Analysis: benefits from tourism in Bieszczady NP

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Introduction

The nature protected areas including national parks deliver significant recreational ecosystem services that enable regional development based on nature-oriented sustainable tourism. The visitors travel to enjoy the biodiversity of the national park whilst some of them stay there overnight despite carrying extra costs as compared to their normal everyday life. Some proportion of these costs at the same time means revenues of the market agents based in the region and providing different kinds of goods and services to the visitors, e.g. hospitality and accommodation, catering, transport, insurance, regional food and handicrafts, rent of special equipment, etc. Apart from compensation of the incurred material costs of the local entities, a certain proportion of these revenues can be attributed to the added value generated by the nature-based industries. In addition to the input made by the entities and their staff, some proportion of this added value can be assigned to the contribution of the protected ecosystems to the regional development based on tourism.

In order to estimate this contribution, a survey-embedded study has been carried out in the Bieszczadzki National Park (BdPN).

Methodology

General approach and research framework

The survey-embedded research methodology (Manual…2024) was originally developed for the national parks of Germany (Job et al. 2023) and then adapted to the Polish conditions. According to the methodology, the regional economic effect is calculated by multiplying average costs per visitor per day and annual number of visitor days, and accounts for economic multipliers:

Regional economic effects of tourism in the NLP region
=
Number of visitor days (differentiated according to visitor structures)
x
average expenditure per visitor per day
x
economic multipliers (1)

When applied fully and correctly, the methodology allows taking into account differences in visiting different zones of the national park under scrutiny, structure of visitors' groups, types of recreation, seasons, days of the week and weather conditions. In order to reduce the error margin of extrapolation, the survey activities include (i) visitors' count, (ii) flash interviews qualifying the visitors as locals, day- or overnight visitors, and (iii) full interviews to elicit extended data on the visitors' spending behaviour and motivation. In accordance with the methodology, the number of daily visitors is extrapolated from the count

The field survey phase has been conducted by the group of project volunteers at six BdPN locations (i.e., Wołosate Parking, Muczne, Stacja Edukacyjna BdPN Zatwarnica, Przełęcz Wyżniańska, Parking Brzegi Górne, and Wetlina) since late November 2024 until October 2025 in order to address the seasonally uneven dynamics in recreational visits. Altogether, the survey has been conducted over seventeen field days (including six in the winter season, five in the summer season, and six in the low season) including both weekdays and weekends.

Unfortunately, some flaws emerged in the raw data (e.g., lack of interviews administered at some particular locations or lack of some season – day of the week – weather conditions combinations amongst the actual field survey days). In order to fix those flaws, conservative assumptions were made to avoid overestimation of the metrics under scrutiny. Thus, lack of interviewing at some dates/BdPN locations was assumed as zero visiting. On the down side, this assumption led to implausible seasonal distribution of the visiting data, where visitors' stream, say in the low season weekend might *ceteris paribus* exceed the same in the summer season. Another major data flaw at the moment is a lack of possibility to exactly localise the flash interviews, so no reliable spatial distribution of the local, day- and overnight visitors was recovered. Therefore, the final results refer to the BdPN area as a whole.

On the basis of the adjusted raw data from the flash interviews, the frequency altogether has been extrapolated to the entire survey year on the basis of the survey days, following the steps described below.

1. The available flash interviews have been first extrapolated from the 20 minutes of survey time to the full survey hour. To do this, a flash interview has been multiplied by the frequency, calculated by dividing the number of visitors counted by the number of flash interviews conducted. Subsequently, the values for each of the relevant visitor groups (= locals, day visitors and overnight visitors) have been extrapolated to the full hour;
2. the hourly values of the visitor groups have been added up for the survey hour, whilst the total for all eight (or six in the winter season) survey hours have been calculated;
3. the previous interim result has first been extrapolated to a core period of twelve hours (7:00 a.m. to 7:00 p.m.). The assumption was made that the frequencies in the early morning and towards evening are lower than during the day - regardless of the course during the day. Therefore, for the total of four missing hours between 7:00 a.m. and 7:00 p.m., a surcharge of ten per cent on the previously extrapolated counting result was assumed, which, however, was only included proportionally:

$$\sum_{Passanten12h} = \sum_{Passanten} + \left(\sum_{Passanten} * 0{,}1 * \frac{\Delta t}{12} \right)$$

Where Δt represents the difference between the hours actually recorded and twelve hours (summer/off-season: Δt = 4; winter season: Δt = 6).

4. In order to determine the number of visitors outside the core period, a distinction has been made between the three seasonal periods. It was assumed that in the period between 7 p.m. and 7 a.m., 2.5% in the winter season, 5.0% in the low season and 7.5% in the summer season, which is characterised by longer days, pass the counting point.

$$\sum_{Passanten24h} = \sum_{Passanten12h} + \left(\sum_{Passanten12h} * s \right),$$

where *s* is the constant for the respective seasonal period.

Determining the total number of visitors and visitor structures for the survey year followed. Since it can be assumed that landscape-related leisure activities in particular are dependent on the weather, the estimation methodology took this into account and included *weather* as another variable in addition to *season* and *day of the week* to extrapolate visitor numbers to the entire tourism-relevant survey period (a full calendar year). For this purpose, area-specific data from local weather stations (in Komańcza and in Lesko)[1] have been used essential for outdoor recreation (i.e., mean temperature between 0 and 24 h, daily sunshine duration in minutes, daily precipitation in millimetres, and snow cover depth in centimetres have been taken into account) was used to describe weather conditions of particular days of the year and determine whether they fell into *good weather* or *bad weather* categories in regard with the recreational visiting of the BdPN. In accordance with the study

[1] https://dane.imgw.pl accessed 15th November 2025.

methodology, representative visiting structures have been determined for the season – day of the week – weather conditions combinations (as means of the appropriate visiting data).

In particular, for the summer and low season, the three parameters *temperature, sunshine duration* and *precipitation* were used. In order to render these parameters comparable and additive their values were first standardised with the help of the z-transformation:

$$z_i = \frac{x_i - \bar{x}}{s_x}$$

where

z_i *i*-th value of the "new" variable *z;*

x_i *i*-th value of the "old" variable *x;*

$\bar{x}$ arithmetic mean of *x;*

s_x standard deviation of *x*.

For the weather indicator, first the sum of the standardised variables was formed. The variable *precipitation* for the summer and low seasons as well as the variable *temperature* for the winter season entered the evaluation with the negative sign. If the calculated value for the particular day was above zero, *good weather* was assumed, whilst for values below zero *bad weather* was assumed, which has been expressed via introduction of a dummy variable equal to unity for good weather and to zero for bad weather. After determining whether *good* or *bad weather* is present, twelve day types have been formed, namely: *summer_weekend_bad weather; summer_weekend_good_weather; summer_weekday_bad_weather; summer_weekday_good_weather; winter_weekend_bad_weather; winter_weekend_good_weather; winter_weekday_bad_weather; winter_weekday_good_weather; low_weekend_bad_weather; low_weekend_good_weather; low_weekday_bad_weather; low_weekday_good_weather.*

From the individual survey days, twelve representative day types have been estimated by calculating of

- the average number of average visitor-days – from the actual full interviews data where overnight visitors were weighted from the more numerous and random flash interviews;
- average accommodation cost – from the actual full interviews data;
- catering costs – from the official per diem allowance prices (reduced by the meals included into the accommodation prices);
- share and average accommodation and catering costs of the respondents being BdPN visitors in the narrower sense – assumed to be those choosing more than five points score when answering the question about impact of the National Park status on their visiting decision.

These estimations are assumed to represent a representative weekday or weekend day per seasonal segment, differentiated again in each case according to good and bad weather. Since primary data from the seventeen survey days failed to directly represent some season – day of the week – weather combinations (e.g., no actual survey days have directly represented

summer_weekend_good_weather or *low_weekend_good_weather* combinations), conservative assumptions as follows have been made in order to avoid overestimation:

- *summer_weekend_good_weather = summer_weekday_good_weather;*
- *summer_weekday_bad_weather= 50%_summer_weekend_bad_weather;*
- *winter_weekend_bad_weather = winter_weekday_good weather;*
- *low_weekend_good_weather = low_weekend_bad_weather*.

