AVAILABILITY OF GREEN AREAS IN THE CONTEXT OF THE 3-30-300 RULE: THE CASE STUDY OF WOLSZTYN CITY

MAGDALENA SZCZEPAŃSKA , KLAUDIA WYRWA

Faculty of Human Geography and Planning, Adam Mickiewicz University, Poznań, Poland

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ABSTRACT: Current recommendations for shaping greenery in the city refer to the 3-30-300 rule, i.e. providing residents of a residential building with a view of trees, direct proximity to greenery at the place of residence and pedestrian access to a high-quality public park or other area. Many cities implement this rule as part of local greening programmes. The authors analyse the structure of green areas in the city of Wolsztyn, assessing it in the context of the 3-30-300 rule. As a result, they identify areas requiring better access to greenery and propose specific actions to increase the availability of greenery within the city. The recommendations formulated can improve residents' quality of life and the urban environment.

KEYWORDS: availability of green areas, spatial planning, urban resilience, ecosystem services, green infrastructure

Corresponding author: Magdalena Szczepańska, Faculty of Human Geography and Planning, Adam Mickiewicz University, Poznań, ul. Krygowskiego 10, 61-680 Poznań, Poland; e-mail: ***szmagda@amu.edu.pl***

Introduction

Green infrastructure, integral to landscape and ecosystem, is widely considered crucial in creating resilient and sustainable cities (Ogrodnik 2017). The availability of greenery close to the place of residence has a significant impact on improving the quality of life of city residents (Mensah et al. 2016, Nguyen et al. 2021). The presence of greenery in urbanised areas also positively affects the quality of the natural environment (Aronson et al. 2017). Studies also show a relationship between the presence of greenery and climate cooling, improving microclimatic conditions (Wong, Chen 2008), reducing air and noise pollution and having a beneficial effect on mental and physical health (Klompmaker et al. 2019). Thus, access to green areas is increasingly recognised as an environmental justice issue (Wolch et al. 2014). In the face of growing challenges of urbanisation and climate change, increasing attention is being paid to design and management to support the provision of ecosystem services (Kronenberg 2012, Stępniewska, Mizgajski 2023). In this context, the 3-30-300 rule (Konijnendijk 2022) is a particularly practical and effective spatial planning tool to ensure access to greenery in the vicinity of the place of residence. This rule assumes that at least three trees are visible from house windows, large enough to constitute a significant element of the surrounding landscape. Further, having at least 30% tree canopy cover in the immediate neighbourhood and providing access to high-quality public green areas (at least 0.5 ha) within 300 m

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of the residence correspond to about a 5-minute walk (Konijnendijk 2022). Components 30 and 300 are supported by a considerable number of previous research results (WHO 2016, Nieuwenhuijsen 2020, van den Bosch et al. 2023). There is little evidence yet to support the third component, but numerous studies have shown measurable benefits of visual access to green areas for mental health, psychological renewal and well-being (Benfield et al. 2015, Browning et al. 2020, Labib et al. 2022, Patwary et al. 2022). Many cities around the world have already adopted the 3-30-300 rule, formally or informally, as part of their greening programmes. The United Nations Economic Commission for Europe (2021) and the Nordic Council of Ministers (2022) recommended the implementation of 3-30-300. However, it may be difficult to meet in densely populated cities. Guidance on how to measure, monitor or evaluate the rule has been provided by Browning et al. (2023).

This study aims to identify the current state of greenery availability in Wolsztyn city in Poland in accordance with the 3-30-300 rule. At the same time, the possibilities of measuring greenery in a small city in the context of this rule will be verified. As a result, places and activities contributing to ensuring and optimising access to green areas in the city, and thus equal opportunities for access to the benefits resulting from their presence, which may be useful for local authorities, will be indicated. The time scope of field research needed to complete this work includes the years 2023–2024. The spatial range is limited to the administrative boundaries of Wolsztyn and its closest area. The planning documents cover the area of the Wolsztyn commune.

Methods

In the first stage of the research, a review of available planning documents related to the city and commune of Wolsztyn, legal acts, spatial and statistical Internet sources and literature on the subject was carried out. Use was made of QGIS version 3.28 (QGIS Development Team. QGIS Geographic Information System. Open Source Geospatial Foundation Project http://qgis.org) and data from the Topographic Object Database (BDOT10k), the State Register of Borders (PRG), Light Detection and Ranging (LiDAR) and other sets available within the National Geoportal and the Spatial Information System of the Wielkopolska Province (SIP). Then, forest and urban areas, as well as canopy trees, surface biologically active areas and greenery for the whole city, were analysed to obtain the characteristics of the study area. Additionally, the following greenery indices were calculated:

- forest and woodland surface index above 1 ha per inhabitant (FWI) – refers to total greenery, including informal greenery:

$$FWI = \frac{\text{forests and woodlands above 1 ha}}{\text{number of city inhabitants}}$$

