

Looking at the Suburban Landscape from the Functional Perspective – Taking Jan Gehl’s Approach to the Neighbouring Municipalities of Wrocław, Poland

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Abstract

Due to employment opportunities and service access, suburban lifestyles often involve strong functional relationships with the city. However, as a new living environment, the suburban area serves more than mere housing purposes, instead emerging as an arena for different kinds of leisure activities that positively influence health and well-being. With an awareness of the influence of suburban design on health and well-being, this study aimed to utilise a place-based approach to investigate the characteristics of necessary and optional activity points for suburban residents. To do so, we used Gehl's categories for necessary and optional activities and data from the Public Participatory Geographic Information System (PPGIS). We employed the concept of activity spaces to describe individuals' spatial behaviour for necessary and optional activities and characterise them. This study demonstrated that the relationship between suburban dwellers and the city is more highly reflected in necessary than optional activities. Suburban areas provide an environment for optional activities that mainly occur within settlement areas, agriculture, forest, and protected areas. Finally, the study concludes that the use of landscapes with high cultural and natural value for optional activities could be improved.

Keywords

well-being, health, suburban area, necessary activities, optional activities, activity spaces

Introduction

In Europe, rapid urbanisation significantly influences the suburbanisation of major cities (Antrop, 2004), leading to substantial changes in land use (Sylla & Solecka, 2019). As suburban landscapes evolve, agricultural land is increasingly converted into residential areas (Solecka et al., 2017), offering relatively affordable housing compared to urban centers. In Poland, suburban expansion is characterised by the rapid spread of single-family housing, often lacking adequate services, public transit, public spaces, and infrastructure (Kajdanek, 2012).

Despite these challenges, suburban residents maintain strong functional ties to the city, primarily for employment and access to essential services. However, suburban areas are not merely residential extensions of urban centers; they also serve as spaces for various activities, including recreation, leisure, and closer interaction with nature — factors that contribute positively to health and overall quality of life (Raza et al., 2020).

This study examines the suburban municipalities surrounding Wrocław from a landscape perspective, exploring the transformation of these areas and their evolving role in residents' lives.

In the study, landscape is defined as an “area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors” (European Landscape Convention, 2000). With the knowledge that landscape is shaped by natural and human factors, we assume that it could also provide space for different activities or encourage such activities through its cultural and natural elements (Vallés-Planells et al., 2014; Gehl, 1971). Laatikainen et al. (2017) used land use to study the physical environment of positive places and provide insights into how the physical environment impacts human behaviour between different age groups. Cultural and natural landscape elements (such as historical buildings and natural monuments) contribute to landscape historicity, naturalness, and imageability and are often employed as indicators to capture the visual character of a landscape (Ode et al., 2008). The features of a physical environment can influence the way in which it is used and, in turn, the health of its users (Sallis et al., 2016), as well as their level of satisfaction with it and, consequently, their well-being (Kytä et al., 2016).

Jan Gehl (1971) described three types of activities that occur in public spaces. Firstly, necessary activities are related to everyday duties, including work, education, and shopping, and comprise actions required for daily routine. They occur year-round and are not dependent on outdoor environments. Secondly, optional activities occur if there is a willingness and a favourable time and place and include activities related to sports and recreation, appearing only if they are encouraged within the space. This means that the quality of the environment facilitates optional activities – the better the quality, the more often optional activities occur (Majewska et al., 2022). Finally, social activities depend on the presence of people within public spaces. Any sign of passive (e.g., observing) or active (e.g., greeting, playing) social behaviour is categorised as social activity. Social activities are also referred to as “resultant” because they frequently evolve from activities in the other categories as people meet in the same space.

The design of suburban areas may influence necessary and optional activities through spatial relations between activity points (e.g., work, services, and recreational) and impact the health and well-being of suburban dwellers. In recent years, a number of health-promoting aspects in urban context have been studied (Besenyi et al., 2014; Haybatollahi et al., 2015; Laatikainen et al., 2017, 2018, 2019; Kajosaari & Laatikainen, 2020; Kolat et al., 2022). Zhang et al. (2019) demonstrated the indirect effects of destination accessibility on suburban dwellers’ depressive symptoms and highlighted the importance of time on public transit and driving time to the suburban neighbourhood and signs of depression.

