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Gender inequalities in Transylvania's largest peri-urban forest usage

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Abstract Urban green spaces (public gardens, parks, urban and peri-urban forests) offer multiple-use opportunities and spaces for recreational activities and played a key role in supporting mental and physical health of dwellers during Covid-19 pandemic, being ones of few places where outdoor and social activities where allowed. This study was conducted in Brașov city (also known as Kronstadt, by its German name), the second largest metropolitan area of Romania and surrounded by a significant area of peri-urban forests in Transylvania. Brașov city own just 5.62 sqm of urban green space/inhabitant, one of the lowest in the country, so the presence of a large peri-urban forest area become very valuable for locals and tourists visiting the area. Due to its importance and because understanding visitors' expectations and perceptions is a key element to support decision-makers and ensure proper management of these forests, the Brașov's forests administrator (Kronstadt Local Public Forest District – RPLPK) decided to investigate how dwellers generally interact with the peri-urban forests and to identify opportunities for improving the capacity of forests in providing social and recreational services. Data were collected through the administration of CAWI (computer assisted web interview) to 314 respondents at beginning of 2021, at exactly one year distance after the pandemic lockdown was imposed all around the country. Analyzing the participants responses, a surprising fact become evident: the use of peri-urban forest is not gender equal, women being less able than men to access these green natural spaces and, therefore, to uptake the benefits provided by the peri-urban forests

Keywords: peri-urban forest, gender, social values, recreational value, health.

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Introduction

Even before Covid-19 pandemic period, the role of urban green spaces (UGS) and urban and peri-urban forests in providing of major public health benefits has been carefully documented. Loss of UGS and trees is related to cardiovascular and lower-respiratory-tract illnesses (Donovan et al. 2013), while evidence shows that doing activities in the presence of nature it leads to positive short and long-term health outcomes, achieving good mental health, achieving potential, and coping well with stress and adversity (Barton & Pretty 2010). Psychology studies showed that simple and brief interactions with nature can produce marked increases in cognitive control and demonstrate the restorative value of nature as a pathway for improving cognitive functioning, concluding that nature must be recognized as fundamental for achieving effective cognitive functioning (Berman et al. 2009).

Nature must not be considered as merely an amenity and evaluated solely by its economic functionality, but also by the social value it provides. The social value of forests can be defined as the value created by people's experiences of forests, connected to the framework of cultural ecosystems and which incorporates good health and well-being, good living environment, outdoor recreation and tourism, aesthetical values, outdoor education and knowledge about forests and environment, intellectual and spiritual inspiration, identity and cultural heritage (Plieningera et al. 2013, Tu et al. 2016, Guan et al. 2017, Bjarstig and Stens 2018, Gafta et al. 2021, Alessandro et al. 2022, Birks et al. 2022, Hegetschweiler et al. 2022). Social value of forests is a vague concept and is mainly associated with recreation and tourism, but also with silence or the feeling of privacy and solitude, which is highly valuable since environments providing silence and solitude are more often lacking in largely urbanized societies (Bjarstig & Stens 2018, Bjärstig et al. 2018, Pieratti et al. 2019, Pelleri et al. 2021, Oviedo et al. 2022, Wang et al. 2022).

During Covid-19, governmental restrictions and concerns about infection determined a drastic change in the way people use UGS as places of recreation, encounter or physical activity, that provide heat and noise mitigation and air filtration, and promote social networking and inclusion. In this respect, the 2030 EU Biodiversity Strategy foresees a larger role for UGS and urban forestry to restore biodiversity and strengthen physical and mental well-being supporting a green recovery after the COVID-19 pandemic (da Schio et al. 2021, De Meo et al. 2022, Park & Chang 2022). Covid-19 pandemic had a strong influence on how people relate to nature, a significant increase of nature base activities and visits to UGS, urban and peri-urban forests being noticed especially due to its capacity to reduce stress for citizens (Wubbelt et al. 2021, Scarneci-Domnisoru & Csesznek 2022, Su et al. 2022).