- retention potential index (RPI) of the city:

$$RPI = \frac{\text{biologically active surface}}{\text{total city area}} \times 100\%$$

- resource index (RI) of green areas in the city's surface – refers to developed/formal green space:

$$RI = \frac{\text{green areas}}{\text{total city area}} \times 100\%$$

For analytical and methodological purposes, in the area of Wolsztyn, six residential buildings were randomly selected, considering the type of construction (multi-family and single-family) and the diverse location (city centre and outskirts). For each of these locations, an in-depth analysis of the visibility of trees, the degree of tree canopy coverage in the immediate vicinity, the coverage of the area with biologically active surfaces and the availability of green areas within a radius of 300 m from the place of residence was carried out. To conduct the study of tree visibility, photographic documentation – panorama views from the windows of previously selected buildings was made, taking into account the number of levels. According to the analysed rule, these should be views from every flat in a particular multi-family building. Unfortunately, this was not possible due to the lack of owners' permission to access private apartments. Therefore, views from the windows available in staircases of particular multi-family buildings were analysed. To examine the degree of tree canopy coverage

in the city, LiDAR measurement data were used for 31 map sheets covering the entire city area. The data come from May 2022. The downloaded point clouds were imported into the QGIS programme, where only selected points represented high vegetation. The result was a raster image of two values: 5 – representing the area covered with canopy trees and 0 – the area deprived of canopy trees. The raster image had cells with dimensions of approximately 30 cm × 30 cm due to the spatial resolution of the data used. To calculate the percentage of wooded areas in the entire city, raster statistics were used, which allowed determining the number of cells with the values of 0 and 5. Similarly, area of surroundings designated for analysis of buildings was determined in a buffer zone of 30 m from the face of the walls. Then, the fragments with buildings were eliminated from the raster map covering this area, which allowed a detailed determination of the degree of ground cover with tree canopy in the immediate vicinity of the buildings. All calculations were performed in QGIS and Microsoft Excel.

In order to analyse the coverage of the area with biologically active surfaces, 15 m areas were designated in the QGIS programme around each of the analysed buildings. Within these boundaries, biologically active areas were marked using an orthophotomap, and then their percentage share in the designated areas was calculated. For the last analysed aspect, green areas exceeding 0.5 ha were distinguished, and then buffers were created around them, distances of up to 300 m in a straight line and considering the communication network in relation to the designated locations (assuming that 300 is 5 minutes). Owing to this action, it was possible to determine the accessibility of residential buildings to public green areas that meet the criteria of the 3-30-300 rule. The acquired spatial and numerical data were compiled into tables. When developing guidelines for the creation of new green areas and improving access to greenery in the city centre, a site visit was carried out.

Research area

Wolsztyn is located in the southwestern part of Wielkopolska Province, 70 km southwest of Poznań in Poland. It is classified as a small city – its area is 477.98 ha and the number of inhabitants is 12,085 (BDL 2024). Urbanised areas constitute about half of the city's area (249.17 ha). The city's urban structure is dominated by single-family housing located on the city's outskirts. Multi-family housing is concentrated near industrial and storage areas. Wolsztyn's economy is characterised by a strong position in services and industry and is highly diversified. The city has developed industries such as machinery, food, wood and metal processing. Wolsztyn has also good conditions for tourism development – the city is located on two lakes and has a marina. This centre has the only operational locomotive shed in Europe, and old locomotives still run from Wolsztyn to Poznań, constituting a significant tourist attraction on a national and European scale. The vision for Wolsztyn is the sustainable development of tourism, aimed at strengthening the local economy and society, and increasing competitiveness (Kaczmarek, Konecka-Szydłowska 2013). Thus, urban greenery constitutes a special aspect of Wolsztyn's spatial policy. The essential planning document – Study of Conditions and Directions of Spatial Development of the City and Commune of Wolsztyn (SUiKZP 2017) – indicates that the surroundings of new buildings often lack planned greenery, which could soften the contrasts in spatial development. The document indicates the need to ensure protection for green areas, including the city park in Wolsztyn and manor parks in rural areas. The study considers designated rules for protecting the natural environment, landscape and heritage, which are culturally related to greenery and recreation. It is a planned expansion of greenery in urban complexes, adapted to the needs of everyday rest, recreation and tourist traffic. Improving standards of residence, work and rest, according to the document, is crucial.

Results

Analysis of indicators and spatio-functional structure of urban greenery

The green areas of Wolsztyn city present a spatially and functionally diversified structure, constituting 12.18% of the city area, which gives 48.8 m^2 per inhabitant (BDL 2024). Most of the green areas are adjacent to surface water.

However, there are also places where the continuity of greenery is interrupted, which is a challenge for users and the coherence of the urban ecosystem. The green areas in Wolsztyn are distributed randomly but a particular relationship is noticeable – larger green complexes are located on the city's outskirts, while in the centre, there are single, smaller green areas. The most significant clusters of greenery are mainly located in the northern part of the city, near the lake. The southeastern part of Wolsztyn shows a significantly smaller quantity of greenery than other areas. This lack of greenery is due to the dominance of industrial and storage areas in this location.