By multiplying the demand volume *B* by the average daily expenditure per person *a*, the gross (i.e., including VAT) regional tourism industry turnover has been determined for every particular day of the study period, dependent of which season – day of the week – weather combination this day falls into:

$$U_{zs}^{b} = \sum_{z=1}^{k} B_z \cdot \sum_{s=1}^{l} a_s$$

At this and subsequent steps, a differentiation between the BdPN visitors in the narrow sense and broad sense has been made, whereas both the day visitors (onsite catering) and overnight visitors (onsite accommodation and catering) have been accounted for.

Next, determination of the net turnover has been carried out by deducting the VAT from gross turnover:

$$U_{zs}^{n} = \sum_{z=1}^{k}\sum_{s=1}^{l} U_{zs}^{b} - \left[\sum_{z=1}^{k}\sum_{s=1}^{l} U_{zs}^{b} \cdot \left(1+M_s\right)^{-1}\right]$$

VAT has been calculated by using sector-specific tax rates M_s and deduction of the calculated VAT from the gross turnover of respectively hospitality (8 per cent VAT) and catering (23 per cent VAT) sectors.

Determining the direct income effects has been performed then following the formulae

$$E_{zs}^{d} = \sum_{z=1}^{k}\sum_{s=1}^{l} U_{zs}^{n} \cdot w_s^{d}$$

i.e., by multiplying the net turnover by a value-added ratio w^d_s. The value-added ratio standing for the share of net turnover that remains as gross value added (i.e., domestic compensation of employees + depreciation + net operating surplus + other taxes on production minus subsidies) was assumed equal to 23.5 per cent which is the 2021 Poland's value added ratio for the aggregated sectors of wholesale and retail trade, accommodation and food[2].

In addition to the direct income effect, an indirect income effect has been determined:

[2] https://ec.europa.eu/eurostat/cache/digpub/european_economy/vis/03_01_02/index.html?lang=en accessed 15th November 2025

$$E_{zs}^{i} = \sum_{z=1}^{k} \sum_{s=1}^{l} \left(U_{zs}^{n} - E_{zs}^{d} \right) \cdot w^{i}$$

following the methodology guidelines, a German indirect income rate w^i = 30 per cent has been used for the calculation. After this, the total income effect was calculated as a sum of the direct and indirect income effects:

$$E = E_{z_s}^{d} + E_{z_s}^{i}$$

Finally, the employment effects has been determined as follows

$$EA = \frac{E}{V}$$

where the average regional primary income per inhabitant *V* of the Podkarpackie voivodeship was assumed to be equal to PLN 55,100[3].

After removing incomplete questionnaires and obvious outliers, a total of 461 full interviews and 243 flash interviews entered the final dataset, whereas the overall count of visitors throughout the seventeen survey days totalled 2,360. The data was collected on important visiting characteristics including e.g., the past visiting frequency, visitors' origin and distance of travel, funds actually spent onsite on accommodation, food, and other goals, as well as the visitors' sociodemographic metrics. Other important factors accounted for were whether the Park's visitor qualifies as a local resident, one-day visitor or overnight visitor of the BdPN region. BdPN region was defined as three administrative units (gminas) within which the National Park was located: Cisna, Czarna, and Lutowiska. Therefore, the financial results have been calculated for the area directly influenced by conservation measures.

Results and Discussion

Sample descriptive statistics and representative visitor's profiling

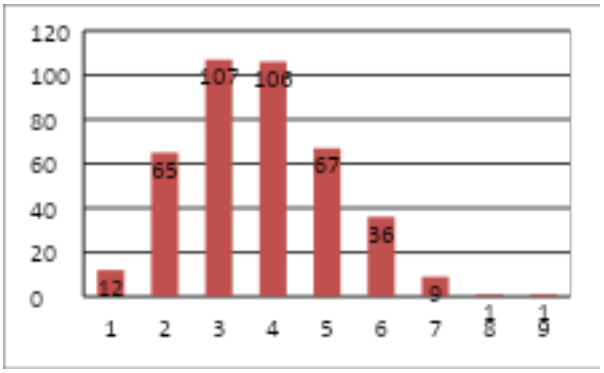
The overnight visitors who were asked to choose from the list the recreation activities they practiced in the BdPN, picked from one to nine activities (Fig. 1a) whereas the overwhelming majority picked three or four of them. When analysed altogether (Fig. 1b), mounting hiking appeared the absolutely predominant activity mentioned by 393 of 405 overnight visitors, whilst admiring nature (368 mentions), wildlife observation & birdwatching (261 mentions), regional cuisine & gastronomy (191), and sightseeing (170) have the same order of magnitude in terms of their mentioning frequency. At the same time, alternatives like health & rehabilitation (47), visiting family & friends (16), mushrooms & berries picking (17) appeared far less popular amongst the overnight visitors. Such a

3 https://gospodarkapodkarpacka.pl/news/view/59947/wstepne-szacunki-pkb-na-podkarpaciu-w-porownaniu-z-calym-krajem accessed 15th November 2025

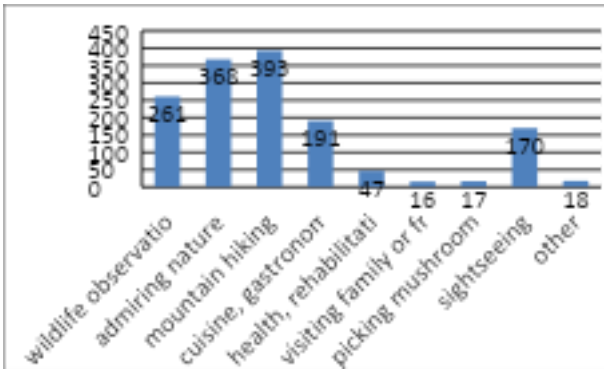
distribution of frequencies seems consistent with the *a priori* expectations in the case of the National Park visitors.

However, when the first choices were analysed separately (Fig. 1c), admiring nature (192 mentions) appeared the most popular choice, followed by cuisine & gastronomy (133) and mountain hiking (66). Surprisingly, wildlife observation & birdwatching was picked in the first turn by only two overnight visitors which might point at a less qualified character of the BdPN visitors who prefer in the first turn admiring nature in a broad sense to its specific qualified exploration. On the other hand, order effects could have emerged, as the alternatives to pick were presented to respondents following the stable order as the survey organisers were lacking opportunity to randomise the order and mitigate the order effects.

(a)



(b)



(c)