Like elsewhere, evidence of behavioral changes has been highlighted also in Romania, in general, and in Brașov city, in particular. Brașov is located in the historic region of Transylvania and is the second largest metropolitan area of Romania (Tudose et al. 2021). It is the 8th largest city in Romania and the biggest in its region. Brasov city is ringed by the Carpathian Mountains, has an elevation of 538 meters and a population of 290,000 dwellers (Brasov Metropolitan Agency for Sustainable Development 2022). According to Google Community Mobility Report (Google, May 2022), during the Covid-19 pandemic period mobile data tracking shows a 65% increase in visits to parks in Romania and 51% increase in visits to parks in Brașov city. The lower number of visits to parks measured in Brașov compared to Romania may be explained by two factors:

(1) Brașov is surrounded by a significant area of peri-urban forest in Transylvania and

(2) the mean surface of all UGS inside the city is just 5.62 sqm/inhabitant (EC 2022), less than 25% of the UGS surface recommended

by European Commission. If accounting just the surface of public parks, the surface of green space drops to less than 1 sqm/ inhabitant (Corbu 2020). As an anecdotic comparison, European cities similar as size and landscape have almost double UGS surface per inhabitant: Karlsruhe (Germany) – 16.15 sqm, Brno (Czech Republic) – 14 sqm, Ljubljana (Slovenia) – 10.73 sqm or Plovdiv (Bulgaria) – 9.7 sqm (EC 2022).

This combination of factors generated high pressure on the peri-urban forest of Brașov, those areas becoming increasingly valuable for dwellers and tourists visiting Brașov. Between 11th of January – 8th of February 2021, at one year distance after the pandemic lockdown was imposed all around the country, the Brașov's forest administrator (Kronstadt Local Public Forest District – RPLPK) conducted a survey to find out how dwellers generally interact with the peri-urban forests and identify opportunities for improving the capacity of forests in providing recreational services.

Analyzing the participants responses (n=314), we found a surprising fact: the use of peri-urban forest is not gender democratic, women being less able than men to access these green natural spaces and, therefore, to uptake the benefits provided by peri-urban forests. The aim of this paper is to i) highlight the differences in between men and women behavior in using peri-urban forests services, ii) analyze the factors that are generating those differences, and iii) suggest measures to facilitate a more gender democratic access to peri-urban forests. We will present the main findings in the Results, will compare and discuss our findings with other similar studies in the Discussion and will propose a set of measurements, campaigns and strategies in the Conclusions.

Materials and Methods

Study area

Brașov is the „entry gate" to Transylvania, the 8th largest city in Romania and the biggest in its region (region 7 Center: Alba, Brașov, Covasna, Harghita, Mureș and Sibiu). It is strategically located in the center of Romania, at a point where three major highways will meet (Fig. 1), close to Bucharest and to several other large urban centers in Romania (Ploiești, Sibiu, Târgu Mureș) (Rise Consortium 2018). Brașov was the second city in terms of attractiveness in the 1960s and 1970s, when it was a symbol of the industrialization policy applied by the Communist Party. Nowadays we are witnessing a "new industrialization", determined by foreign investments in the city, which determines a constant and intense migratory flow to Brașov. Of the 256 largest cities in the EU, Brașov has registered one of the fastest growth rates between 2000 and 2015. According to The World Bank Brașov is in top 3 most attractive cities in Romania, both for people and business (Cristea et al. 2017).

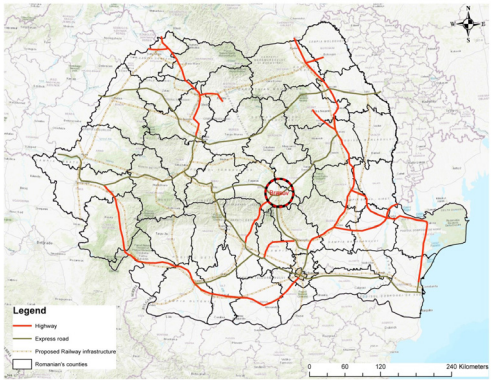

Figure 1 General Master Transport Plan (Sources of background map: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community).

Population of Brașov city by 1st of July 2021 was 289,122 dwellers but, out of 638,369 inhabitants in Brașov County (at 2020, July 1st, according to National Institute of Statistics, Brașov County Statistics Institute), Brașov Metropolitan Area (Fig. 2) gather 469,865 inhabitants (73% of the total inhabitants of the county). Brașov Metropolitan Area (BMA) is composed out of 7 cities (Brașov, Săcele, Codlea, Râșnov, Ghimbav, Predeal and

Zărneşti) and 10 rural areas (Sânpetru, Hărman, Prejmer, Tărlungeni, Bod, Hălchiu, Cristian, Feldioara, Vulcan and Budila). Săcele, Codlea, Râşnov, Ghimbav, Sânpetru and Cristian are the main residential satellites of Braşov, playing the role of large dorms for the city. The highest population density is in Braşov city, at 1,321.7 inhabitants per square kilometer.