The measure of the area of forests and woodlands above 1 ha per inhabitant (FWI) is an essential source of information on the availability of informal greenery, which is particularly important in the context of ecosystem services, urban resilience and sustainable development of the city. The index was calculated by the previously adopted formula:

$$FWI = \frac{362{,}200\ m^2}{12{,}085\ \text{inhabitants}} = 30\ m^2\ \text{per inhabitant}$$

With the result 30 m² per person, it can be stated that the area of large-scale forests and woodlands per inhabitant in Wolsztyn is in line with WHO recommendations (2016) defined as a minimum of 9 m² per person, with an indication of a more favourable value for a city resident of 50 m² per person. This result is also close to the average value of the forest cover index (37.84 m² per person) for the nearest (within 25 km) small towns in the region (BDL 2023, BDOT10k). A more in-depth analysis of the city's land cover showed (Table 1) that the dominant form of vegetation is grass and agricultural crops (21.9%), and forest or shrubland (9.14%).

Based on the collected data, the city's retention potential index (RPI) was determined:

$$RPI = \frac{182.56\ ha}{477.98\ ha} \times 100\% = 38.19\%$$

This index amounted to 38.19%, which, provided that its value is maintained, can create good retention conditions in the city.

As part of the analyses, additional measurements of urban green areas were performed,

Table 1. Land cover in Wolsztyn city based on BDOT10k (geoportal.gov.pl).

Covering area	Surface [ha]	Percentage share in total city area [%]
Surface water	2.53	0.53
Development	249.17	52.13
Forest or wooded area	43.68	9.14
Shrubby vegetation	2.85	0.60
Permanent cultivation	28.83	6.03
Grass vegetation and agricultural cultivation including grass vegetation alone	104.67 81.11	21.90 16.97
Communication area	14.70	3.08
Unused ground	0.33	0.07
Square	18.14	3.80
Other undeveloped areas	13.08	2.74
Total	477.98	100.00

considering their recreational functionality and the degree of their development (Table 2). On this basis, the green area RI was calculated, emphasising formal forms, so-called developed or composed, i.e. parks, green areas, housing estate green areas, promenades and avenues, cemeteries and family allotment gardens.

$$RI = \frac{84.27\ ha}{477.98\ ha} \times 100\% = 17.63\%$$

Table 2. Formal green areas in Wolsztyn city based on BDOT10k (geoportal.gov.pl) and BDL (bdl.stat.gov.pl).

Type of green areas	Surface [ha]	Percentage share in total city area [%]
Parks	23.30	4.87
Green areas	12.70	2.66
Housing estate green areas	13.29	2.78
Promenades and avenues	0.34	0.07
Cemeteries	6.63	1.39
Family allotment gardens	28.01	5.86
Total	84.27	17.63

The results indicate that 17.63% of the city's areas have formal greenery, which is favourable for creating resident-friendly conditions for rest and recreation.

Analysis of tree visibility and distribution

Given the analysis of tree availability in different types of buildings (Table 3), the residents of multi-family buildings (buildings 1, 2 and 6) can observe more trees from their windows. The

panoramic photos show the visibility of at least five trees from each multi-family building. For single-family buildings, the availability of trees was lower. In the city centre (building 3), there are several small trees visible, but they do not meet accessibility standards for greenery in the immediate surroundings. The lack of large trees results most probably from dense development, and expanding road and walking infrastructure. Trees visible from the building in Bohaterów

Table 3. Characteristic residential buildings selected for tree visibility analysis.

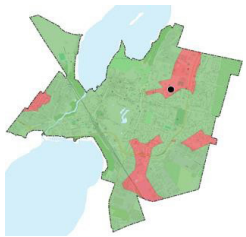
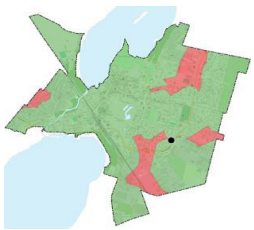
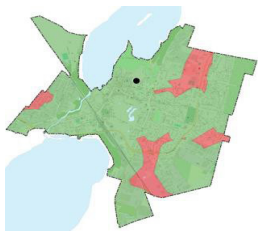
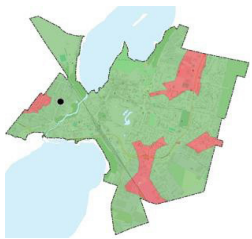
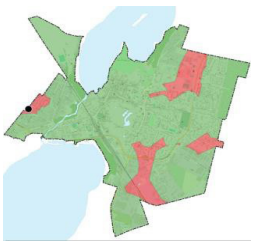
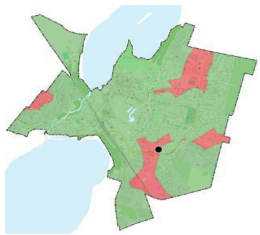
No.	Position	Address / Building type / Floor	View	Trees (No.)
1.		Garbarska 8 St. Type: multi-family Floor: 4		6+
2.		Żeromskiego 21 St. Type: multi-family Floor: 3		15+6
3.		Poznańska 20 St. Type: single-family Floor: 0		0
4.		Bohaterów Bielnika 13 St. Type: twin Floor: 0		16
5.		Poniatowskiego 62 St. Type: twin Floor: 1		10+1
6.		Konopnickiej 6 St. Type: multi-family Floor: 1		95

