

# Ecosystem services approach in national park planning: factors influencing the inhabitants' perspectives on local natural resources and protected areas

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## Research Article

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## Abstract

Despite changing paradigms on nature conservation, protected areas (PAs) such as national parks (NPs) remain key elements of systems of nature protection. Nowadays PAs are perceived as socio-ecological systems and there is a conviction that using ecosystem services (ES) approach (and follow-up derivatives) may help explaining social reluctance towards planned or existing PAs. In our study we focused on the planned Turnicki National Park (TuNP) in the far eastern part of the Polish Carpathians - an arena of intensive conservation conflict between proponents of park establishment and various local stakeholders. We examined the case through the ecosystem services perspective, using a questionnaire survey covering local communities around the planned TuNP. Further, we analyzed the interactions between perception of benefits from nature and attitudes towards NPs, as well as we assessed how social and economic status of local inhabitants shape attitudes towards PAs. Also, we discussed potential roles and viewpoints for a NP for a better coexistence with local social environments. We found important associations between attitudes towards parks and different factors, such as age, the length of living in a municipality, level of education and net income. Most notably, respondents who saw benefits of nature were more positive towards NPs in general and TuNP in specific, however those who prioritized provisioning services were more skeptical. The study has shown that using ES lens can help exploring the factors important in establishment and management of PAs and suggesting approaches to improve people's attitudes towards PAs.

## Introduction

In spite of significant efforts undertaken over the last few decades, the process of ecosystem loss, fragmentation and degradation is still ongoing worldwide and in particular in Europe (Steffen et al. 2015, EEA 2021). The pan-European goal of halting biodiversity decline, initially set for 2010, had already been postponed twice due to the subsequent failures to meet the deadline. Currently, it is targeted to 2030 as a part of the new European Union Biodiversity Strategy (EC 2020). Meanwhile, rich biodiversity and healthy ecosystems are strongly linked to human well-being, through provision of goods and services, and contributions to social relations and efficient economies (Harrison et al. 2014, Folke et al. 2021). Thus, biodiversity decline constitutes a threat to our future and there is a need to adapt existing conservation tools for challenges to meet global conservation goals. To achieve that, a better integration of human dimension perspective into biodiversity conservation is necessary (Bennet et al. 2017).

The unfavorable trends in conservation outcomes have been a result of many aggravating factors, including the negative attitudes and resulting public resistance towards establishment and enlargement of protected areas (PAs) (Kati et al. 2014, Mika et al. 2019). For instance, in the EU member states establishment of the transnational network Natura 2000 sparked a variety of serious human-nature conflicts (Krott et al. 2000; Paavola 2004) driven by numerous fears and prejudices on negative impacts of protected areas, i.e. hampering local development (Hiedanpää 2002, Grodzińska-Jurczak and Cent 2011). Another issue is a relatively slow pace of PAs development in particular countries, especially with relation to the terrestrial areas (UN WCMC 2021). For instance, in Poland not a single national park has been established or significantly enlarged since 2001, mainly due to restrictive national environmental law, giving local governments a possibility to halt establishment of new NPs in their regions or localities (Niedziałkowski et al. 2014). Until today 23 existing national parks cover only around 1% of Poland territory, which places the country below the EU average (IUCN 2022) and far from the latest targets of EU Biodiversity Strategy for 2030, that calls for strict protection of 10% of land, including all old-growth forests (EC 2020). While the Polish system of protected areas has expanded a lot over last two decades, mostly due to adoption of the Natura 2000 network (EC/EEA 2022), this raises a question of the actual role that national parks may now play in nature conservation among other legal forms of PAs.

Over last decades, understanding of PAs has changed: PAs evolved from being isolated islands to elements of conservation networks and finally to objects managed alongside with areas surrounding them within so called "landscape approach" (Palomo et al. 2014). Accordingly, conservation areas are nowadays perceived rather as socio-ecological systems and framed within "people and nature" paradigm which underlines the importance of human culture and institutions co-creating interactions between societies and the environment (Mace 2014). This new framing builds on previous, more utilitarian way of considering human-nature relationships ("nature for people") and engages multidimensional and nonlinear vision of shared human-nature

environment (Sandbrook et al. 2019). Whilst this broadening the scope of the nature conservation paradigm is intended to ease tensions between conservation objectives and economic activity, practical difficulties in integrating these visions can stimulate even more environmental conflicts. This was already the case for Central and Eastern European countries where post-socialist nature conservation legislation underwent a gradual and conflicting shift towards a more participatory PA management approach along with the Europeanisation process (Niedziałkowski et al. 2012, Yakusheva 2019). We therefore claim that exploring such conservation issues through the lens of socio-ecological system may be helpful in understanding diverse background of emerging opposition towards creation or enlargement of PAs.

Despite changing paradigm of nature and conservation, PAs such as national parks remain key elements maintaining species diversity and habitat integrity (Geldmann et al. 2013, Gray et al. 2016, Oldekop et al. 2015). They still play a vital role in the system of nature protection both worldwide (IPBES 2019), and at continental scale (EC 2020) contributing to the achievement of important conservation and sustainability policies, such as the UN Sustainable Development Goals (UN 2015), or the EU ecological connectivity and restoration targets (EC 2020). They are not only biodiversity reservoirs but also nodes of green infrastructure providing environmental resilience and ecosystem services (Kati et al. 2014, EEA 2020).

At the same time, nature protected within PAs can successfully generate contributions to humans, the value of which can be revealed through a use of the ecosystem services (ES) concept (MEA 2005). Based on the concept, benefits coming from nature can be recognized, measured and incorporated into economic calculus and their value can be then introduced into environmental decision making, in both quantitative and qualitative form. Over the last decade the concept of ES has been criticized, debated (see e.g. Raymond et al. 2013, Kadykalo et al. 2019) and finally developed into the conceptual framework of "nature's contributions to people" (NCP) (Pascual 2017). The NCP approach further expands the operational scheme of ES by highlighting the role human culture (or non-material ecosystem services) plays in defining links between people and nature (Kadykalo et al. 2019). In addition, it emphasizes the role of local, indigenous knowledge in our understanding of nature's contribution to local communities (Diaz et al. 2018). Here we believe that using ecosystem services (or its derivatives such as NCP) approach can contribute to understanding social reluctance towards planned or existing PAs and thus help reconciling or mitigating conservation conflicts.

In our study we focused on a planned Turnicki National Park (TuNP), in the far eastern part of Polish Carpathians. This territory has been, from 1980s until now, an arena of an intensive conflict between proponents of park establishment and various local stakeholders being against that (Boćkowski 2018b). At the same time, it has been an exemplary field for a general debate on national parks in Poland. Also, in contrast to the case of enlargement of the world-known Białowieża National Park (Blicharska & Herzele 2015; Niedziałkowski 2016), it has not ever been a subject of investigation from the perspective of perceived ecosystem services (Boćkowski 2020). Therefore, the area of planned TuNP serves as an excellent test ground for exploring whether the concept may contribute to planning or reforming a national park by bringing out new attitudes or insights to existing debate among various stakeholder groups.

The main goal of our study was to examine the use of ecosystem services lens in explaining opinions towards the planned national park amongst local inhabitants. Therefore our analysis is focused on three detailed goals: (1) to analyze the interactions between perception of benefits from nature and attitudes towards national parks, (2) to explore how social and economic status of local inhabitants shapes attitudes towards such PAs and (3) to discuss potential roles and ideas for a national park for a better coexistence with local social environments

## Methodology

### Study area

We collected data on perception of benefits from nature and attitudes towards national parks from the area of three municipalities (Bircza, Fredropol, Ustrzyki Dolne) located in the vicinity of the planned national park (Fig. 1). These are vast forest areas, located in Subcarpathian Province to the south of Przemyśl at the present border with Ukraine, which from the 1930s started to attract attention of naturalists because of their exquisite natural values (Boćkowski 2018b). The area at the

time and still now is the last large and little transformed forest complex in the band of Polish foothills, with old-growth trees, and rich and unique flora and fauna (Walendziak & Boćkowski 2018).

The studied area remained largely uninhabited and poorly developed as a result of II World War hostilities and evictions of the local population that happened shortly after. Then, from the 1960s to the 1980s, this area was incorporated into a secret resort for hunting dignitaries which has retained its remoteness to this today (Affek 2011, 2015). Currently, the south-eastern part of the province, where the municipalities are located, represents the most peripheral and economically the least developed part of the region. Their local communities are struggling with problems typical for intense transformation and modernization processes, such as lack of jobs related to the abandonment of agriculture, dependence on social welfare, risk of poverty and exclusion, shortages in infrastructure, and low availability of public services as well as meager resources of human and cultural capital that hinder adaptation to the changing labor market, low entrepreneurship and relatively low institutional organization (Klekotko 2020).

All three municipalities are characterized by low population density, prevailing land use is agriculture and forestry with a dominant share of forest areas managed by Polish State Forests (Annex No. 1). Agricultural land is very fragmented in private land where plots of several hectares dominate. The best conditions for agricultural activity due to the microclimate, soil valuation class, and terrain prevail in the municipality of Fredropol. In turn, the municipalities of Bircza and Ustrzyki Dolne are much more mountainous, have a lower quality of soils and greater forest cover, reaching about 60%, which predestinates them for the limited husbandry and breeding of animals and other extensive forms of use, such as permanent meadows and pastures (Boćkowski 2018a).

The municipalities in question are covered by various forms of area protection, which, combined with a unique cultural landscape and low population density makes them attractive for tourists (especially for ecotourism, agritourism and active tourism). Tourist infrastructure is best developed in the Ustrzyki Dolne municipality and the weakest in the Fredropol municipality. While employment related to forestry is still important part of the local labor market, the structure of entrepreneurship has changed over the last two decades, with a growing share of entities related to trade, construction and services of various type (Boćkowski 2018a).

## Methods

To explore local opinions towards the planned national park we conducted a questionnaire survey between July and October 2019. The main survey was preceded by a pilot study in localities with similar socio-economic characteristics, located just outside the study area. Address points marking residential buildings (households) for the survey were drawn using the publicly available GIS spatial database. An additional amount-proportional lottery was used for the five largest towns, which included min. 50% of all address points in a given municipality. The remaining points were drawn from all over the area, except for these localities. This was to avoid the potential under-representation of larger towns in the draw. The survey was conducted with one adult in each household, similarly in multi-family buildings with up to 10 apartments (buildings with more than 10 households were not included in the sample).