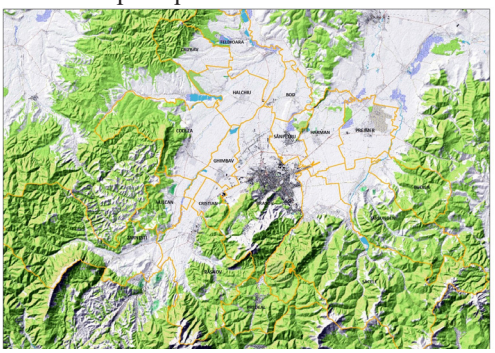

Figure 2 Braşov Metropolitan Area (Sources of background map: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community).

The size and population density of Braşov are comparable with most of middle-sized cities and their surrounding peri-urban forests across Europe in similar climate zones, so the results of this study are valuable beyond the study area. Braşov is also a leading tourism destination in Romania, adding, in the past pandemic years, more than a million tourists every year to those about half a million dwellings living in the metropolitan area. "For leisure tourism, Braşov is the main destination. Young people and those with high incomes are more attracted to Brasov" (Cristea et al. 2017). Brasov is the absolute leader in the Central Region with a percentage of 45% of the total number of tourists coming to the area, being visited in 2019 by 1.4 million tourists. The Covid-19 pandemic had a significant impact over tourism sector 012 (National Statistics Institute). A large proportion of the tourists visiting the city are attracted by the natural surroundings, especially by the peri-urban forests of Braşov. No official statistical data about the number of locals or tourists visiting the peri-urban forests of Braşov are available, but public information is highlighting a high interest for the forests both in the pre-pandemic and pandemic period.

The study area is represented by the peri-urban forests of Braşov and border forests administrated by Kronstadt Local Public Forest District – RPLPK (Fig. 3), located east to Făgăraş mountains and including Tâmpa, Postăvaru Massif, Piatra Mare Massif, Piatra Craiului and the northern part of Bucegi mountains.

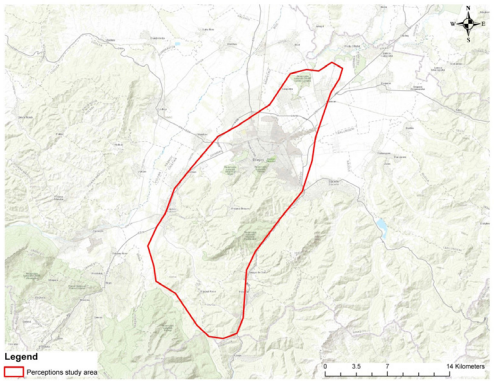

Figure 3 Braşov Metropolitan Area (Sources of background map: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community).

Methods

The study general objective was to identify how non-specific stakeholders (represented by the general population of BMA) interact with nature, in general, and with the peri-urban forests of Braşov in particular. It aimed to socio-demographic profile the dwellers who visit the peri-urban forests around Braşov (occasionally and unorganized, individually or in small groups, for recreational purposes), estimate the frequency and motivation they access peri-urban services, evaluate perceptions on peri-urban functionalities, identify the need sand expectations of visitors and opportunities to improve the capacity of peri-urban forests to provide recreational services.

Due to Covid-19 pandemic governmental restrictions and concerns about infection the methodology followed for interviewing the subjects was CAWI (computer web assisted

interview). To this end, invitations to dwellers were sent through e-mail distribution lists, newsletters, social-media and local mass-media press releases. Due to the limitations of using this solely method in reaching elderly respondents, we included in the panel participants aged 18 to 75, who can manifest a more proactive approach to the peri-urban forests then the general population.

Data was collected between 11th of January – 8th of February 2021, only fully answered surveys being included in the present analysis. The validated sample was weighted according to official data of the National Institute of Statistics and statistically and qualitatively analyzed.

Out of the 475 validated questionnaires, 314 subjects come from the Brașov city and BMA and they have been fully answered to the interview. For an easy-to-read, only the findings with a Pearson Chi-Square significance level lower than 0.05 will be highlighted in this paper, whereas the decimals will be excluded.