Another health and well-being factor in the suburban landscape is community attachment. Interaction with friends, family, and community is strongly related to well-being (Fagerholm et al., 2020a) and may improve life quality in peri-urban areas. Fu (2018) demonstrated that the indirect effect of the use of public space on depression is mediated by neighbourhood-based social networks and neighbourhood attachment. Moreover, Arnberger and Eder (2012) suggested that the perceived supply and quality of green space can promote community attachment. The study investigated the influence of public green space and recreation behaviour on community attachment and explored how urban and suburban dwellers differ in regard to community attachment. Urban residents showed higher community attachment, valued community green space more, and perceived better quality of life in their community than suburban dwellers. This confirmed that public spaces produce platforms for community formation and the base for socially sustainable areas that are also relevant for peri-urban contexts (Kajdanek, 2012; Kasemets et al., 2019).

Given the knowledge of the influence of suburban design on health and well-being, this study aims to identify the relationships between necessary and optional activities and structural characteristics of the neighbouring municipalities of Wrocław. To do so, we utilise Gehl’s categories for necessary and optional activities, data from the Public Participatory Geographic Information Systems (PPGIS), and a place-based approach. Necessary activities serve to illustrate everyday activities, while an analysis of optional activities identifies the key features and conditions for people to use space for recreation, leisure activities, and social life. We employ the concept of activity spaces to describe and characterise individuals’ spatial behaviours (Hasanzadeh, 2019) for necessary and optional activities. To better plan and manage suburban areas, we must understand how people use the suburban landscape, their relationship to the city, their use of the city, and how

recreation areas in the suburban areas could be improved. To do so, we seek to answer the following research questions:

1. How is the relationship between suburban dwellers and the city reflected in necessary and optional activities?
2. To what degree does a suburban area provide an environment for optional activities for suburban dwellers?
3. Which landscape characteristics describe places that suburban residents choose for optional activities?

Methodology

Data collection

To study this phenomenon, we adapted a place-based approach, meaning that we study the issue from the perspective of a specific place – the localisation of human activities on a map is crucial and provides possibilities for empirical investigations of the environments used by suburban dwellers (Brown and Kytä, 2014). The data was collected through the PPGIS questionnaire, which was located on a web-based platform and enabled respondents to map places in their neighbourhoods. Using this method, we were able to gather and combine personal background data, thematic data, and geographical information. The PPGIS questionnaire was distributed among inhabitants of peri-urban municipalities of Wrocław, using random household sampling (letters and leaflets distributed by traditional post), online open marketing of the municipalities, and social media groups on municipality-specific topics. Prior to running the questionnaire, it was tested in different age groups to ensure its usability and equal accessibility for all. Concerning the usability of the questionnaire, only point information could be marked on the map (Gottwald et al., 2016). The survey was distributed between June and October 2019.

We collected PPGIS data about activities in Wrocław's neighbouring municipalities by asking respondents to mark their homes, their places of work or education, frequently visited places, important places in the landscape, and activities related to water, movement, and recreation. Respondents were able to change their background map (satellite image or topographic map) and zoom in or out of the map to locate their activity points. Frequently visited places were described as those locations, other than their home or work, that were often visited, including stores or places where they dropped off or picked up their children. Important places in the landscape were described as those that were significant due to environmental, cultural/historical, aesthetic/scenic, or personal value, and were previously used as a subjectivist approach to assess the perceived quality of a landscape (Solecka et al., 2022). Respondents also indicated how often they visited those places, which we assumed to be used for optional activities. Activities were grouped as related to water, movement, and social life. Activities related to water, which included swimming, kayaking, water-cycling, stand-up paddling, power boating, boating, and fishing, were grouped separately due to the presence of the rivers in the case study area (e.g., Odra, Bystrzyca, Barycz, Widawa, and Ślęza). Activities related to movement included the most popular outdoor activities, such as walking, running, cycling, and hiking. Activities related to recreation and social life included meetings with friends and family, barbecues, picnics, cultural activities (e.g., concerts and exhibitions in the fresh air), and relaxing in and observing nature.

Case study area

The case study area comprised ten neighbouring municipalities of the city of Wrocław located in the Lower Silesia region of southwest Poland (Figure 1; Table 1). This area is characterised by agricultural character and high suburbanisation pressure arising from the rapid development of Wrocław and its neighbouring municipalities. Rapid land use changes primarily include conversion from farmland to new settlement areas (Solecka et al., 2017). Spatial decisions that indicate those changes are made on a local scale, and the planning documents for all municipalities include new housing areas (Świąder et al., 2020).