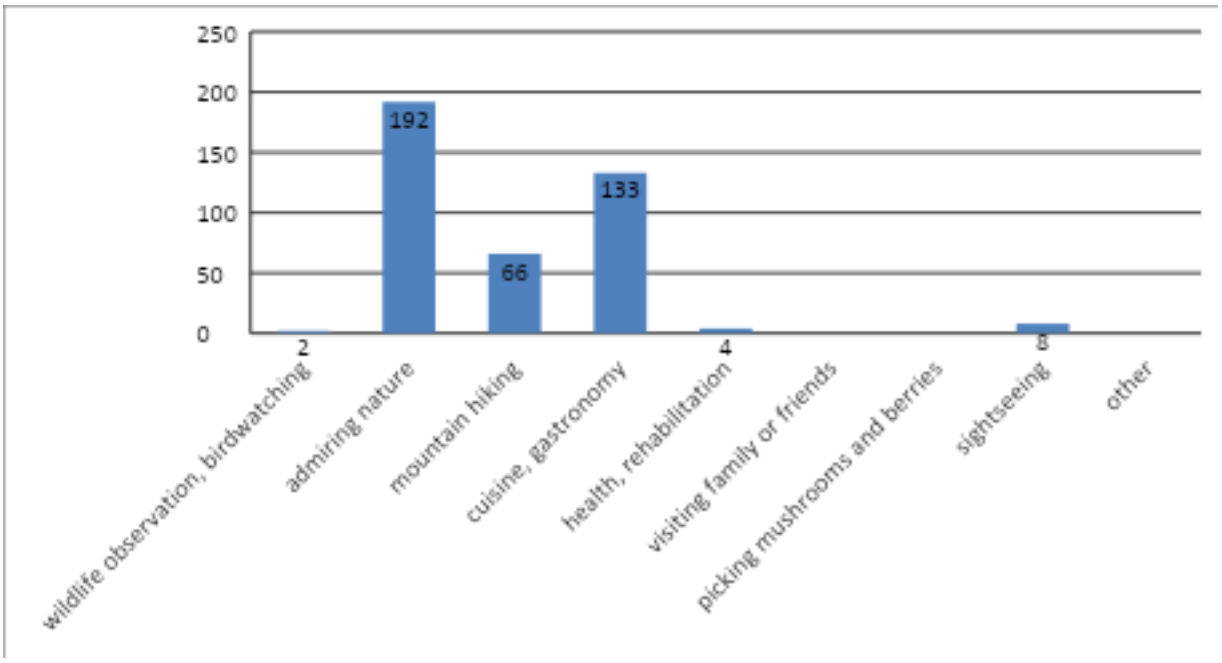


Fig.1 – Recreational activities (overnight visitors): (a) frequency distribution of reported recreational activities by number, (b) frequency distribution of recreational activities reported by the visitors, (c) frequency of reporting recreational activities chosen at the first place.

When asked to specify the type and standard of their accommodation in the BdPN region (Fig.2), ca. 40 per cent of the overnight visitors picked a guesthouse, followed by a bed & breakfast farmstead (24 per cent) and hotel (12 per cent). Therefore, altogether ¾ of the respondents preferred medium and higher accommodation standard when staying in the region overnight, whereas low budget variants (e.g., hostel, mountain hostel, camping or private apartments via international booking systems) were chosen by their minority; niche options like health resort were chosen by the insignificant proportion of respondents.

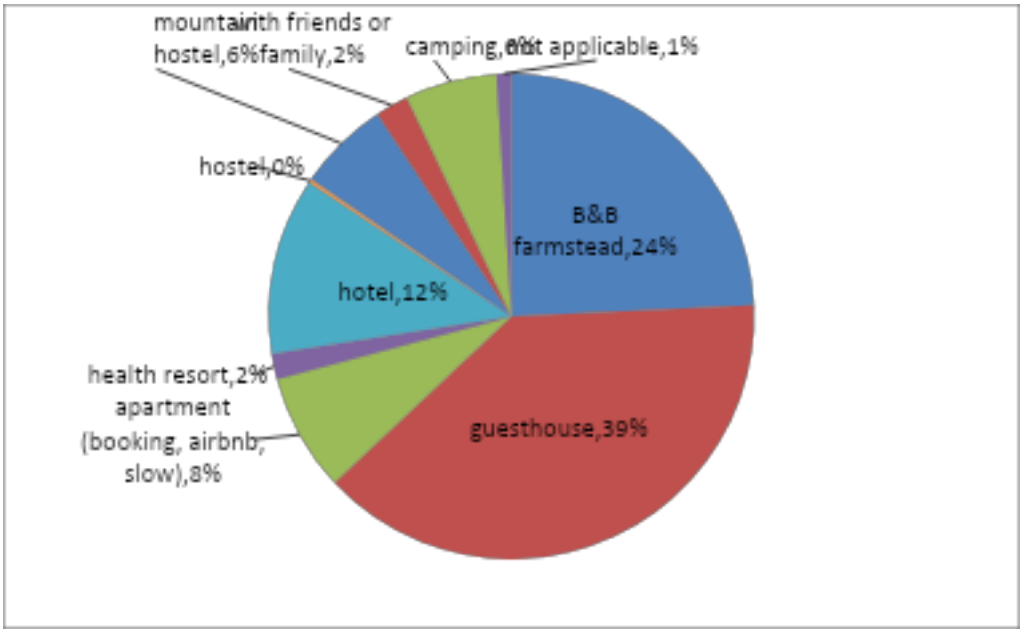


Fig.2 – Accommodation types (overnight visitors)

The respondents (461) were asked about the forms of spatial protection of the Bieszczady mountains, which in fact are multiple (partly adjoining, partly overlapping). Besides the BdPN itself, they include the natural reserves, landscape parks, natural monuments, protected landscape area, ecological, Natura 2000, and Ramsar sites, as well as the international UNESCO designations – as transboundary International Biosphere reserve "East Carpathians" and the World Heritage Site. The options being ticked in the appropriate boxes embrace all the spatial protection forms however with different frequency. As expected, National Park appeared the best recognisable spatial protection form – both altogether (Fig.3) and as the respondents' first choice (Fig.4). In line with the *a priori* expectations, other forms of spatial protections (but the natural reserve) are far less commonly known. More surprisingly, two international UNESCO designations which are considered big international distinctions for the nature protected areas, namely trilateral Biosphere Reserve and World Heritage Site appeared quite poorly recognised by the visitors. For instance, none of them has picked UNESCO status as her first choice when answering the appropriate question.

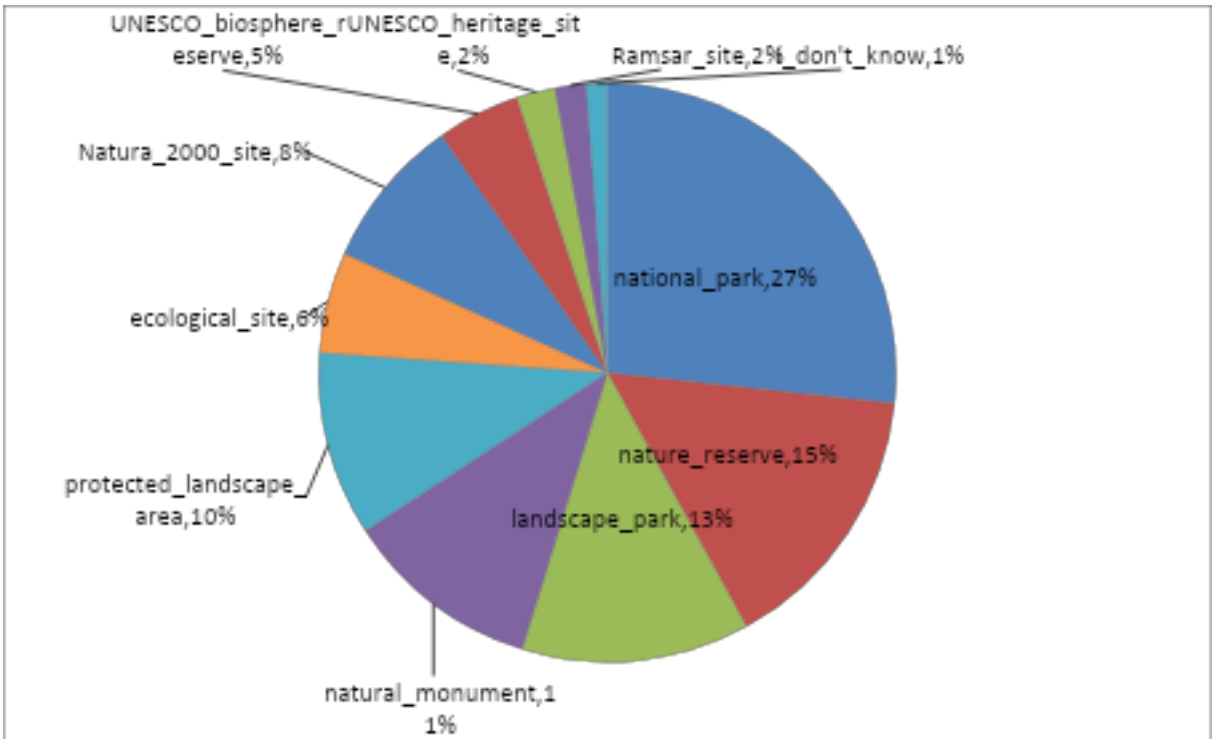


Fig.3 – Recognition of the multiple spatial protection forms in the Bieszczady Mountains by the respondents