A total of 527 survey responses (response rate of 39,4%) were collected in three municipalities (Tab. 1). The majority of respondents had moderate levels of education and were either retired or contract workers. While there was a significant group of unemployed or economically inactive respondents, many of them declared during the interview that they worked on their own farm. Among all 527 respondents, those living in households with two permanent members, less often three or four people, dominated.

Table 1 Basic sample characteristics

Number of responses (Bircza/Fredropol/Ustrzyki Dolne)	527 (184/176/167)
Gender in % (men/women)	40.9/59.1
The average age /median	51/54
Minimum/maximum age	18/86
Dominant age (range)	60-64
Years of residence in a municipality (average/minimum/maximum)	41.5/1/86
Average monthly net income per person in a household in US \$/national avg.	375/450*
Education in % (lack/vocational/secondary/higher)	(17/27/35/19)
Professional status in % (unemployed/contract/own enterprise/retired)	(14/34/14/35)

Notes: \* - in 2019.

The questionnaire (Annex No. 2) consisted of 34 questions in total, organized in several groups. The study started with selection of key benefits from nature for the local community, proposed based on a modified ecosystem services CICES classification (Haines Young & Potschin 2018) and notions adapted to a Polish context and verified in the previously conducted relevant research (Pietrzyk-Kaszyńska et al. 2014, Tusznió et al. 2020). Modifications were necessary to ensure applicability of the research process. As proved by Tusznió et al. (2020), it sometimes requires the researchers' acceptance of terminological inconsistencies – e.g. the need to communicate ecosystem services as 'benefits from nature', even though the latter belong to a different level of an ES cascade (see also Boerema et al. 2017).

Next, the questions concerned, *inter alia*, the current limitations and potential threats to delivery of prioritized benefits, followed by questions on the respondents' attitudes towards national parks – first, in general and second, particularly about the planned TuNP. The latter included: sources of information about TuNP, knowledge about the NP project, opinions on potential benefits and losses from its creation and finally general attitude towards its creation. The last parts of the questionnaire considered professional relation of respondents to farming, tourism and logging industry, including attitudes and opinions towards tourism activities in the area, and finally – socio-demographic information.

The questions about the benefits of nature were analyzed with descriptive statistics and the chi-square test to analyze the differences in prioritization of benefits from nature. The degree of support for national parks was assessed using eight statements measured on a Likert scale (Cronbach's  $\alpha = 0.844$ , 48.2% of the total variance explained). Individual responses against selected independent variables were analyzed using the non-parametric test (Kruskal-Wallis) and post-hoc pairwise analysis. Then, after reversing coding of items (2, 4, 6, 8) that negatively load the assumed cognitive construct, a synthetic indicator (variable) of support for the current role of national parks was created. Its distribution differed from the normal one, however, due to the small skewness of the distribution for the created variable "Role of parks" (SKE = -0.121,  $SE_{SKE} = 0.106$ ), one-way analysis of variance and post-hoc analysis (Tukey's test) were used to examine the influence of the municipality (Annex No 1) as a differentiating factor support for the role of national parks. Subsequently, the correlations (Spearman's  $\rho$ ) between the synthetic indicator of support and selected quantitative variables were examined. The attitude towards establishing the TuNP between the municipalities were analyzed with the use of one-way analysis of variance; we also examined correlations (Pearson's  $\rho$ ) of the attitude to TuNP with quantitative variables and the synthetic indicator of support for national parks as well as differences in responses on the attitude towards TuNP depending on gender (Student's t-test), and on the declared professional situation (Kruskal-Wallis test).

## Results

### Priority services from nature and perceptions of national parks

When asked for choosing up to five most important benefits from nature, respondents tended to select mostly those of material character (52,8 % of all choices), i.e. provisioning services (Tab. 2). Drinking water, wood for heating purposes, harvesting plants and animals built up to nearly 40% of all choices. The rest was divided fairly equally between cultural (24,7%) and regulatory services (22,5%).

Table 2 The summary of chosen priority services from nature (all 5 choices summed up)

	Count	% of total	% cumulated
<b>Sourcing drinking water (P)</b>	345	13,6	13,6
<b>Sourcing wood for heating purposes (P)</b>	252	9,9	23,5
<b>Harvesting plants (P)</b>	213	8,4	31,9
<b>Animal farming (P)</b>	195	7,7	39,5
<b>Landscape values (C)</b>	189	7,4	47,0
<b>Picking up wild mushroom/herbs/berries (P)</b>	182	7,2	54,1
<b>Purifying water/air (R)</b>	159	6,3	60,4
<b>Flood and drought protection (R)</b>	144	5,7	66,0
<b>Practising sport/tourism/recreation (C)</b>	124	4,9	70,9
<b>Habitat of wild pollinators (R)</b>	123	4,8	75,7
<b>Spiritual or religious values (C)</b>	91	3,6	79,3
<b>Ecological education (C)</b>	76	3,0	82,3
<b>Mitigating climate extremes (R)</b>	67	2,6	84,9
<b>Noise protection (R)</b>	64	2,5	87,5
<b>Sourcing water for farming/industrial purposes (P)</b>	61	2,4	89,9
<b>Cultural heritage (C)</b>	56	2,2	92,1
<b>Sourcing wood for non-heating purposes (P)</b>	53	2,1	94,1
<b>Inherent value/value of being (C)</b>	51	2,0	96,1
<b>Scientific research (C)</b>	40	1,6	97,7
<b>Sourcing wild animals and derivatives (P)</b>	27	1,1	98,8
<b>Erosion control (R)</b>	16	0,6	99,4
<b>Extracting clay/gravel/minerals (P)</b>	12	0,5	99,9
<b>Other</b>	3	0,1	100,0
<b>Total</b>	2543	100,0	

Notes: P – provisioning, C – cultural, R – regulatory ecosystem services.

The priorities regarding benefits from nature significantly differed among respondents with different synthetic score representing the “approval of national parks” ( $\text{Chi}^2 = 22.2879$ ,  $p < .001$ ). The respondents who were in general positive towards national parks valued mainly provisional ecosystem services (48% of all choices) while cultural (28%) and regulatory (24%) services played less important role for them (Fig. 2).

The respondents who had in general negative attitude towards national parks prioritized provisional services even more (57% of all choices), followed by regulatory (23%) and cultural (21%) services (Fig.3).

### **Priority services from nature and perceptions of Turnicki National Park (TuNP)**

Share of prioritized provisional, cultural and regulatory services significantly varied ( $\text{Chi}^2 = 24.9864$ ,  $p < .001$ ) between three groups of respondents with different attitudes (negative/neutral/positive) towards TuNP (Annex No 3). Nevertheless, the respondents seemed to value provisional ecosystem services most regardless of their attitude towards creation of the park (Annexes No 4-6).

We found significant differences (Kruskal Wallis test  $H = 92.521$ ;  $p < 0.001$ ) in general approval of parks between respondents' selection of key benefits. We revealed that respondents who scored relatively low in terms of approval of national parks were choosing sourcing wild living animals and sourcing wood for non-heating and heating purposes as priority compared to most of other benefits (Fig. 4). On the contrary, respondents scoring relatively highly in terms of approval of national parks were predominantly choosing scientific research, habitat of wild pollinators and landscape values as key benefits.

Significant differences (Kruskal Wallis test  $H = 43,373$ ;  $p = 0,004$ ) were found in approval of TuNP between respondents choosing particular key benefits. The respondents who chose sourcing wood for non-heating purposes as key benefit scored significantly lower in terms of approval of TuNP than respondents choosing habitat for wild pollinators and practicing sport/tourism/recreation (Fig. 5).

### **General opinions on national parks (NPs)**

The respondents presented a fairly balanced perspectives over various roles of NPs, with no extreme opinions over any statements (Fig. 6). Most of the respondents (65.6%) agreed that national parks prevent the excessive exploitation of the environment. At the same time, 65.8% of respondents indicated difficulties in using the forest caused by the presence of national parks. More than half of the respondents (61.2%) agreed that national parks protect heritage of citizens while, 58,3% believed that they serve to interest of only a fraction of society. Quite on the contrary 51% did not agree that existence of national parks is no longer needed.

For nearly all the items (except the statement that national parks protect against excessive use of environment) we found statistically significant differences in responses between respondents from individual municipalities. In multiple pairwise comparisons, respondents from the Fredropol municipality showed greater support than respondents from the Bircza and Ustrzyki Dolne municipalities for statements that national parks: may stimulate local development ( $p = 0.003$ ;  $0.028$ ), protect heritage of citizens ( $p = 0.007$ ;  $0.024$ ) and that living within a NP may be a reason to be proud ( $p < 0.001$ ). On the other hand, respondents from the Fredropol municipality showed significantly lower support than respondents from other municipalities for statements that NPs serve to interests of only a fraction of society ( $p = 0.002$ ;  $p < 0.001$ ) and that NPs may be replaced by other forms of nature protection ( $p = 0.003$ ;  $p < 0.001$ ). Respondents from Bircza municipality showed greater support for the statement that NPs prevent local people from use of the forest ( $p < 0.001$ ) than the respondents from the Fredropol municipality, while the latter showed significantly greater support than respondents from both other municipalities for the statement that NPs hinder disposal of own property ( $p < 0.001$ ;  $p = 0.023$ ).

### **Opinions on national parks (NPs) and planned Turnicki National Park (TuNP) across studied municipalities**

There was a statistically significant ( $F = 14.912$ ,  $p < 0.001$ ) differences between the three municipalities regarding the attitudes national parks. It should be noted though that the effect size of the examined factor was small (partial  $\eta^2 = 0.054$ ). Post-hoc analysis (Tukey's test with correction for multiple comparisons) showed differences for the pair Fredropol-Bircza ( $p < 0.001$ ) and Fredropol-Ustrzyki Dolne ( $p < 0.001$ ), showing a more positive attitude of the inhabitants of the Fredropol municipality towards national parks (Fig.6).

From the total number (527) of respondents, 69,4% have heard of the planned TuNP and those were asked for expressing their attitude towards its creation. In general, respondents from all municipalities were rather skeptical towards the plans of

establishing the park (Fig. 7): there were significant differences between municipalities ( $F = 5.881$ ,  $p < 0.003$ ), while the effect size for the municipality variable turned out to be small (partial  $\eta^2 = 0.031$ ). Respondents of Fredropol municipality showed more positive attitude towards this planned park than the other two municipalities ( $p < 0.005$  for Fredropol-Bircza and  $p < 0.014$  for Fredropol-Ustrzyki Dolne).

