

The recreational functions of Warsaw's urban and suburban forests

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Abstract. To research attitudes to urban and suburban forests, a questionnaire was given to the random sample of 500 Warsaw residents. The most important factors identified by respondents included unlimited accessibility of urban forests as well as their proximity to urban areas.

The main forest recreational activities expected by Warsaw residents were longer walks, natural silence and calm, also the absence of litter. A few respondents were receptive to the idea of managed forests as well as natural forests, if improving the quality of recreation is not taken into account.

Respondents were willing to be taxed at 52 PLN/person/year in order to receive the desired level of non-timber forest functions in urban forests. Like residents of other regions of Poland, the respondents specified that the protection of air quality and protection of the natural environment are the most important non-timber forest functions. Among the most frequently visited forests located within the borders of Warsaw city are forests close to Choszczówka, Bielański forest and the forest in Koło, which receive respectively 251, 204 and 162 visitors/ha/day. The management of recreational resources in urban forests is expected to be diverse and adapted to the preferences of visitors.

Key words: preferences and social research, cities, recreation

1. Introduction

Forest areas, irrespectively of their location, natural characteristics and functions, are an important geographic element, which has special significance for the development of recreation and tourism, while importance of forests differ for the residents of rural and urban areas (Burlita 2006)¹.

In case of urban residents, such factors as life style, higher income level, higher value of free time, increased mobility (number of private vehicles²) as well as accessibility of forests (well developed road network³) make recreation in forests a more common form of spending

the free time. This raises the intensity of recreational use in such areas.

For the resident of largely modified anthropogenic environment, such as cities, forests create a possibility to satisfy the primary necessity to have a contact with natural environment. Moreover, it has a positive effect on human mentality, helps to cure or to mitigate many illnesses, as well as to find calmness and relaxation (Jaszczak 2008). Those are the main reasons causing the rapid increase in demand for places of rest and recreation in quickly extending and densely populated urban areas (Kaliszewski 2006). In response to growth in such demand, respectively prepared forest areas are being searched for.

1 The difference in acceptance of forests as a special place for recreation for urban and rural residents comes from the difference in their treatment of free time, which is related to the urban life style (non-agricultural economic activity), and corresponds to ceremonial arrangement of farm activities and ritual-religious activities in countryside.

2 In 2005, in Poland there were more than 12,3 million private cars, and in 2009 – 16,5 million vehicles. The number of cars in 2009 in Mazowieckie province was 480 per 1000 residents, while in 2005 this number was 370 cars per 1000 residents (Transport drogowy w Polsce 2010).

3 On average in 2009, there were 122 km of roads per 100 km² of land area. In Mazowieckie province this number was 141 km, and in Śląski Region it was the highest and equal to more than 200 km (Transport drogowy w Polsce 2010).

The study of public opinion should be used as guidance during planning and implementation of economic activities related to recreational forest functions and forest areas with intense recreational use while serving the protection of forest environment and improvement of economic efficiency. Such studies help to meet the needs and expectations of urban population and at the same time to gain its affection for the projects related not only to recreational and tourist use of forest areas, but also for the daily economic activities, which are often poorly accepted by local residents.

The goal of current study is to learn the views of the Warsaw residents (Warsaw being the largest agglomeration in Poland) on the topic of urban forests, needs for rest and recreation, and also readiness to bear necessary costs covering such needs.

2. Subject and scope of research

According to the National Census of Population of 2011, the population of Polish cities is 23.1 million people (60% of Polish residents). The average population density in cities is 1074 persons/km², while the national average is 123 persons/km² and 53 persons/km² in rural areas (Cities in numbers 2010).

Mean monthly expenditures on recreation and culture of urban residents in 2010 (in cities with more than 500 thousand residents) were 167 PLN, in smaller towns (20-99 thousand residents) it was 80 PLN, while in villages it was 49 PLN (Budgets of home economies in 2010). It could also be surprising that residents of large cities work shorter hours than rural residents. The people who work 50 hours and more weekly were 10.6% in cities in the 4th quarter of 2009, and 14.2% in the countryside. It is important to mention that shortening the work hours is becoming a tendency worldwide and also in Poland. The standard annual time of work (regulated by the Labor Code) decreased from 2156 hours in 2000 to 2016 hours in 2012 (Rocznik 2010).

