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ECOSYSTEM SERVICES-BASED PLANNING AND MANAGEMENT OF MULTIFAMILY RESIDENTIAL AREAS: BRIDGING PRACTITIONERS' APPROACHES AND RESIDENTS' PREFERENCES

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ABSTRACT: This paper addresses the realm of planning and managing greenery in multifamily residential areas. We uncover parallels between practitioners' approaches, residents' preferences, and the spatial attributes of residential areas that influence the supply of ecosystem services (ES). We focus on cultural ecosystem services (CES), the most directly experienced by urban inhabitants. Employing a multi-method approach encompassing a workshop for practitioners, a discrete choice experiment (DCE)-based survey of urban residents, and mapping of greenery attributes in Poznań (Poland). Our study underscores the importance of shaping conditions that facilitate bundled regulating and cultural ES. Practitioners recognise the role of greenery in the production of ES. This resonates with residents' preferences for predominantly green neighbourhoods, with the dominance of trees and some facilities for active recreation. Mismatches between opting for well-maintained greenery with some benches while neither the level of maintenance nor facilities for passive recreation are crucial for residents. Ultimately, we identify four types of multifamily residential areas reflecting varying degrees of resident preferences. These findings offer valuable information for the future development of multifamily residential areas, helping to design urban green spaces that respond to values and needs and, consequently, to increase the provision of cultural ecosystem services and support the regulating ones.

KEYWORDS: green space preferences, residential development, ecosystem services management, discrete choice experiment

Introduction

This paper addresses the planning and management of greenery in multifamily residential areas, a problem often overlooked in Urban Ecosystem Services (ES) research. Studies of ES provided by greenery in cities have focused principally on parks and forests (Menconi et al., 2021; Farkas et al., 2023), while other types of green space, ranging from brownfields (Luo & Patuano, 2023) to street green (Lu et al., 2023), are studied to a lesser extent. Multifamily residential areas translate into the capacity to deliver ES (Bastian et al., 2012). Although some studies on ES provided by multifamily residential areas have emerged recently (Mao et al., 2020; Schmid & Säumel, 2021; Zwierzchowska et al., 2021), the problem is still infrequent in ES research. This is surprising given that in European cities, 71% of the population lives in flats (Eurostat, 2021) and, in many cities, multifamily housing dominates (Schmeidler, 1998; Czepczyński, 2008; Bekő, 2015). The latter type of residential space is related to a range of positive economic, social, and environmental outcomes (Winston, 2017), and we can expect it to grow in the future (Mcmillan & Lee, 2017; Naess et al., 2020). As such, multifamily residential areas are a crucial part of urban ecosystems around the world.

While shaping the urban fabric, green areas that supply ES compete with other important land uses (Haaland & van den Bosch, 2015; Zhao et al., 2022; Nazombe & Nambazo, 2023). Although there is a growing literature on ES integration into planning practice (van Haaren & Albert, 2011; Kaczorowska et al., 2016; Qiu et al., 2022), a lack of capacity and a reluctance to consider ES in practice remain important barriers in urban planning (Grunewald et al., 2021). Cortinovis and Geneletti (2019) find that the integration of ES in urban policies and planning is two-speed: recreation and some regulating services linked to typical urban environmental problems have already gained recognition, while others ES are hardly considered. Apart from recreation, cultural ecosystem services (CES) appear to be the least well incorporated into urban planning (Tandarić et al., 2020). Recognising the importance of integrating CES into urban planning is essential for several reasons. First, natural features and processes that allow people to gain cultural goods or advantages (Haines-Young & Potschin, 2018) are the most directly experienced by residents in urban areas (Plieninger et al., 2013; Gavrilidis et al., 2023). Second, they are bundled with other ES, creating sets of associated ES that appear together across space or time (Raudsepp-Hearne et al., 2010; Saidi & Spray, 2018). Although the analysis of these bundles is an opportunity to enhance policy effectiveness, evidence of their actual use in decision-making is still lacking (Saidi & Spray, 2018).

As the contemporary decision-making model has shifted from a traditional top-down approach to a participatory planning and co-creation approach, the role of residents in the planning process has increased (Frantzeskaki & Kabisch, 2016; Masik et al., 2021). Residents' preferences regarding spatial arrangements appear to provide useful insights into planning measures that meet their needs. Their relative character means that studying the public's preferences regarding the attributes of greenery that shape the supply of ES is a challenge (Scholte et al., 2015). Although a growing number of studies describe approaches used to involve stakeholders in the planning process (Uittenbroek et al., 2019; Kujala et al., 2022), few consider the juxtaposition of the views of different stakeholders, such as practitioners and residents. Previous research has shown that there are incompatibilities between the perspectives of practitioners (experts) and residents (nonexperts). Although experts tend to approach issues as 'matters of fact', non-experts tend to view them as 'matters of concern' (Latour, 2004; Stewart & Lewis, 2017). Both perspectives are important, albeit different, and combining them can help to form a cohesive and meaningful space.

