INFLUENCE OF AN INTERVIEW LOCATION ON OPINIONS ABOUT THE ECOSYSTEM SERVICES PROVIDED BY TREES

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Abstract: Collecting opinions regarding environmental management is essential, particularly in urban areas where space is limited, and interests often collide. However, the impact of the conditions in which the research is conducted on opinions and preferences elicited via surveys and interviews about the environment is usually taken for granted. The recent development of computer-aided survey methods allows a simulation of an environment, which can create an artificial environment for interviews. Therefore, examining whether direct access to the environment impacts opinions and preferences becomes a significant issue when considering environmental policies and management design and execution. This study examines whether the location of an interview, indoors or outdoors (in the vicinity of trees), influences the opinion on the ecosystem services (ES) trees provide. A quasi-experimental method with a map-aided computer-assisted personal interview (CAPI) survey in two Polish cities, indoors and outdoors, in the vicinity of trees, shows that respondents' location did not significantly affect the opinion on the ES provided by trees. However, on average, respondents answering the survey inside buildings marked more trees on a map than those answering outside. We argue that although an interview location does not have a significant impact on the results, from the perspective of various stakeholder groups in participatory processes, the convenience of place is more important than the character of the place (i.e., in the vicinity of trees) as long as the survey method is mediated by a virtual representation of the subject of the study.

Keywords: interview location, place contextuality, trees, ecosystem services, PPGIS

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Introduction

The presence of greenery in urban areas influences inhabitants' well-being (Carrus et al. 2015; Bertram, Rehdaz 2015) and helps to reduce stress and prevent mental illness (WHO, 2021). The importance of urban green spaces (UGSs) is increasingly recognised and addressed, e.g., by the

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World Health Organization, whose European recommendation is that citizens should have access to parks of a minimum area of 0.5 hectares within a 5-minute walking distance (WHO, 2016), and the European Environment Agency, which points out that the degree of greening is poorer in communities of lower socio-economic status and needs to be improved (EEA, 2022). A targeted action to reduce inequalities in access to high-quality green space can maximise health and well-being benefits of nature in cities.

Trees, as a particularly important part of greenery in cities, provide a number of ecosystem services (ES) (Livesley et al. 2015) that contribute to inhabitants' quality of life. Current policy instruments that guide the planning of cities recognise the need for new governance arrangements to implement ambitious targets to increase tree numbers and canopy cover (Ordóñez et al. 2020). However, densely developed city space often collides with tree planning and management. It involves various forms of protests and concerns articulated by groups of residents. The perspective of the residents who often own the tree-covered land needs to be taken into account for drafting feasible policies. Depending on the local or national legal norms in force, their voice should also be considered regarding public areas, especially when urban planning decisions interfere with the environment. Therefore, engaging the public and stakeholders in environmental policy design and implementation has continued to be popular in recent decades. It has become a standard in many countries to include inhabitants' opinions in both land use planning procedures and day-to-day decision-making (Reed 2008; Rawluk et al. 2017; Lee 2021). Also, bottom-up actions, such as tree planting initiatives (Geron et al. 2023; Coleman et al. 2023), rely on residents as actors and are an example of a larger trend in decentralised environmental governance (Batterbury, Fernando 2006).

That is why, although substantial scientific knowledge is available on tree-provided ES (Scholz et al. 2018; Salmond et al. 2016), its supplementation by the opinions and preferences of inhabitants about trees in their specific surroundings is essential for decision-making at local level (Carolan 2008). It is important to secure public support for planned projects and to encourage residents to participate in the implementation of pro-environmental strategies actively. For this reason, public attitudes on the environment and stakeholder group engagement have, in recent decades, increasingly gained importance in the development of environmental policies and management practices (Silva et al. 2016). Various forms of interviews and surveys are widely used to collect opinion data on the environment. One of the issues that are gaining popularity in this area is collecting information about societal preferences while assigning values to ES. Thus, inhabitants' perception of the ES (and disservices) provided by trees have been investigated (Riechers et al. 2016; Riechers et al. 2018; Olsson et al. 2020; Ko, Son 2018), but the issue of accuracy and reliability of data collected from people gained little concern. Yet, mere participation alone is often insufficient, e.g., to address justice concerns (Mabon et al. 2022). One can argue that the reliability of knowledge about inhabitants' preferences is essential to green policy.