Table 1 Socio-demographic information of respondents (n=314)

Variable	Values	Frequency	Valid Percent
Sex	Male	151	47.9
	Female	163	52.1
Age	18 - 25	35	11.2
	26 - 35	64	20.5
	36 - 45	61	19.5
	46 - 55	55	17.6
	56 - 65	65	20.6
	66 - 75	34	10.7
Education	10 classes	3	0.9
	12 classes	30	9.5
	Post-secondary	35	11.1
	College (university)	15	4.7
	Faculty	125	39.8
	Master	87	27.7
	Doctorate	16	5.0
	MBA	4	1.2
	Missing	1	
Occupation	Student	16	5.2
	Unemployed	3	1.0
	house -wife -man	1	0.4
	Retired	70	22.2
	Employee, without management position	136	43.2
	Employee, with coordination function	19	6.2
	Mid-Manager	13	4.0
	Top-Manager	3	0.8
	Freelance	16	4.9
	Entrepreneur (own business)	19	5.9
	I don't want to answer	19	6.2
Residence	Brașov	260	82.9
	Metropolitan area	54	17.1

Out of the 314 participants (Table 1) 151 were male and 163 females, 2/3 of total being either employee without management position (43%), either retired (22%). 68% of respondents had a university degree, 5% own a Ph.D diploma and 1% own MBA diploma. One participant refused to declare his/her education status. 83% are Brașov residents and 17% are living in the so-called Brașov's bedrooms localities (Table 1).

Results

The vast majority of the respondents (79%) states that are interacting with the peri-urban forests at least bi-monthly (28% more than once a week and 50% at least once a week), 9% are interacting at least monthly while 13% less than once a month. Regarding the number of days since the last visit to Brașov's peri-urban forests (Fig. 4), more than half of the participants (53%) declared a maximum of 7 days, and a quarter of respondents stated a maximum of 30 days passed. 21% of respondents appreciated that it's been over 6 months since the last visit of Brașov's peri-urban forests, 7% declared a period between6 and 12 months, 2% claims more than 12 months, and only 1% of respondents states that they never visited Brașov's peri-urban forests.

Figure 4 Number of days since the last visit to Brașov's peri-urban forests.

Using SPSS crosstabulation and Chi-Square significance test we have investigated correlations between the variables to understand which of the socio-demographics are responsible for behavioral differences in interactions with the peri-urban forests of Brașov. The result indicates that gender

is the only significant covariate strongly and continuously correlating with most of the behavioral patterns and perceptions differences.

The first question asked to be answered was *„What are the first three thoughts that come to mind when you hear the word "forest"?"* and both men and women mentioned as first word (top of mind association) words like oxygen and *relaxation*. The Figures 5 and 6 have been produced using NVivo12 and highlights that top-of-mind associations for men are *oxygen* (most present), walk and health, while for women are relaxation (most present), trees and oxygen.

Figure 5 Men top of mind (1st word) associations

Figure 6 Women top of mind (1st word) associations

When analyzing all the words used to describe the associated thoughts with the forest, results show that both men and women use, fairly equal, associations with the idea of clean air, relaxation and quietness. Since those most visible associations are most common associations, we decided to eliminate the first layer in order to find if there are any unexpected associations or any relevant perceptions differences between men and women. Results shows that, although the mental picture of the forest described by both men and women respondents contain about the same elements, priorities are different for men and women.

The only four different words are included in top

Figure 7 Men - all words associations with forest - second layer.

Figure 8 Women - all words associations with forest - second layer.

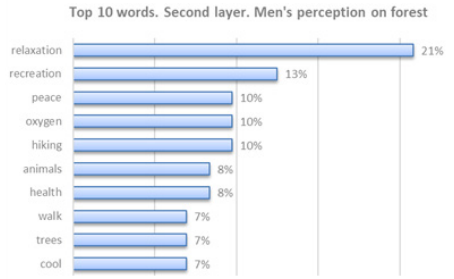

Figure 9 Men – top 10 words associations with forest - second layer.

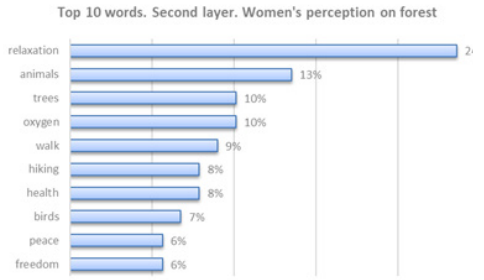

Figure 10 Women – top 10 words associations with forest - second layer.

10 associations to the forest by men and women namely *recreation* and *cool* (used by men) and *birds* and *freedom* (used by women), the rest of eight words being the same both for men and women but used in different order (Fig. 7-10). This result corresponds to different interests and functions of forest to men and women, although both men and women perceive the peri-urban forests of Brașov as contributor to their health and well-being (words used: *relaxation*, *health*, *oxygen*, *peace*, *freedom*).