On average 28% of respondents had "neutral" opinion regarding the approval of the TuNP, with differences between particular municipalities, ranging from 25% (Bircza) to 32% (Ustrzyki Dolne) on average (Fig. 8).

### **The opinions on national parks and Turnicki National Park against socio-demographic and economic variables**

The approval of NPs was weakly negatively correlated with the age of the respondents (Spearman's  $\rho = -0.155$ ,  $p < 0.001$ ). With regard to the variable "number of years of living in the municipality", the strength of this negative correlation increased ( $\rho = -0.299$ ,  $p < 0.001$ ). On the other hand, the higher level of education and the average monthly net income per person in a household had a slightly positive effect on support for NPs ( $\rho = 0.214$ ,  $p < 0.001$ , and  $\rho = 0.157$ ,  $p = 0.002$ , respectively). However, no significant correlation was found between perceived role of parks and the number of people in a household, or respondents' gender ( $t = 1.166$ ;  $p = 0.244$ .) In relation to the occupational situation the results were inconclusive (Kruskall-Wallis test  $H = 9.506$ ;  $p = 0.05$ ; results of post hoc analysis in pairs -  $p > 0.05$ ) (Tab.3).

Similarly to approvals of national parks in general, the positive attitude towards establishment of the TuNP was weakly negatively correlated with the age of the respondents ( $\rho = -0.104$ ,  $p = 0.046$ ) and the number of years of living in the municipality ( $\rho = -0.244$ ,  $p < 0.001$ ). The level of education was moderately positively correlated with the attitude towards TuNP ( $\rho = 0.296$ ,  $p < 0.001$ ), as well as with the average monthly net income per person in a household ( $\rho = 0.176$ ,  $p = 0.004$ ). There was no correlation found between support for the establishment of TuNP and the number of people in the household, gender and the current professional situation. Additionally, there was a strong, positive correlation between the attitude towards the creation of the TuNP and the (positive) opinion on the current role of national parks ( $\rho = 0.705$ ;  $p < 0.001$ ) (Tab. 3).

Table 3 Influence of socio-demographic and economic factors on support for national parks and planned Turnicki National Park

VARIABLE	NATIONAL PARKS	PLANNED TURNICKI NP
Age of the respondents		
Number of years of living in the municipality		
Level of education		
Average monthly net income		
Opinion on national parks	N/A	
Attitude towards planned Turnicki NP		N/A
Number of people in a household	✘	✘
Respondents' gender	✘	✘
Occupational situation	?	✘

Notes: Icons mark negative (red) and positive (green) correlations between the variables. Darker color marks strong correlation. A cross means there was no demonstrated statistically significant relationship between the variables. A question mark means an ambiguous result.

### Type of activity versus general opinions on national parks and Turnicki National Park

Ownership of a farm was a significant factor which stayed in negative relationship with positive attitudes towards national parks, i.e. farm owners tended to be more skeptical about national parks in general. At the same time there was no relationship between farm ownership and attitude towards planned TuNP (Tab. 4). On the contrary, respondents related professionally to tourist sector had more positive attitude both to TuNP and parks in general. At the same time, respondents belonging to broadly perceived logging industry had negative attitude towards parks in general. Belonging to such industry was not, however, related to particular attitudes towards TuNP.

Table 4 Effect of type of activity on opinions about national parks

	Do you have farm?	N	Mean	SD	Std. Error	t	df	Sig. (two tailed)
<b>Approval of national parks</b>	No	246	3,29	.92211	.05879	3.911	522.981	.000*
	Yes	279	2,95	1.05240	.06301			
<b>Attitude towards Turnicki NP.</b>	No	158	2,61	1.382	.110	1.958	364	.051
	Yes	208	2,32	1.423	.099			
	<b>Are your incomes related to tourism?</b>	N						
<b>Approval of national parks</b>	No	482	3,08	.99126	.04515	-2.059	523	.040*
	Yes	43	3,41	1.13571	.17319			
<b>Attitude towards Turnicki NP.</b>	No	332	2,39	1.390	.076	-2.175	364	.030*
	Yes	34	2,94	1.536	.263			
	<b>Are your incomes related to logging industry?</b>	N						
<b>Approval of national parks</b>	No	414	3,19	.99996	.04915	3.370	523	.001*
	Yes	111	2,83	.98541	.09353			
<b>Attitude towards Turnicki NP.</b>	No	277	2,52	1.418	.085	1.767	364	.078
	Yes	89	2,21	1.369	.145			

### Perception of limitations and threats to benefits from nature, benefits and losses from creation of TuNP versus opinion on national parks and TuNP

Perceived current limitations to benefits drawn from nature showed no effect on opinions towards national parks and planned TuNP (Annex No 7). In turn the respondents who saw future threats to benefits from nature were more likely to approve the role of national parks (mean score of approval: 3.19 to 2.97). However, no such relation was found with regard to the attitude towards planned TuNP (Annex 5).

Majority of respondents perceived losses rather than benefits from the potential establishment of the park (Tab. 5). Those who saw benefits were prone to perceive national parks, including TuNP, in more accepting manner. In similar way perception of losses was correlated with more negative opinions on both the planned TuNP and national parks in general.

Table 5 Effect of perceived benefits and losses from the creation of Turnicki National Park on opinions of national parks

	Can you see potential benefits from creation of TuNP?	N	Mean	SD	t	Sig. (two tailed)
<b>Approval of national parks</b>	No	264	2,65	0,89827	-11.230	0,000*
	Yes	102	3,78	0,77474		
<b>Attitude towards TuNP</b>	No	264	1,94	1,129	-13,399	0,000*
	Yes	102	3,75	1,224		
	Can you see potential losses from creation of TuNP?	N	Mean	SD	t	Sig. (two tailed)
<b>Approval of national parks</b>	No	70	3,79	0,90778	8.324	0,000*
	Yes	296	2,77	0,92382		
<b>Attitude towards TuNP</b>	No	70	3,79	1,215	9,984	0,000*
	Yes	296	2,13	1,260		

## Discussion

This study contributes to the ongoing discussions in the conservation social science, on 1) factors influencing people's perception towards NPs (e.g. Schenk et al. 2007, Vodouhê et al. 2010, Bennet & Dearden 2014, Rossi et al. 2015, Job et al. 2021), and 2) potential contributions of the ES concept to studying and managing perceptions of local communities towards NPs and PAs in general (Martín-López et al. 2012, van Ripper et al. 2012, Brown & Fagerholm 2015, Mączka et al. 2019, Tusznió et al 2020). We found important associations between attitudes towards parks and different factors. The main variables associated with differences here are related to age, the length of residing in a certain municipality, level of education and net income, which is in line with other studies (e. g. Mensah et al. 2017, Ward et al. 2018). Similarly to the world-known case of enlargement of the Białowieża Forest (Niedziałkowski et al. 2014) inhabitants of studied municipalities, which are also highly forested areas, seemed to value provisional ecosystem services most, although regulatory and cultural services were not by any means neglected. Such prevalence of appreciation for provisional services was observed also in other studies of ES in planned PAs (e.g. He et al. 2018a).

Most notably, respondents who saw benefits from nature were more positive towards NPs (including TuNP). Moreover, respondents who gave priority to provisioning services were more skeptical towards national parks (including TuNP) while approval for them was associated with appreciation of cultural and regulatory services. This corresponds with interpretation of Blicharska & Herzele (2015) who distinguish three narratives when speaking of people-forest relationship in Białowieża Forest: "managerial", "livelihood" and "primeval". The second one, presented by local inhabitants, underlines the provisional role of the forest in fulfilling people's needs whereas "primeval", presented by NPs supporters, focuses on intrinsic values and natural ecological processes. Interestingly, while perception of general threats to benefits from nature was associated with a more positive attitude towards NPs and Turnicki NP, predicting losses from creation of Turnicki NP resulted in skepticism towards it. This can suggest that to promote positive views on PAs, one needs to address the underlying fears and prejudices and build a positive image of PAs as providers of benefits (particularly provisioning services, which are most readily identified (Martin-Lopez et al. 2012)).

The respondents of the study presented rather balanced mix of general opinions on national parks perceiving both advantages and disadvantages of such protected areas. It is though noteworthy that they were rather skeptical against the statement that NPs may be replaced by other forms of nature protection. The differences in approval of particular statements we found for

examined municipalities correspond with results of previously conducted qualitative workshops (Boćkowski et al. 2020) and measured indicators of general support for national parks and Turnicki NP, showing Fredropol municipality as the most conservation-friendly. Whereas the difference in general approval for NPs may be due to the different structure of land use between municipalities and location of the seat of the local forest inspectorate, which manages the vast majority of forests in the planned park and has a significant impact on the negative attitude of the inhabitants towards the park project (Boćkowski et al. 2020). Accordingly, the other revealed differentiating factor was the type of inhabitants' activity. Ownership of a farm and professional relation with logging industry was associated with more negative approach towards NPs and professional relation with tourism was associated with positive attitude, which reflects the voices in current discourse around the planned Turnicki NP (Boćkowski et al. 2020) and other protected areas in southern and eastern Poland (Grodzińska-Jurczak & Cent 2011, Niedziałkowski et al. 2014, Kamal et al. 2015).

While PAs such as national parks (NPs) and forest reserves may play a significant role in preventing deforestation and boosting effectiveness of conservation efforts (Andam et al. 2008, Joppa & Pfaff 2010), their efficacy in ecosystem degradation may be questioned due to increasing human impact (Jones et al. 2018), and tendency to be located in areas less vulnerable to economic exploitation (Joppa & Pfaff 2009). Also, they often follow a conventional and exclusionary approach rooted in 19<sup>th</sup> century conservation philosophy failing to integrate a variety of social, cultural and political factors which can result in hostile attitudes towards PAs (Andrade & Rhodes 2012). Therefore, we argue that there is a need for improved approaches to conservation, also in locations more threatened by economic exploitation. This may include the creation of new PAs under multiple framing of coexisting conservation paradigms acknowledging them as socio-ecological systems (Mace 2014). Further, the use of the ES concept (also in conjunction with NCP framework) is an approach that can help to explore complex socio-ecological systems with strong human-nature linkages (Dean et al. 2021), such as outlined in the present study.