Specifically, to date, the location where an interview or survey is carried out is customarily considered insignificant. This assumption can be accepted by default in many studies for the sake of convenience, but this approach is challenged (Elwood, Deborah 2000; Herzog 2005; Hanssen 2012; Gagnon et al. 2015; Jackson 2021). It is argued, however, that the choice of location is not just a technical correlate but a part of the social context of the study, and consequently needs to be an integral part of the interpretation of the findings. In particular, studies on the environment can be considered as sensitive for respondents' settings (Korpilo et al. 2018; Lee 2021; Maricchiolo et al. 2021; Stedman 2003; Zadeh, Sulaiman 2010). In this paper, we investigate whether the opinion on the ES provided by trees in cities is influenced by the location where the study takes place and could, therefore, affect respondents' opinions.

The issue of the location of the data collection has gained additional importance owing to technological development in recent years. Although a questionnaire interview or survey have been standard methods of collecting opinion data, particularly regarding local environment and local environmental knowledge (Zadeh, Sulaiman 2010; Moran, Rau 2016), advances in IT technology have enabled the development of questionnaires based on Geographic Information Systems (GIS) which created new opportunities for the

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implementation of such research, but also uncertainties regarding the results obtained.

Technical facilitation of data collection, visualisation, and analysis, led to the creation of various useful metrics based on land cover information (McVitte, Faccioli 2020; Pocewicz et al. 2012) and the development of public participation GIS (PPGIS) that has been growing recently (Brown et al. 2016; Hovorka, Auerbach 2010; Tsai et al. 2013; Korpilo et al. 2018).

This technological advancement offers new possibilities, including computer-aided data collection using augmented or virtual reality tools (Piga et al. 2021; Fukuda et al. 2019) or the use of the Internet of Things (IoT) for awareness and learning purposes (Tabuenca et al. 2023; Tabuenca et al. 2020). These new advances can be treated as part of the gamification trend, i.e., the process of applying games, particularly computer games, design elements in non-game contexts by integrating elements of fun, challenge, and competition (Deterding et al. 2011; Tenório et al. 2018; Rodosthenous et al. 2023). As a result, opinion surveys also tend to rely more and more on computer-aided web interviews, especially since COVID-19. The consequences of this process are not evident. Therefore, the role of respondents' location context in the data collection process requires scrutiny.

Current knowledge: The role of research location

The place where research is carried out has usually been considered insignificant (Jackson 2021). Therefore, in most studies, location is treated as a matter of convenience. Yet, the location is not entirely a minor technical matter. For example, location has been noted as an element of the social context of an interviewing process that is integral to the interpretation of findings (Herzog 2005). Scholars have noted the impact of an interview location in wide-ranging disciplines, including sociology (Herzog 2005), geography (Elwood, Deborah 2000; Röhrich et al. 2014), ethnographic studies (Illic 2015), nursing research (Gagnon et al. 2015), transport studies (Hanssen, Sandberg 2012) and environmental studies (Jones et al. 2014).

The role of respondents' location is acknowledged from two main points of view. (1) It is emphasised that the issue needs to be considered during the research design phase (Grace 2013). Place characteristics may influence the results, and therefore, these need to be controlled. (2) The location of an interview or survey can influence the results if a study covers specific topics. For instance, if a study relies on recalled experiences of an environment, the effect of location can be significant. In a study on ferry travel times, interviews carried out on a ferry led to different results than interviews held elsewhere (Hanssen, Sandberg 2012). The emphasis on time spent traveling on ferries among those interviewed at home suggests that other benefits of ferry travel, such as being able to relax and enjoy the scenery, are more easily forgotten than the sense of non-productive travel time that could have been devoted to other activities. Thus, depending on the research setting, respondents are more or less likely to recall various experiences that are contextually stimulated by being in the place. Similarly, in a spatial orientation study, an interview closer to an area in question resulted in more accurate recollections (Röhrich et al. 2014).

Environmental studies are susceptible to research settings, often necessitating conducting interviews in natural areas (Shwartz et al. 2014) since the nearness of natural areas can influence the opinions expressed regarding, e.g., the meaning of an attachment to place (Stedman 2003; Nicolosi, Corbett 2018). The nearness of green areas can have an impact on the expressed opinions. Stedman (2003) argues that contrary to the over-constructed views of the place, attributes of the physical environment matter for understanding the place. According to Jenner and Myers (2018), interviews conducted in private spaces (either in person or via online tools) result in greater sharing of deeply personal experiences, whereas interviews conducted in public spaces can produce 'politically correct' hedging and less detailed answers from participants. For these reasons, the location of an interview or survey, which plays a role in constructing personal reality, should be considered during the design of study methods, as it influences recollections and opinions (Grace 2013; Herzog 2005). Location embodies and constitutes scales of spatial relations and meanings and incorporates the participants' power and

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positionality concerning the people, places, and interactions discussed in an interview (Elwood, Deborah 2000). Moreover, taking into account aspects of location broadens the gathered data by linking the results with other relevant contextual information (Illic 2015). Such a combination can provide observational qualitative data that is complementary to verbal communication. While location is recognised as a crucial aspect of anthropological research (Herzog 2005; Illic 2015), it is also a significant factor in environmental studies (Stedman 2003).