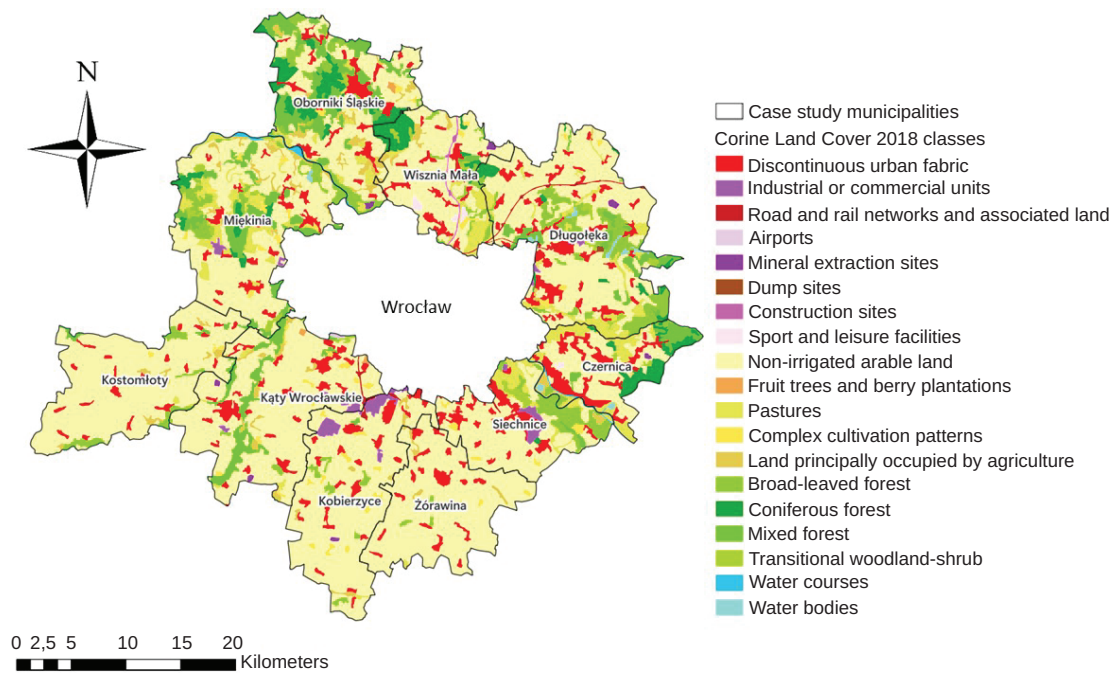


Figure 1. The case study area, covering ten municipalities around the city of Wrocław in southwest Poland

Source: European Environment Agency (EEA), *Corine Land Cover 2018*, land cover data based on satellite imagery analysis, available at: <https://land.copernicus.eu/pan-european/corine-land-cover>

Table 1. Case study municipalities, their number of inhabitants, and their area (ha)

Municipality	Number of inhabitants	Area (ha)
Wisznia Mała	10,868	10,308
Długoleka	30,856	21,202
Czernica	14,368	10,532
Siechnice	18,726	9,598
Żórawina	10,303	12,002
Kobierzyce	19,953	14,986
Kąty Wrocławskie	25,058	17,610
Kostomłoty	6,486	14,274
Miękinia	10,899	17,677
Oborniki Śląskie	19,636	15,028

Analysis of activity points

To analyse the features of the physical environment of places for necessary and optional activities, we employed a similar approach to that of previous studies (Laatikainen et al., 2017). The set of GIS-based variables was based on land cover data. Additionally, we analysed the spatial relation to protected areas (landscape parks, nature reserves and Natura 2000 areas, and ecological land uses; Table 2) and the presence of natural monuments and cultural heritage objects to examine their role in providing opportunities for leisure activities in the suburban landscape (Table 3). As the basis unit for analysis, we utilised the spherical buffers of 100m to characterise the direct surroundings of the activity points. The Corine Land Cover database for 2018 was used to characterise land cover data, while vector data from the General Directorate for Environmental Protection was employed to analyse the relationship with protected areas and natural monuments. In order to analyse the relationship with cultural heritage objects, we used a database of topographic objects from the General Office of Geodesy and Cartography for the years 2017, 2018, and 2020 (depending on the availability for each municipality). We took Gehl's approach towards the types of activities that occur in the public spaces of cities, and we used it to analyse the use of suburban areas from a planning perspective. Additionally, we categorised activities related to everyday routines (e.g., going to

work or shopping) as necessary activities, while activities related to water, movement, or recreation and visiting important places were regarded as optional activities (see Table 3). We excluded the category of social activities because, as “resultant” activities, they appear simultaneously with the other two categories and are dependent on the presence of other people. We assumed that places representing high-quality areas for optional activities would also support social interactions.