Forest areas used for rest and recreation by urban residents gain a particular significance if area of urban forest is taken into account. About 900 thousand hectares of forests⁴ (with an average of 0.06 ha/person) are located within 86 cities with more than 50 thousand residents and population of 14200 thousand people at the distance of 10 km from their borders, including:

- 654 thous. ha of forests managed by the PGLLP (Leśnictwo 2010)
- 84 thous. ha county forests,
- 22 thous. ha of hiking and recreational parks, and
- almost 10 thous. ha of greens (Mienie 2009).

In Warsaw, the area of forests is about 8 thous. ha (15% of its area), including 4.6 thous. ha of public forests from which 1.4 thous. ha of forests is managed by PGLLP and 0.4 thous. ha are within county forests. Private forests occupy an area of 3 thous. ha (ObszarMetropolitalnyWarszawy 2011). Forests with the area of 3,6 thous. ha belong to the city of Warsaw. They are divided into 15 forest complexes in 4 forest zones: Bielany – Młociny (838 ha), Bemowo – Koło (556 ha), Kabaty (903 ha), Forest of Sobieski (1353 ha) (Janeczko, Woźnicka 2009).

Eight thousand hectares of forests located within the Warsaw city boundaries are complemented by the forests of 4 forest districts - Chojnów, Celestynów, Drewnica and Jabłonna, which circle the capital with the forest area of 48 thous. ha⁵. The area of four more forest districts - Garwolin, Pułtusk, Mińsk Mazowiecki and Wyszaków – is about 68 thous. ha. They create a protective belt for the Forest Promotional Complex (LKP) “Warsaw Forests”.

National forests managed by the PGLLP, which include 8 forest districts located within 40-50 km from the center of Warsaw and have the area of about 120 thous. ha, are complemented by 82 thous. ha of private forests supervised by forest districts. In addition, there is the Kampinos National Park with an area of about 30 thous. ha.

The area of forests in the close proximity to Warsaw city is about 230 thous. ha (30% of forests in the Mazowieckie province of Poland).

There is about 0.005 ha of forest (around 50 m²) per one Warsaw resident⁶, while there is 0.13 ha of forest per the resident of Warsaw agglomeration (Warsaw and nearby counties), whereas Polish average is 0.23 ha of forests. It is one of the main arguments, which leads many authors to the conclusion that major changes in natural environment are occurring within the metropolitan area of Warsaw (Furman, 2001), which covers the area as far as 30-40 km from Warsaw center (Chmielewski, 1996).

That is the reason due to which Warsaw area is considered one of two most problematic areas of forest

⁴ The data of the Central Statistical Office (GUS) does not include the total area of private forests in cities. It could be estimated that approximately such area is not less than 150 thous. ha.

⁵ Forest Promotional Complex “Warsaw Forests” was created within the borders of forests districts on April 1, 2005.

⁶ By the end of 2008, the number of Warsaw residents was 1 709 thousand people (Ludność ... 2009).

management (the second one is industrial Górnśląski region) (Łonkiewicz 1993).

The following goals were set during the questionnaire research conducted among the 500 random samples of Warsaw residents:

1) to research the views and opinion of Warsaw residents on the topic of non-timber forest function, including recreational management of forests,

2) to identify forest complexes located in Warsaw and its surrounding, which are visited by Warsaw residents for the purposes of rest and recreation,

3) to establish maximum distance, which Warsaw residents are ready to cover in order to spend free time in forests,

4) to estimate the readiness to co-finance non-timber forest functions using the method of CVM – Contingent Valuation Method⁷. This method includes the question allowing us to identify the value of hypothetical monetary sum, which Warsaw residents are ready to allocate on co-financing of recreational forest management of forests situated in their direct surrounding (amount described as WTP – Willingness To Pay).

3. Methodology

The research using the questionnaire was conducted from July 26 to August 7, 2008. The survey covered a random representative sample of 500 Warsaw residents older than 18 years. The questionnaire comprised of 15 questions. Three of them had an open format, while the rest of them were multiple-choice questions or cafeteria-style checklist⁸. The survey also included questions about the social-economic position of the respondent. The structure of the questionnaire, understanding of questions, comprehensiveness and correctness in choice of cafeteria questions was tested during the pilot study.

The following factors were established from the presented views of Warsaw residents in order to fulfill the first goal of the research:

1) frequency of forest visits for recreational purposes,

2) motives, which lead to a forest visit,

3) factors affecting the convenience of recreation,

4) dangers related to forest visits,

5) ranking of selected forest functions,

6) elements affecting recreational attractiveness of forest areas,

7) the most important elements of recreational forest management, which are lacking in Warsaw and surrounding forests,

8) preferred type of forest stands and forests using pictures (Gołos 2010).