Thus, from a methodological perspective, several issues are indicated concerning the location of the data collection process: (1) Research location plays a role in constructing reality, serving simultaneously as both a cultural product and producer (Herzog 2005). (2) Place characteristics embody and constitute scales of spatial relation and meaning. These incorporate the power and positionality of participants into the people, places, and interactions, e.g., discussed in the interview (Elwood, Deborah 2000). (3) Regarding the data gathered, the location links opinions with observation (Illic 2015) and thus provides qualitative data by observation, complementary to verbal communication, which is fundamental in research. (4) Research location also involves legal and ethical issues (dos Santos et al. 2016), e.g., concerning privacy.

Although emphasising the importance of respondents' location appears in the context of the qualitative, interpretative research, Jones et al. (2014) apply the quantitative approach in their study on mental models elicitation concerning the environment. The study tested whether an interview location and circumstances can influence the answers if a topic refers to the environment. It aimed at the elicitation of mental models concerning the interviewees' understanding of the vegetation along the creek's impact on water quality. The results of the interviews carried out either in the vicinity of the creek (situated procedure) or in dwellings (non-situated procedure) showed that an interview location affected the mental models expressed, particularly the richness of the mental representation of the environment. The mental model concept was applied in the study, which is a cognitive representation of external reality that people use as the basis for acting (Jones et al. 2011; Otto-Banaszak et al. 2010). Jones et al. analyse psychological mental models via: (a) the number of concepts used by interviewees (the richness of the environment mental representation); (b) the number of functional linkages (the understanding of the environment's functioning); (c) mental model density (the ratio of functional linkages to the concepts expressed). The results of the study showed that the interviews carried out in the vicinity of the creeks (situated procedure) and in houses (non-situated procedure) differed. Thus, the results of the study by Jones et al. provide evidence that the location of the interviews, understood as the place of filling in the questionnaire, affected the expressed mental models and, through them, attitudes toward the environment. Focusing on environmental studies, we assume two basic types of locations should be considered: inside the building (that is without contact with the environment) and outside the building (near the objects under investigation).

Materials and methods

Ecosystem services as a theoretical framework

The current approach to environmental management, based on framing 'people and nature' (Mace 2014), emphasises a feedback loop between ecosystems and human welfare (Díaz et al. 2015; Maricchiolo et al. 2021). The ES concept enables researchers to investigate the benefits that trees provide to people, both tangible environmental ES (wood, fruit, shade, etc.) and intangible benefits, such as aesthetic value (MEA 2005; Song et al. 2018). Publications on trees in urban areas, e.g., Stockholm (Bolund, Hunhammar 1999) and New York (Nyelele et al. 2019), concerned the significance of ES on a community and individual's quality of life (Bolund, Hunhammar 1999). The importance of ES increases in city centers (Chang et al. 2017). Public policies affect the provision of ES, which benefits residents (Mace 2014; Mączka et al. 2016), so collecting information on opinions, expectations, and perception of ES is essential (Reed 2008; Hurlbert, Gupta 2015; Mączka et al. 2019; Mączka et al. 2021; Jones-Walters, Çil 2011). In particular, information about people's demand for the ES provided by trees relies mainly on eliciting this information from various groups

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of residents. The reliability of collected data on ES is an important issue for designing and implementing policies concerning green spaces. Although the ES approach offers the potential to improve environmental policies and management, it has not yet been widely implemented because of the lack of adequate data (Schirpke et al. 2017). For this reason, we applied the ES concept to our study design regarding the impact of research location on environmental responses as a feasible tool for comparing the noticeable impact of nature on respondents' opinion.

Research design

This study was designed to test whether opinions on the ES provided by trees are influenced by respondents' location using procedures similar to those of Jones et al. (2014). Seventeen categories of ES which are grouped into four types (i.e., provisioning, regulating, habitat, and cultural services – Fig. 1.) were included in the analysis based on the economics of ecosystems and biodiversity (TEEB, 2010) classification of ES and its adaptation for trees in Poland by Kronenberg (2012). Our final ES list was as follows: provision of oxygen; wind protection; production of fruit and nuts; trees as 'witnesses' of history; supplying wood, branches and leaves; noise reduction; impact on the aesthetics of space; educational opportunities; sense of intimacy; separation from neighbours; impact on health and well-being; providing habitat and food sources for animals; improving air and soil moisture, strengthening interpersonal bonds; air purification; protection against snowdrifts; places of recreation; and protection from the sun (providing shade).

