly transforming cities, including Yerevan, the spatial distribution of green spaces does not align with patterns of population density, raising concerns about equity and effectiveness in urban planning.

This study rethinks urban green space accessibility through a GIS-based perspective, focusing on the Armenian capital as a case study. Rather than treating accessibility as a simple function of distance, the research adopts a network-based approach to evaluate walkable access to public green spaces (Nicholls, 2001; Wang et al., 2021). The inventory of public green spaces was compiled from cadastral data provided by the Yerevan Municipality, comprising destination and local parks within the city's administrative boundaries. Service area analysis was performed in ArcGIS Network Analyst on a pedestrian network derived from OpenStreetMap, with walking thresholds of 300, 500, 700, and 1500 m at an assumed speed of 5 km/h. Resident counts within each service area were estimated by intersecting the polygons with the WorldPop 100 m gridded population dataset (2020, UN-adjusted).

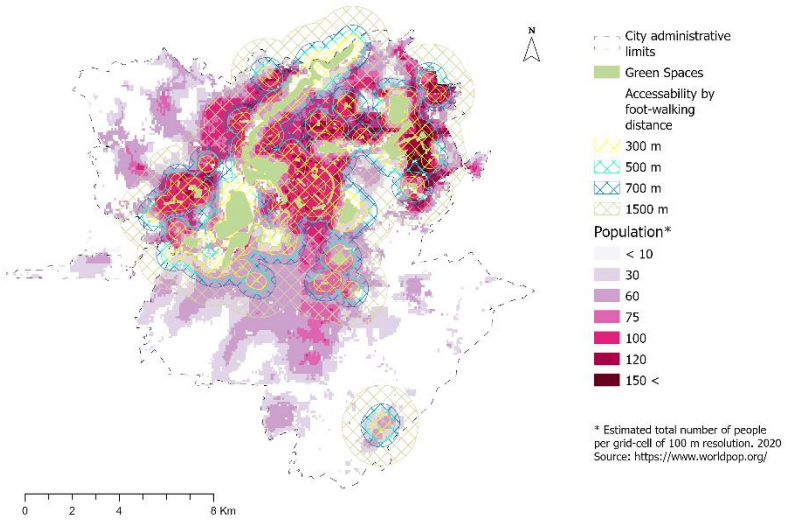

Fig. 1. Spatial accessibility to public green spaces in Yerevan by walking distance, overlaid on the WorldPop 100 m population grid. *Source:* authors' elaboration.

The resulting accessibility patterns (Figure 1) reveal significant spatial disparities in access to green spaces across the city. Of Yerevan's 1.075 million residents, only 319,354 (about 30%) live within a 300 m walk of a public green space — the threshold associated with a five-minute walk and embedded in the 3-30-300 rule for greener, healthier neighbourhoods (Konijnendijk, 2023). Coverage rises to roughly 44% within 500 m and 53% within 700 m, while

around 35% of the population still lives beyond 1500 m from any destination or local park (Petrosyan and Piloyan, 2025). The disparities are also pronounced between districts: central and inner-city areas approach full coverage at the 300 m threshold, whereas several peripheral districts remain largely uncovered even at 1500 m. These findings indicate that current green space provision falls well short of contemporary planning benchmarks and does not reflect the spatial structure of the urban population.

Beyond the empirical results, the study emphasises the role of cartographic representation and geospatial analysis in supporting evidence-based decision-making. The cartographic contribution lies in the joint visualisation of network-based service areas and a high-resolution population grid, which makes underserved zones legible at the level of individual residential blocks rather than aggregated administrative units. By visualising accessibility patterns, the approach provides a clearer understanding of spatial inequalities and helps identify priority areas for intervention. For Yerevan, where green-space accessibility has not previously been mapped against the 3-30-300 rule, this case provides the first systematic, cartographically grounded baseline against which future planning interventions can be assessed. The proposed perspective contributes to ongoing discussions on sustainable and human-centred urban development, demonstrating how GIS-based methods can inform more equitable and effective planning strategies in Yerevan and comparable urban contexts.

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