Other research goals were fulfilled through establishment of names of visited forest complexes, by evaluation of distances accepted by respondents for traveling to forest sites where they prefer to rest, or by estimation of economic values of public forest functions using the CVM and WTP methods.

The discussion of research results is presented below. It includes among others, the analysis of the proportional structure of replies and in some cases the attempt to generalize the results of random sample to the population of Warsaw city.

4. Results

All the questions of the questionnaire were covered by 431 respondents (86.2% of total number of questioned respondents), who during the period of 12 months (July 2007 – July 2008) visited (with varying frequency) the forests of Warsaw city and its surroundings. The largest group of respondents indicated that they visit forests at least once per month (41% of respondents), while daily forest visits were declared by 7% of respondents (tab. 1).

Warsaw residents more commonly visit nearby forests during weekends – 58% of respondents (tab. 2). If we assume that such forest visit covers only one day of the weekend, then every weekend day could expect the visitation of about 350 thousand people or 1.5 person/ha/day of each weekend day (for the forest area of 230 thousand ha). Recalculating this to the forest area of 50 thousand ha, which includes forests within Warsaw city borders and four nearby forest districts, brings the intensity level to 7 person/ha/day. If assuming that residents spend every weekend day only in forests within

⁷ The Contingent Valuation Method (CVM) is the technique used for valuation of goods which do not have market price (public goods or external effects). This technique is survey-based and establishes hypothetical amounts, which respondents are ready to spend in exchange for given in the survey actions, in our case related to forest environment. The valuation can include the estimation of particular amount or Willingness To Pay (WTP) in order to preserve high quality of forest environment or improvement of its quality. It could also estimate the monetary value, which is expected by respondents in order to cover damages caused by the low quality of the environment when such state could not be improved or in case of decreasing environmental quality – Willingness To Accept (WTA) (Garrod G.D., Willis K.G. 1997; Loomis J.B, Gonzales-Caban A. 1998)

⁸ Cafeteria-style checklist is a set of proposed replies in the closed question of survey. While answering to such question, the respondent selects the answer, to which he agrees, or which is close to his views, opinion.

city limits (8 thous. ha), the intensity level comes to 50 person/ha/day. The small group of respondents – about 5% or 50 thousand people – showed that they can find time for forest visits also during weekdays.

The most commonly visited forest areas were Kampinos Forest (28% of respondents) and Kabacki Forest (11% of Warsaw residents). Significance of the Kabacki Forest for recreation comes mainly from its location near to the largest residential areas of Warsaw – Ursynów and Kabaty – as well as its proximity to transportation lines (metro station). The open format of the question related to the names of forests visited by Warsaw residents generated inaccuracy in methodology. The respondents often mentioned instead of forest names the names of places where forests are located. Due to this reason, it was difficult to associate such answers as “around Zegrze,” legionowski or wyszkowski forests to specific forest complexes. The large number

of respondents did mention other forest areas largely located further away from Warsaw. Among them should be mentioned Kozienska Forest, vicinity of Radom, forests along Pilica, vicinity of Minsk Mazowiecki, or forests in Mazury.

Besides the question on the most commonly visited forest areas, there was a question on forest areas as the favorite place for recreation. To this question the respondents more often indicated Kampinoski Forest (23% of respondents – 260 thous. people) and Kabacki Forest (20% of respondents – 225 thous. people) (tab. 3). If we assume that replies to the above questions reflect the intensity of recreational use, then every weekend day Kampinoski and Kabacki Forests can expect visitation of 160 and 140 thousand people or 5 and 75 person/ha, respectively. A higher intensity was shown for Belanski Forest, forest on Koło and forest of Bródno: 204, 162 and 157 person/ha/day (tab. 4).