This study addresses the aforementioned overlooked role of greenery in multifamily residential areas, a need for integrating CES into urban planning, and a shift in the contemporary decision-making model into a co-creation approach. Its goal is to identify and understand what are the matches and mismatches between practitioners' approaches to ES provided by greenery in multifamily residential areas and the residents' preferences. The following three objectives guided our investigation: (1) identify which ES are seen as the most important by practitioners engaged in urban planning and management; (2) identify which attributes of greenery residents in multifamily residential areas prefer; (3) map and assess the most important attributes of greenery in multifamily residential areas, which, in turn, shape the conditions for ES provision in the city.

Residential greenery as CES provider

The assessment of different classes of ES requires different approaches. CES, in particular, are difficult to define, classify, and measure, as they require both a recognition of the environmental space and data regarding cultural practices (Fish et al., 2016). This poses a challenge when trying to incorporate CES into planning. Proposed solutions involve creating opportunities to generate space for CES through designing multifunctional and diverse urban green-blue infrastructure. This requires specific spatial settings or specific elements that allow for certain practices (Tandarić et al., 2020). Although the inclusion of the CES concept into urban planning is a great challenge, studies have identified the main features of the space that contribute to the supply of CES, such as vegetation coverage, green space management level, the number of public activity spaces, and water bodies (Mao et al., 2020). In the following, we focus on characteristics regarding greenery attractiveness relevant from the residents' perspective.

Greenery is the most obvious manifestation of nature, and this is generally believed to be an important factor in explaining the clear preference for natural scenes over built scenes (Purcell & Lamb, 1998). However, the results of studies that seek to identify the most attractive type of greenery remain inconclusive. For example, a study carried out in the Netherlands found that lower vegetation density predicted higher levels of pleasure (Staats et al., 1997). In Israel, people preferred high canopy cover and moderate plant density (Misgav, 2000), while another study in coastal Chile indicated that participants rated landscapes with denser vegetation more highly than low-density scenes (de la Fuente de Val & Mühlhauser, 2014). The results of research conducted in different locations vary. Therefore, it seems that preferences regarding vegetation configuration are geographically and culturally embedded.

In the case of an urban residential area, one of the most challenging decisions is how to distribute the proportion of greenery and built-up space (Artmann et al., 2019; Dieleman & Wegener, 2004). While a compact built-up might bring greater comfort thanks to the availability of services and lower real estate maintenance costs (e.g. due to better infrastructure construction methods), people tend to perceive low building density as one of the characteristics of a high-quality environment (Rapoport, 1977), which has been explained by reference to the general human preference for natural settings (Ulrich, 1993).

In Western cultures, a demand for a certain level of visible care, control, and tidiness of greenery is often observed (Nassauer, 1995). Unmaintained green spaces evoke a sense of danger and are associated with a lack of finance and neglect (Sefcik et al., 2019). Notwithstanding these findings, attitudes toward green areas are changing, and unmaintained (informal) greenery is receiving increasing attention in many cities (Sikorski et al., 2021; de la Fuente de Val, 2023).

In urban residential areas, facilities that allow people to spend time outdoors are another factor that moderates how people use the space, supports the implementation of CES, and consequently contributes to physical and mental health (Ranchod et al., 2014; Ayala-Azcárraga et al., 2019). People's recreational habits and the demand for appropriate facilities differ as a function of the physical and social environment (Neuvonen et al., 2007). The supply of close-to-home recreation facilities should meet the needs of people. The latter point is especially important in the case of less mobile groups: children and older people (Cheng et al., 2019; Gavand et al., 2019).

Although the importance of residential greenery is widely acknowledged, access to it is limited in many urban areas and often discussed in the context of social injustice (Calderón-Argelich et al., 2021). In multifamily residential neighbourhoods, attractive and desirable green areas have a price: there is a trade-off between greenery and other demands, such as distance to facilities, shops, health services, transportation, etc. (Erlwein & Pauleit, 2021).

Methods and Materials

Study Area

Poznań is a city in the western part of Poland. It is a typical second-tier European city, a hub for economy, education, culture, and mobility. It has a population of approximately 0.5 million and covers an area of 262 km² (GUS, 2022). Poznań is a green city – forested and wooded areas, and shrubby and grassy vegetation constitutes 43.3% of its surface (Geoportal, 2019). A city-wide structure, called a green wedge-ring system, stretches along the Warta River valley and its tributaries, and the city's historical fortifications. While preserving this greenery has been one of the main objectives of spatial planning for years (Chorążewicz, 2010), the distribution of green spaces in Poznań is uneven. Their percentage in the 42 local administrative units that make up the city varies from 8.3% to 70.4%, while the share of built areas varies from 9 % to 91.7% (Geoportal, 2019). This diversity reflects the compact city centre and the larger green spaces on the outskirts of the city. Although these numbers are drawn from official statistics, they do not capture greenery at the level of housing estates, which, due to their small area, are not included in databases that adopt a more general geometric and thematic resolution. Zwierzchowska et al. (2021) find great variation in green space across different types of multifamily residential areas, which makes Poznań an interesting city for studying ES provided by residential neighbourhood greenery.