Table 2. Protected areas within the case study's municipalities

Type of protected area	Name of protected area	Municipalities
Nature 2000 site	Dolina Baryczy	Miękinia, Oborniki Śląskie
	Grądy w Dolinie Odry	Czernica, Siechnice
	Łęgi Odrzańskie	Kąty Wrocławskie, Kobierzyce, Siechnice and Czernica
Landscape park	Park Krajobrazowy Dolina Bystrzycy	Kąty Wrocławskie i Kobierzyce
	Park Krajobrazowy Doliny Baryczy	Miękinia i Oborniki Śląskie
Nature reserve	Odrzysko	Siechnice
	Zabór	Miękinia
Ecological land use	-	Czernica, Siechnice, Żórawina, Kobierzyce, Kostomłoty, Miękinia

Table 3. GIS-based measures used to study the physical environment of the activity points

Variable	Type of variable	Measures	Data source
Housing	Land use	Share of housing in each activity point buffer	Corine Land Cover 2018
Agriculture	Land use	Share of agriculture in each activity point buffer	
Industrial area	Land use	Share of industrial area in each activity point buffer	
Extraction sites	Land use	Share of extraction areas in each activity point buffer	
Forest	Land use	Share of forest in each activity point buffer	
Green areas	Land use	Share of green areas in each activity point buffer	
Wetlands	Land use	Share of wetlands in each activity point buffer	
Water	Land use	Share of water in each activity point buffer	
Protected areas	Structure of protected areas	Location of activity points within the protected areas	General Directorate for Environmental Protection
Natural monuments	Structure of protected areas	Location of natural monuments within each activity point buffer	
Cultural heritage objects	Structure of cultural heritage	Location of cultural heritage objects within each activity point buffer	Database of topographic objects from the General Office of Geodesy and Cartography for the years 2017, 2018, and 2020

Additionally, we analysed the functional and spatial relationships between suburban dwellers and the city. We calculated the number of optional and necessary activity points located within the city, within the case study area, and outside of both. We also examined the workplace locations of respondents living within different buffer zones from the city border and their mean distance from home to work. We used the buffers of 5km, 5.1–10km, 10.1–15km, 15.1–20km, and 20.1–25km to understand how the closeness of the city impacts suburban dwellers' travel behaviours.

Analysis of activity spaces

When calculating the activity space for each respondent's necessary and optional activities, we employed a home range model based on an individual's mobility patterns, collected as frequently

visited destinations through the PPGIS survey (Hasanzadeh et al., 2017). The concept of activity space is used to describe and capture individuals' spatial behaviours (Hasanzadeh et al., 2018). We included home points in both necessary and optional activity spaces datasets as they worked as reference points in the analysis.

We utilised the terms of “monocentric”, “bicentric”, and “polycentric” to describe activity spaces. Activity spaces were characterised as monocentric if they consisted of a single cluster of activity places located within the home surroundings. Bicentric was used when, in addition to the cluster of activities around the home, activity spaces had another centre of activities somewhere further. Finally, polycentric was used for activity spaces, which, alongside a cluster of activities around the home, had at least two more centres of activities further from the place of residence (Hasanzadeh, 2019).

We calculated the number of activity spaces located entirely within the case study area to understand how many respondents were able to satisfy their needs for necessary and optional activities in the suburban area. We used the buffer zones described above to check the relationship between the type of centrality and the distance between the respondent's home and the city border.

Results

A total of 468 people responded to the survey. Over half (53%) were adults aged 15–64, 2% reported being over 64 years old, and 45% of all respondents did not report their age. From the randomly sampled respondents, 80% were aged between 15 and 64, 8% were over 64 years old, and 12% did not report their age. Meanwhile, from the open marketing sample, 52% were 15–64 years old, 2% were over 64 years old, and 46% did not report their age. A similar pattern was also witnessed in regard to respondents' genders. From the random sample, 48% were women, 45% were men, and 7% did not report their gender. From the crowdsourced data, 35% were women, 24% were men, and 41% did not report their gender. We compared respondents' characteristics to the Census Data from the study site according to the Polish General Statistical Office (aged 18–64=67%, aged over 64=18%; female=52%, male=48%) and found that gender distribution was relatively similar between the sample and census data, whereas the representation of the older age group was clearly lower in the sample compared to the census data. No respondents under 18 years of age participated in the survey. Among respondents who reported on the duration of living in the case study area, 28% had lived in the area for less than five years, 21% between five and ten years, 21% more than ten but less than 20 years, and 30% more than 20 years. 24% of respondents stated that their motivation for moving to the suburban area arose from the good connection to the city. Other popular motivations included pleasant environment (16%), closeness to nature (15%), relatively cheap housing (13%), possibilities for sport and recreation (8%), service access (7%), closeness to school/work or access to daycare and kindergarten (6%), and strong local communities or possibilities for hobbies (4%). The mean number per household was two for cars, three for bikes, and 0.4 for public transport monthly tickets. 80% of respondents lived in single-family housing, with the remaining 20% in multi-family housing. We used the criteria of mapping home points within the case study area for data validation. As a result, we selected 343 respondents who marked 2,187 points (see Table 4).