Table 1. Visit frequency in forests of the Warsaw residents

Visit frequency in forests	% of responses	Estimated number of Warsaw residents visiting forests (thousands)	Maximum statistical error
1	2	3	4
Daily	7	102	2,2
Several times per week	5	58	1,9
Once per week	12	154	2,8
1-2 times per month	21	279	3,5
Less than once per month	41	564	4,3
Never visiting forests	14	181	3,0
Total	100	–	–

Table 2. Visiting schedule in forests for Warsaw residents

Day of the week	% of responses	Estimated number of Warsaw residents visiting forests (thousands)	Maximum statistical error
1	2	3	4
On weekends	58%	697	4,5
On weekends and weekdays	30%	350	4,0
On weekdays	5%	50	1,9
Hard to say	7%	50	2,0
Total	100	–	–

Table 3. Forest complexes indicated by the Warsaw residents as their favorite recreational areas

Forest complexes	% of responses	Estimated number of Warsaw residents visiting forest complexes on weekends (thousands)
1	3	4
Kampinos forest	23%	161 000
Kabacki forest	20%	140 000
Biełański forest	9%	63 000
Mazowiecki Landscape Park	8%	56 000
Chojnowski Landscape Park	7%	49 000
Choszczówka and its vicinity	5%	35 000
Forests near Zegrze	5%	35 000
Forest in Bródno (and vicinity)	4%	28 000
Wyszkowski forest (and its vicinity)	4%	28 000
Rembertowski forest	3%	21 000
Legionowskie forests	3%	21 000
Forest in Koło	2%	14 000
Bemowo	2%	14 000
Młociny	2%	14 000
Nadarzyn and Podkowa Leśna	2%	14 000
Forests near Magdalenka and Sękocin	2%	14 000
Other	13%	91 000
Hard to say	5%	35 000

The hierarchy of factors attracting people to forest recreation demonstrated that the most important role have aspects related to respondents' habit to rest in forest environment – 70% of respondents selected the definition “in such place it is possible to rest” (tab. 5). Moreover, forest is associated with the place having significantly better air quality – the category “like to breathe fresh air” was selected by 41% of respondents. Another important factor is the possibility to collect forest mushrooms and berries, which was mentioned by almost every fourth respondent visiting the forest. Traveling cost and time were shown to be essential for the selection of recreational forest area by a large number of respondents. Twenty percent of respondents selected the term “forest is near to my home.” A similar response (20%) was given to the question related to the “low cost of recreation.” Furthermore, the group of questions defined as “family motives” should also be highlighted among the motives contributing to visitation in forests. It was

selected by 33% of respondents, including such motives as having a dog – 18%, or children and grandchildren – 15% of respondents. The motives showing the forest as a habitat for wildlife also play an important role, as 21% of respondents showed that in forests they “like to observe the nature”.

Among seven factors of questionnaire, which have an effect on recreational attractiveness of forests surrounding the Warsaw city, the largest group of respondents selected silence and calm (more than 31% of respondents – table 6). Such choice corresponds to replies to the question on reasons for forest recreation. Seventy percent of respondents recognized that they like forest as a place for recreation (tab. 5). Significantly smaller group of respondents – 17% – valued natural qualities of forests, including the look of forest stands. The location of forests also has a very large influence on the attractiveness of forests as was shown in the reply “proximity of forests to someone's home” selected by 15% of re-

Table 4. Intensity of recreational activities in selected forests of Warsaw and its vicinities (person/ha/day)

Forest complexes	Forest area (ha)	Intensity of recreational activities (person/ha/day)
1	2	3
Choszczówka and its vicinity	139	251
Biełański forest	152	204
Forest in Koło	43	162
Forest in Bródno (and vicinity)	89	157
Forests near Zegrze	332	105
Kabacki forest	925	75
Młociny	102	68
Rembertowski forest	933	22
Bemowo	509	14
Forests near Magdalenka and Sękocin	1 073	13
Nadarzyn and Podkowa Leśna	2 166	6
Legionowskie forests	3 821	5
Chojnowski Landscape Park	6 800	3
Kampinos forest	38 000	2
Wyszkowski forest (and its vicinity)	21 000	1
Mazowiecki Landscape Park	22 000	1
Other	–	–

Table 5. Motive for the recreation in forests as indicated by the Warsaw residents

Motives	% of responses*
1	2
I like forest as a good place to get some rest	70%
I like to breathe fresh air	41%
I like to pick mushrooms, berries, etc.	27%
I like to observe the nature, birds, insects	21%
The forest is near to my home	20%
I select such type of recreation due to its low costs	20%
I have a dog, which likes and has to run	18%
I have children, grandchildren who like to walk in the forest	15%
I don't have another possibility to get rest outside my home (for example garden plot, family in the village)	11%
I like biking in the forest	9%
Other reasons	7%
Hard to say	1%

* The sum is not equal to 100, because of the possibility to give maximum three answers.