Sports opportunities as services facilitated by the cultural ecosystems of the Brașov peri-urban forests are being prioritized for men compared to women, while women associate peri-urban forest with a potential danger (*animals*). These first qualitative results are being confirmed further by the quantitative analysis, that reveals significant differences between the way men and women interact (Table 2) and perceives the cultural ecosystems services provided by the peri-urban forests of Brașov.

Table 2 Frequency of visiting the peri-urban forests of Brașov (n=314).

How often do you go to the forests around Brasov?	several times a week	at least twice a month	monthly	less often than once a month
Men	35.6%	50.0%	7.5%	6.8%
Women	21.4%	50.3%	10.1%	18.2%
Total	28.2%	50.2%	8.9%	12.8%

Table 3 Time passed since last visit into a peri-urban forest of Brașov (n=314).

How long has it been since you last visited the forest (for whatever reason)?	Men	Women
Maximum 7 days	57.6%	48.8%
1-2 weeks	15.9%	17.1%
2-4 weeks	6.0%	10.4%
1-2 months	4.0%	7.9%
3-6 months	9.9%	3.7%
More than 6 months	4.0%	9.1%
More than 12 months	2.6%	1.2%
Never		1.8%

Time passed since last visit into a peri-urban forest being also significantly associated by the respondents' sex (Table 3). Therefore, men are 66% more often interacting weekly with the peri-urban forests than women, whiles the proportion of women visiting the peri-urban forests less often than once a month is 3 time higher than men's'.

The *fear of wild animals* and the *reduced accessibility* significantly corelate with the sex of respondents at significant level (Table 4). The participants that responded they haven't been into Brașov' peri-urban forests more than six months have been asked to select from a series of predefined answers a possible reasons that stopped them from visiting the forests or to freely write their own. The only reason indicated by men was the lack of time, while women indicated besides the lack of time and the fear of animals and reduced accessibility.

Table 4 Reasons not to visit the peri-urban forests for more than six months (n=314).

What keeps you from going into the peri-urban forests?	Men	Women
[I do not like it]	0.0%	0.0%
[Too many people]	0.0%	0.0%
[I'm afraid of wild animals]	0.0%	64.3%
[Accessibility is reduced]	0.0%	100.0%
[Lack of time]	100.0%	100.0%
[Dirt and garbage]	0.0%	0.0%

Activities in the peri-urban forests of Brașov are mainly social activities, the vast majority of participants to the study declaring they are accompanied by friends (53%), spouse/ partner (43%) or the extended family (40%) when visiting the peri-urban forests (Fig. 11). Nevertheless, we found significant differences in visiting peri-urban forests of Brașov patterns when the data were analyzed in relation to the sex of respondents (Table 5). The proportion of men' traveling alone in the forests of Brașov is nearly six times higher than women' and four time higher when travelling with the colleagues. Data showed that women are travelling in the peri-urban forests of Brașov mostly accompanied by husbands and friends.

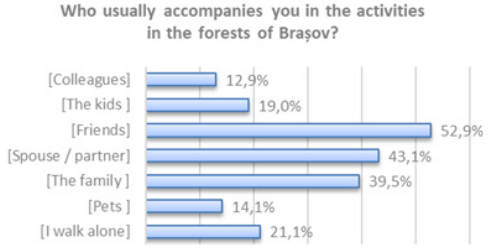

Figure 11 Peri-urban forests visiting partners.

Table 5 Peri-urban forests visiting partners (n=314).

Who usually accompanies you in the activities in the forests of Brașov?	Men	Women
[I walk alone]	36.7%	6.8%
[Pets]	20.5%	8.2%
[The family]	36.8%	42.0%
[Spouse / partner]	36.3%	49.3%
[Friends]	47.3%	58.0%
[The kids]	16.7%	21.1%
[Colleagues]	20.9%	5.6%

Most used starting points by all respondents in walking/hiking through the peri-urban forests of Brașov are the ones close to mount Tâmpa (in the old city center or in Răcădău neighborhood) or the old road to Poiana Brașov at Pietrele lui Solomon. All these starting points are inside the city or close to the city and easily accessible through urban public transport, aspects that strongly influence the ranking of the most visited areas by dwellers.

In Table 6 the colored cells represent the starting points with statistically significant differences by sex, results showing that women prefer those inside the city or close to the city

and easily accessible starting points more than men, while men prefer more remote starting points (Fig. 12).

Table 6 Most used starting points by gender (n=314).