We applied a quasi-experimental design. Two studies were carried out in the Polish cities of Poznań and Gdańsk. In each city, the same geo-questionnaire was filled out in two locations: indoors and in the vicinity of trees outdoors. Geo-questionnaires are one of the PPGIS methods that enables the connection of questions with interactive maps (Czepkiewicz et al. 2018). We used a computer-assisted personal interviews (CAPI) technique for our study. The participants were informed about the general aim of the exercise which was to develop a map of the most valuable tree-covered areas and the ES associated with their presence for the municipality in which the survey was conducted. They were instructed to identify exact locations and/or locations associated with the presence of trees that were important to them. To perform this task, respondents were asked to think about trees in their neighbourhood and also trees away of their neighbourhood, and requested to identify (pin) the locations of each single tree or areas covered by trees on a virtual city map. For each tree, participants were to attribute ES (provided by this tree or tree-covered area) perceived as important, chosen from a list of 17 services. One to 17 ES could be selected. They were asked first to mark a tree location and then to attribute ES from the list, for each location separately. The respondents could zoom in on the map in order to identify locations more precisely. Trees could be pinned

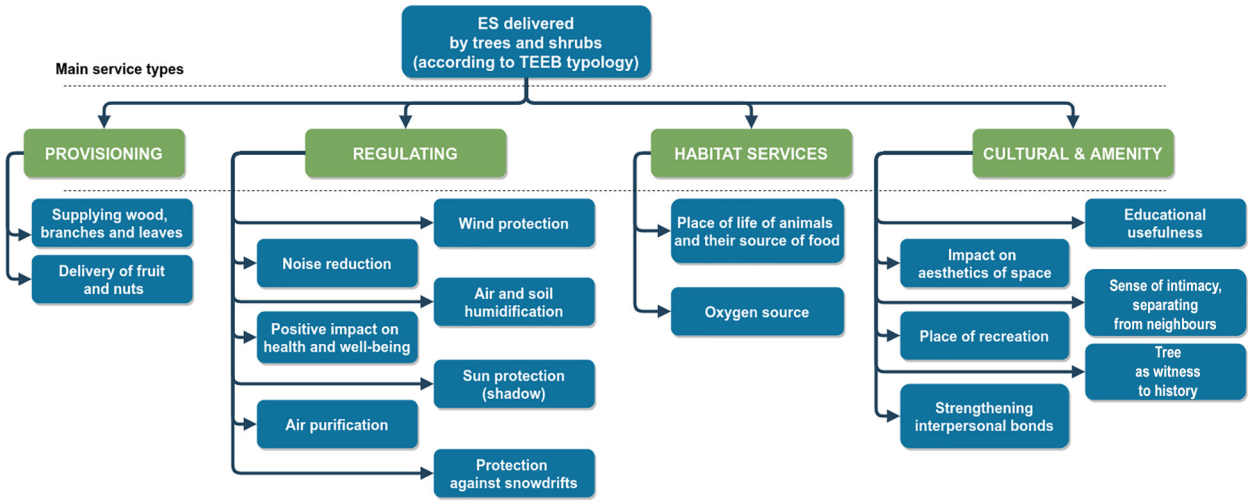

Fig. 1. The list of the ecosystem services (ES) provided by trees investigated in the research. Source: own study.

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in their approximate location, and there were no restrictions based on the type, species of trees, or the number of indicated trees.

The purpose of the study was to verify how the location of the interviews affected the number of indicated locations related to the presence of valuable trees and the number of benefits they provided, according to the research participants. This effect was tested for (a) all the trees identified, and (b) only for the first tree indicated. Testing for both cases was justified because, in most cases, the respondents pinned only one tree.

The study is based on the quasi-experimental design with a grouping variable, which is indoors or outdoors during the interview. In accordance with the design, to control the respondents' age and level of education, we recruited student volunteers (aged 18–25) for answering the questionnaire. We excluded students of biology, as they could have in-depth knowledge, which could give misleading results. For the indoor interviews, students were recruited during the classes but interviews took place after class time. The number of interviewees was to be the same or similar in both groups and the total number in each group was set to allow the statistical analysis.

We selected two places for data collection in the vicinity of trees based on land use maps, with both selected areas having tree canopies and being in proximity to the local universities. The presence of trees in the immediate area where the geo-questionnaire was filled out could have affected the opinion about the benefits, i.e., an opinion about the number and types of ES provided by trees considered important by the respondents. The study did not control the places where the respondents indicated the trees. It made it possible to focus only on how the indoors/outdoors factor influenced the ES perception.