In many countries, the practical use of the ES concept is still in early development stages and the effectiveness of ES based policies relative to other interventions remains poorly understood (Bennet et al. 2015, Schirpke et al. 2017, Blicharska and Hilding-Rydevik 2018). This is also a case of Poland where such an approach has been practically absent in the national legislation (Mizgajski et al. 2014, Mączka et al. 2016) and cannot function at the operating level in executive regulations (Stępniewska et al. 2018b). Poland possesses vast databases of spatial data, which can be the basis for the nationwide ES assessment (Mizgajski & Stępniewska 2012, UNEP GRID 2015), the recognition of the concept among Polish scientists has been growing (Affek et al. 2020, Mizgajski et al. 2014), and there emerge first signs of ES adoption to the strategic and legal documents, but the actual implementation is still in its infancy (Stępniewska et al. 2018a). This, together with the fact that existing nature-related regulations are not harmonized with others in terms of ES maintenance, reflects current unsatisfactory levels of operational knowledge of experts and public awareness of the concept. As a result there is no wider interest in the ES approach at the regional or local levels (Stępniewska et al. 2018a, b).

The differences in perceptions found between respondents with different characteristics suggest that to improve attitudes towards PAs, one needs to consider the different characteristics of various groups in local communities (like demographics) and e.g. design tailor-made communication/information activities that take into account regional socio-economic and political contexts (Karanth & Nepal 2012, Oldekop et al. 2015) as well as their dynamic nature (MacKenzie et al. 2017). In case of the NPs it may suggest site-specific governance, better integration of local communities into decision-making by using the knowledge of local stakeholders, accounting for people's perceptions, and integrating the demand for ES (Schirpke et al. 2021). Interestingly, the studied Turnicki NP project has long included entirely state-owned land (Walendziak & Boćkowski 2018), which theoretically should eliminate conflicts with majority of local private owners and entrepreneurs mitigating the negative attitudes of the local public opinion towards the planned park. However, most of this area (both forest and non-forest) is managed by the State Forests, which derive significant profits from forest management (RDLP Krosno 2017) and are the main economic beneficiary of local forest resources. Additionally, providing employment and active participation in the life of local communities, including cooperation with local entrepreneurs, gives local forestry inspectorate a significant impact on the local public opinion (Boćkowski et al. 2020). Furthermore, there is a position of representatives of local administration throughout Poland, which generally support the State Forests in the scope of their right to define the principles of nature protection in forest areas, while expecting that they will bear the financial and resulting responsibility for the conservation

objectives (Referowska-Chodak 2020). Continued in-depth studies of the stakeholders' perceptions are then crucial since ultimately it is positive perceptions, and not scientific evidence, that ensure support of local municipalities and long-term positive outcome of conservation efforts (Bennet 2016). At the same time, more inter- and transdisciplinary approaches are needed to support a better understanding of complex relationships between stakeholders, including system thinking, identifying key feedback loops driving system dynamics, and targeting leverage points transforming a system towards desirable state (Schirpke et al. 2020)

In addition, we found a strong, positive correlation between the attitude towards the creation of the TuNP and the (positive) opinion on the current role of national parks in general. This implies that the strengthening of general views on PAs can contribute to improving local perceptions on PAs nearby. It is also in line with the observation that park-people relationships worldwide seem to be defined by residents' personal attitudes towards PAs (Allendorf 2022). At the same time it is visible that in every studied municipality general attitude towards national parks was significantly more positive than attitude to the planned Turnicki NP displaying a gap between these two. This might be partly a result of the locally manifested "Not-in-my-backyard" (NIMBY syndrome (Wexler 1996) which explains "Locally unwanted land uses" (LULUs, Freudenburg & Pastor 1992). To better understand these mechanisms, application of a multi-level PA conflict framework might be necessary (Rechciński et al. 2019). Moreover, it is worth noting that distrust as a source of opposition to NP may obscure economic assessments of benefits and disadvantages being commonly assumed as primary factors (Stern 2008). Hence we would like to note that the discrepancy revealed may have its distant origin, first in forced resettlement after the II World War, and then in the period of long-term isolation of the studied area for the purposes of the authorities during the communist regime in Poland (Affek 2015). Such extreme examples of a top-down approach to landscape management could have resulted in a reluctance to the authorities and centralized decisions that continues to this day, as in post-socialist European countries nature conservation is still often associated with the state domination and command-and-control management (Kluvankova-Oravska et al. 2009, Yakusheva 2019). Therefore, it is argued that the development of local community acceptance for a given protected area is strongly dependent on the participation of residents in the decision-making process (Andrade & Rhodes 2012).

## Conclusions

This study has shown that using ES lens can help exploring the factors important in establishment and management of PAs and can also suggest what to focus on in designing approaches to improve people's attitudes towards PAs. It is being argued that to make ES concept operational and put it into practice conservation managers need to gain a palette of knowledge related to: developing common understanding between stakeholders, knowing the role of formal and informal institution in shaping action on the ground, linking knowledge and action and, finally, methods and tools that can be applied (Carmen et al. 2018). It seems desirable that trustworthy knowledge development should be conducted through deliberative approach to ecosystem research and management with engagement of various stakeholders working on addressing complex conservation problems (Raymond et al. 2013, Olivier et al. 2021), which may be enhanced by employing wide range of social science methods (Moon et al. 2018; Grodzińska-Jurczak et al., 2022). The ES concept may be here used as "boundary object" using interpretative flexibility to bring opposing stakeholders to the table (Steger et al. 2018), especially in countries reforming and consolidating their PA system (Mączka et al. 2019).

We can see several implications of the results of the study to the case of Turnicki NP and management of national parks in current legal and socio-economic environment. First, creation of a national park can have both negative and positive impacts on local communities which are unequally distributed (Ward et al. 2018). The potential implications of conservation may affect various actors within, adjacent to and beyond park area, so there is a need of predictive social impact assessment when planning the protected area and further monitoring after its establishment (Kaplan-Hallam & Bennet 2017). The creation of a national park may be also considered in terms of reallocation of resource rights and benefits that create positive or negative changes in economy, health, education and culture as well as other secondary social impacts. Therefore such establishment should be preceded by a number of steps starting from identifying affected groups through assessing the impact of possible rights reallocation to identify and implement actions to address such impacts (Mascia & Claus 2008). A comprehensive framework taking national park as socio-ecological system and using ecosystem services approach can be applied to link the

biophysical world to the socio-economic context. Such approach should facilitate stakeholders' involvement and reducing trade-offs between ecosystem services important for local livelihood and those of wider public importance (He et al. 2018b).

While we agree NPs should remain a permanent element of the nature protection system, we argue that the role of NPs is not defined once and for all, because they have to adapt to the dynamically changing challenges of the modern world. Establishing and maintaining new NPs would require long-term political and financial commitment along with collaborative management which is critical for their continued success (Andrade & Rhodes 2012). Apart from providing and demonstrating tangible benefits for neighboring populations, greater focus is needed on building trustworthiness of park managers in order to secure conservation objectives (Stern 2008). In the context of environmental and socio-economic changes to (mountain) park areas, the ES approach may play an important supportive role in management of NPs (Schirpke et al. 2017) At the same time, the direct translation of the results socio-economic analyzes between parks may be difficult due to different baseline conditions and respective specific local issues (Job et al. 2021). Therefore, understanding the peculiarity of a certain NP and people living in it may be crucial for its conservation program (Andrade & Rhodes 2012).

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### Conflict of interests

The authors have no competing interests to declare that are relevant to the content of this article.

### Author contributions

All authors contributed to the study conception and design. Material preparation and data collection were performed by Mariusz Daniel Boćkowski, Joanna Tusznió, Marcin Rechciński and Małgorzata Grodzińska-Jurczak. Analysis was performed by Mariusz Daniel Boćkowski. The first draft of the manuscript was written by Mariusz Daniel Boćkowski and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

## References

1. Affek A (2011) Landscape continuity versus landscape transformation: a case study in the Wiar River catchment, Polish Carpathians (1780–2000). *Probl. Landsc. Ecol.* 30: 147–155
2. Affek A (2015) Spatially explicit changes in land ownership through 3 socio-political systems: A case study from southeast Poland. *Geogr. Pol.* 88, 3: 519–530. <http://dx.doi.org/10.7163/GPol.0032>
3. Affek A, Degórski M, Wolski J, Solon J, Kowalska A, Roo-Zielińska E, Grabińska B, Kruczkowska B (2020) Ecosystem Service Potentials and Their Indicators in Postglacial Landscapes. *Assessment and Mapping*. Elsevier. <https://doi.org/10.1016/C2017-0-04088-0>
4. Allendorf TD (2022) A global summary of local residents' perceptions of benefits and problems of protected areas. *Biodivers Conserv.* <https://doi.org/10.1007/s10531-022-02359-z>
5. Andam KS, Ferraro PJ, Pfaff A, Sanchez-Azofeifa GA, Robalino JA (2008) Measuring the effectiveness of protected area networks in reducing deforestation. *Proc Natl Acad Sci* 105:16089–16094. <https://doi.org/10.1073/PNAS.0800437105>
6. Andrade GSM, Rhodes JR (2012) Protected Areas and Local Communities: an Inevitable Partnership toward Successful Conservation Strategies? *Ecol Soc* 17 (4):14. <https://doi.org/10.5751/ES-05216-170414>
7. Bennett EM, Cramer W, Begossi A, Cundill G, Díaz S, Egoh BN, Geijzendorffer IR, Krug CB, Lavorel S, Lazos E, Lebel L, Martín-López B, Meyfroidt P, Mooney HA, Nel JL, Pascual U, Payet K, Harguindeguy NP, Peterson GD, Prieur-Richard AH, Reyers B, Roebeling P, Seppelt R, Solan M, Tschakert P, Tschamtk T, Turner BL, Verburg PH, Viglizzo EF, White PCL, Woodward G