Table 4. Different types of activities that occur in the suburban area of Wrocław, Poland

Type of activity	Number of points
Necessary activities	1,028
Home	343
Work	303
Frequently visited places	382
Optional activities	1,159
Important places in landscape	491
Activities related to water	174
Activities related to movement/sport	275

Table 4. – cont.

Type of activity	Number of points
Activities related to social life, recreation, relax	219
Total:	2,187

Analysis of activity points

To analyse the physical characteristics of necessary and optional activity points, we calculated the mean share of different land cover types within the buffers of mapped activity points (Table 5). Necessary activities were concentrated in housing areas (61–63%, with 47% covered entirely by housing), while the direct surroundings of optional activities consisted of a mixture of agriculture (29–42%), forest (14–31%), and housing (17–42%). Additionally, 21% of optional activity points were located entirely within agricultural land and 20% in the forest.

Table 5. Land use (%) within the buffers of necessary and optional activities*

Land use type (%)	Necessary activity points		Optional activity points			
	Work/school/university	Frequently visited places	Important places	Movement activities	Recreation activities	Water activities
Housing	63	61	20	17	42	24
Industrial and service area	15	13	2	3	2	6
Extraction site	0	0	2	0	1	3
Green area	4	5	7	5	4	3
Agricultural land	15	13	31	42	30	29
Forest	2	6	35	31	18	14
Wetlands	0	0	0	0	0	0
Water	0	1	5	2	3	20

* Values above 10% are marked in bold.

To better explain the determinants for the location of optional and necessary activities, we analysed their relationship to protected areas and cultural or natural monuments (Table 6). This relationship identified that necessary activities have very little spatial overlap with protected areas (5%), while optional activities have some spatial overlap (32%). 28% of necessary activities are located within a distance of 100m to cultural monuments, compared to 8% of optional activities. Necessary activities are located in the city centre, characterised by a high density of cultural heritage objects. Consequently, there is some relationship between them. We might expect a relationship between optional activities and cultural monuments; however, the relationship was rather weak. We did not observe a relationship between natural monuments and necessary or optional activities.

To understand the relationship between suburban dwellers and the city, we analysed the spatial locations of necessary and optional activity points (Table 7). The majority of necessary activity points are located within the city of Wrocław (51%). However, a considerable proportion of necessary points are also located within the suburban area itself (43%), with only 6% located outside of either one. Only 12% of optional activity points are located within the city, while 74% are located within the suburban area. Moreover, due to the presence of mountains, 14% of optional activity points are located outside of the case study area, primarily in the South and southwestern parts of the Lower Silesia region.