Fig. 1. View from the staircase window, taking into account the building's floor and the view range: A – ground floor, B – floor 2/3 and C – floor 4/5.

Bielnika St. are located mainly in private spaces. For the building in Poniatowski St., the situation is much more advantageous, probably due to its location on the city's outskirts.

Additionally, an analysis was performed related to the visibility of trees and the ground surface depending on the height of the buildings and the floor inhabited (Fig. 1). The building in Garbarska St. was selected for research purposes due to the largest number of available floors (5). The direction and range of views from apartments in the building are also important.

This analysis has shown that with a higher floor, the terrain's range of visibility and the horizon line's distance increase unless another building blocks this visibility. This means that residents of higher floors can enjoy better views and a greater sense of space. At the same time, despite the increased availability of greenery on higher floors, the distance to trees and green areas decreases with the height of the building and the distance from the ground surface, which may be important for people who value close contact with nature.

Analysis of tree canopy land coverage

The results of analysing the placement of canopy trees using satellite data are shown in Figure 2. The city's canopy tree coverage is 21.82%, so this aspect of the 3-30-300 rule would not be met for the entire city. However, it should be noted that the city also includes areas that are non-urbanised, which may affect the data. In smaller residential areas, the situation may vary significantly. Tree cover is visible throughout the city, particularly dense in the north, south and along the Dojca River. Rows of trees are also visible near the stadium and allotment gardens. Larger patches of greenery are visible in the central part of the city, whereas industrial and railway areas are devoid of trees. However, according to urban design, they require the introduction of insulating greenery of a technical nature, therefore with limited accessibility.

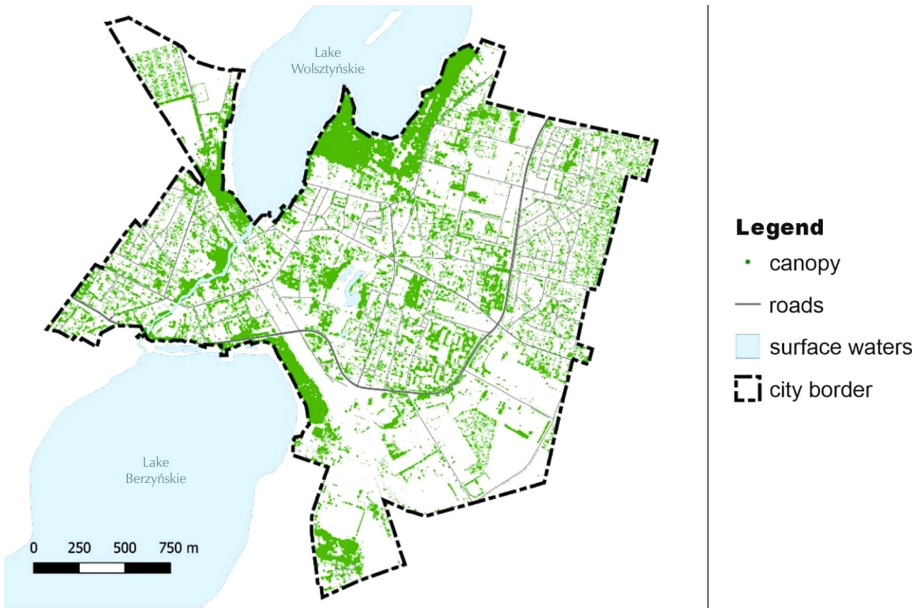
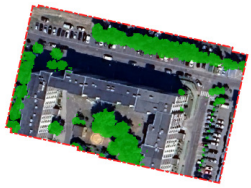
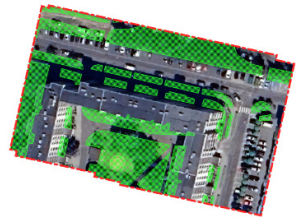
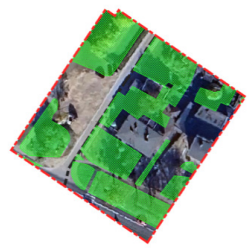


Fig. 2. Area covered with tree canopy in Wolsztyn city based on data measuring LiDAR (geoportal.gov.pl). LiDAR – Light Detection and Ranging.