- (2015) Linking biodiversity, ecosystem services, and human well-being: three challenges for designing research for sustainability. *Curr Opin Environ Sustain* 14:76–85. <https://doi.org/10.1016/J.COSUST.2015.03.007>
8. Bennett NJ (2016) Using perceptions as evidence to improve conservation and environmental management. *Conserv. Biol.* 30 (3):582–592. <https://doi.org/10.1111/cobi.12681>
  9. Bennett NJ, Dearden P (2014) Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Mar Policy* 44:107–116. <https://doi.org/10.1016/J.MARPOL.2013.08.017>
  10. Bennett NJ, Roth R, Klain SC, Chan K, Christie P, Clark DA, Cullman G, Curran D, Durbin TJ, Epstein G, Greenberg A, Nelson MP, Sandlos J, Stedman R, Teel TL, Thomas R, Verissimo D, Wyborn C (2017) Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biol Conserv* 205: 93-108. <https://doi.org/10.1016/j.biocon.2016.10.006>
  11. Blicharska M, Van Herzele A (2015) What a forest? Whose forest? Struggles over concepts and meanings in the debate about the conservation of the Białowieża Forest in Poland. *Forest Policy and Economics* 57: 22-30. <https://doi.org/10.1016/j.forpol.2015.04.003>
  12. Blicharska M, Hilding-Rydevik T (2018) “A Thousand flowers are flowering just now” – towards integration of ecosystem services concept into decision making. *Ecosyst Serv* 30: 181-191. <https://doi.org/10.1016/J.ECOSER.2018.03.001>
  13. Boćkowski MD (2018a) Historia gospodarowania na ziemiach projektowanego Turnickiego Parku Narodowego. Rys historyczny. In: Boćkowski MD (ed) *Projektowany Turnicki Park Narodowy. Stan walorów przyrodniczych – 35 lat od pierwszego projektu parku narodowego na Pogórzu Karpackim*. Fundacja Dziedzictwo Przyrodnicze, Nowosiółki Dydyńskie, pp 31–50
  14. Boćkowski MD (2018b) Historia starań o utworzenie Turnickiego Parku Narodowego. In: Boćkowski MD (ed) *Projektowany Turnicki Park Narodowy. Stan walorów przyrodniczych – 35 lat od pierwszego projektu parku narodowego na Pogórzu Karpackim*. Fundacja Dziedzictwo Przyrodnicze, Nowosiółki Dydyńskie, pp 51–63
  15. Boćkowski MD, Tusznio J, Rechciński M, Grodzińska-Jurczak M, Klekotko M, Valasiuk S, Gołębiowska B, Szkop Z (2020) Analiza społecznych i ekonomicznych uwarunkowań cennych przyrodniczo obszarów Pogórza Przemyskiego i Gór Słonnych. Fundacja Dziedzictwo Przyrodnicze, Kraków
  16. Boćkowski MD (2020) Wstęp. In: Boćkowski MD (ed) *Analiza społecznych i ekonomicznych uwarunkowań cennych przyrodniczo obszarów Pogórza Przemyskiego i Gór Słonnych*. Fundacja Dziedzictwo Przyrodnicze, Kraków, pp 15-20
  17. Boerema A, Rebelo AJ, Bodi MB, Esler KJ, Meire P (2017) Are ecosystem services adequately quantified? *J. Appl. Ecol.* 54 (2), 358–370. <https://doi.org/10.1111/1365-2664.12696>
  18. Brown G, Fagerholm N (2015) Empirical PPGIS/PGIS mapping of ecosystem services: A review and evaluation. *Ecosyst Serv* 13:119–133. <https://doi.org/10.1016/J.ECOSER.2014.10.007>
  19. Carmen E, Watt A, Carvalho L, Dick J, Fazey I, Garcia-Blanco G, Grizzetti B, Hauck J, Izakovicova Z, Kopperoinen L, Liquele C, Odee D, Steingröver E, Young J (2018) Knowledge needs for the operationalisation of the concept of ecosystem services. *Ecosyst Serv* 29:441–451. <https://doi.org/10.1016/J.ECOSER.2017.10.012>
  20. Dean G, Rivera-Ferre MG, Rosas-Casals M, Lopez-i-Gelats F (2021) Nature’s contribution to people as a framework for examining socioecological systems: The case of pastoral systems. *Ecosyst Serv* 49:101265. <https://doi.org/10.1016/J.ECOSER.2021.101265>
  21. Díaz S, Pascual U, Stenseke M, Martín-López B, Watson RT, Molnár Z, Hill R, Chan KMA, Baste IA, Brauman KA, Polasky S, Church A, Lonsdale M, Larigauderie A, Leadley PW, van Oudenhoven APE, van der Plaats F, Schröter M, Lavorel S, Aumeeruddy-Thomas Y, Bukvareva E, Davies K, Demissew S, Erpul G, Failler P, Guerra CA, Hewitt CL, Keune H, Lindley S, Shirayama Y (2018) Assessing nature’s contributions to people. *Science* 359(6373): 270–272. <https://doi.org/10.1126/science.aap8826>
  22. EC (2020) EU Biodiversity Strategy for 2030. Bringing nature back into our lives. European Commission. [https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030\\_en](https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en). Accessed 08 February 2022

23. EC/EEA (2022) The Biodiversity information system for Europe. Countries. Poland. <https://biodiversity.europa.eu/countries/poland>. Accessed 10 February 2022
24. EEA (2020) Building a coherent Trans-European Nature Network. European Environmental Agency. <https://www.eea.europa.eu/themes/biodiversity/green-infrastructure/building-a-coherent-trans-european>. Accessed 10 February 2022
25. EEA (2021) EEA Signals 2021. Europe's nature. European Environmental Agency <https://www.eea.europa.eu/publications/eea-signals-2021-europes-nature>. Accessed 08 February 2022
26. Folke C, Polasky S, Rockström J, Galaz V, Westley F, Lamont M, Scheffer M, Österblom H, Carpenter SR, Chapin III FS, Seto KC, Weber EU, Crona BI, Daily GC, Dasgupta P, Gaffney O, Gordon LJ, Hoff H, Levin SA, Lubchenco J, Steffen W, Walker BH (2021) Our future in the Anthropocene biosphere. *Ambio* 50: 834–869 <https://doi.org/10.1007/s13280-021-01544-8>
27. Freudenburg WR, Pastor SK (1992) NIMBYs and LULUs: Stalking the syndromes. *Journal of Social Issues* 48(4): 39-61
28. Geldmann J, Barnes M, Coad L, Craigie ID, Hockings M, Burgess ND (2013) Effectiveness of terrestrial protected areas in reducing habitat loss and population declines. *Biol Conserv* 161:230-238. <https://doi.org/10.1016/j.biocon.2013.02.018>.
29. Gray CL, Hill SL, Newbold T, Hudson LN, Börger L, Contu S, Hoskins AJ, Ferrier S, Purvis A, Scharlemann JP (2016). Local biodiversity is higher inside than outside terrestrial protected areas worldwide. *Nat Commun*, 7:12306. <https://doi.org/10.1038/ncomms12306>
30. Grodzinska-Jurczak M, Cent J (2011) Expansion of nature conservation areas: problems with Natura 2000 implementation in Poland? *Environ Manag* 47: 11–27. <https://dx.doi.org/10.1007/s00267-010-9583-2>
31. Grodzińska-Jurczak, M., Krawczyk A, Akhshik A, Dedyk D, Strzelecka M (2022) Contradictory or complementary? Stakeholders' perceptions of a circular economy for single-use plastics. *Waste Manage* 142: 1–8. doi: 10.1016/J.WASMAN.2022.01.036.
32. Haines-Young R, Potschin MB (2018) Common International Classification of Ecosystem Services (CICES) V5.1. Guidance on the Application of the Revised Structure. Fabis Consulting Ltd., Nottingham
33. Harrison PA, Berry PM, Simpson G, Haslett JR, Blicharska M, Bucur M, Dunford R, Egoh B, Garcia-Llorente M, Geamăna N, Geertsema W, Lommelen E, Meiresonne L, Turkelboom F (2014) Linkages between biodiversity attributes and ecosystem services: A systematic review. *Ecosystem Services* 9:Pages 191-203. <https://doi.org/10.1016/j.ecoser.2014.05.006>
34. He S, Gallagher L, Su Y, Wang L, Cheng H (2018a) Identification and assessment of ecosystem services for protected area planning: A case in rural communities of Wuyishan national park pilot. *Ecosyst Serv* 31:169–180. <https://doi.org/10.1016/J.ECOSER.2018.04.001>
35. He S, Su Y, Wang L, Gallagher L, Cheng H (2018b) Taking an ecosystem services approach for a new national park system in China. *Resour Conserv Recycl* 137:136–144. <https://doi.org/10.1016/j.resconrec.2018.04.030>
36. Hiedenpää J (2002) European-wide conservation versus local wellbeing: the reception of the Natura 2000 Reserve Network in Kavia, SW-Finland. *Landscape and Urban Planning* 61:113–123. <https://doi.org/10.1016/S0169-2046%2802%2900106-8>
37. IPBES (2019) Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES secretariat, Bonn, Germany. [https://ipbes.net/sites/default/files/inline/files/ipbes\\_global\\_assessment\\_report\\_summary\\_for\\_policymakers.pdf](https://ipbes.net/sites/default/files/inline/files/ipbes_global_assessment_report_summary_for_policymakers.pdf). Accessed 10 February 2022
38. IUCN (2022) World Database on Protected Areas. <https://www.iucn.org/theme/protected-areas/our-work/world-database-protected-areas>. Accessed 10 February 2022
39. Job H, Bittlingmaier S, Mayer M, von Ruschkowski E, Woltering M (2021) Park–people relationships: The socioeconomic monitoring of national parks in Bavaria, Germany. *Sustain* 13: 8984. <https://doi.org/10.3390/su13168984>
40. Jones KR, Venter O, Fuller RA, Allan JR, Maxwell SL, Negret PJ, Watson JEM (2018) One-third of global protected land is under intense human pressure. *Science* (80- ) 360:788–791. <https://doi.org/10.1126/science.aap9565>
41. Joppa LN, Pfaff A (2009) High and far: Biases in the location of protected areas. *PLoS One* 4: <https://doi.org/10.1371/journal.pone.0008273>