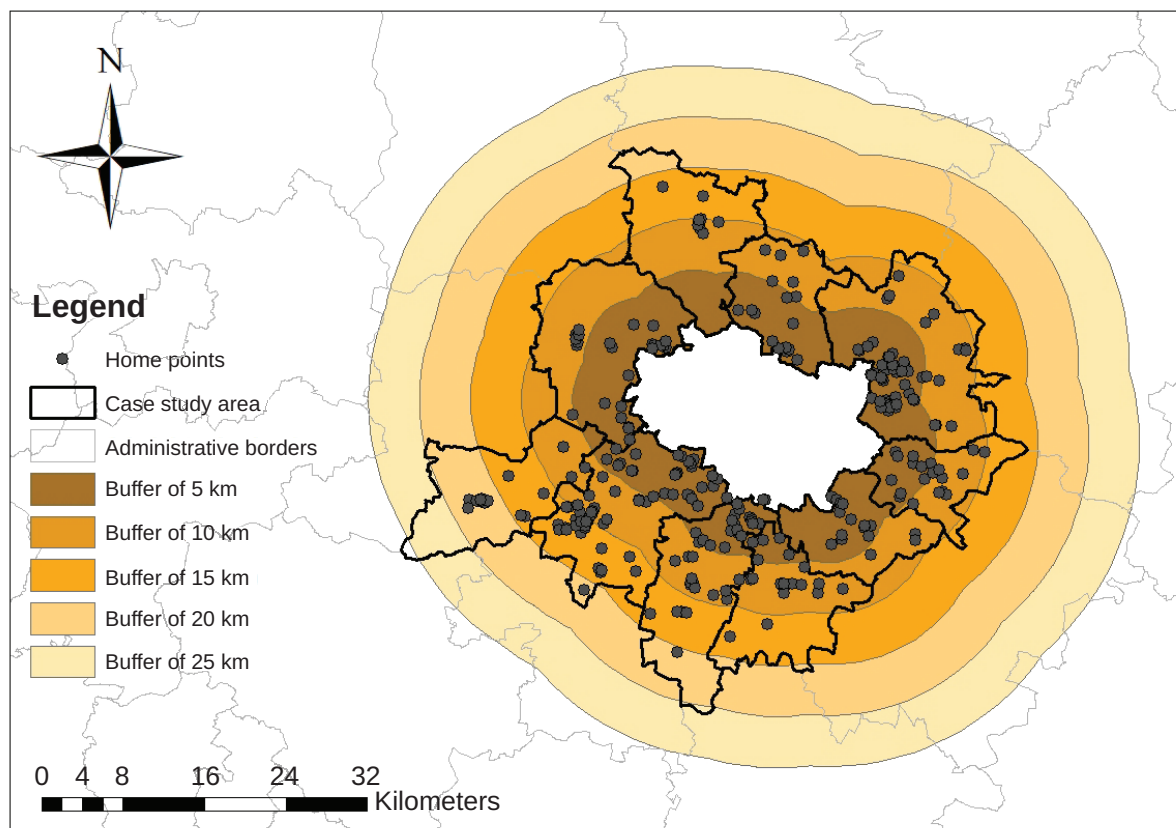
Table 6. Location of activity points in relation to protected areas and cultural or natural monuments

Location	Necessary activities (Total=685)		Optional activities (Total=1,159)			
	Work/school/ university	Frequently visited places	Important places	Movement activities	Recreation activities	Water activities
Within protected areas	7 (1%)	9 (1%)	128 (11%)	65 (6%)	37 (3%)	39 (3%)
Outside protected areas	669 (98%)		890 (77%)			
Within the buffer of 100m from cultural monument	11 (2%)	15 (2%)	41 (4%)	7 (0%)	9 (1%)	2 (0%)
Outside the buffer from 100m of cultural monument	659 (96%)		1,100 (95%)			
Within the buffer of 100m from natural monument	0 (0%)	3 (0%)	9 (1%)	1 (0%)	4 (0%)	0 (0%)
Outside the buffer of 100m from natural monument	683 (100%)		104 (99%)			

Table 7. Location of activity points within the city of Wrocław, in the case study area, and outside of them*

Location	Necessary activities		Optional activities			
	Work/school/ university	Frequently visited places	Important places	Movement activities	Recreation activities	Water activities
Within the city of Wrocław	172 (25%)	174 (25%)	60 (5%)	29 (3%)	30 (3%)	16 (1%)
Within the case study area	114 (17%)	184 (27%)	362 (31%)	229 (20%)	173 (15%)	96 (9%)
Outside of the case study area and the city	17 (2%)	24 (4%)	69 (6%)	17 (1%)	16 (1%)	62 (5%)
Total	685 (100%)		1,159 (100%)			

* Values above 10% are marked in bold.

**Figure 2.** Home points located within the five buffer zones in the case study area

Source: Head Office of Geodesy and Cartography (GUGiK), *State Register of Borders (PRG)*, available at: <https://www.geoportal.gov.pl>

To identify the functional and spatial relationship between suburban dwellers and the city, we calculated how many of them worked within the city, within the case study area, and outside of it, depending on the distance from home to the city border (Table 8 and Figure 2). 66% of respondents living within the buffer of 5km from the city worked in Wrocław, and only 31% worked within the case study area or further away (3%). For the next buffer zones, the number of respondents working in Wrocław slowly decreased from 55% within the buffer of 10km to 45% in the buffer of 15km. Meanwhile, the number of respondents working in the suburban area increased (from 40 to 48%). In the buffer of 20km, one half of respondents worked in the suburban area, 17% in the city, and 33% outside of this area. The mean distance from home to work results in 19.74km (with a median of 12.79km) and the mean distance from home to regularly visited places was 15.39km.