When analysing the tree canopy coverage within 30 m of the analysed apartments, the 30% threshold was exceeded only by two multi-family buildings (buildings 2 and 6), for which the result is marked in green in Table 4. In the vicinity of each of them the abundance of trees can be noted, which may be related to the fact of maintaining more considerable distances between such buildings and the need to create common and publicly accessible recreational spaces. One multi-family building did not exceed the required 30% (building 1), but in its surroundings, many trees can be also found. We can state that problems with accessibility to large canopy trees occur to a greater extent in the vicinity of single-family houses. For example, a single-family building located in Poznańska St. (object 3) is characterised by a low coverage ratio of canopy trees, i.e., 8.07%, despite the possibility of creating a home garden in this type of development. The analysed location is associated with a compact estate development, where the housing is dense, and the trees in its vicinity are relatively young and have not yet reached their target parameters. The remaining single-family buildings have private plantings. In the case of Poniatowskiego St. (object 5), it is worth noting that the favourable construction of road infrastructure in this area includes designated green belts separating houses from the roadway, which additionally affects the positive microclimate and aesthetics of the surroundings.

The author of the 3-30-300 rule indicates that in places in which it is hard to grow and develop trees, the 30% target of their canopy coverage should be replaced by other vegetation (Konijnendijk 2022, 2023). To assess the accessibility of greenery, the biologically active area in the vicinity of the buildings was additionally analysed. The study covered buffers with a range of 30 m around selected locations. The analysis showed that only one building does not meet the criteria for the required 30% greenery coverage. This is facility 3, located in Poznańska St. The area lacks street greenery, and the part that was included as a biologically active area is not directly available for residents of the analysed building. Covering an impermeable area surface has a negative impact on the environment, climate, retention and residents, reducing their positive aesthetic feelings and well-being, resulting from the lack of contact with nature. Among single-family buildings, the highest degree of greenery (46.15%) is noted in building 5, located on the outskirts of the city, which may be due to the lower level of building density. The highest share of biologically active areas in the immediate vicinity is characteristic of multi-family buildings (buildings 1, 2 and 6). The share of biologically active areas for each of them has reached the required result, which is at least 30%, and in two cases, even above 50% of the surface. Therefore, it can be stated that problems with access to

Table 4. Analysis of coverage with tree canopy and biologically active surfaces.

No.	Tree canopy coverage within 30 m of the building	Area covered with tree canopy [%]	Biologically active surfaces within 30 m of the building	Area covered with biologically active surfaces [%]
1.		22.33%		33.83%
2.		37.00%		49.73%
3.		8.07%		6.02%
4.		15.60%		30.05%
5.		23.92%		46.15%
6.		34.13%		47.57%

biologically active surfaces occur to a greater extent in the vicinity of single-family houses, especially in the city centre.

Analysis of the availability of green areas

To verify the availability of green areas within a 300 m radius, areas of diverse character with the size of at least 0.5 ha were distinguished among the greenery in Wolsztyn (Fig. 3). Zones were created around them at distances of 100, 200 and 300 m in a straight line, which covered 415.66 ha of the city area (86.96%). Thus, it has been found that the remaining part (62.43 ha), constituting 13.04% of the total city area, does not have access to any larger green space within 300 m. These areas 'cut' into the city from the north and south, and more gently from the west and east, constituting 94.30 ha. Thus, the number of residential buildings without access to designated green areas is 184, which is 11.77% of all inhabited buildings. Buildings not covered by green areas are mainly single-family houses located in the western and eastern parts of the city and multi-family buildings located in the north and south. In the city centre, on the other hand, good access to green areas is observed even at a distance of 200 m. It is also possible to choose from various types of greenery within a range of 300 m. Convenient access to green space has been also noted in the northern part of the city, in the vicinity of Wolsztyńskie Lake. At the same time, these areas are the largest in terms of the city size. Additionally, the network analysis (Fig. 3) has not shown any significant differences in accessibility – one building changed the outcome unfavourably (building 2 was outside the range of 300 m = 5 minutes). However, this changed the overall result for all the locations studied – only 33.3% of the buildings have access to green areas at a distance of 300 m.

After plotting the range of green areas available within the city limits (Fig. 4), it is noticeable that among the buildings analysed, only half have access to greenery in the range of 300 m. This is an important observation, suggesting the need to make it easier to reach greenery for all areas not covered by the analysed accessibility range. The author of the 3-30-300 rule indicates that if it is not possible to create new green areas of at least 1 ha, it would be optimal to create such spaces of 0.5 ha. In the city of Wolsztyn, this may be problematic because most of the surface not covered by access to greenery within a radius of 300 m has been already built up.