42. Joppa LN, Pfaff A (2010) Global protected area impacts. <https://doi.org/10.1098/rspb.2010.1713>
43. Kamal S, Kocór M., Grodzińska-Jurczak M (2015) Conservation opportunity in biodiversity conservation on regulated private lands: Factors influencing landowners' attitude. *Environ Sci Policy* 54: 287–296. [https://doi: 10.1016/J.ENVSCI.2015.07.023](https://doi.org/10.1016/J.ENVSCI.2015.07.023).
44. Kadykalo AN, Lopez-Rodriguez MD, Ainscough J, Droste N, Ryu H, Avila-Flores G, Le Clec' S, Munoz MC, Nilsson L, Rana S, Sarkar P, Sevecke KJ, Harnačková ZV (2019) Disentangling 'ecosystem services' and 'nature's contributions to people'. *Ecosystems and People* 15(1): 269–287. <https://doi.org/10.1080/26395916.2019.1669713>
45. Kaplan-Hallam M, Bennett NJ (2018) Adaptive social impact management for conservation and environmental management. *Conserv Biol* 32:304–314. <https://doi.org/10.1111/cobi.12985>
46. Karanth KK, Nepal SK (2012) Local residents perception of benefits and losses from protected areas in India and Nepal. *Environ Manage* 49:372–386. <https://doi.org/10.1007/s00267-011-9778-1>
47. Kati V, Hovardas T, Dieterich M, Ibisch P L, Mihok B, Selva N (2014) The challenge of implementing the European network of protected areas Natura 2000. *Conserv Biol* 29 (1): 260–270. <https://doi.org/10.1111/cobi.12366>
48. Klekotko M (2020) Analiza kontekstu społeczno-kulturowego. In: Boćkowski MD (ed) Analiza społecznych i ekonomicznych uwarunkowań cennych przyrodniczo obszarów Pogórza Przemyskiego i Gór Słonnych. Fundacja Dziedzictwo Przyrodnicze, Kraków, pp 29-56
49. Kluvánková-Oravská T, Chobotová V, Banaszak I, Slavikova L, Trifunovova S (2009) From government to governance for biodiversity: the perspective of Central and Eastern European transition countries. *Environ Policy Gov* 19: 186–196. <https://doi-10.1002/eet.508>
50. Krott M, Julien B, Lammertz M, Barbier JM, Jen S, Ballesteroz M, de Bovis C (2000) Voicing interests and concerns: Natura 2000: an ecological network in conflict with people. *For Policy Econ* 1:357–366. [https://doi.org/10.1016/S1389-9341\(00\)00031-9](https://doi.org/10.1016/S1389-9341(00)00031-9)
51. Mace GM 2014. Whose conservation? *Science* 345(6204): 1558–1560. <https://doi.org/10.1126/science.1254704>
52. MacKenzie CA, Salerno J, Hartter J, Chapman CA, Reyna R, Tumusiime DM, Drake M (2017) Changing perceptions of protected area benefits and problems around Kibale National Park, Uganda. *J Environ Manage* 200:217–228. <https://doi.org/10.1016/J.JENVMAN.2017.05.078>
53. Martín-López B, Iniesta-Arandia I, García-Llorente M, et al (2012) Uncovering ecosystem service bundles through social preferences. *PLoS One* 7:e38970. <https://doi.org/10.1371/journal.pone.0038970>
54. Mascia MB, Claus CA (2009) A Property Rights Approach to Understanding Human Displacement from Protected Areas: The Case of Marine Protected Areas. *Conserv Biol* 23:16–23
55. Mączka K, Matczak P, Pietrzyk-Kaszyńska A, Rechciński M, Olszańska A, Cent J, Grodzińska-Jurczak M (2016) Application of the ecosystem services concept in environmental policy—A systematic empirical analysis of national level policy documents in Poland. *Ecol Econ* 128:169–176. <https://doi.org/10.1016/J.ECOLECON.2016.04.023>
56. Mączka K, Chmielewski P, Jeran A, Matczak P, van Riper CJ (2019) The ecosystem services concept as a tool for public participation in management of Poland's Natura 2000 network. *Ecosyst Serv* 35:173–183. <https://doi.org/10.1016/J.ECOSER.2018.12.005>
57. MEA (2005). Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC
58. Mensah S, Veldtman R, Assogbadjo AE, Ham C, Glèlè Kakaï R, Seifert T (2017) Ecosystem service importance and use vary with socio-environmental factors: A study from household-surveys in local communities of South Africa. *Ecosyst Serv* 23:1–8. <https://doi.org/10.1016/J.ECOSER.2016.10.018>
59. Mika M, Zawilińska B, Kubal-Czerwińska M (2019) Exploring the determinants of local people's attitude toward national parks in Poland. *Folia Geographica* 61 (1): 5–16. <https://doi.org/10.4467/20833113PG.20.002.12260>
60. Mizgajski A, Stępniewska M (2012) Ecosystem services assessment for Poland – challenges and possible solutions. *Econ Environ* 2:54–73

61. Mizgajski A, Bernaciak A, Kronenberg J, Roo-Zielinska E, Solon J, Sleszynski J (2014) Development of the ecosystem services approach in Poland. *Ekon i Środowisko* 4 (51): 10-19
62. Moon K, Blackman DA, Adams VM, Colvin RM, Davila F, Evans MC, Januchowski-Hartley SR, Bennett NJ, Dickinson H, Sandbrook C, Sherren K, St. John FAV, van Kerkhoff L, Wyborn C (2019) Expanding the role of social science in conservation through an engagement with philosophy, methodology, and methods. *Methods Ecol Evol* 10:294–302. <https://doi.org/10.1111/2041-210X.13126>
63. Niedziałkowski K, Paavola J, Jędrzejewska B (2012) Participation and protected areas governance: the impact of changing influence of local authorities on the conservation of the Białowieża Primeval Forest, Poland. *Ecology and Society* 17(1): 2. <http://dx.doi.org/10.5751/ES-04461-170102>
64. Niedziałkowski K, Blicharska M, Mikusiński G, Jędrzejewska B (2014) Why is it difficult to enlarge a protected area? Ecosystem services perspective on the conflict around the extension of the Białowieża National Park in Poland. *Land Use Policy* 38(0): 314–329. <https://doi.org/10.1016/j.landusepol.2013.12.002>
65. Niedziałkowski K (2016) Why do foresters oppose the enlargement of the Białowieża National Park? The motivation of the employees of the State Forest Holding as perceived by social actors engaged in the conflict over the Białowieża Forest. *Forest Research Papers* 77(4): 358-370. <https://doi.org/10.1515/frp-2016-0037>
66. Oldekop JA, Holmes G, Harris WE, Evans KL (2015) A global assessment of the social and conservation outcomes of protected areas. *Conservation Biology* 30: 133-141. <https://doi.org/10.1111/cobi.12568>
67. Oliver T, Benini L, Borja A, Dupont C, Doherty B, Grodzińska-Jurczak M, Iglesias A, Jordan A, Kass K, Lung T, Maguire C, McGonigle D, Mickwitz P, Spangenberg JH, Tarrason L (2021) Knowledge architecture for the wise governance of sustainability transitions, *Environ Sci Policy* 126: 152-163. <https://doi.org/10.1016/j.envsci.2021.09.025>
68. Paavola J (2004) Protected Areas Governance and Justice: Theory and the European Union's Habitats Directive, *Environmental Sciences* 1 (1): 59-77, <https://doi.org/10.1076/evms.1.1.59.23763>
69. Palomo I, Montes C, Martín-López B, González JA, García-Llorente M, Alcorlo P, Rosario García-Mora M (2014) Incorporating the Social-Ecological Approach in Protected Areas in the Anthropocene. *BioScience* 64: 181–191. <https://doi.org/10.1093/biosci/bit033>
70. Pascual U, Balvanera P, Díaz S, Pataki G, Roth E, Stenseke M, Watson RT, Bařak Dessane E, Islar M, Kelemen E, Maris V, Quaas M, Subramanian SM, Wittmer H, Adlan A, Ahn S, Al-Hafedh YS, Amankwah E, Asah ST, Berry P, Bilgin A, Breslow SJ, Bullock C, Cáceres D, Daly-Hassen H, Figueroa E, Golden CD, Gómez-Baggethun E, González-Jiménez D, Houdet J, Keune H, Kumar R, Ma K, May PH, Mead A, O'Farrell P, Pandit R, Pengue W, Pichis-Madruga R, Popa F, Preston S, Pacheco-Balanza D, Saarikoski H, Strassburg BB, van den Belt M, Verma M, Wickson F, Yagi N (2017) Valuing nature's contributions to people: the IPBES approach. *Current Opinion in Environmental Sustainability* 26–27: 7-16. <https://doi.org/10.1016/j.cosust.2016.12.006>
71. Pietrzyk-Kaszyńska A, Rechciński M, Olszańska A, Mączka K, Matczak P, Niedziałkowski K, Tusznió J, Peek B, Grodzińska-Jurczak M (2016) Usługi ekosystemów na obszarach cennych przyrodniczo z perspektywy różnych grup interesariuszy. Instytut Ochrony Przyrody PAN, Kraków
72. Raymond CM, Singh GG, Benessaiah K, Bernhardt JR, Levine J, Nelson H, Turner NJ, Norton B, Tam J, Chan KMA (2013) Ecosystem Services and Beyond: Using Multiple Metaphors to Understand Human–Environment Relationships. *BioScience* 63: 536-546. <https://doi.org/10.1525/bio.2013.63.7.7>
73. Rechciński M, Tusznió J, Grodzińska-Jurczak M (2019) Protected area conflicts: a state-of-the-art review and a proposed integrated conceptual framework for reclaiming the role of geography. *Biodiv and Conserv* 28(10): 2463-2498. <https://link.springer.com/article/10.1007/s10531-019-01790-z>
74. Referowska-Chodak E (2020) The Organization of Nature Conservation in State-Owned Forests in Poland and Expectations of Polish Stakeholders. *Forests* 11(8):796. <https://doi.org/10.3390/f11080796>
75. RDLP Krosno (2017) Plan Urządzenia lasu. Opis ogólny lasów Nadleśnictwa Bircza. Regionalna Dyrekcja lasów Państwowych w Krosnie, Przemyśl