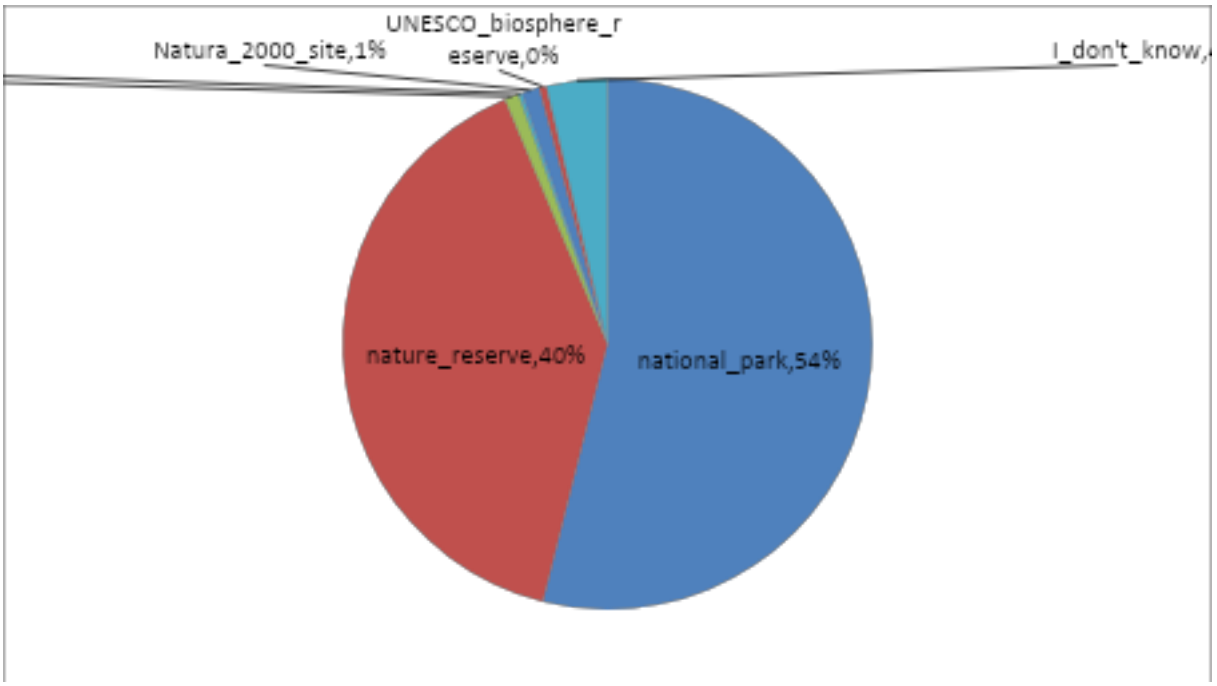


Fig.4 – First mentioned form of spatial protection (all visitors)

The respondents were asked to specify the impact which the National Park status made on their decision to visit the Bieszczady Mountains. To do so, they had to pick from the ten-point scale, where one point meant no impact at all, whilst ten points meant the highest importance. The frequency

distribution (Fig.5) suggests that for the overwhelming majority, the National Park status mattered above average, with the absolute majority admitting the highest impact thereof on their visiting decision. At the same time only sixty visitors of the 458 declared no impact at all. However, if asked whether they would come to the region had the National Park status been non-applicable (Fig.6), only 23 per cent declared their hypothetical no attendance. Therefore, the National Park's status seems important as the tourist brand in the visiting decision making, however it mostly works as a proxy of the recreational values themselves, not as a decisive factor though. However, had National Park status not represent the true natural values of the region, it would play a far poorer role in the visiting decision making.

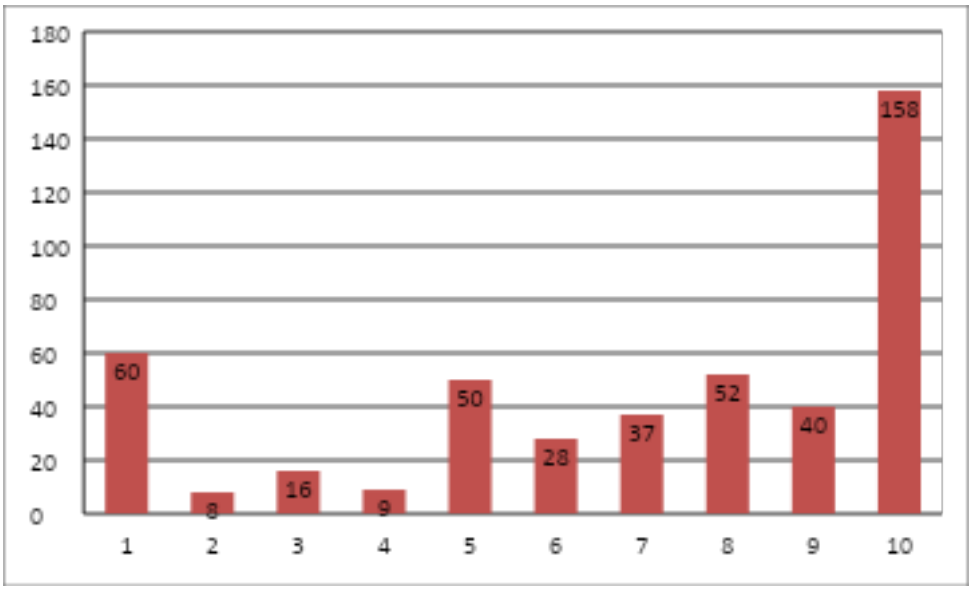


Fig.5 – National Park's importance for the visiting decision on 10-point scale (all visitors)

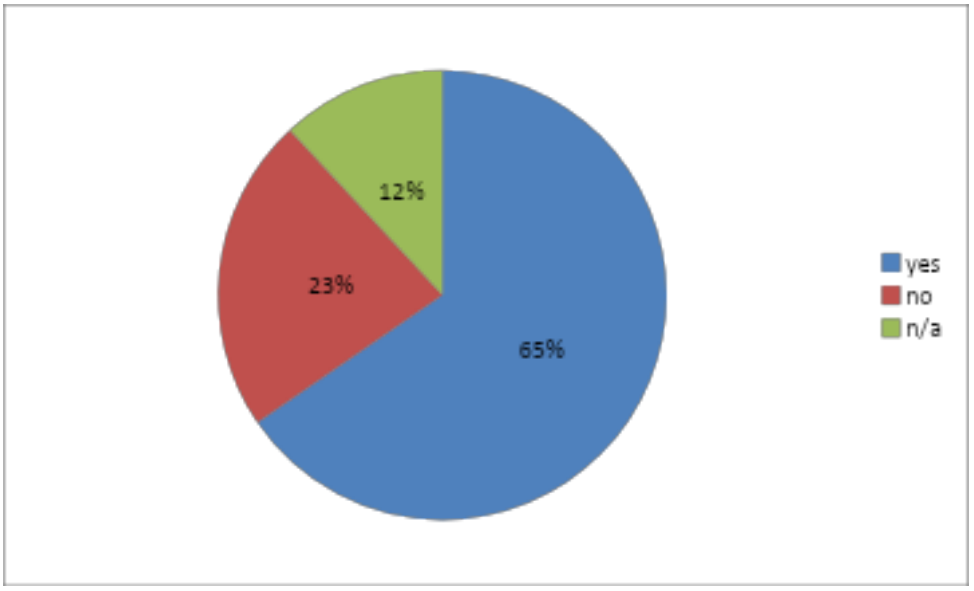


Fig.6 – Would you come to Bieszczady had it lacked the National Park's status (all visitors)?