Methods

Workshop with practitioners

In the first part of our study, we organised a workshop. Here, the aim was to understand the key ES and their role in spatial planning and management practice from the point of view of practitioners. The workshop was a tool for performing an in-depth assessment of complex issues with high levels of uncertainty (Tusznio et al., 2020; Allen et al., 2021; Sagie & Orenstein, 2022). Such an approach emphasises the topic rather than polling participants, which is especially relevant when participants are practitioners with a broad knowledge of the investigated topics. The workshop took place in April 2022 and brought together 14 practitioners: municipal officials who worked in urban planning, architecture, sport, and recreation, and representatives of environmental NGOs. After a brief introduction to the concept of ES, participants were asked to hierarchise the given list of regulatory and cultural services. Then, the prioritised ES were discussed from the perspective of urban planning and management. The discussion embraced both the general perspective on the need and opportunities for ES to be more widely used in urban spatial management and the challenges to incorporating the ES approach into decisions or actions taken by participants.

The Discrete Choice Experiment

A Discrete Choice Experiment (DCE) was used to investigate residents' preferences and trade-offs between the attributes of greenery in multifamily residential areas. The DCE method is used for the non-market valuation of preferences. It has been used in a number of studies on ES and environmental policy (Juutinen et al., 2011; De Valck et al., 2017; Kim et al., 2020) and is considered a reliable method for assessing social preferences (Bateman et al., 2002). The DCE enabled us to quantify the importance of the attributes of the greenery of the multifamily residential area and whether residents are willing to sacrifice them for others. We use it as a proxy for the CES capacity. Based on the literature regarding the formulation of attributes (Bateman et al., 2002; Holmes & Adamowicz, 2003) and their number (Miller, 1956; Cowan, 2001), we chose six attributes of space (see Table 1). This number was guided by the value of the D-efficiency index (Louviere et al., 2000). One attribute represents the so-called 'payment vehicle', which is used to estimate the relative cost and benefits that are associated with the other attributes. Typically, researchers ask how much money residents would be willing to pay for an attribute of space that is valuable to them (Louda et al., 2021). However, in our study, we used the distance residents need to cover (de Valck et al., 2017) to reach a car park or a bus stop, as this is more relevant from a green spaces planning and management perspective. Moreover, it is less abstract because good access to a car park or a bus stop is a key demand of residents and therefore shapes the development of residential areas (Brandt & Maennig, 2012; Wang et al., 2015;

Gadziński & Radzimski, 2016). The other five attributes were as follows: type of greenery cover, proportion of greenery/ built-up area (openness of space), level of greenery maintenance, facilities for active recreation, and facilities for passive recreation (Table 1).

Table 1. Attributes of residential greenery and their levels

	0	1	neither option
type of greenery cover	grass and shrubs	trees	
openness of space (greenery/built up proportions)	predominantly built-up area	predominantly green areas	
greenery maintenance	unmaintained greenery	maintained greenery	X
facilities for active recreation	no facilities	biking trail, open-air gym, playing field	
facilities for passive recreation	no facilities	benches, barbecue area	
distance to the closest car park / bus stop *	ca. 500 m	ca. 20 m	

*(if no underground parking is available)

These attributes were included in a questionnaire that consisted of 21 questions divided into four sections: (a) the DCE, (b) the sociodemographic characteristics of the respondents, (c) the current and potential place of residence, and (d) the use of a car and public transport. The main question was: "You have a choice of two flats in Poznań. They differ only with respect to the immediate surroundings of the building. Which one would you like to live in?" Residents could choose between the two options (or neither). The selection of the set was repeated seven times, in random order, for each resident. One of the seven questions was a control question used for validation.

The pilot questionnaire was tested in May 2022, and the online survey was run between 19 and 31 May 2022 using Qualtrics software. The sample consisted of residents of Poznań. We used a voluntary sampling method (Pietrzyk-Kaszyńska et al., 2017). The questionnaire was distributed to 107 Facebook groups targeting local councils and informal groups of residents. The sample presents the bias that is typically found in voluntary online surveys. Voluntary sampling inherently favours individuals who are active on social media and have more time or motivation to participate in internet-based surveys at a higher level of education. Those with fewer levels of education, lower motivation to participate, or limited internet competence and access are underrepresented. A total of 423 questionnaires were distributed, and 284 were completed. After validation, 263 remained for further analysis, which was sufficient based on the formula suggested by de Bekker-Grob et al. (2015). Importantly, the number of observations in the model is equal to the number of cases (surveyed residents) multiplied by the number of choice sets and the number of alternatives within a given set. In our

study, this calculation resulted in 4734 observations, which is sufficient for a logistic regression estimation.