Table 8. The location of the workplace of respondents living within different buffer zones from the city border

Workplace location	Buffer of 5km		Buffer 5-10km		Buffer 10-15km		Buffer 15-20km	
	Number of points	%	Number of points	%	Number of points	%	Number of points	%
Wrocław	105	66	54	55	19	45	2	17
Suburban area	49	31	40	40	20	48	6	50
Further	6	3	5	5	3	7	4	33
Total	157	100	99	100	42	100	12	100
Frequently visited places	Number of points	%	Number of points	%	Number of points	%	Number of points	%
Wrocław	129	57	34	35	8	19	3	23
Suburban area	98	43	63	65	34	81	10	77
Further	0	0	0	0	0	0	0	0
Total	227	100	97	100	42	100	13	100

The mean distance from home to work in different buffer zones is growing for people working in Wrocław and is relatively similar for people working in the suburban area within different buffer zones (Table 9).

Table 9. Mean distance from home to work depending on the distance of home from the city (km)

Location of workplace	Buffer of 5km	Buffer 5–10km	Buffer 10–15km	Buffer 15–20km
Wrocław	13.70	22.44	29.82	34.17
Peri-urban area	5.76	5.73	8.60	5.58
Further	34.55	21.26	516.50	19.41

Analysis of activity spaces

In order to understand how suburban dwellers use space for necessary and optional activities, we calculated their activity spaces (Table 10). Calculating the activity spaces was only possible for respondents who marked more than just their home points. Therefore, we selected 326 respondents for further analysis. 24% of necessary activity spaces were located entirely within the case study area, meaning that all necessary activity points were located within the case study area. 35% of optional activity spaces were located entirely within the case study area.

Table 10. Location of necessary and optional activity spaces within the case study area

Location	Necessary AS		Optional AS	
	Number	%	Number	%
Within case study area	80	24	113	35
Total	326	100	326	100

We calculated the centrality of activity spaces to investigate the spatial characters of suburban dwellers' travel behaviours (Table 11). The results showed that half of respondents had polycentric activity spaces (50%), 36% of the respondents used two locations in their everyday travel behaviours, and only 6% lived locally in a monocentric way. 8% of respondents were not assigned due to the low number of points.

Table 11. The centrality of suburban dwellers' activity spaces within the case study area

Centricity	Number of respondents	%
Monocentric	20	6
Bicentric	117	36
Polycentric	163	50
Not assigned	26	8
Total	326	100

We used the buffers of 5km, 5.1–10km, 10.1–15km, 15.1–20km, and 20.1–25km to understand if the centrality of activity spaces was dependent on the distance between the city and home point (Table 12 and Figure 4). The polycentric character of activity spaces dominated within the buffers of 5, 10, and 15km (54–62.5%). Only the buffer zones between 20.1 and 25km dominated bicentric activity spaces (54%); however, the number of points was too small (11) to draw conclusions. In the first three buffer zones, 30–41% of activity spaces were bicentric, while only 5–8% were monocentric. There were no home points located within the buffer between 20.1 and 25km.

Table 12. The centrality of activity spaces in relation to the distance from respondents' home points to the city*

Centricity	Buffer of 5km		Buffer 5-10km		Buffer 10-15km		Buffer 15–20km	
	Number of respondents	%	Number of respondents	%	Number of respondents	%	Number of respondents	%
Monocentric	8	5	7	8	3	7.5	2	18
Bicentric	64	41	35	38	12	30	6	54
Polycentric	85	54	50	54	25	62.5	3	28
Total	157	100	92	100	40	100	11	100

* Values in % are marked in bold.

Discussion

This study incorporated empirical evidence on the use of space in the suburban area of Wrocław concerning necessary and optional activities. Our results confirmed that the residents of suburban areas remain functionally dependent on the city, with the majority of necessary activities occurring within the city and the majority of residents working within it, even when residing at a distance of 10km from the city border. Almost a quarter of respondents' necessary activity spaces were located entirely within the city limits. The prevailing type of centrality of necessary activity spaces was polycentric within the buffer of 15km from the city border. Ramezani et al. (2021) showed that neighbourhoods with higher job density typically limit their activities to a monocentric activity space. Moreover, proximity was identified as one of five main factors influencing the choice of travel mode for school (Race et al., 2017), while also influencing adults' travel behaviours, further confirming our results. A study from the city region of Hamburg demonstrated that travel-related aspects, such as the absence of good options to reach destinations by walking, cycling, or public transport, were suburban-urban relocators' dominant reasons for leaving suburbia (Bruns and Matthes, 2019).