The above conclusion is corroborated by the answers to the questions about importance for the visiting decision making of the characteristics of the BdPN, namely its biodiversity richness (Fig.7) and

wilderness, remoteness from developed areas, and peripheral location (Fig.8). Answering the questions, how important for their visiting decision were the opportunity to commune with wild nature and the fact that this region is far from civilisation, the number of respondents assigning their highest score almost doubled compared to the similar question on the impact of the National Park status, whereas those assigning the lowest score were limited to only few individuals. Again, the respondents value the natural characteristics of the National Park far above its formal status, pointing at their high environmental conscience.

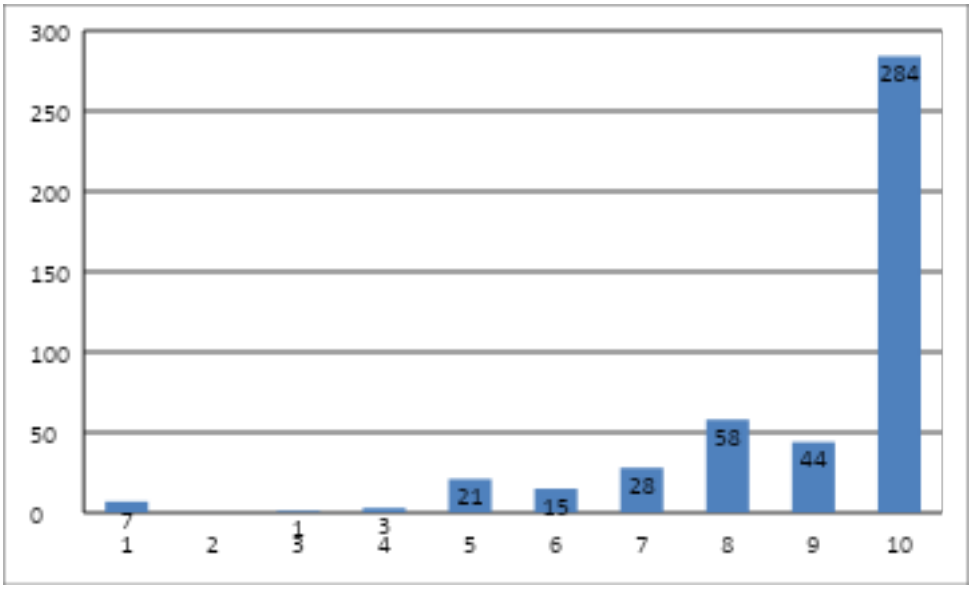


Fig.7 – How important was biodiversity in your decision to come here (all visitors)?

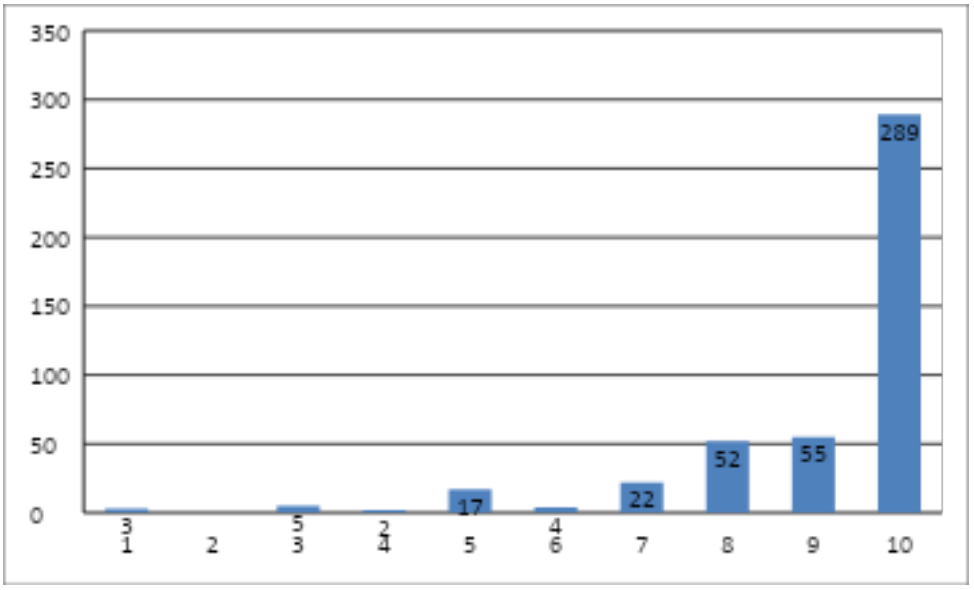


Fig.8 – Importance of the BdPN wilderness and peripheral location for the visiting (all visitors)?

Moreover, the absolute majority of the respondents would not come to the region if there were more attractions and entertainment such as observation towers, restaurants, and ski lifts there (in accordance with their declarations – Fig.9). This declaration confirms again that the wilderness and

remoteness of the BdPN constitutes its flagship value and major tourist attraction for its main consumers' segment.

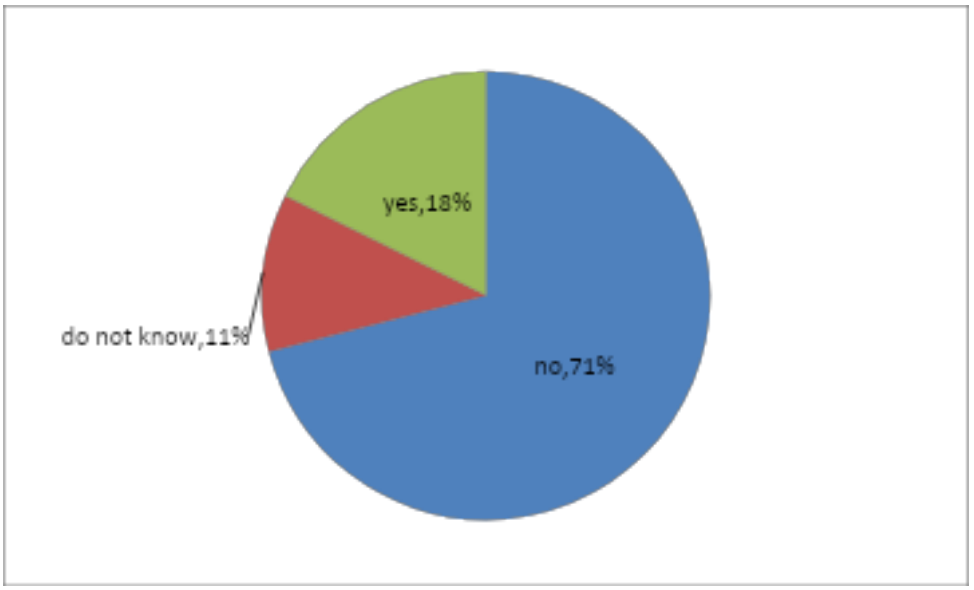


Fig.9 – Would you come here if there were more attractions and entertainment such as observation towers, restaurants, and ski lifts (all visitors)?

The majority of respondents (68 per cent) declared their willingness to pay more for entering the BdPN (Fig.10).