Five logistic regression models were tested, and a conditional logit model with case-specific variables (CDLcs, model 4) was chosen as the most appropriate. By choosing a particular option, the resident assigns the highest utility to that option. Therefore, the model parameters are interpreted in the context of the influence of an individual factor on a person's preference for a particular feature of urban space. Independent variables are the levels of the attributes shown in Table 1. Five attributes had values of 0 or 1, while the distance to a parking lot or the nearest bus stop was coded according to assumed distances ranging between 20 and 500 metres. The configuration of independent variable values for a given resident was indicated by the arrangement of attribute levels and options in the sets.

Spatial Analysis of multifamily residential areas

In the next step, we mapped two of the most preferred by residents attributes illustrating the predominance of greenery or built-up and the type of greenery in the multifamily residential areas. We calculated the proportion of the built-up area and the proportion of tree crowns. A multifamily residential neighbourhood was defined as the area within 100 metres of the outline of the building for all of the multifamily residential buildings in Poznań. In total, the surroundings of 7481 multifamily (with three or more flats) buildings in Poznań were taken into account. The percentage of the built-up area and tree crowns were assigned to the centroids of buildings. Then, average values for these attributes were calculated for the 42 local administrative units in Poznań. All analyses were performed using QGIS 3.22 Białowieża, based on the Topographic Objects Database (Geoportal, 2019), which provides data on the characteristics of buildings and the distribution of tree crowns for Poznań (GEOPOZ, 2019), notably their surface.

Results

Urban ES from the perspective

The results of the workshop showed that practitioners paid more attention to regulating than to cultural services. Regulation of temperature and humidity was considered the most crucial. Additionally, the provision of habitats for wild plants and animals, and the regulation of air quality were also prioritised by practitioners. In contrast, noise reduction was rated as less important. Passive recreation (*relaxation and rest in nature*) was the most important CES, while active recreation (*recreation and sport interaction in nature*) was the least important (Figure 3).
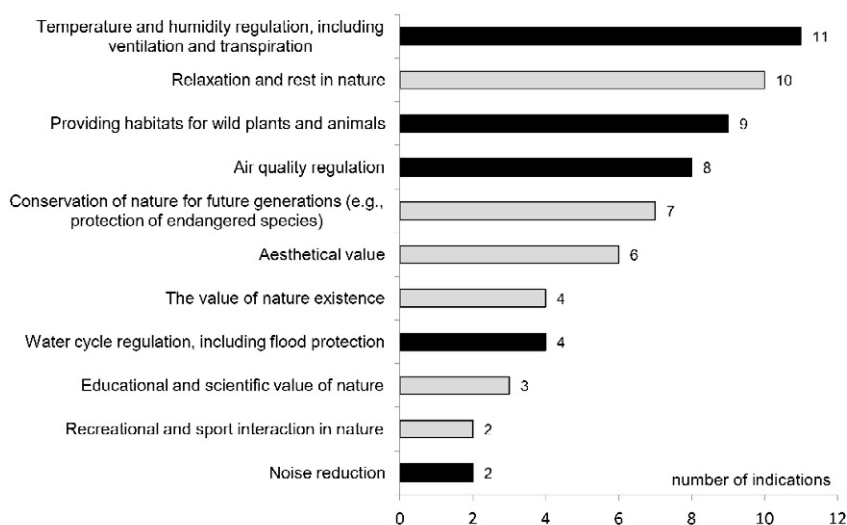
Figure 3. The most important regulating and cultural ecosystem services in Poznań according to practitioners, Black indicates regulating ecosystem services; grey indicates cultural ecosystem services

Workshop participants mainly referred to types of green spaces that provide a set of ES that are specific to it rather than a single ES as such. This shows that their approach is space- and ES bundle-oriented.

The participants emphasised that both the unmaintained and the maintained greenery are important providers of ES. They noted that unmaintained (informal) greenery has the potential to be an important element of green infrastructure in the city:

> There is a great need for unmanaged greenery, which nature has often recovered through negligence so that something that could often be called a reserve has developed. In these cases, the introduction of utilitarian functions, e.g. recreational or sports, will destroy the qualities of these areas.

Participants noted the importance of assessing biodiversity in order to create spaces that support calm reflection and observing nature without any infrastructure. The need to delimit areas with primarily recreational or ecological functions, as stated by practitioners, is due to the high impact of active recreation on green spaces. The growing pressure of sport and recreation in urban greenery leads to competition between different CESs.

> There should be separate green spaces and recreational and sports spaces. We started talking about sports in our society 15 years ago; before then, it was less common for people to spend their time this way.

According to practitioners, the crises that have affected society in recent years have increased the importance of spending time in green spaces, which could increase conflicts of use. The first was the COVID-19 pandemic, which reduced people's opportunities to spend time outside, including, for a while, in green spaces, and further increased their value. The second was the refugee crisis related to the war in Ukraine, which resulted in the arrival of many migrants, mainly mothers with children, for whom the opportunity to spend time in green spaces was a respite.