Data collection

The study was conducted in April and May 2019, when the trees had produced leaves. In Poznań, vegetation develops a few weeks earlier than in Gdańsk. For this reason, the survey in Gdańsk was conducted at the beginning of May, about two weeks later than in Poznań. Surveys done indoors were located within university buildings, while outdoor surveys were carried out in parks adjacent to the university buildings where deciduous trees, such as linden, elm, and beech, predominated. The weather at the time of the surveys was moderate, with a temperature of about 20°C (68°F) and no rain (Photo 1). The survey was conducted using desktop computers (indoors) and laptops or tablets (outdoors).

We conducted 125 interviews in total, 45 of which were carried out in the vicinity of trees,

Table 1. The number of questionnaires given by location.

	Outdoors			Indoors			Total
	Total outdoors	Male	Female	Total indoors	Male	Female	
Gdańsk	21	9	12	55	24	31	76
Poznań	20	7	13	22	6	16	42
Total	41	16	25	77	30	47	118

Source: own study.

Photo 1.
Source: taken by the authors.

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and 80 in buildings. Out of 125 interviews conducted, 118 respondents indicated that trees offered benefits (this piece of data is available in an open repository – Inglot et al. 2021). The total number of 118 cases were used in the analysis (Table 1). We did not manage to recruit an equal number of interviews for each group. However, it is not a prerequisite for the quasi-experimental study, and we reached the total numbers allowing for the statistical analysis (Bauer et al. 2008; Jóźwiak, Moerbeek 2013; Neuhäuser et al. 2021).

A non-parametric Mann-Whitney U test was used to analyse group differences. A chi-square test was used to test for differences in ES attributed to the trees marked on maps. In cases with fewer than five observations in compared subgroups, Yates' correction for continuity was applied. The analyses were carried out using R software.

Results

Impact of our study location on the indicated number of trees

The respondents pinned 197 trees in total. The study location significantly affected the number of trees pinned on maps by the respondents (Mann-Whitney U test: U = 2013.5, p = 0.003486). Forty-four percent of the respondents completing the questionnaire inside buildings indicated more than one tree, while only 15% of those answering outside identified more than one tree (Fig. 2).

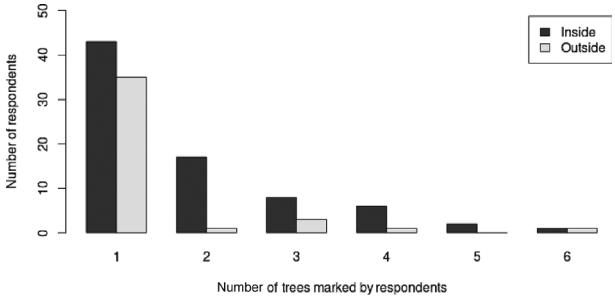

Fig. 2. The number of trees identified by the respondents answering the questionnaire indoors or outdoors.
Source: own study.

Those who answered indoors indicated 2.4 times more trees than those who were outdoors. However, this did not result in a significant difference between the number of the ES marked by the respondents in two compared locations (Mann-Whitney U test: W = 1688.5, p = 0.5344; Ansari-Bradley test for the difference in scale parameters: B = 2196.5, p = 0.1995).

Impact of an interview location on the number of ES attributed to trees

The respondents indicated ES 806 times in total. For the IN measurement, the most frequently indicated ES were: Impact on aesthetics of space (59); Oxygen source (57); Positive impact on health and well-being (48), and the least frequently indicated were: Supplying wood, branches and leaves (8); Educational usefulness (10); Protection against snowdrifts (12). For the OUT measurement, the most frequently indicated ES were: Oxygen source (30); Air purification (27); Sun protection (shade) (26), and the least frequently indicated were: Protection against snowdrifts (3); Supplying wood, branches and leaves (5); Tree as witness to history (6).

The differences in the number of ES between the places regarding the place where interviews were conducted (IN and OUT) are minor and not statistically significant (Table 2).

For the first trees in the IN measurement, respondents indicated ES 419 times in total, and for OUT measurement, it was 255 times in total. For the IN measurement, the most frequently indicated ES were: Impact on aesthetics of space (54); Oxygen source (51); Air purification (41), and the least frequently indicated were: Educational usefulness (6); Supplying wood, branches, and leaves (6); Tree as witness to history (7). Furthermore, for the OUT measurement, the most frequently indicated ES were: Oxygen source (30); Impact on aesthetics of space (25); Air purification (25); Sun protection (shade) (25). The least frequently indicated were: Protection against snowdrifts (2); Supplying wood, branches and leaves (5); Tree as witness to history (6).

As was the case with the analysis of all trees, the differences between the places where individual ES were ranked in the IN and OUT measurements are minor, and statistically insignificant (Table 2).