Table 6. Factors listed by the Warsaw residents as being crucial for recreational attractiveness of forests surrounding the city

Factors	Average number of points	
	1	2
Silence and calm		31,4
Appearance of tree stands		16,7
Proximity of forests to someone's home		14,7
Landscape		12,6
Presence of riparian areas		10,6
Developed recreational infrastructure		8,5
Cultural, historical and traditional heritage of the given site		5,5
Other reasons		0,3
Total		100

Table 7. Elements of recreational infrastructure, which are listed by the Warsaw residents as lacking from the forests surrounding the city

Elements	% of responses*	
	1	2
Rest facilities (benches, tables, shade structures, etc.)		46%
Bike trails		38%
Hiking trails		30%
Tourist information (road signs, information boards, trail markers)		25%
Health (sport) trails		20%
Educational trails		19%
Car parking lots		10%
Grill areas		9%
Playgrounds		9%
Camping fire areas		7%
Horse-riding trails		5%
Other		2%
Hard to say		10%

* The sum is not equal to 100, because of the possibility to give more than one answer.

spondents. On smaller scale, recreational attractiveness of forests is decided by such elements as landscape, presence of riparian areas, or recreational infrastructure.

Rest facilities (benches, tables, shade structures, etc.) were commonly named by almost half of the respondents as the most lacking element of recreational infrastructure (tab. 7). Partial explanation of such response could be the dominant way of spending time in forests

(hiking) or social-economic characteristic of majority of forest visitors (older people – 46% of respondents were 50 years and older, among whom 27% were above 60 years of age). The respondents also indicated the lack of forest trails – bike trails (38% of respondents) and hiking trails (30% of respondents). Some people pointed to missing “thematic” trails: health and sport trails – 20% of respondents, and educational trails – 19%

Table 8. Factors lowering the quality of recreation in forests surrounding Warsaw as indicated by its residents

Factors		% of responses*
1	2	
Garbage disposal		76%
Contamination of water reservoirs, streams, rivers		38%
Mosquitos, tics, ants		29%
Stray, wandering dogs		22%
Theft, robbery		21%
Fire danger		18%
Danger from bike riders		10%
Lack of monitored parking lots		7%
Other		1%
Hard to say		9%

* The sum is not equal to 100, because of the possibility to give more than one answer.

Table 9. The part of the forest, where Warsaw residents prefer to spend time

Part of the forest		% of responses*
1	2	
Deep in the forest		43%
Close to forest edges		25%
On forest roads and trails		21%
Close to residential areas		5%
Other		0%
Hard to say		6%
Total		100

* The sum is not equal to 100, because of the possibility to give more than one answer.

Table 10. Forest areas which are preferred by the Warsaw residents

Forest areas		% of responses*
1	2	
Near to riparian areas		40%
Within managed areas		23%
In the wild and inaccessible places		20%
Not far from their car, parking lot		8%
Other		1%
Hard to say		8%
Total		100

* The sum is not equal to 100, because of the possibility to give more than one answer.

Table 11. Factors which are disturbing forest recreation as indicated by the Warsaw residents

Factors		% of responses*
1	2	
Garbage and mess in the forest		78%
Broken benches, shade structures, garbage cans		45%
Untidy looking tree stands, broken tree stems, branches		28%
Large number of people		25%
Forest maintenance, timber harvesting, thinning		11%
Absence of stores and restaurants providing food products		10%
Lack of parking lots		8%
Other reasons		3%
Hard to say		5%

* The sum is not equal to 100, because of the possibility to give more than one answer.

Table 12. Rating of selected forest functions as stated by the Warsaw residents

Forest functions		Average number of points
1	2	
Protection of air purity		22,2
Forest as habitat of plants and animals		19,9
Forest as recreational site		14,1
Forest as element affecting climate (weather)		13,7
Protection of water resources		12,9
Soil protection		12,3
Production of timber		4,7
Other		0,1
Total		100

of respondents. The results confirm high importance of tourist information (road signs and information boards or the elements) which helps them to easily orient themselves in the forest, thereby feeling more secure. The lack of such elements was noted by every fourth forest visitor. Interestingly enough, relatively small number of people indicated the lack of parking places – only 10% of respondents, and the lack of places allowing them to spend time with children more interestingly (playgrounds) – 9% of respondents.