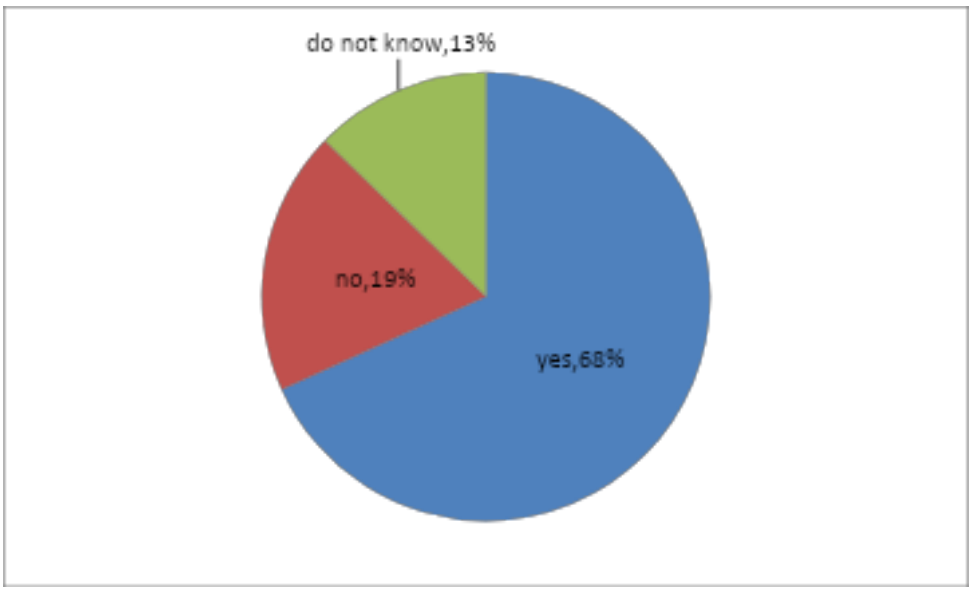


Fig.10 – Willingness to pay (WTP) an extra entrance fee (all visitors)

In the sociodemographic regard, the interviewed sample represents a heterogeneous group of BdPN visitors. Thus, the respondents age (Fig.11) ranged from fifteen to over eighty years old. The histogram shows quantitative predominance of middle-aged individuals amongst the visitors with surprisingly low proportion of young individuals. Men (53 per cent) slightly predominate in the full

interviews sample over women (Fig. 12), whereas ca 300 out of 452 enjoys a university degree (Fig.13).

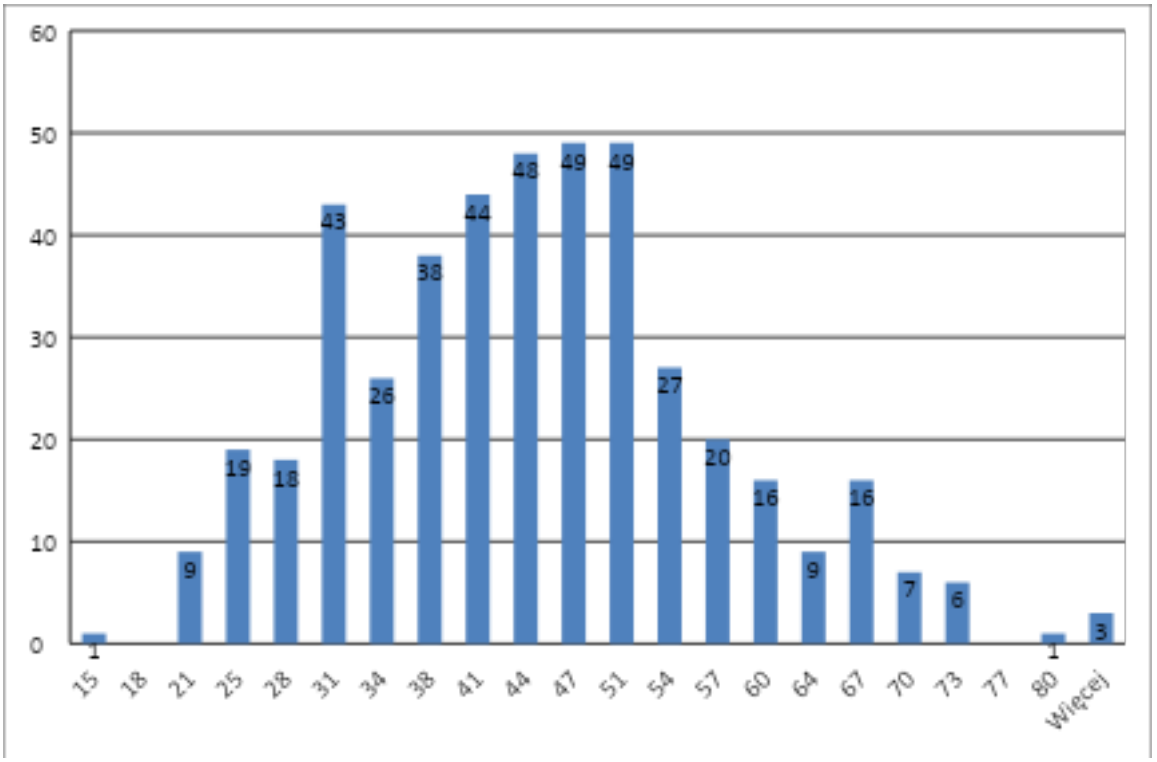


Fig.11 – Age distribution of the full interview respondents

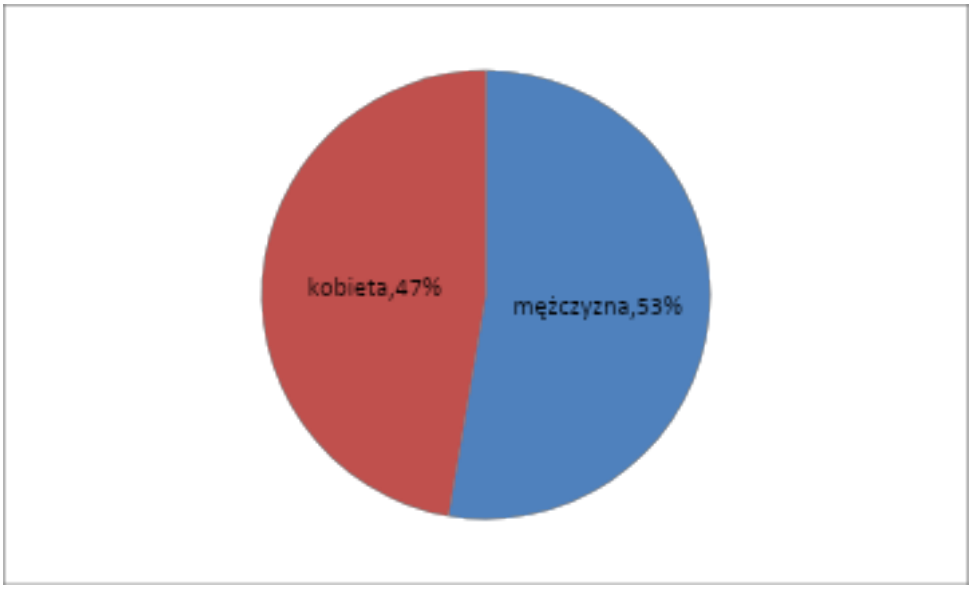


Fig.12 – Respondents' sex (all visitors)

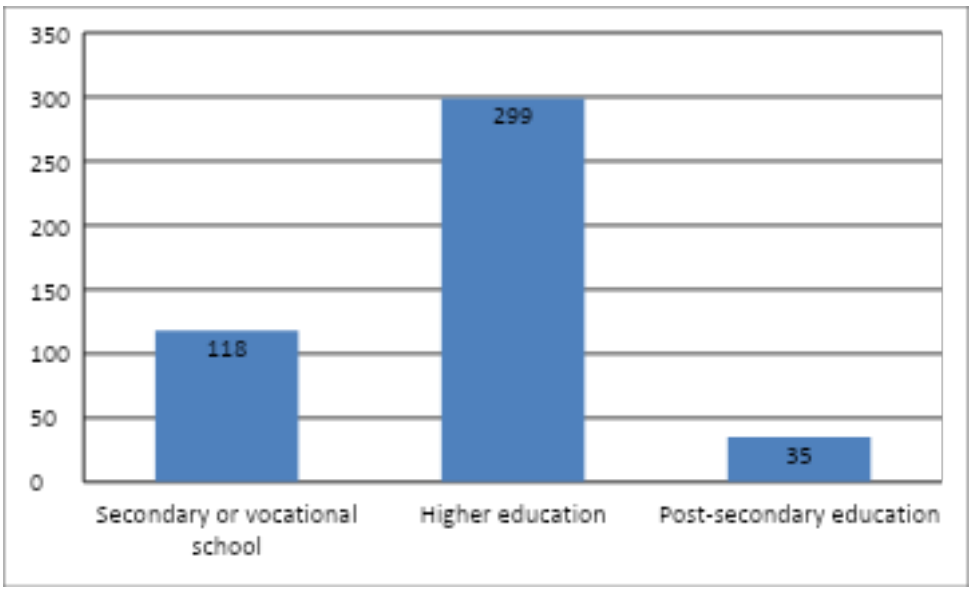


Fig.13 – Respondents' education (all visitors)

In terms of the household structure (Fig.14), the majority of respondents live in the households up to three members, whereas 296 out of 457 respondents live in the households lacking children under 18 y.o. which is consistent with their above discussed age structure.