Usually, from which areas do you start your walk / hike in the forests around Brașov? (choose up to 3)	Men	Women
[Răcădău]	29.5%	37.2%
[Schei neighborhood]	20.5%	20.1%
[Iepure]	9.1%	21.6%
[Noua]	24.6%	24.3%
[Solomon's stones]	40.4%	54.4%
[Poiana Brașov]	25.1%	23.9%
[Râșnov]	20.2%	10.6%
[Dobrogeanu Gherea street]	13.5%	14.2%
[Fântânitei street]	1.2%	1.7%
[Timișul de Jos]	21.4%	10.9%
[Warthe]	6.2%	7.4%
[Tâmpa Gondola area (The alley under Tâmpa)]	27.9%	28.4%

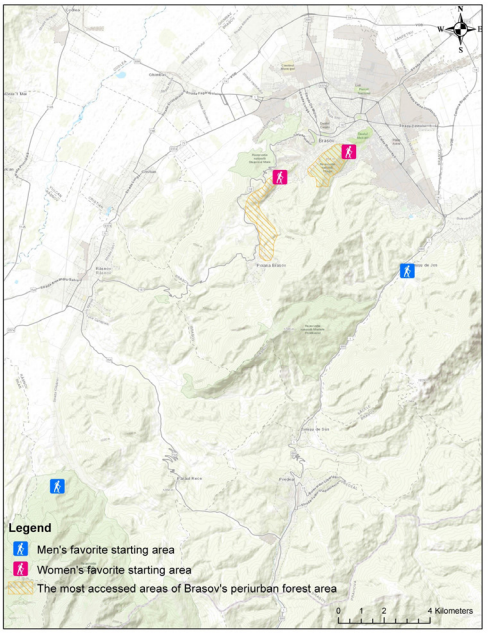

Figure 12 Most attractive peri-urban forests areas (Sources of background map: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community).

Postăvaru massif (that includes Poiana Brașov and the skiing resort area) and Tâmpa are, overall, the most attractive peri-urban forest areas. Attractiveness of a certain peri-urban forest area (Table 7) is strongly and significantly influenced by sex of respondents. Men prefer more difficult areas, selected by four time more men' then women' while women prefer easier to walk and more accessible with the public transportation area.

Table 7 Most attractive peri-urban forests areas by gender (n=314).

Which area of the forests around Brasov attracts you the most?	Men	Women
Crucurul	12.0%	3.1%
Postăvaru Massif	31.3%	23.3%
Noua	6.7%	6.7%
Schei	8.0%	11.7%
Stejerișul Mare	3.3%	2.5%
Tâmpa	19.3%	33.7%
Timișul Sec	2.0%	
Valea Cetății	5.3%	6.1%
Valea cu Apă	6.0%	4.9%
other	6.0%	8.0%

Both men and women are practicing leisure and recreational sports activities in the peri-urban forests of Brașov. However, data shows a significant difference in the pattern of women and men that are using the services provided by forests. Women are using the forest particularly for leisure (walking, sightseeing, admiring the landscape), while men are using the forest for recreational sports activities (running, cycling, skiing, etc.) at a higher degree than women (43% of men declared they practice sports activities compared with only 21% of women).

Relating to the activities type, we noticed significant differences between men and women in practicing different activities. Men are mainly practicing biking (only 15% of men declaring they never been biking into the peri-urban forest of Brașov compared to 41% of women), cable-trail adventure sports or photo hunting, while women are more oriented to activities that implies landscape admiring, picnic, leisure walk, artistic photography, artistic and arts events participations or educative activities coordination. Men declared they are most disturbed/stressed while interacting with the peri-urban forests by people traveling motorcycles (enduro) or ATV at a higher degree than women and by the high tourist density, while women are most stressed by a possible encounter with wild animals.

Perception on cultural ecosystem services and the attributes or products provided by peri-urban forests of Brașov are significantly

influenced by respondents' sex. Men are perceiving peri-urban forests as a natural resource that can and may be sustainably exploited for wood in a higher extent than women, while women are perceiving forests as providers of a wide range of intangible services like recreational purpose or strengthening the feeling of belonging to a place in a higher extent than men (Tables 8-10).

Table 8 Perception on cultural ecosystem services peri-urban forest offers, by sex.