Among the factors lowering the quality of recreation, the respondents more frequently named garbage disposal – 76% of respondents, contamination of water reservoirs, streams and rivers – 38% of respondents (tab. 8). They

also underlined the significance of biotic elements of forest environment, such as mosquitoes, ticks and ants, in lowering the quality of the most popular form of forest recreation, i.e. hiking. For the survey participants, it was also important to feel safe in forests. 20% of respondents selected such negative factors as stray, wandering dogs and theft or robbery.

The most commonly selected part of forest for spending time was deep in the forest – 43% of respondents (tab. 9) – and on forest roads and trails – 25 and 21% of respondents. The largest number of respondents would be willing to rest near to riparian areas – 40% of respondents. Similar number of people selected managed areas – 23%; and wild and inaccessible places – 20% of respond-

Table 13. Significance of equipment improving quality and attractiveness of forest stay and recreation as stated by the Warsaw residents

Equipment	% of responses*
1	2
Garbage cans	72%
Information boards	36%
Toilets	35%
Drinking water sources	28%
Places for sitting, benches, tables	26%
Shade structures	21%
Camp-fire sites	12%
Play equipment	6%
Parking lots	5%
Fitness equipment	2%
Other	1%
Hard to say	8%

* The sum is not equal to 100, because of the possibility to give more than one answer.

Table 14. Structure of the declared by the Warsaw residents hypothetical sums of money: hypothetical value of selected non-timber forest functions (WTP)

WTP, PLN	% of responses
1	2
10	41
20	21
50	19
100	14
200	1
500	1
Another amount	3

ents. Forest visitors like to be near to places, where they left their cars, or near to developed areas. Only 8% and 5% of respondents had other opinion.

The answers clearly indicate that abiotic factors dominate among factors, which are disturbing forest recreation, including garbage and mess in the forest (78% of respondents), broken benches, shade structures or garbage cans

(45% of respondents). Even the large number of forest visitors was not as disturbing (25% of respondents) as dirty and ruined rest sites (tab. 11). Less significant were the factors related to forest management – only 28% of respondents noted untidy looking tree stands, broken tree stems and branches, while only 10% indicated that forest maintenance, timber harvesting or thinning were disturbing. The respondents preferred to rest in tall tree stands, stands with green mossy forest floor, old and open stands, with mixed species structure dominated by broadleaf trees.

Protection of air purity (22 points) and forest as a habitat for plants and animals (20 points) were selected as the most important forest functions (tab. 12). Similar number of points was given to two functions: forest as a place for recreation and forest as an element affecting climate (weather) (14 points). Water and soil protection were equally important to respondents. The water protection function was assigned almost 13 points, while soil protection function received slightly above 12 points. Timber production function was least important to respondents, its average score was around 5 points.

The equipment essential for cleanliness and tidiness of forest sites was stated as most significant for improving the quality and attractiveness of forest recreation, with garbage cans mentioned by 72% of respondents⁹

⁹ In this question, the respondents could select maximum three among ten types of equipment, which improves quality of recreation in forests.

Table 15. Reasons due to which some Warsaw residents stopped participating in co-financing of non-timber forest functions

Reasons	% of responses
1	2
I am not able to pay	29
Other organizations should be responsible for such payments (state, government, country, etc.)	13
Because I pay taxes	9
I don't see the need for that	4
Other	6
Hard to say	39
Total	100

Table 16. Distances, which Warsaw residents are ready to travel in order to come to their favorite forest

Distance (km)	%
1	2
≤ 14	23
15-29	21
30-44	18
45-99	17
≥ 100	16

and toilets by 35% of respondents (tab. 13). Survey participants also noted elements improving safeness, such as information boards – 36% of respondents. Smaller significance was assigned to the level of development of tourist and recreational facilities, including drinking water sources (28% of respondents), places for sitting, benches, tables (26% of respondents), and shade structures (21% of respondents).

Survey participants were also asked if they could assign specific sum annually on co-financing of non-timber forest functions (such as air and water protection, recreation or protection of plants and animals) of forests surrounding their home. The readiness to assign some amount for such purpose WTP>0 PLN was shown by 53% of respondents. Among those people, 41% declared the amount of 10 PLN, twice less or 21% of respondents declared 20 PLN/year/person. Only 16% among 264 survey participants declared sum equal or higher than 100 PLN (tab. 14). The average sum WTP/year/person was 52 PLN, but if negative replies are

also taken into account, this average sum decreases to 27 PLN. People, who denied declaring a specific sum, motivated their answer by their economic situation. Almost 30% of those people accepted that they cannot afford supporting non-timber forest functions (tab. 15).