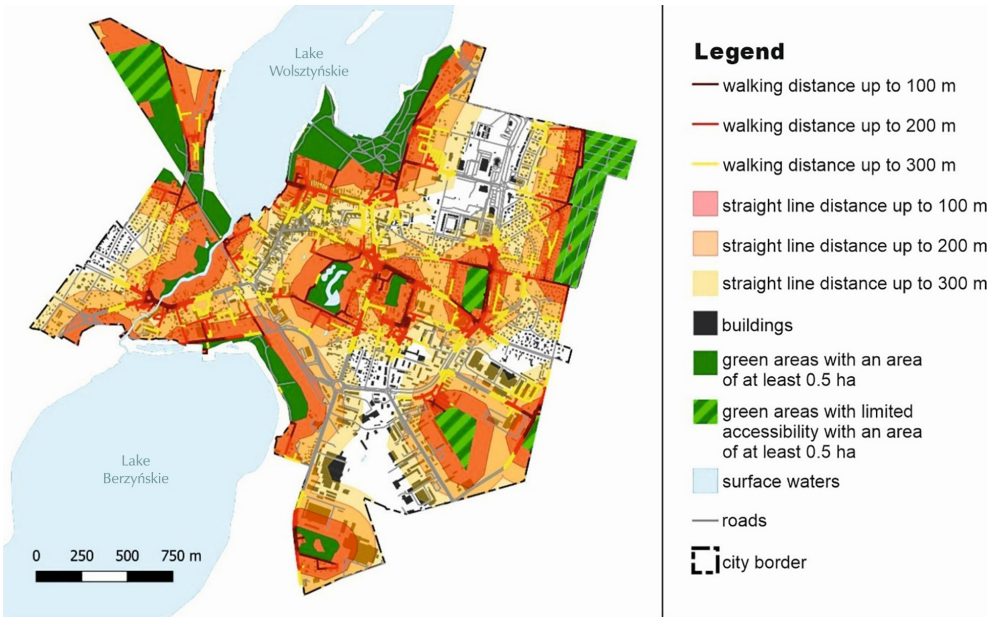


Fig. 3. Availability of green areas with a surface of at least 0.5 ha in Wolsztyn city.

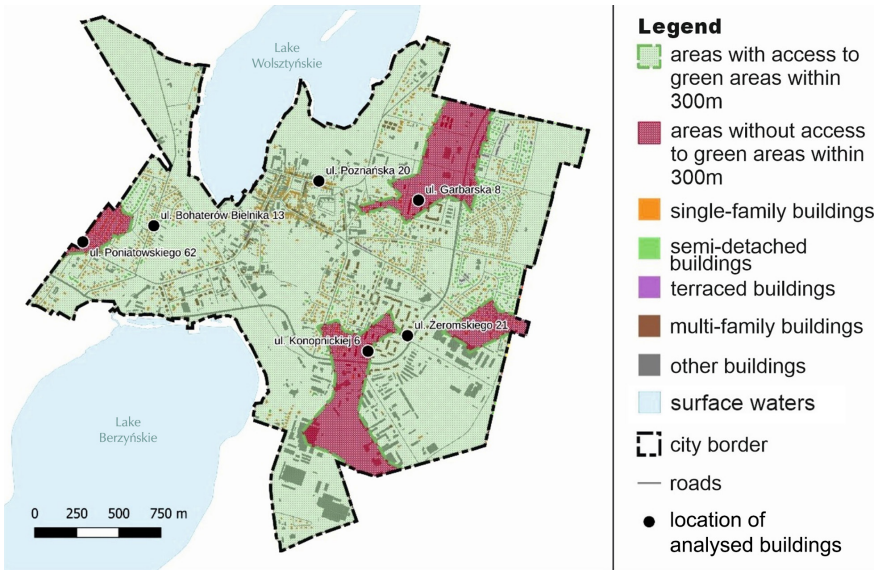


Fig. 4. Availability of greenery with a surface area of at least 0.5 ha for residential buildings in Wolsztyn city.

Discussion of the results and recommendations

Verification of the rule recommendations

Considering the element of the rule that every resident should see at least three large trees from their home windows, it can be concluded that in the city of Wolsztyn those are optimally distributed (all the obtained results are presented in Table 5). Only one of the buildings analysed did not meet this rule, which was caused by the lack of tall trees in the surroundings. Nevertheless, there are new plantings in its vicinity, which will certainly contribute to increasing the amount of greenery visible from the windows of this building in the future. These observations are consistent with the results of the Report (2023), in which most respondents (84%) confirmed that they can see at least three trees from their apartment window. Not every eighth respondent has such a view from their apartment, and 4% of respondents could not specify it. It is worth noting that such a view from the apartment was least frequently declared by respondents living in small towns (up to 5000 inhabitants), as well as residents of the southwestern macroregion of Poland.

Only two out of six buildings analysed meet the requirement of covering at least 30% of the immediate surroundings with the tree canopy. This aspect of the 3-30-300 rule is met by the smallest number of locations examined. However, to compensate for the lack of tree canopy coverage, the availability of other greenery for all buildings is much greater, and only one building does not meet this criterion. This is again the building in Poznańska St. as it is located in a compact development in the city centre.

The last element of the rule is the distance to green areas. Half of the analysed locations met the distance criterion of 300 m, while the network

Table 5. Compatibility of greenery with the 3-30-300 rule in Wolsztyn city.