76. Rossi SD, Byrne JA, Pickering CM, Reser J (2015) 'Seeing red' in national parks: How visitors' values affect perceptions and park experiences. *Geoforum* 66:41–52. <https://doi.org/10.1016/J.GEOFORUM.2015.09.009>
77. Sandbrook C, Fisher JA, Holmes G, Luque-Lora R, Keane A (2019) The global conservation movement is diverse but not divided. *Nat Sustain* 2:316–323. <https://doi.org/10.1038/s41893-019-0267-5><https://doi.org/10.1038/s41893-019-0267-5>
78. Schenk A, Hunziker M, Kienast F (2007) Factors influencing the acceptance of nature conservation measures—A qualitative study in Switzerland. *J Environ Manage* 83:66–79. <https://doi.org/10.1016/J.JENVMAN.2006.01.010>
79. Schirpke U, Marino D, Marucci A, Palmieri M, Scolozzi R (2017) Operationalising ecosystem services for effective management of protected areas: Experiences and challenges. *Ecosyst Serv* 28:105–114. <https://doi.org/10.1016/J.ECOSER.2017.10.009>
80. Schirpke U, Scolozzi R, Dean G, Haller A, Jäger H, Kister J, Kovács B, Sarmiento FO, Sattler B, Schleyer C (2020) Cultural ecosystem services in mountain regions: Conceptualising conflicts among users and limitations of use. *Ecosyst Serv* 46:101210. <https://doi.org/10.1016/J.ECOSER.2020.101210>
81. Schirpke U, Wang G, Padoa-Schioppa E (2021) Editorial: Mountain landscapes: Protected areas, ecosystem services, and future challenges. *Ecosyst Serv* 49:101302. <https://doi.org/10.1016/J.ECOSER.2021.101302>
82. Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, Biggs R, Carpenter SR, deVries W, de Wit CA, Folke C, Gerten D, Heinke J., Mace GM, Persson LM, Ramanathan V, Reyers B, Sörlin S (2015) Planetary boundaries: Guiding human development on a changing planet. *Science* 347(6223): 736. <https://doi.org/10.1126/science.1259855>
83. Steger C, Hirsch S, Evers C, Branoff B, Petrova M, Nielsen-Pincus M, Wardropper C, van Riper CJ (2018) Ecosystem Services as Boundary Objects for Transdisciplinary Collaboration. *Ecol Econ* 143:153–160. <https://doi.org/10.1016/j.ecolecon.2017.07.016>
84. Stern MJ (2008) The power of trust: Toward a theory of local opposition to neighboring protected areas. *Soc Nat Resour* 21:859–875. <https://doi.org/10.1080/08941920801973763>
85. Stępniewska M, Zwierzchowska I, Mizgajski A (2018a) Capability of the Polish legal system to introduce the ecosystem services approach into environmental management. *Ecosyst Serv* 29:271–281. <https://doi.org/10.1016/J.ECOSER.2017.02.025>
86. Stępniewska M, Lupa P, Mizgajski A (2018b) Drivers of the ecosystem services approach in Poland and perception by practitioners. *Ecosyst Serv* 33:59–67. <https://doi.org/10.1016/J.ECOSER.2018.08.010>
87. Tusznió T, Pietrzyk-Kaszyńska A, Rechciński M, Olszańska A, Grodzińska-Jurczak M (2020) Application of the ecosystem services concept at the local level – Challenges, opportunities, and limitations. *Ecosystem Services* 42: 101077. <https://doi.org/10.1016/j.ecoser.2020.101077>
88. UN (2015) Transforming our world: the 2030 Agenda for Sustainable Development. United Nations. <https://sdgs.un.org/2030agenda>. Accessed 10 February 2022
89. UNEP-GRID (2015) Mapowanie i ocena ekosystemów i ich usług w Polsce. UNEP-GRID Warsaw Environmental Information Center, commissioned by the Ministry of the Environment, Warszawa
90. UN WCMC 2021. Protected Planet report 2020. Updated May 2021. United Nations Environment Programme. <https://livereport.protectedplanet.net/>. Accessed 10 February 2022
91. van Riper CJ, Kyle GT, Sutton SG, Barnes M, Sherrouse BC (2012). Mapping outdoor recreationists' perceived social values for ecosystem services at Hinchinbrook Island National Park, Australia. *Applied Geography* 35(1-2): 164-173. [doi:10.1016/j.apgeog.2012.06.008](https://doi.org/10.1016/j.apgeog.2012.06.008)
92. Vodouhê FG, Coulibaly O, Adégbidi A, Sinsin B (2010) Community perception of biodiversity conservation within protected areas in Benin. *For Policy Econ* 12:505–512. <https://doi.org/10.1016/J.FORPOL.2010.06.008>
93. Walendziak J, Boćkowski MD (2018) Ogólna charakterystyka projektowanego Turnickiego Parku Narodowego. In: Boćkowski M.D. (ed) *Projektowany Turnicki Park Narodowy. Stan walorów przyrodniczych – 35 lat od pierwszego projektu parku narodowego na Pogórzu Karpackim*. Fundacja Dziedzictwo Przyrodnicze, Nowosiółki Dydyńskie, pp 23–29

94. Ward C, Stringer LC, Holmes G (2018) Protected area co-management and perceived livelihood impacts. *J Environ Manage* 228:1-12. <https://doi.org/10.1016/j.jenvman.2018.09.018>.
95. Wexler MN (1996) A sociological framing of the NIMBY (not-in-my-backyard) syndrome. *International Review of Modern Sociology* 26(1): 91–110. <http://www.jstor.org/stable/41421101>
96. Yakusheva N (2019) Managing protected areas in Central Eastern Europe: Between path-dependence and Europeanisation. *Land Use Policy* 87:104036. <https://doi.org/10.1016/j.landusepol.2019.104036>

## Figures

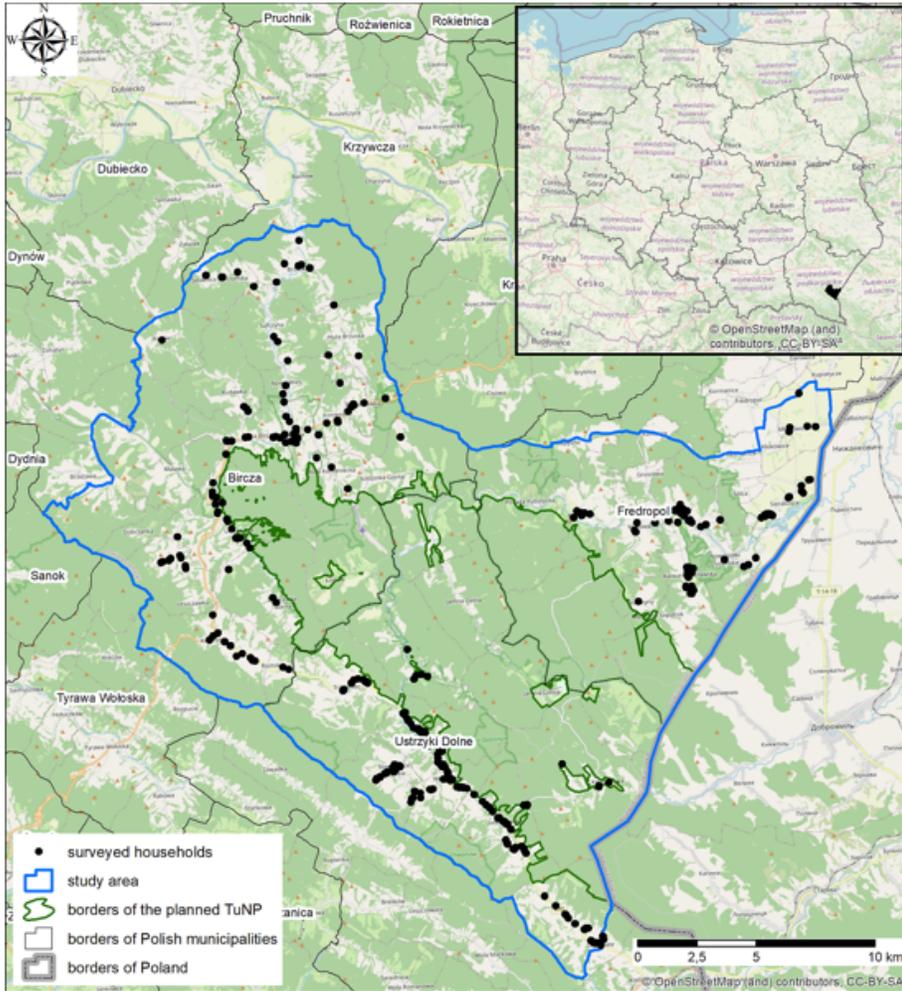
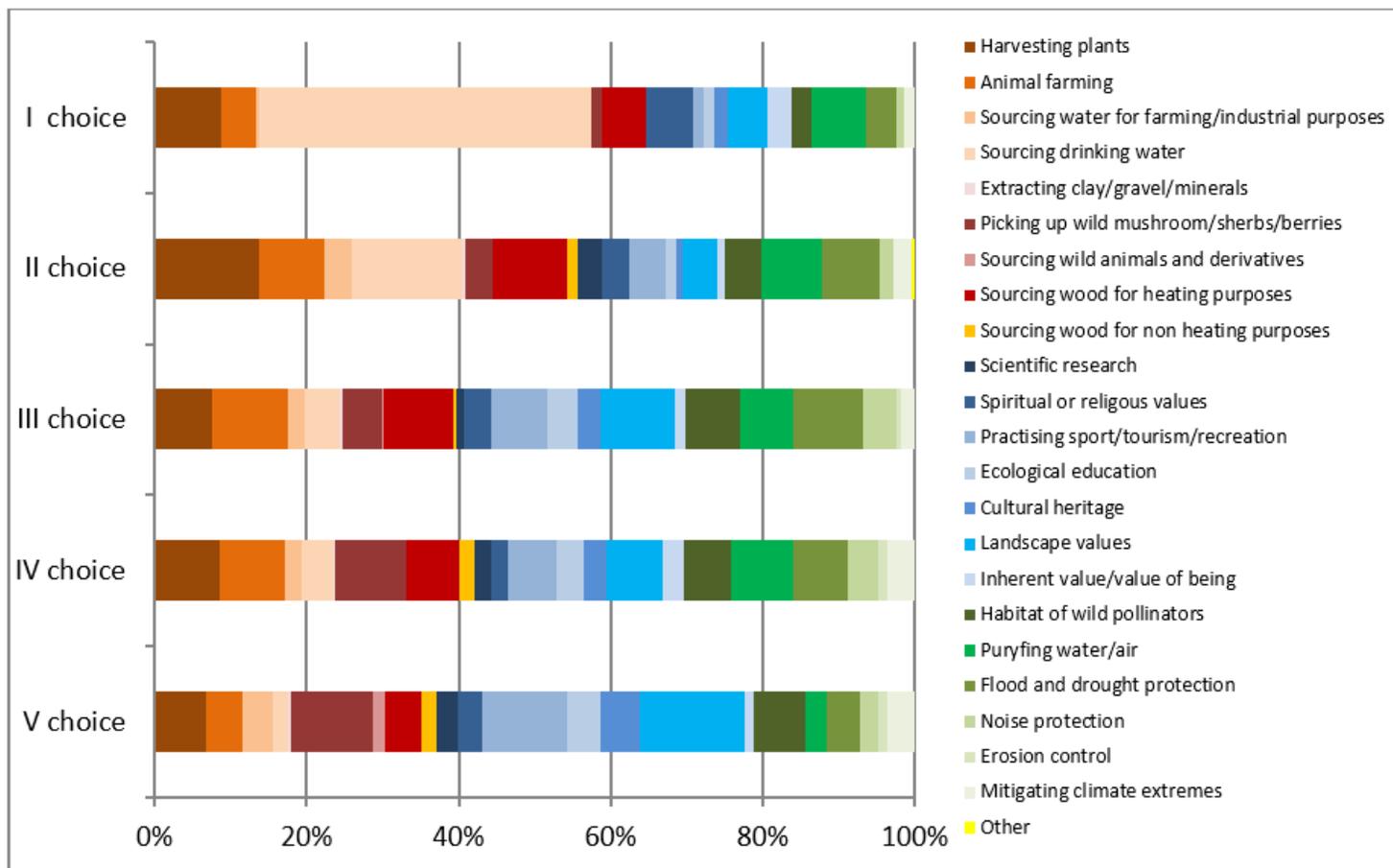