> The pandemic and now the refugee crisis have made us more and more aware of spending time outside.

Residents' preferences regarding residential neighbourhood greenery

The DCE results showed that five out of the six greenery attributes significantly impacted the preferences of the residents. Importantly, the payment vehicle (i.e., the distance to a car park or the nearest bus stop) was significant, and each additional metre separating the resident from the car park or bus stop reduced the marginal utility of the place of residence.
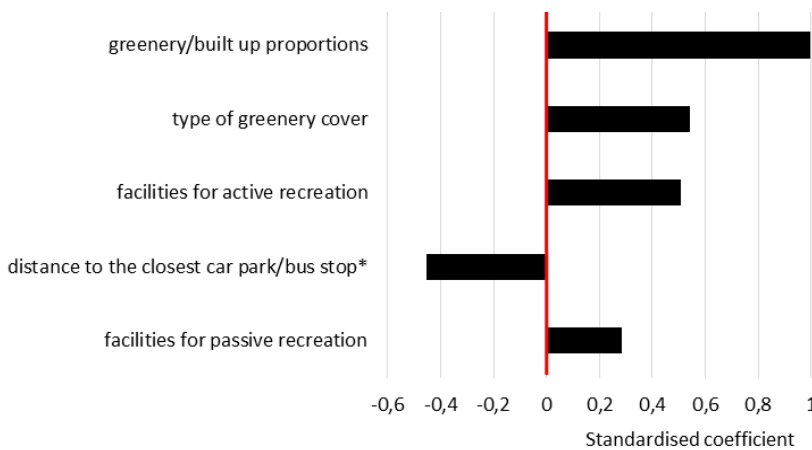
Note: the maintenance of greenery was not statistically significant and, therefore, is not presented.

Figure 4. Attributes of greenery that impact people's interest in living in a particular area. The parameters represent the preference for the attributes

The analysis of willingness to pay (WTP) for each attribute revealed that in order to have more open space, respondents were willing to walk 1058 metres from a car park or a bus stop, assuming other conditions were constant. To have trees as the main type of greenery cover, they were willing to walk 574 metres. They were willing to walk 537 metres to benefit from the presence of infrastructure for active recreation, while passive recreation was the least preferred, respondents were only willing to walk 301 metres to a parking lot or the nearest bus stop (Figure 5).
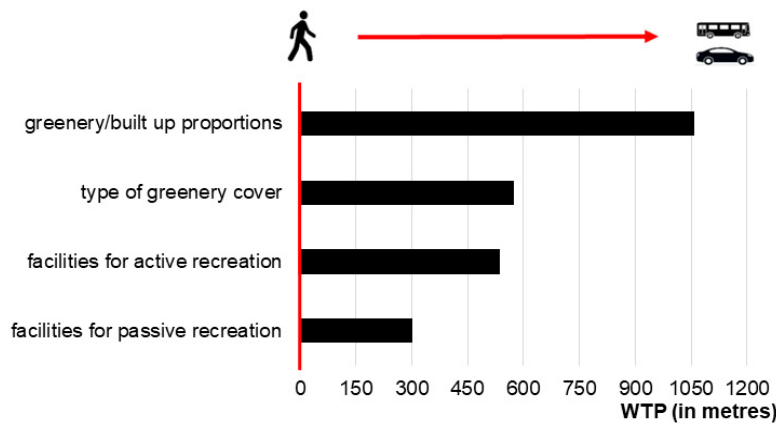

Figure 5. Willingness to pay for the different attributes of neighbourhood greenery

Spatial conditions of multifamily residential areas

On the basis of mapping of the proportion of the built-up area and the proportion of tree crowns, we identified four types of multifamily residential areas (Figure 6):

- Type 1: built-up areas that are denser than average, with a proportion of tree crowns below average. This type corresponds to the old part of the inner city (including the historical centre) and recently developed areas,
- Type 2: denser built-up areas with a higher proportion of tree crowns. This corresponds to districts within the inner city where multifamily houses are an important part of the built environment,
- Type 3: less dense built-up areas with a higher proportion of tree crowns. This group corresponds to tall apartment blocks from the 1960s-1980s surrounded by extensive green space,
- Type 4: less dense built-up areas with a lower proportion of tree crowns. This type corresponds to new housing units located on the outskirts of the city.