No.	Address	Compliance with the 3-30-300 rule elements				
		3 trees	30%		buffer 300 m	network analysis 300 m
			tree canopy	other forms of greenery		
1	Garbarska 8 St.	Yes	No	Yes	No	No
2	Żeromskiego 21 St.	Yes	Yes	Yes	Yes	No
3	Bohaterów Bielnika 13 St.	Yes	No	Yes	Yes	Yes
4	Poznańska 20 St.	No	No	No	Yes	Yes
5	Poniatowskiego 62 St.	Yes	No	Yes	No	No
6	Konopnickiej 6 St.	Yes	Yes	Yes	No	No

analysis confirmed this distance for 1/3 of the analysed buildings. In the context of the conducted analyses, the data of the Report (2023) once again confirm the obtained results – every second respondent (53%) believes that their city lacks a park. Slightly less often, the respondents indicated the lack of greenery in streets and squares (47%) and flower meadows (36%) in the place of residence. Therefore, it is necessary to take steps to improve the current situation by creating new and large-area developments. This will be a significant challenge in a densely built-up environment.

Data obtained from network analysis indicate similar accessibility of green areas to the data presented in the Report (2023). In this report, the majority of respondents declared that the nearest green area (including a park or urban forest) is located near their place of residence, with 31% being able to reach it within 5–10 minutes on foot, and 28% – within 5 minutes. Only 6% of respondents live more than 30 minutes from green areas.

Dense housing development, a lack of space in yards and little space for trees outside public streets or small parks (Schwab 2009) make meeting the first two requirements difficult. According to Pataka et al. (2021), the achievement of lower tree canopy cover, e.g. 15%, would be a significant step forward in ensuring access to nature and better compliance with the 3-30-300 rule. Another problem that constitutes a significant obstacle to the development of tree cover is climatic and water conditions (Pincetl et al. 2013, Begert 2022). It will then be important to focus on achieving 30% vegetation coverage, introducing native and drought-resistant species. In these regions, e.g., a modified vegetation index adapted to the soil may be appropriate (Qi et al. 1994). The feasibility of implementing the last component of the 3-30-300 rule depends on factors such as building density, methods and willingness to finance green spaces. Cities with low building density, where cars dominate as primary means of transport, may encounter difficulties reaching the threshold of green space availability within 300 m (Browning et al. 2023). In such cases, it will be helpful to use participatory processes to define future green space, which may increase the likelihood of residents' acceptance and use of these areas. In these circumstances, the coverage of green areas per capita can be considered a factor influencing their use and the resulting benefits (Larson et al. 2022), while ensuring the high quality of these areas (Knobel et al. 2019).

Implementation of the rule and guidelines

When examining the availability of greenery for the residents of Wolsztyn and the implementation of the 3-30-300 rule, the focus was on identifying locations where new areas of landscaped greenery could be created. The concentration was on the four previously identified areas that were deprived access to green spaces in the range of 300 m (Table 5). Unfortunately, because of high-density development, a minimum area exceeding 0.5 ha was not found in three out of four cases. Technical infrastructure was also a significant limitation.

Between Komorowska and Garbarska streets there is an undeveloped area of approximately 1.3 ha, which is recommended as a space for a park (Fig. 5). When creating guidelines for the development of this area, an effort was made to ensure that they were visually consistent with the sports and recreation zone located on the opposite side of the undeveloped land. In the southern and western parts, trees were separating the park from the roadway, creating a pleasant space for walking and resting, fenced off from the road traffic. Creating a green area in this place would significantly increase the availability of green areas, thus meeting the needs of the northern part of the city regarding the proximity of greenery with an area of at least 1 ha.

Owing to the current state of development in the western, southern and eastern parts of the city, it is impossible to locate new green areas there. Therefore, alternative solutions should be considered to bring residents closer to nature. It is advisable to introduce new trees and shrubs along communication routes and near industrial areas, where trees would play an important role in reducing pollution and noise. Spaces where they can be located have been identified (Żeromskiego and Antoniego Sturnego streets), which will also contribute to increasing the degree of tree canopy coverage in the city. In this context, it is also worth considering the concept of a city courtyard (from Dutch: *woonerf*). This is a way of designing a street in an urbanised zone (especially near schools and residential areas), which, while maintaining its