(a) (b)

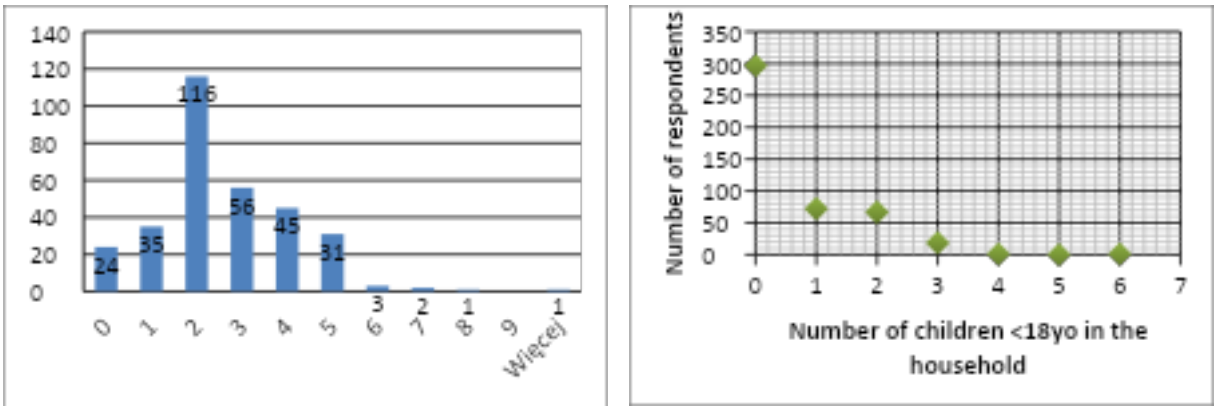


Fig.14 – Respondents' household characteristics (all visitors): (a) number of other household members; (b) number of children under 18 y.o. in the household.

An absolute minority of the full interview respondents earn less than the net monthly income interval 3,500 – 4,499 PLN, whereas their strata earning 4,500 – 8,999 PLN net a month is the most numerous (Fig.15). Permanent employment was the most popular employment status inherent to 349 out of 436 respondents who specified it (Fig.16), whereas retirement was the second most popular reported status (33 individuals).

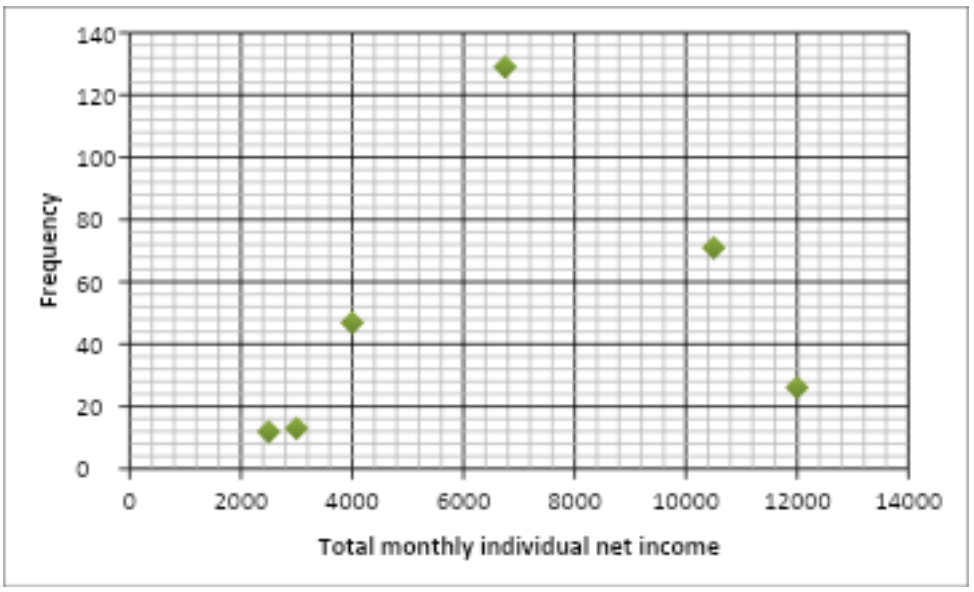


Fig.15 – Total monthly individual net income (take-home pay) including all sources of income (all visitors).

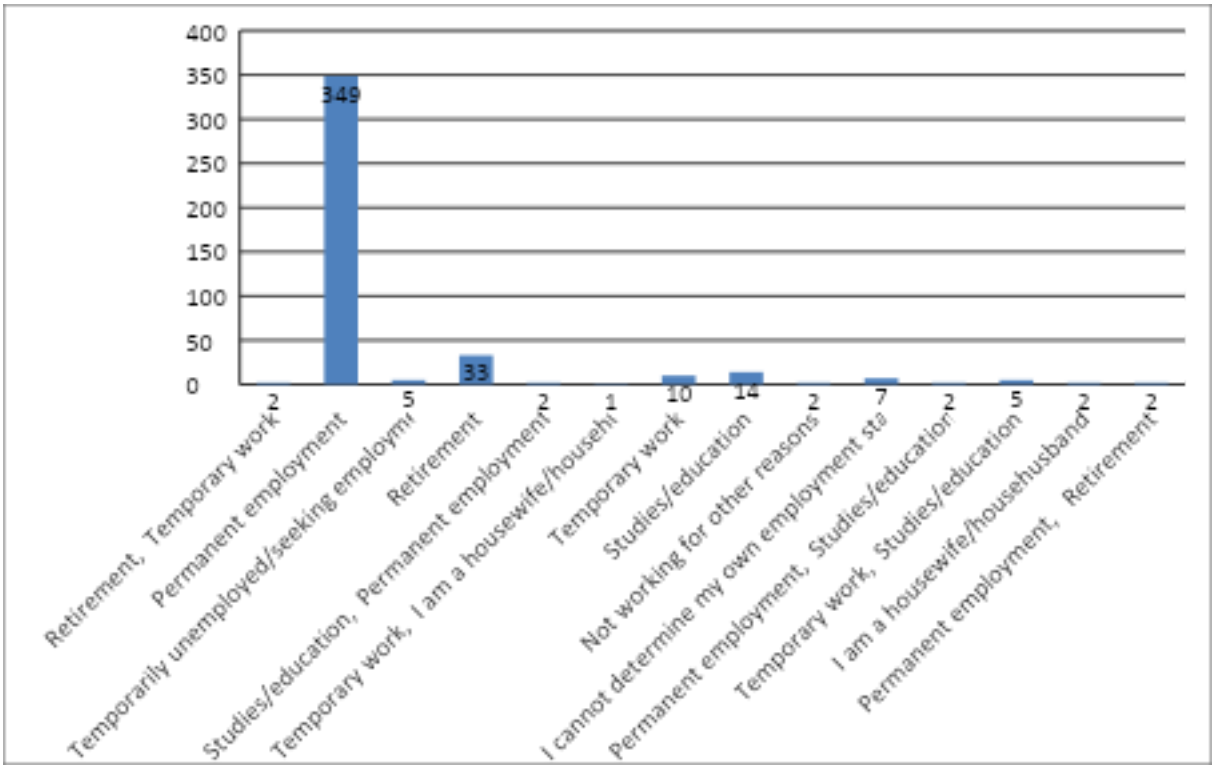


Fig.16 – Respondents employment reported status distribution (all visitors).

In terms of their reported wellness status (Fig.17), over a half of respondents (55 per cent) reported that they have enough money for everything they need, whereas the proportion of those living in reportedly dire life conditions is negligible (ca. 2 per cent).