Most multifamily residential areas are, however, characterised by average values, namely 15–25% tree crowns and 10–20% built-up area.
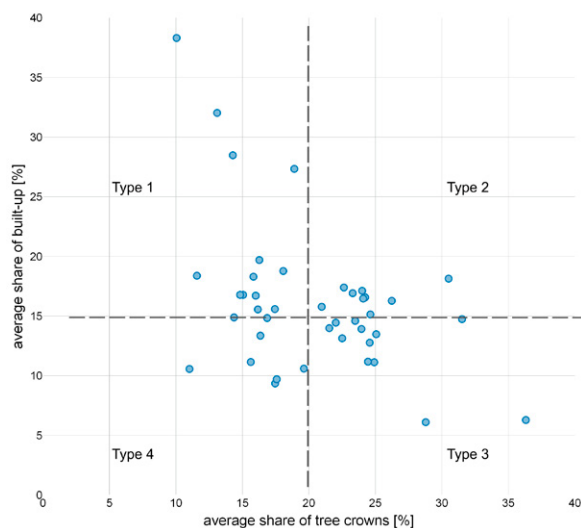
Figure 6. The four types of multifamily residential areas show the proportion of built-up area and tree crowns. Dots represent average values

Figure 7 shows which of the four types of multifamily residential areas dominate in the administrative districts of Poznań. The examples are shown in Figure 8.

Figure 7. Dominating types of multifamily residential areas in the local administrative units of Poznań

Figure 8. Examples of the four types of multifamily residential areas in Poznań

Discussion

Practitioners' versus residents' views on ES

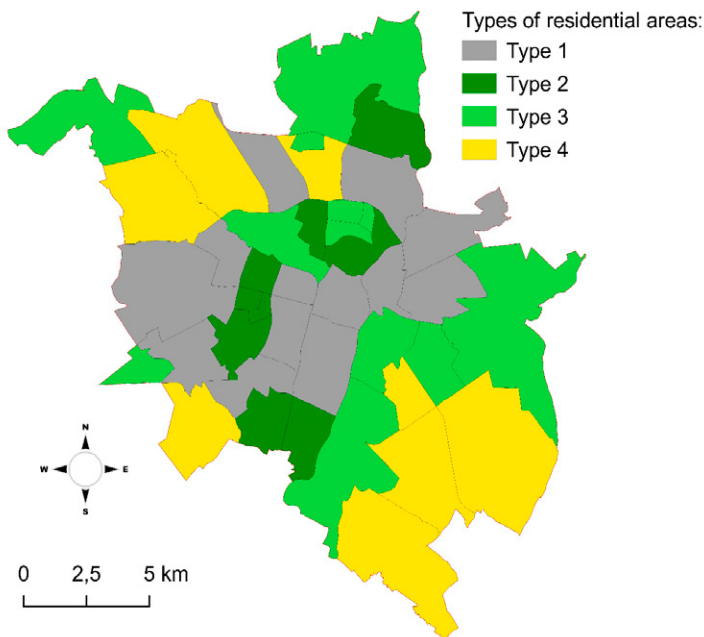A comparison of practitioners' perspectives and residents' preferences for urban greenery underlines the ongoing dilemma regarding the ideal balance between greenery and buildings in the city. Our study revealed both agreement and discrepancies between the views of the groups. For practitioners, regulation of temperature and humidity was the most important ES, followed by passive recreation (relaxation and rest in nature). Although regulating ES was more frequently indicated as being crucial for the city, our results highlight the importance of shaping the conditions that support bundled regulating ES and CES. Practitioners recognise the importance of greenery in production and delivery. It differs from the previous research by Kronenberg (2015) that revealed the under-appreciation of the importance of trees as a serious barrier to preserving urban ES.

Residents highly valued green areas over built-up areas in the vicinity of buildings where they would like to live. This attribute of space was much more important to them than any other. This is not surprising, as the importance of close-to-home greenery is widely recognised as an important driver of living conditions (Hong et al., 2021), and disparities in greenery access are considered an indicator of environmental injustice (Lakes et al., 2014).

The residents' perspectives support practitioners' views on urban planning because a high proportion of greenery enables air flow, thermal control and water regulation (Szulczewska et al., 2014). Regulating ES are closely coupled with the type of greenery cover. The respondents' preference for trees is in line with the fact that they play a much more important role as providers of regulating ES than low vegetation (Przewoźna et al., 2022).

At the same time, there was an important mismatch between the opinions of practitioners and residents about the maintenance of the greenery. Practitioners underlined the role of unmaintained greenery in the city. This is in line with a growing worldwide trend that values it as an important source for biodiversity conservation (Harrison & Davies, 2002) and the provision of multiple ES (Luo & Patuano, 2023). Residents, however, did not perceive the level of maintenance as an important factor in their choices. As other studies show, the preference for the level of green maintenance is conditioned both by socio-economic context and cultural and spiritual requirements (Manyani et al., 2021). Therefore, although our results do not show opposition to informal green space, they suggest the need to inform and persuade residents to adopt a more balanced attitude towards unmaintained greenery (Pietrzyk-Kaszyńska et al., 2017).

Divergences were also found between the two groups with respect to recreation facilities. Residents indicated that facilities for active recreation were more important than facilities for passive recreation. It could be linked to the fact that our sample is slightly younger than the population (GUS, 2022). It may also be evidence of the ongoing cultural change and related to increased awareness of the mental and physical benefits of outdoor physical activity (Grzyb et al., 2021). In any case, it is interesting since providing equipment for active recreation in the housing neighbourhood may help to disperse users and reduce recreational pressure on more valuable green areas in the city. Meanwhile, our findings for practitioners were the opposite: they viewed passive recreation (relaxation and rest) as the most important CES, while active recreation was perceived as less significant and even a threat to the condition of green spaces.