On a scale of 1 to 5, where 1 means "strongly disagree" and 5 "strongly agree" please let us know to what extent you agree with the following statements:	Men	Women	sig. Level
The forest around Brașov offers visitors joy, recreational pleasure	4.71	4.86	0.001
The forest around Brașov forms and strengthens the feeling of belonging to a space, to a generous forest ecosystem	4.37	4.64	0.001
The forest around Brașov must be strictly preserved for future generations	4.11	4.67	0.000
The forest around Brașov must be exploited sustainably as a timber resource	2.70	2.54	0.05
The forest around Brașov has an educational role, through awareness of spiritual values, cultural services and historical information specific to the area.	4.10	4.36	0.009
The forest around Brasov must be protected	4.88	4.81	0.271
The forest around Brașov is essential in maintaining biodiversity	4.72	4.73	0.078
Walking in the woods (whether for walking, hiking or sports) has a positive effect on people's mood and well-being.	4.88	4.90	0.008
The forest around Brașov has a special cultural significance	3.98	4.24	0.045
The forest around Brașov has a special historical significance	4.05	4.30	0.008
The forest around Brașov is a proof of the multiculturalism of the area	3.67	4.08	0.008
The forest around Brașov is a source of artistic inspiration	4.13	4.46	0.008
The forest around Brașov is a space where sports activities can take place	4.50	4.25	0.070

However, women seem to perceive peri-urban forests in an eco-friendlier manner than men and devote more attention to the educational role of forests or to its capacity to provide food in a sustainable way (Tables 8-10).

Table 9 Perceived importance of peri-urban forests attributes, by sex.

What do you think are the essential attributes of spending your free time in the woods?	Men	Women	sig. Level
Forest health and forest cleanliness	4.65	4.74	0.007
Recreational infrastructure and safe use of infrastructure	4.25	4.51	0.020
Accessibility (ease of access to trails, including for people with disabilities)	4.23	4.32	0.006
Citizen safety	4.45	4.63	0.147
Ability to organize cultural activities	3.38	3.73	0.013
Biodiversity	4.69	4.71	0.019
Sights (e.g. crosses) and / or natural monuments	4.00	4.09	0.002
Intangible heritage (customs / traditions - June, legends, stories)	3.99	4.07	0.125

Table 10 Perceived importance of peri-urban forests services and products, by sex.

Imagine that you are the manager of the forests around Brașov and decide which activities are the most important for maintaining and improving the services and products provided by these forests and for increasing the attractiveness of the forests. How would you divide / prioritize the following activities? Allow each one a percentage so that you get 100%.	Men	Women	sig. Level
sports	10.75	10.24	0.011
Tourism	14.23	14.35	0.001
Cultural and historical	6.07	6.39	0.087
Educational	7.87	10.61	0.009
scientifically	7.45	7.18	0.086
Supply of wood for industry and energy	7.45	4.95	0.006
Utilization of non-wood products (mushrooms, berries, plants, etc.)	4.46	6.04	0.027
Hunting	3.50	2.63	0.318
Air quality control	14.48	17.68	0.003
Noise reduction	8.06	8.82	0.057

Discussion

Through this study, we found that dwellers of Brașov city and BMA are highly interacting with peri-urban forest for different activities (79% are interacting with the peri-urban forests at least bi-monthly). Although we do not have a pre-Covid-19 baseline data to comparison of the number of dwellers visiting the peri-urban forest, the mobile data tracking (Google Community Mobility Report May 2022) showed a 51% increase of visits into the city

parks, behavior quite similar to dwellers around the world during Covid-19 pandemic (Grima et al. 2020, Beckmann-Wübbelt et al. 2021, da Schio et al. 2021, Park and Chang 2022, Uchiyama & Kohsaka 2022). Therefore, we can estimate a significant increase of dwellers within the peri-urban forests of Brașov.

Most used starting points in interacting with peri-urban forests of Brașov are the ones inside the city or close to the city and easily accessible through urban public transport, that highlight that vicinity and easily accessible roads are the most important factors in interacting with peri-urban forests. These findings are in line with previous studies that reported the proximity of forests and a well-developed road network as the most important factors that influences the frequency of visits in the urban and peri-urban green spaces (Zhou et al. 2018, Beckmann-Wübbelt et al. 2021, Elbakidze et al. 2022, Kovács et al. 2022). We also found significant differences by sex, results showing that men access more remote starting points in a higher extent than women.

Respondents are spontaneous associating peri-urban forests with oxygen, health, relaxation, recreation or bird watching, similar associations being found by previous studies that showed that most frequently associations with the peri-urban forests are related to health, wellbeing and a good living, tourism, along with nature-centered experiences such as bird watching (Bjarstig & Stens 2018, Grima et al. 2020, Beckmann-Wübbelt et al. 2021, Baumeister et al. 2022).