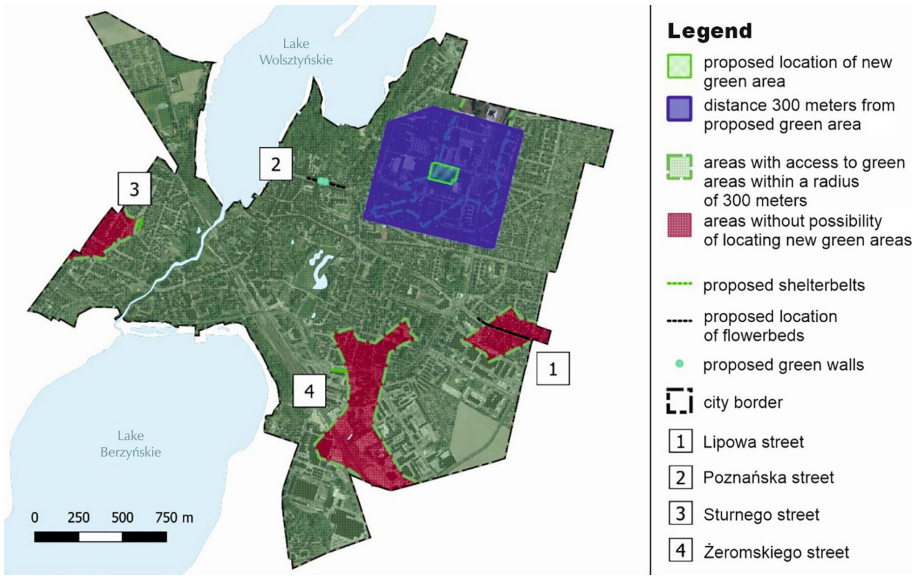


Fig 5. Proposed locations for introducing new forms of greenery in Wolsztyn city.

essential functions, leads to the creation of a space with a high level of safety and integration, as well as aesthetic and recreational values involving greenery (Dudek 2019, Leereveld et al. 2024).

Noticing the dense urban development in the city centre and the lack of an adequate amount of greenery, it was decided to introduce changes in Poznańska St. It is recommended that paving from the area around the trees be removed and, additionally, a so-called facade or elevation gardens may be set up. At the Synagogue building, it is advisable to implement green walls, unpaving the area and planting trees, shrubs and climbers. This action will certainly increase the aesthetics of the place but will also have a positive impact on reducing air pollution, microclimate and increasing biodiversity in this area of the city. In addition to the top-down planned solutions introduced in the city, practices are proposed that would encourage the local community to green Wolsztyn and increase their involvement in shaping and maintaining urban greenery. Thus, actions in the field of urban green acupuncture are recommended, based on the assumption that many small interventions in the form of 'green points' in a highly urbanised space can improve the quality of life of city residents while ensuring beneficial effects on the scale of the city or at least its district (Stangel 2023). These actions are to engage and integrate the local community. In practice, this could mean greening the yards that are part of cooperatives and communities, with the support of the relevant city bodies (Czekiel-Świtalska 2010).

It is also recommended that educational, cultural and healthcare institutions be supported in establishing thematic, educational and school gardens, so-called green workshops (Batorczak 2015) and therapeutic gardens (Latkowska 2008). A valuable initiative would be also the creation of community gardens (Škamlová et al. 2020), pocket parks (Ferris et al. 2001) and actions aimed at opening allotment gardens (Dymek et al. 2021). A particularly important aspect of greenery in the city is home gardens (Cameron et al. 2012). For this reason, substantive and design advice and material support (e.g. in the form of seedlings of native tree species) for private/individual owners in single-family housing would be valuable. The richness of the vegetation and compositional coherence will be conducive to the urban ecosystem. Another action should be high-quality design guidelines for greenery for development companies within the housing estate space in multi-family housing (Gałecka-Drozda et al. 2021). In the face of green revitalisation activities and the pursuit of food self-sufficiency in cities, a vital direction would be promotion of agriculture and urban gardening (Szczepańska, Staszewska 2016).

Conclusions

The research has shown a varied distribution of trees in the city of Wolsztyn. The distribution of free-standing trees is more significant in the

eastern part of the city. Still, access to more extensive wooded areas is limited there, which emphasises the need to increase the presence of greenery in this part of the city. The total tree canopy coverage of the city is below the assumed 30% threshold indicated in the rule. This highlights the need to take action related to the intensification of introducing new plantings in Wolsztyn. The analysis of land cover showed the dominance of built-up areas in the city landscape, reaching over half of its area. Biologically active surfaces occupy a significant part of the city, but their location requires optimisation to provide all residents with equal access to greenery. The analyses showed that not all of the residential areas had the same access to it. Especially in the outskirts of cities, there is a lack of green areas with surfaces over 0.5 ha available within a radius of 300 m. This indicates the need for an integrated approach to urban greenery management, taking into account local factors and residents' expectations. Although the city of Wolsztyn has a significant greenery resource, it is necessary to take additional measures to fully implement the 3-30-300 rule. Actions conducive to the implementation of the guidelines of this rule have been proposed, such as striving to increase the availability of trees and creating new green areas in line with green urban acupuncture, especially along the roads, in the city centre, and in industrial areas. More effective implementation would have a beneficial effect on the quality of the urban ecosystem and the living conditions of residents and, at the same time, would contribute to strengthening the city's resilience. The implementation of the 3-30-300 rule can be achieved in Wolsztyn to a large extent with the effort of inhabitants and local authorities.

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