One of the reasons why residents value facilities for passive recreation to a lesser extent may be that they do not need them to relax. As Nordh et al. (2023) show, opportunities to be in direct contact with nature (e.g., sitting or walking on grass) are increasingly demanded by society. In light of these changes, it appears that the infrastructure for passive recreation becomes less important because, to some extent, grassed areas are sufficient.

Residents' preferences versus spatial conditions of multifamily residential areas

Our study showed that city residents would like to live in predominantly green residential neighbourhoods, with trees as the dominant type of greenery cover. This seems to contradict the reality of urban development, which is the ongoing taking of land without compensation of green spaces (Zulian et al., 2022). However, such preferences reflect the global call for making cities greener.

In Poznań, as in most of the second-tier cities in Central and Eastern Europe, a large part of the urban area had been developed during the socialist era, when economic conditions were not the principal factor of development. As much as 12 out of the 42 districts of Poznań that respond best to the needs of the respondents (type 3), are mainly post-socialist areas in which tall blocks of flats are surrounded by spacious green zones. Our results confirm the study by Tandarić et al. (2022), claiming that socialist planning provided abundant, fair-sized, well-distributed green spaces with clearly outlined functions. The post-socialist change into market-orientated growth endangered some green standards and qualities achieved in the former period (Haase et al., 2019).

Type 4 multifamily residential areas are also less densely built up. Here, however, the proportion of tree crowns is below average. These areas are mainly located on the outskirts of the city, where agricultural land is being transformed by urban sprawl. It is possible that, in the future, the density of the built environment will grow, and therefore, the capacity of ES may deteriorate. As observed by Ronchi et al. (2020), a development-driven economy often fails to meet the needs of the local population regarding the value of ecological space. Although the situation will improve as trees planted in these new housing estates will grow over time, Mania and Kozacki (2008) report that planning regulations do not provide the level of urban greenery necessary for ecological functions. Kronenberg et al. (2023) reinforce this picture with observations on developers' activities. Although they recognise green as an important asset of a residential area, developers would rather abuse public green spaces offered by local authorities than take part in developing new ones. Therefore, the greenery in type 4 multifamily residential areas is very vulnerable, and the future delivery of ES in these areas will be shaped, to a large extent, by future decisions about their spatial development.

The two remaining types of greenery are characterised by a higher than average proportion of built-up area. For type 2, this is followed by the presence of trees (a higher than average proportion of tree crowns). According to Jansson (2014), this is the most desired direction for urban development, as it combines the benefits of the compact city with relatively high ES capacity. Our spatial analysis showed that this situation is present in districts located within the inner city, which are highly diverse in terms of both the type of built environment and the type of greenery.

Finally, the multi-family residential greenery of type 1 is characterised by dense built-up areas and a low proportion of tree crowns. The results of the DCE analysis showed that this is the least desired type. First, this type is present in the most central districts of the city, with the Old Town as the most extreme case (38% of built-up areas within 100 m of multifamily residential buildings and only 10% of tree crowns). Second, it is characterised by densely urbanised multifamily residential areas, which were built under development pressure at the expense of ecological and social aspects. Indeed, one of the main obstacles to ongoing re-urbanization, which is a prerequisite for sustainable urban development, is the lack of green spaces in city centres (Haase et al., 2008). However, we explored the opinions of residents about their preferences for residential green and not other factors that make a district a desirable place to live. As Cohen et al. (2012) in the example of Paris, the relations between district prestige, ecological parameters and building density are complex and nonlinear.

Limitations

Our study has three limitations. The first one concerns the sampling method used in the DCE. Recruiting a voluntary sample runs the risk of self-selection bias. However, a representative sample was impossible as there is no database of the population living in multifamily residential buildings in Poznań. We addressed this problem by only sending the questionnaire to district councils and informal groups of Poznań residents, which were neighbourhood-oriented; no other channel was used. Future research could address this and strengthen representativeness by incorporating additional recruitment methods, such as direct engagement with local organisations and non-digital community centres.

The second limitation concerns the selection of attributes for the DCE. The method requires a limited number of attributes, while the demand for CES is multi-dimensional. Multiple factors influence residents' choices, such as age group, income, lifestyle, occupation, previous residential experience, etc. Thus, our results cannot reflect all of the preferences regarding places of residence; they can help, however, to prioritise attributes that have been selected based on the literature.

The third limitation concerns the spatial analysis since it only examined two of the five attributes taken into account in the DCE. However, at the city level, there is no detailed, up-to-date data available regarding either the presence of facilities or the level of greenery management. Moreover, these data are highly volatile in space and time. Nevertheless, the two attributes used in our analysis were most important for respondents, and this paper adds to the literature on how these two preferences can be spatially translated.