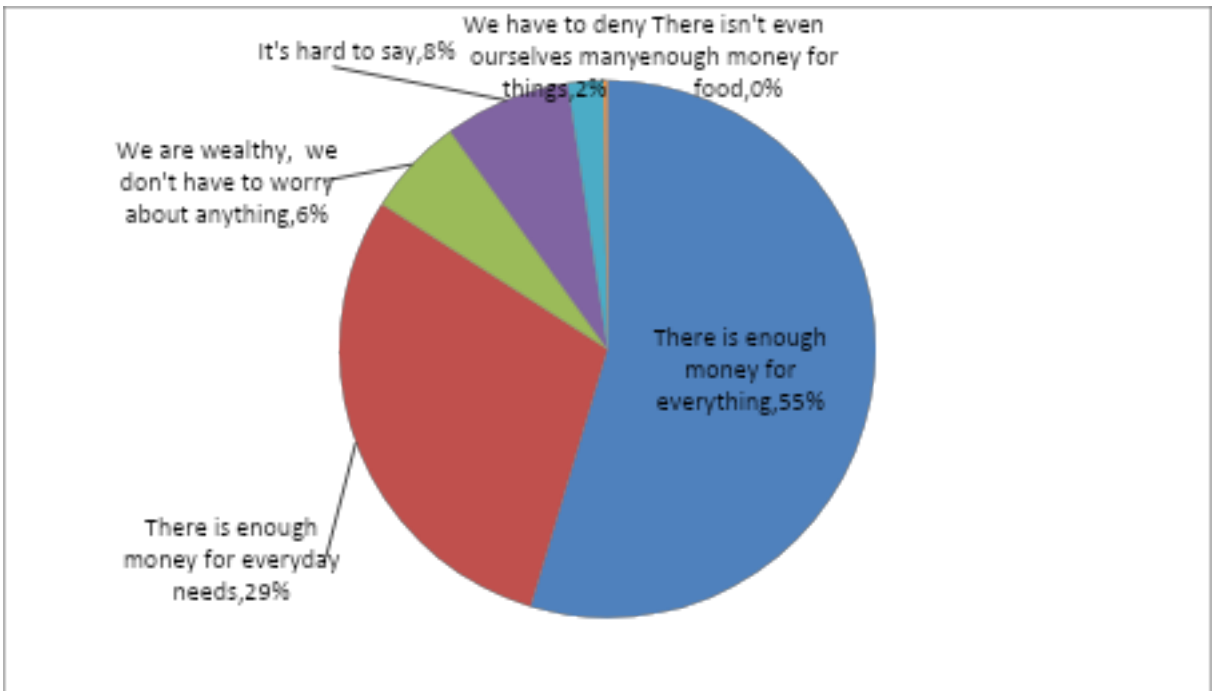


Fig.17 – Respondents' self-reported wellness status (all visitors)

Summing up, a most typical BdPN visitor is a male in his late forties – early fifties, living in a small (2-3 members) household without (or with adult) children, enjoying university degree, being permanently employed for a salary close to or above Poland's average which allows him to cover all his needs. He is practicing three to four recreation activities in the BdPN region, most probably including mountain hiking and admiring nature in a broad sense. He stopped overnight at the local guesthouse. He is aware of the National Park and other spatial forms of protection in the Bieszczady mountains; their National Park status most probably was important for his visiting decision making, however he would have come there anyway, since it is the natural values and remote location of Bieszczady really matter to him, not the formal protection status itself.

Regional Economic Effect of the BdPN Functioning

Extrapolating the sample data over the visiting type, day of the week, season, and weather conditions criteria, allowed approximating the financial and economic characteristics of the local hospitality and catering sectors of the BdPN region (Table 1).

The table below shows two categories for the majority of the estimated metrics: general metric generated by tourists for the economic agents of the particular administrative units (gminas) in general and the metric generated by tourists who came to the region specifically because of the National Park. Apparently, the overwhelming majority of the income comes from tourists intentionally choosing this region for its natural assets and/or National Park status.

Table 1 – Estimated financial and economic metrics of the hospitality and catering sectors in the region of BdPN in November 2024 – October 2025

Gross turnover hospitality	mln PLN	127.6
incl. gross turnover hospitality, BdPN	mln PLN	116.7
Gross turnover catering	mln PLN	35.3
incl. gross turnover catering, BdPN	mln PLN	33.3
Gross turnover total	mln PLN	162.9
incl. gross turnover, BdPN	mln PLN	150.0
Net turnover hospitality	mln PLN	117.4
incl. net turnover hospitality, BdPN	mln PLN	107.4
Net turnover catering	mln PLN	27.2
incl. net turnover catering, BdPN	mln PLN	25.6
Net turnover total	mln PLN	144.6
incl. net turnover total, BdPN	mln PLN	133.0
Direct income (gross value added) rate for PL accommodation and food[4]	per cent	23.5
Total direct income (gross value added)	mln PLN	34.0
incl. total direct income (gross value added), BdPN	mln PLN	31.3
Indirect income effect rate[5]	per cent	30.0

[4] https://ec.europa.eu/eurostat/cache/digpub/european_economy/vis/03_01_02/index.html?lang=en accessed 15th November 2025

[5] Assumed to be equal to the indirect income effect rate for Germany used in the original methodology

Total Indirect income effect	mln PLN	33.2
incl. total indirect income effect, BdPN	mln PLN	30.5
Total income effect	mln PLN	67.2
incl. total income effects, BdPN	mln PLN	61.8
Average regional primary income per inhabitant, Podkarpackie voivodeship[6]	PLN/person	55,100
Employment effect of BdPN in terms of hospitality and catering	FTE	1,121
BdPN total area	ha	29,000
BdPN income effect in hospitality and catering	PLN/ha	2,130

Estimated results demonstrate that protected mountain ecosystems of the BdPN generate significant values being acquired by the local tourist sector providing hospitality and catering services to the visitors. Thus, due to the protected mountainous ecosystems visited and enjoyed by the tourists, gross value added exceeding PLN 31 million was generated by the industry in twelve months. Together with the indirect income effect (i.e., added value generated by the intermediate sectors) being attributable to the nature-oriented tourism in BdPN, they gained over PLN 61 million (or PLN 2,130 per every hectare of the Park). Rough estimation suggests that the mountain ecosystems being protected in the BdPN are responsible for employment of over eleven hundred full-time positions by the local hospitality and catering providers.

The number of 1,121 full-time equivalents (FTE) is a fictitious number of people who can earn their living through tourism in the BdPN region (including all non-employed persons and other household members to be provided for). Therefore, sustainable tourism could provide full-time employment to over eleven hundred local inhabitants.

Conservative assumptions made throughout the estimation exercise suggest that the obtained results only reflect the bottom limit of appropriate metrics which would likely have increased as a result of a more comprehensive estimation.

Moreover, the study showed that the fact that the area is protected and remains wild is one of the most important factors motivating visitors to come to the region.

6 https://gospodarkapodkarpacka.pl/news/view/59947/wstepne-szacunki-pkb-na-podkarpaciu-w-porownaniu-z-calym-krajem accessed 15th November 2025

Conclusions

- Most of the tourists coming to the BdPN region choose it deliberately because of the National Park status, natural assets, remoteness, and wilderness;
- The majority of visitors put the natural values and remoteness before the formal spatial protection status, which is rather perceived as their proxy;
- Tourism generated approximately 67.2 mln PLN income for the analysed region (including 61.8 mln PLN directly attributable to the BdPN attractiveness for the visitors);
- Every hectare of the protected land generates 2,130 PLN of income per year;
- Sustainable tourism potentially provides full-time employment to over 1,100 local inhabitants.

Ref.

Manual Interviews in Bieszczady, 2024

Job, H., Majewski, L., Bittlingmaier, S., Engelbauer, M., Woltering, M. (2023). Regionalökonomische Effekte des Tourismus in Biosphärenreservaten Deutschlands. Ein wissenschaftlicher Beitrag zum Integrativen Monitoring Programm für Großschutzgebiete aus sozioökonomischer Perspektive. Bundesamt für Naturschutz, Bonn – 108 pp. DOI 10.19217/skr667

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