The attractiveness of forests for rest and recreation could above all be expressed through intensity of recreational attendance. If factor of accessibility of forest complexes is excluded, it could be assumed that the person traveling to specific forest will first of all be driven by forest attractiveness and familiarity, as well as presence of free time he could spend on traveling to the forest and back and also on being in the forest. In such a situation, the factor which holds ground for selection of forest area is the distance from someone's home, and within the Warsaw agglomeration it would be the time of traveling to the forest. The distance which could be considered as midpoint is about 30 km. People, who are ready to travel (maximum 29 km) for recreational purposes consisted 44% of respondents, and those, who are ready to travel more than 30 km – 51% (tab. 16).

The choice of pictures presented to respondents (Gołos 2010) indicated that Warsaw residents more readily select broadleaf forest as the place for recreation. Largely overgrown forest floor is not considered as obstacle. There was a difference in expectations toward forest appearance and visited forest types. The respondents more often pointed to the picture of beech forest with low amount of light reaching forest floor (26% of respondents) and the picture showing coniferous forest with well-developed ground cover (21% of respondents). Interestingly enough, small number of respondents also reported their willingness to rest in young pine forest (10% respondents) or on forest plantation (6% of respondents).

5. Discussion

The analysis of presented results of social studies against the background of studies conducted in different objects among local residents and tourists should take into account not only the existing differences in characteristics of the research objects or plots, but also the differences in survey structure and content (number and type of categories for selection in closed questions) as well as method of asking the question. When detailed survey analysis can not be implemented, the results presented in the discussion should be treated as general comparison of received results.

The results of the given study of the random representative sample of Warsaw residents (Zajęc, Gołos 2008) largely differ from the similar study conducted in 2008 using a sample of 521 Warsaw residents (Janeczko, Woźnicka 2009). Our results show significantly smaller number of people who visit forest daily or once per week – 7 and 12% of respondents respectively, compared to the study of Janeczko and Woźnicka (2009) where visitation was estimated to be 17 and 44% respectively. Preferred places of rest in the forest also differed. Our study showed that 43% of respondents would like to rest deep in the forest. In the study of Janeczko and Woźnicka (2009) such people accounted to only 12%. Forest edges were selected as the preferred place of rest by almost 25% of respondents in the current study, whereas their share was 57% in the study of Janeczko and Woźnicka (2009). Forest interior was more favored by the residents of Śląsk (38% of respondents) (Gołos et al. 2002), and of Podlasie (44% of respondents) (Zajęc et al. 2002).

The share of respondents indicating the lack of bike and hiking trails in the current study comprised 38 and 30% of the respondents from Warsaw¹⁰, which is similar to the study of Janeczko and Woźnicka (2009) where 22% of respondents pointed to the lack of hiking trails and 14% of respondents to the lack of bike trails. The large significance of hiking trails was also confirmed by the studies in the Podlaski (Zajęc et al. 2002) and Śląski (Gołosi 2002) regions of Poland. In the first study more than 44% of respondents and in the second study more than 58% of respondents identified hiking trails as an important element of the recreational forest management. The significance of linear elements of recreational management is confirmed by the answers of respondents from the Tucholskie forests, where more desired were the bike trails (20%) and hiking trails (10%) (Kikulski 2009).

There were differences in reasons deciding the attractiveness of urban Warsaw forests for people in the current study and the study of Janeczko i Woźnicka (2009). The respondents in our study mostly selected the need to contact with nature (31% of respondents). Among the seven factors crucial for recreational attractiveness of forests surrounding Warsaw, most of the respondents selected “silence and calm” (more than 31%). Silence and calm (60% of respondents) as well as healthy air (53% of respondents) were main reasons for visiting forests to the residents of Rogów (Sławska, Sławski 2009).

Garbage in the forest (31% of respondents), ruined recreational equipment, such as broken benches, turned around garbage cans, etc. (19%), noise (17%) and high numbers of other people (15%) were the most common factors selected while questioning on the elements disturbing forest recreation in urban Warsaw forests according to the study by Janeczko i Woźniacka (2009). In the study by Sławska and Sławski (2009), the respondents of the Rogów town were also coherent in their opinion that the biggest problem in forests is garbage. Such response was given by as much as 68% of respondents. Our study showed similar results. Main factors disturbing forest recreation were garbage and mess in the forest (78% of respondents), broken benches, shade structures, and garbage cans (45% of respondents). Even the large number of forest visitors was not as disturbing (25% of respondents) as dirty and destroyed places of recreation (Zajęc, Gołos 2008).