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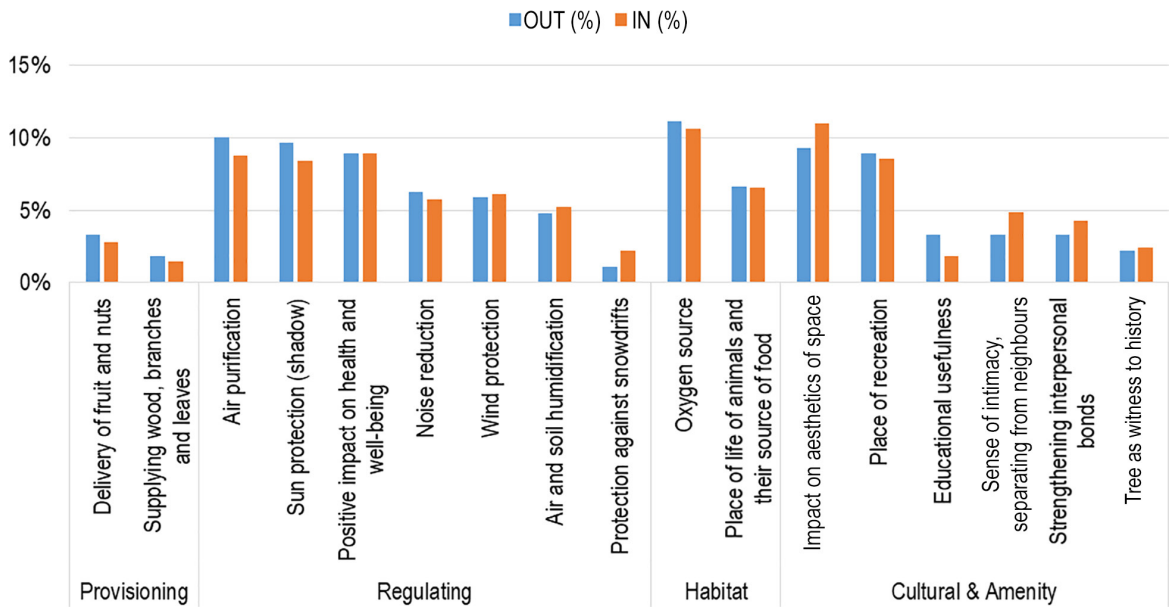

Fig. 3. The number of ES indications for IN and OUT locations, for all trees indicated. Source: own study.

To verify whether the respondents' answers concerning the differences varied because of an interview location, we tested each ES separately for: (a) all the trees identified and (b) only the first tree indicated. Therefore, one could expect that those pinning one tree could constitute a specific group in terms of the attributed ES. The influence of the respondents' location on the number of ES was not significant either for all the trees or for the first indicated tree (Table 2).

Impact of a city on the number of the ES indicated

We additionally tested whether the city was a significant factor impacting the opinion. It was hypothesised that the opinion between the cities about the number and types of ES provided by trees considered important by the respondents was insignificant. A significant difference would suggest the existence of an additional city-related factor influencing the opinion.