In the suburban area of Wrocław, the mean distance to work was 19.74km (with a median of 12.79km), and the mean distance from home to regularly visited places was 15.39km. This was a very similar result to the mean commuting distance in rural areas in Poland (16.2km; Bartosiewicz and Pielesiak, 2019). Compared to the neighbourhoods in Kuninkaankolmio, which represent typical suburban residential areas in Greater Helsinki, the mean distance from home to work, school,

and childcare facilities was 6.12km. We assumed that suburban dwellers primarily moved by car, given that the mean number of cars per household was two, while the mean number of public transport monthly tickets per household was 0.4. This confirmed findings from other studies that living in a suburban area emphasises the use of a car (Du et al., 2020). Other studies confirmed that moving to suburban neighbourhoods improves attitudes towards cars (De Vos et al., 2018). Moreover, car driving dominated as the fastest means of transportation in the suburban area of Helsinki; however, public transport was frequently used for longer trips to destinations where public transport connections were good, particularly the city centre (Salonen et al., 2014). In order to achieve better mental and physical health in suburban areas, design policies should strive to reduce the negative effects of over-long travel time in cars by providing active built environments in terms of population density, quality of public space, land use diversity, walkability, and accessibility.

The vast majority of optional activity points were located within suburban areas, with one-third of optional activity spaces located entirely within the case study area. Those results indicate that suburban dwellers typically utilise their neighbourhoods for sport and recreation, yet some are unable to satisfy their needs within the suburban area. Optional activities occurred in settlement areas as well as agricultural land and forest. One-third of optional activities happened in protected areas, while the influence of cultural objects on optional activities was limited. According to a study of the physical environment of positive places in the Helsinki Metropolitan Area, results differ between age groups. However, in all age groups, positive places are covered by green areas and water in around 30%, providing confirmation for our result (Laatikainen et al., 2017).

We did not identify a relationship between protected areas, natural and cultural monuments, and the location of optional activities. Protected areas with high levels of greenness and biodiversity could work as areas for contact with nature, as well as improve the psychological regeneration and perceived well-being of suburban dwellers. Such associations were found in a study conducted in Melbourne, Australia by Mavoja et al. (2019). We assumed that the lack of such a relationship may have arisen from the low accessibility to areas of high natural value found in other studies (Kalinauskas et al., 2021; Rabe et al., 2018; Solecka et al., 2022); therefore, such places do not provide possibilities for optional activities. Cultural and natural monuments may help to build local identity and improve the development of place identity by offering historical continuity and imageability (Ode et al., 2008). We assumed that, when combined, the accessibility, restoration, and multifunctionality of places with high cultural or natural value could improve peri-urban areas' environmental quality and, in turn, enhance health and well-being (Collins et al., 2009). Consequently, a high-quality environment that fosters optional activities would also support social interactions and positively impact the health and well-being of suburban dwellers, as noted in previous studies (Fagerholm et al., 2020).

Limitations

Although this study examined the spatial characteristics of the necessary and optional activities of suburban dwellers, there remain several critical challenges. Due to the limited amount of data concerning background information, the study did not draw conclusions regarding age or sex, which may be influential in the use of space in suburban areas. The sample was not representative, as the technique used for data collection meant that elderly people were underrepresented. Furthermore, to investigate the landscape characteristics, the study utilised land use data, protected areas, and cultural and natural monuments. These landscape characteristics did not encompass such landscape features as relief or landscape aesthetics, which may be relevant in the selection of a place for optional activities.

Conclusion

In this paper, we utilised PPGIS data collected from ten suburban municipalities located around the city of Wrocław to investigate the individualised distribution of necessary and optional activity spaces. This was operationalised using a set of GIS-based measures, spatial analysis, and types of activity space (Hasanzadeh et al., 2019). The results of the study indicated that the city provides

spaces better suited to necessary activities and suburban areas rather those better suited to optional activities. We conclude that strong functional relationships with the city may arise from the improved employment opportunities and service access that characterise the city, as confirmed by those respondents whose primary motivation for moving to a suburban area was a good connection to the city. Suburban areas offer an environment for optional activities that predominantly occur within settlement areas, agriculture, forest, and protected areas. The use of landscapes with high cultural and natural value could be improved by increasing their accessibility and multifunctionality.

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