In two studies similar number of respondents expressed their will to rest in managed forests: 26% of respondents in the study of Janeczko and Woźniacka (2009) and 23% in the study of Zajęc and Gołos (2008). Besides that the large number of respondents selected for recreation unmanaged forests (20% of respondents). This agrees with the data from Rogów town where 21% of respondents preferred forests without recreational infrastructure (Sławska and Sławski 2009). The share of such people in Tucholskie forests was 34% (Kikulski 2009).

The results of the study and characteristics of the forest areas located within city limits and their direct surroundings indicate the necessity to establish specially designed methods of forest management specifically related to recreational management, which differ from the methods in forest areas located further from large cities. It is even more justified due to reduction of various functions of forests to social function only (Paschalis 2009). Implementing in practice special for-

¹⁰ The respondents could select maximum three among eleven elements, which are missing from the forest sites around Warsaw.

est management methods designed for productive urban and suburban forests could strengthen the existing opinion in public consciousness that the main goal of urban forests (independently of their ownership) is to manage them according to the recreational needs of residents and not to maximize the timber production (Ważyński 2007). Creation and further enhancement of the positive perception of forest management in public consciousness could have a special significance for the work of the State Forests National Forest Holding (PGLLP). It could become an efficient method for generating positive response of the essential economic activities in forests, which are currently viewed as damaging and destructive work of foresters.

The methods “devoted” to urban forests should not only use the environmental and technical achievements of forest practice, but also take into account directions and methods of forest management expected by the local community. It could be the way of solving potential and existing social conflicts related to forest economy. The principal goal of such activities should be protection of forests through methods preventing anthropogenic hazards. Detailed guidelines and principles of management in urban forests should apply to all types of ownership; however, they should take into account the limitations related to the differences in ownership rights.

6. Summary and conclusions

The outcomes of the survey conducted on the random representative sample of 500 Warsaw residents allow us to evaluate their recreational activity and learn their opinion and preference as well as expectations toward the methods and directions of recreational forest management. The collected information confirms the crucial role of forests located within the limits of large cities and their vicinities as an important element of recreational space, which allows daily and weekend recreation of its residents. Attractiveness of these areas comes from their unlimited accessibility and direct proximity to residential areas. In author’s opinion, featured results can serve as guidelines for forest practices as well as the source of knowledge on the topic of social perception of the role and significance of forests.

The results of the study allow us to formulate the following conclusions:

1. Preferences of Warsaw residents indicate that forest interior has special significance for recreation. Elements which facilitate and improve the attractiveness of hiking – the dominant form of forest recreation – should be located there. Such information is significant for the planning of various types of roads, so that their

direction would not be limited to forest edges, but also lead to forest interior.

2. While taking care of quality of forest recreation, it would be important to provide silence and calm and also to pay special attention to cleanliness and tidiness of forest sites doing this in agreement with autonomous authorities. The first factor listed above is decisive for attractiveness of forest areas as recreational sites, while the second one is the factor which decreases the quality of recreation the most. In order to take care of forest neatness, it is crucial to provide sufficient number of garbage cans and to look after their good technical condition.

3. While preparing plans for recreational forest management, it is necessary to meet the expectations of the group which prefers to have developed recreational infrastructure as well as those, who like natural forest appearance without recreational facilities (similar number of responses – 23 and 20% of respondents). Based on the collected data, it could be assumed that in many cases it would be sufficient to prepare convenient access to forests (parking lots) resigning from the special equipment.

4. The residents of Warsaw (53% of respondents) expressed their readiness to co-finance non-timber forest functions and management declaring the hypothetical sum of 52 PLN/person/year (Contingent Valuation Method). Such result indicates that in the future it would be possible to get at least partial financing of selected forms of recreational activities of Warsaw residents.

5. The collected amount of evidence confirms the rooted social consciousness order of the most important non-timber forest functions and management. Similar to other studies (Gołos 2010), the most important function specified by respondents was protection of air purity (22 points) and forest place as a habitat for plants and animals (20 points).

Frequency of forest visitations showed significant activity of Warsaw residents related to spending part of their free time in forests located close to their homes. Estimates of recreational intensity of selected forest areas in Warsaw indicated special need in taking care of forests in vicinity of Choszczówka, Bielański Forest and forest on Koło.

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