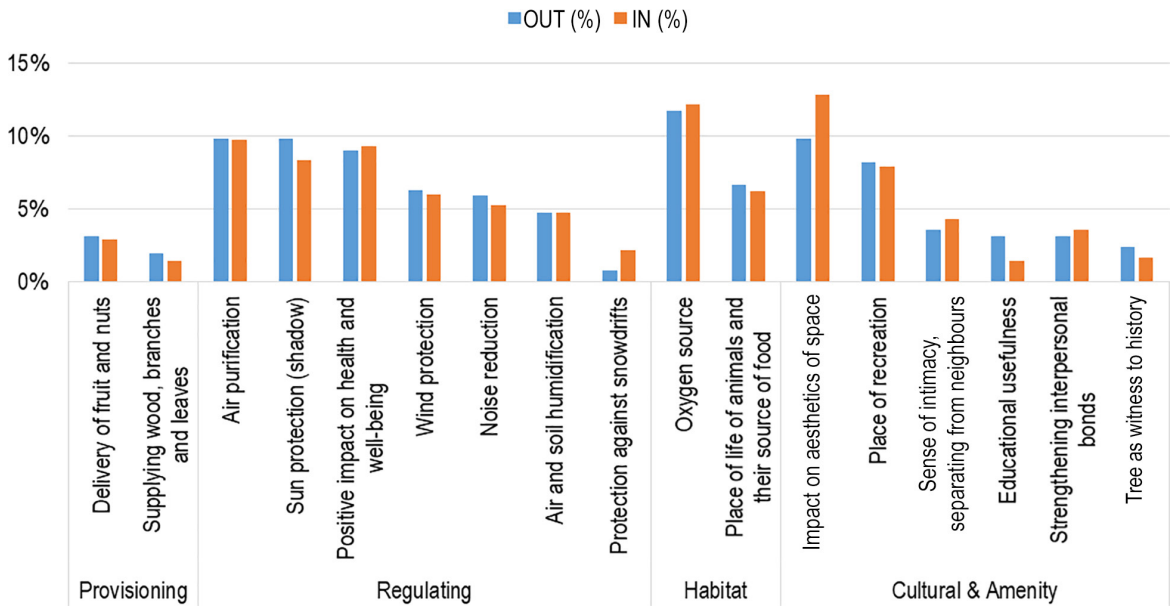

Fig. 4. The number of ES indications for IN and OUT locations, for the first tree indicated. Source: own study.

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Table 2. The difference between the number of ecosystem services (ES) indicated indoors (IN) and outdoors (OUT) and the general number of ES in Gdańsk (Gda) and Poznań (Poz), expressed as a percentage of each ES imitated in a given group (IN/OUT/Gda/Poz).

Ecosystem services	All trees				First tree				Difference between cities			
	IN [%]	OUT [%]	Chi2	P	IN [%]	OUT [%]	Chi2	P	Gda [%]	Poz [%]	Chi2	P
Oxygen source	11	11	0.010	0.920	12	12	0.598	0.439	10	11	0.789	0.374
Wind protection	6	6	0.162	0.687	6	6	0.507	0.476	5	8	3.165	0.075
Delivery of fruit and nuts	3	3	0.101	0.751	3	3	0.293	0.588	3	3	0.067	0.796
Tree as witness to history	2	2	0.100	0.752	2	2	0.839	0.360	3	2	0.159	0.690
Supplying wood, branches and leaves	1	2	0.089	0.765	1	2	0.614	0.433	2	1	0.479	0.489
Noise reduction	6	6	0.016	0.899	5	6	0.798	0.372	5	7	1.302	0.254
Impact on aesthetics of space	11	9	3.194	0.079	13	10	1.013	0.314	11	9	2.739	0.098
Educational usefulness	2	3	1.591	0.207	1	3	3.514	0.061	2	3	0.419	0.517
Sense of intimacy, separating from neighbours	5	3	1.790	0.181	4	4	0.031	0.861	5	3	1.070	0.301
Positive impact on health and well-being	9	9	0.010	0.920	9	9	0.318	0.572	9	9	0.061	0.805
Habitat and food source for animals	7	7	0.026	0.872	6	7	0.684	0.408	7	7	0.003	0.958
Regulating air humidity and soil moisture	5	5	0.256	0.613	5	5	0.147	0.701	5	5	0.027	0.869
Strengthening interpersonal bonds	4	3	0.849	0.357	4	3	0.000	0.997	4	3	0.361	0.548
Air purification	9	10	0.265	0.607	10	10	0.648	0.421	9	10	0.436	0.509
Protection against snowdrifts	2	1	0.987	0.320	2	1	0.773	0.379	2	2	0.038	0.845
Place of recreation	9	9	0.016	0.899	8	8	0.754	0.385	9	9	0.001	0.973
Sun protection (shade)	8	10	0.276	0.599	8	10	1.579	0.108	8	10	1.149	0.284

Source: own study.

The analysis showed that ES were indicated 515 times in total in Gdańsk and 291 times in Poznań. In Gdańsk, the most frequently indicated ES were: Impact on aesthetics of space (58); Oxygen source (54); Positive impact on health and well-being (47), and the least frequently indicated were: Protection against snowdrifts (10); Supplying wood, branches and leaves (10); Educational usefulness (11). The differences between the places in which each ES was ranked in the two cities are small. They fall within adjacent quartiles and amount to a maximum of three positions – as are the cases for Impact on aesthetics of space, which in Gdańsk was ranked first and in Poznań fourth and Sun protection (shade), which in Gdańsk was ranked sixth and in Poznań third. Thus, the analysis confirmed that the city in which the surveys were conducted was not a significant factor affecting the opinion of ES, according to chi-square statistics.

Discussion and conclusions

A sufficient provision of trees in urban areas appears increasingly difficult because of limited space, growing infrastructure and development needs, and contradictory demands from various groups. Therefore, policies and management regarding trees require engaging stakeholders to develop feasible solutions. Elicitation of societal demands regarding multiple benefits provided by green areas is instrumental in informing policies' design and reconciling conflicts (Przewoźna et al. 2022; Mączka et al. 2021). New technologies for collecting survey data with stakeholders' opinions and preferences make the task cheaper and more comfortable. However, such data need to be reliable. What seems particularly relevant, given the environmental problems, is direct or indirect contact with nature in the situation of collecting data from stakeholders.