Our data shows there is a significant difference in the pattern of women and men in using the services provided by forests (women using the forest preferably for leisure, while men are using the forest for recreational sports activities). Regarding the perception on cultural ecosystem services provided by peri-urban forests, men are perceiving peri-urban forests in a higher extent than women as being a natural resource that can and may be sustainably exploited for wood, while women are perceiving them in a higher extent as having a wider range of intangible services, such as offering recreational pleasure or strengthening the feeling of belonging to a place.

Our data shows that women seem to perceive peri-urban forests in an eco-friendlier manner than men and offer a greater importance to the educational role of forests or to its capacity to provide food in a sustainable way, findings that are highlighted in previous studies (Plieninger et al. 2013, Beckmann-Wübbelt et al. 2021). Scores calculated for all the immaterial and intangible cultural ecosystem services peri-urban forests offers are significant higher when were given by women than ones given by men, showing that peri-urban forests may be perceive as more important by women than by men. Similar findings were reported by other authors that state that nature is a priority mainly for women than for men (Lin et al. 2014, Schipperijn et al. 2010, da Schio et al. 2021, Nitya et al. 2022).

Despite the important role perceives by women, we found significant differences between the way that men and women are using the cultural ecosystems services offered by the peri-urban forests of Brașov. Men interacting weekly with the peri-urban forests, 66% more often than women and the proportion of women visiting the peri-urban forests less often than once a month being 3 time higher than men's', while time passed since last visit into a peri-urban forest being also significantly associated by the respondents' sex. The proportion of men' traveling alone in the forests of Brașov is nearly six times higher than women' and four time higher when travelling with the colleagues, while women are travelling in the peri-urban forests of Brașov mostly accompanied by husbands and friends. The main reasons indicated by women included in our study for less interactions with Brașov's peri-urban forests are the fear of wild animals and the reduced accessibility, reasons significantly corelating with the sex of respondents.

These findings are in contrast with the results of some previous studies that showed that women are more likely to visit the urban green spaces than men (da Schio et al. 2021),

but are confirmed by other studies (Morris et al. 2011, O'Brien et al. 2017) that states the women concerns about safety, and often visit woodlands in the company of family, friends or when walking the dog, rather than alone.

Conclusions

The aim of this study was to investigate the Brasov city and BMA inhabitants' behavior in relation to the visits of the peri-urban forest by analyzing various factors, and to identify measures that ensure a more demographic access to these forests. As we stated at the beginning, this study had limited access to population due to Covid-19 pandemic governmental restrictions and concerns about infection, so the method we chose to interview the subjects was CAWI. We recognize the limitations of using this single method in reaching elderly respondents and, also, that individuals included in the final panel may manifest a more proactive approach to the peri-urban forests than the general population. Nevertheless, findings highlighted in this paper are supported by results reported by other studies, showing that population included in the sample manifest similar behavior and perceptions with other subjects researched around the world living in similar characteristics area, in proximity of the forest.

Activities in the peri-urban forests of Brașov are mainly social, the majority of participants declared that they are usually accompanied by friends, spouse/partner or the extended family when visiting the peri-urban forests.

Considering that previous studies found that lack of access to green spaces increase by 2.2 times the perceived importance of the urban and peri-urban forests in offering wellbeing during pandemic (Beckmann-Wübbelt et al. 2021, da Schio et al. 2021, De Meo et al. 2022, Park & Chang 2022) and that Brașov's dwellers have limited access to urban green space (UGS) inside the city of Brașov, at just 5.62 sqm/inhabitant, we can appreciate that peri-urban forest of Brașov are playing a highly important role in supplying social and cultural services (incorporating good health and well-being, silence, the feeling of privacy and solitude, good living environment, outdoor recreation and tourism, aesthetical values, outdoor education and knowledge about forests and environment, intellectual and spiritual inspiration, identity and cultural heritage).

Considering, also, that women perceive peri-urban forests in an eco-friendlier manner than men and offer a greater importance to the educational role of forests or to its capacity to provide food in a sustainable way but are interacting with the peri-urban forests significantly less than men, we concluded that rapid measurements should be taken by policy makers to democratize women's access to forest services. Practical measurements may include, without being limited, introduction of public transportation (at least in weekends) to more remote peri-urban forest areas, development of new trails close to the city, installation of monitoring cameras and panic buttons along the trails.

Urban and peri-urban forests are playing an important role in offering services not only during crisis periods, such as Covid-19 pandemic, and are determinant infrastructure for the population's health, wellbeing, identity and cultural heritage. The results of this study can serve as a powerful argument to policy makers and forests managers to develop strategies and plans to assure easier, secure and gender equal access to the urban and peri-urban forests.

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