Conclusions

In this paper, we combined three perspectives on the role of urban greenery in the supply of CES: practitioners, residents, and spatial conditions in multifamily residential areas. Our aim was to understand the main matches and mismatches between the views of the two groups. Our results show that both groups highly valued urban greenery and, in most cases, were in agreement. The following conclusions are the results of our study.

First, practitioners emphasise regulating ES delivered by urban greenery bundled with CES. What practitioners point out at the city-wide level is accurately perceived by residents at the very local level: greenery in the vicinity of a place of residence is extremely important for urban dwellers. It is so important that they are ready to walk over 1 km to a car park or a bus stop to enjoy living in a flat that is surrounded by predominantly green areas.

Second, there is a mismatch regarding the approach to recreation between the two groups of respondents. Practitioners consider passive recreation to be an important function of urban greenery, while active recreation is considered a threat to ecological conditions. However, residents declare that they value facilities that enable active recreation more than facilities for passive recreation. This discrepancy requires further research. However, this conclusion claims that urban planners should balance active and passive recreation facilities to meet resident preferences while preserving ecological integrity.

Third, our spatial analyses of the city of Poznań revealed that some districts meet the preferences of residents better than others. This means that any recommendations concerning urban greenery that are addressed to planners and managers should take into account the internal differentiation of the city. By tailoring urban greenery planning to specific district characteristics, urban planners can better align green spaces with the unique needs and preferences of local residents, potentially enhancing neighbourhood appeal and cohesion.

An important outcome of our study is the comparison of the perspectives of practitioners and residents. Following the worldwide trend that seeks to make urban planning and management more inclusive, our proposed method not only allows the identification of residents' preferences but also prioritises them. Trade-offs between greenery and other demands are an intrinsic problem in urban development. The DCE study proved to be a helpful method to study these trade-offs. Therefore, it can be used to guide urban management and planning and help design urban green spaces that reflect values and needs. Finally, our results show that practitioners and residents think alike, although they may reach the same point via different routes.

Acknowledgements

The contribution of the authors

Conceptualisation, S.K., P.M., I.Z., M.L., K.M., A.G. and M.D.; methodology, S.K., P.M., I.Z., M.L., K.M., A.G. and M.D.; data curation, P.M., I.Z., K.M. and A.G.; formal analysis, M.L., K.M. and A.G.; writing, S.K., P.M., I.Z., M.L., K.M., A.G. and M.D.

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PLANOWANIE I ZARZĄDZANIE OSIEDLAMI MIESZKANIOWYMI
NA PODSTAWIE USŁUG EKOSYSTEMOWYCH: ŁĄCZĄC PERSPEKTYWĘ PRAKTYKÓW
I PREFERENCJE MIESZKAŃCÓW

STRESZCZENIE: Artykuł dotyczy sfery planowania i zarządzania zielenią w budownictwie wielorodzinnym. Zidentyfikowano podobieństwa między podejściem praktyków, preferencjami mieszkańców i atrybutami przestrzennymi obszarów mieszkalnych, które wpływają na podaż usług ekosystemowych. Analizie poddano usługi kulturowe, najbardziej bezpośrednio doświadczane przez mieszkańców miast. Zastosowane metody obejmowały warsztaty dla praktyków, badanie ankietowe mieszkańców miast oparte na eksperymencie dyskretnego wyboru (DCE) oraz mapowanie atrybutów zieleni w Poznaniu. Nasze badanie podkreśla znaczenie kształtowania warunków, które ułatwiają łączenie regulacyjnych i kulturowych usług ekosystemowych. Praktycy dostrzegają rolę zieleni w dostawie usług ekosystemowych, co odpowiada potrzebie bliskości zieleni wyrażanej przez mieszkańców. Ci ostatni preferują zielone osiedla, z dominacją drzew i pewnymi udogodnieniami dla rekreacji aktywnej. Obie grupy różnią się jednak stosunkiem do utrzymania zieleni i podaży obiektów rekreacyjnych; dla mieszkańców ani poziom „zadbania" o zieleń, ani udogodnienia dla rekreacji pasywnej nie są kluczowe, podczas gdy praktycy uważają za konieczne podejmowanie takich właśnie badań. Zidentyfikowano cztery typy wielorodzinnych obszarów mieszkalnych odzwierciedlających różne preferencje mieszkańców. Uzyskane wyniki dostarczają cennych wskazówek dla przyszłego rozwoju osiedli wielorodzinnych, pomagając projektować miejskie przestrzenie zielone odpowiadające na wartości i potrzeby ludzi, a tym samym zwiększać dostarczanie kulturowych usług ekosystemowych oraz wspierać usługi regulacyjne.

SŁOWA KLUCZOWE: tereny zieleni, zabudowa mieszkaniowa, usługi ekosystemowe, eksperyment dyskretnego wyboru