Although in most cases, the location of an interview or a survey is not considered a decisive determinant of results, when the research concerns the environment, it has been claimed that the fact that a respondent can sense the nature when answering a questionnaire can impact the opinions expressed. This study tested the importance of location by studying opinions about tree-provided ES and revealed that respondents' location (indoors vs. outdoors) did not significantly affect their opinions on the subject in question. This contradicts the results of Jones et

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al. (2014), who found a significant impact on their respondents' mental model of the ES of vegetation when the respondents were in the vicinity of a creek. However, whereas Jones et al.'s study focused on in-depth cognition of the environment, the focus of our study was on benefits from trees. This might explain why our results differed from those of Jones et al., but this issue deserves further investigation. In particular, the influence of socio-demographic variables needs to be closely considered, in line with variables related to the context of data collection, such as time to fill out the questionnaire. The sample of participants in our study consisted only of students from urban areas aged 18–25, who voluntarily took part in the study, which potentially limited the applicability of the results to a smaller demographic that does not encompass different age groups, experiences with ES or attachment to the places in which its presence is appreciated. For this reason, one cannot clearly hypothesise the extent to which age, education, house ownership or occupation might influence perceptions of ES in indoor/outdoor conditions. Determining the importance of these factors would require further investigation. The fact that the study was focused only on trees, a specific part of the environment, is another limitation of the study. Research related to other components of nature, such as water, soil or air, could produce different responses to the question. Furthermore, the impact of the research tools requires closer exploration. When tested, these elements could provide a better understanding of the factors affecting the importance of a place in eliciting opinions about ES provided by natural environments. Also, the timing of the study needs more scrutiny. This research was carried out during the spring season, when trees are in full leaf. It could distort the perception of services such as shade and aesthetics, which may vary across different seasons.

Interestingly, in our study, the respondents' location had a significant impact on the number of trees indicated. Although the difference was not significant, the respondents located indoors identified, on average, more than twice as many trees. This result is counterintuitive as one would expect that answering a questionnaire with trees in the immediate surroundings would incline a respondent to mention more trees, compared to those answering the questionnaire indoors. The result can be explained by greater convenience and comfort when completing the questionnaire inside a building. In general, it suggests that a respondent is somewhat mentally 'isolated' from external stimuli, which could also support the claim that, contrary to Jones et al., this study reflected the respondents' 'shallow' opinion (Mandelbaum 2018).

Furthermore, regardless of the measurement location (indoors vs. outdoors) and the studied area (Gdańsk or Poznań), the highest number indications were noted for the ES related to the aesthetics of space, air quality, sun protection, and positive health impacts. On the one hand, our results partially correspond to the findings of the study on the preferences of experts regarding the ES provided by trees (Przewoźna et al. 2022), in which regulating ES (including those related to air quality) were also highly ranked. On the other hand, unlike in our study, experts considered cultural ES (including those related to the aesthetics of space) less important. However, it should be noted that ranking ES was not the aim of our study, some potentially significant variables (e.g., socio-demographic) were not controlled, and the observed differences are rather small and not statistically significant, hence further research should be conducted in the context of ES ranking.

The study's results provide insights into opinions about the environment (the ES provided by trees) in a micro-perspective. It has implications for participatory decision- and policy-making on the municipal level. One can claim that, when asking for an opinion about the environment, the place where an interview is located appears insignificant, contrary to more personal issues, e.g., those concerning family (Jenner, Myers 2018). Therefore, for collecting opinions about the environment, a more important factor is the convenience of the place where the research is carried out (Jones et al. 2011), as opposed to the character of the place (e.g., indoors vs. outdoors). This is particularly important when carrying out research that meets one of the main criteria of a participatory process, i.e., inclusiveness – providing equal representation to all the groups concerned with the outcome (Schroeter et al. 2016).

Finally, today, the development of computer/mobile-based research technologies makes collection of opinion and reference data easier and

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cheaper. Also, it enables the geolocalisation of answers. The application of virtual or augmented reality in research will highlight technological impacts on the collected data. Scrutinising this gamification-like process is necessary for gathering data on stakeholders' preferences to design and implement better environmental policies. Therefore, the subject requires future investigation.

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Authors' contribution:

PM: conceptualisation, methodology, investigation, data curation, writing – original draft, writing – review & editing, funding acquisition, project administration, supervision; MM: conceptualisation, investigation, data curation, writing – original draft, writing – review & editing, visualisation; KM: conceptualisation, writing – original draft, writing – review & editing; PP: conceptualisation, writing – original draft, writing – review & editing, data curation, visualisation; AI: investigation, writing – review & editing, data curation, visualisation.

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