Figure 1

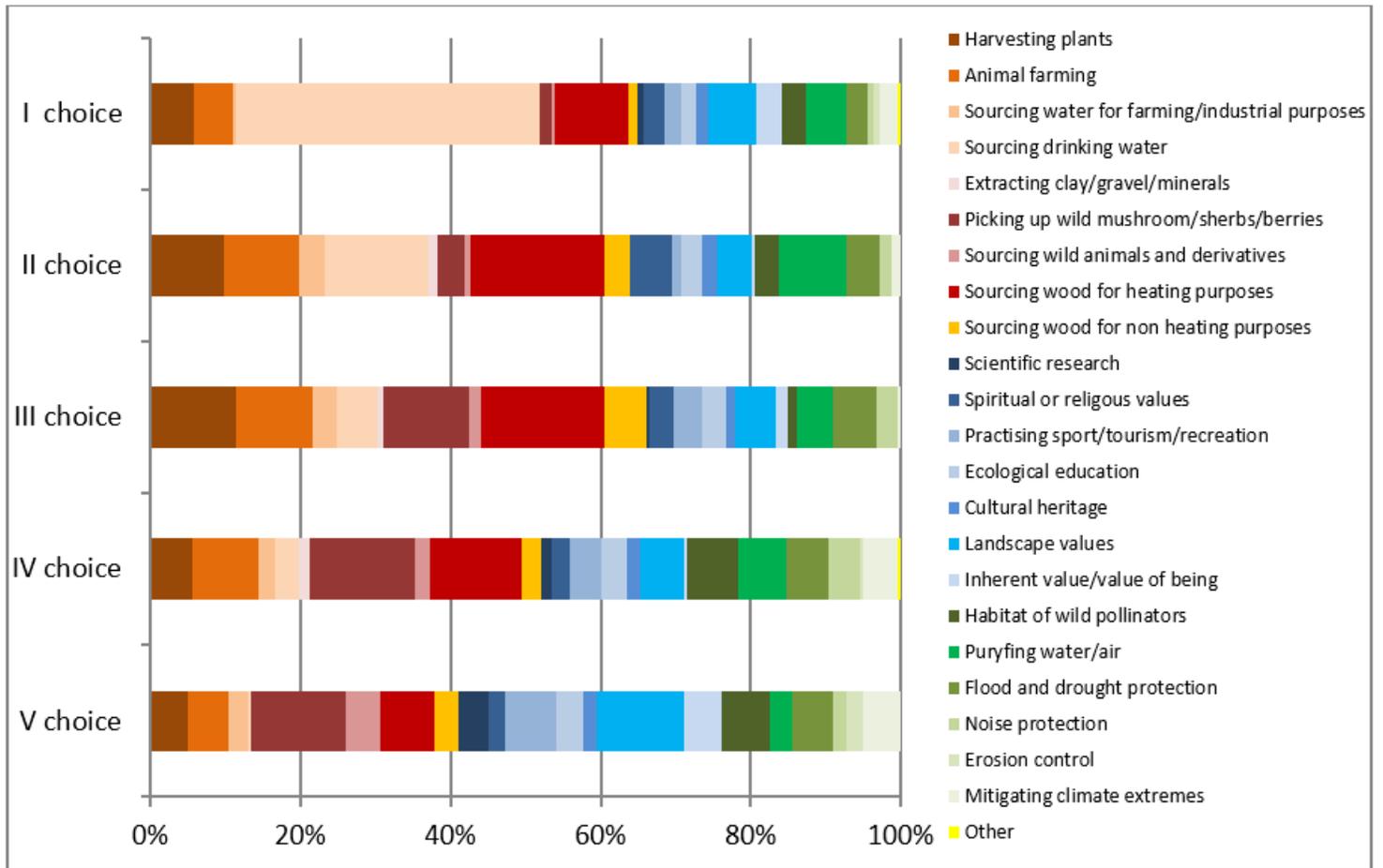
Map of the study area



**Figure 2**

Choice of benefits in respondents who scored > 3.0 („positive”) out of 1-5 in „approval of national parks”

Notes: shades of red / orange indicate benefits classified as provisional ecosystem services, shades of blue - cultural services, and shades of green - regulatory services; data label percentages have been rounded to the nearest whole number; number of respondents: 1st choice N = 277, 2nd choice N = 277, 3rd choice N = 275, 4th choice N = 269, 5th choice N = 251.



**Figure 3**

Choice of benefits in respondents who scored  $\leq 3.0$  („negative”) out of 1-5 in „approval of national parks”

Notes: shades of red / orange indicate benefits classified as provisional ecosystem services, shades of blue - cultural services, and shades of green - regulatory services; data label percentages have been rounded to the nearest whole number; number of respondents: 1st choice N = 245, 2nd choice N = 246, 3rd choice N = 245, 4th choice N = 236, 5th choice N = 222.

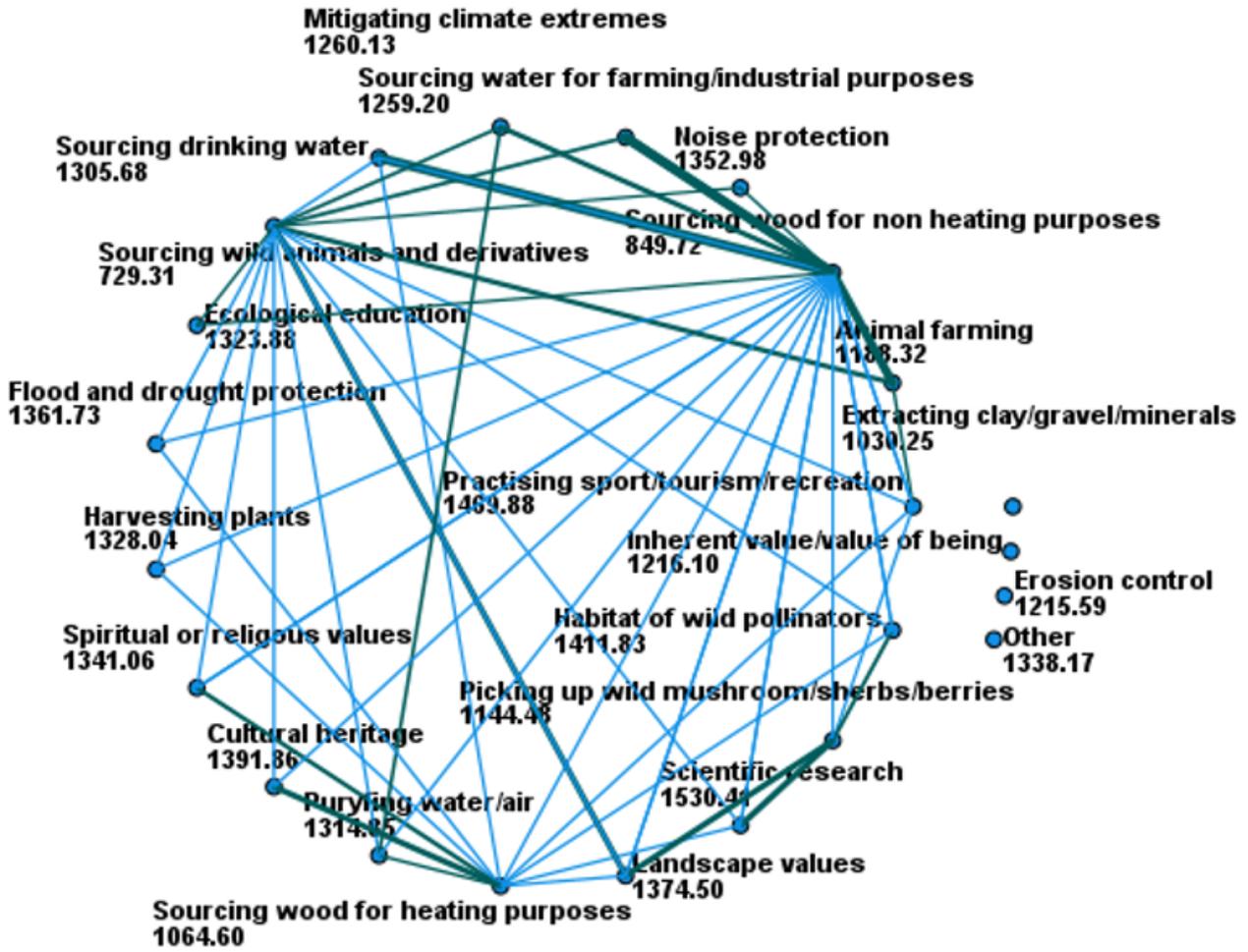


Figure 4

Post hoc pairwise comparisons between choices of benefits against the score of approval of national parks

Notes: Each node shows the sample average rank of a given choice of benefit.

Blue lines mark statistically significant ( $p < .05$ ) differences between items

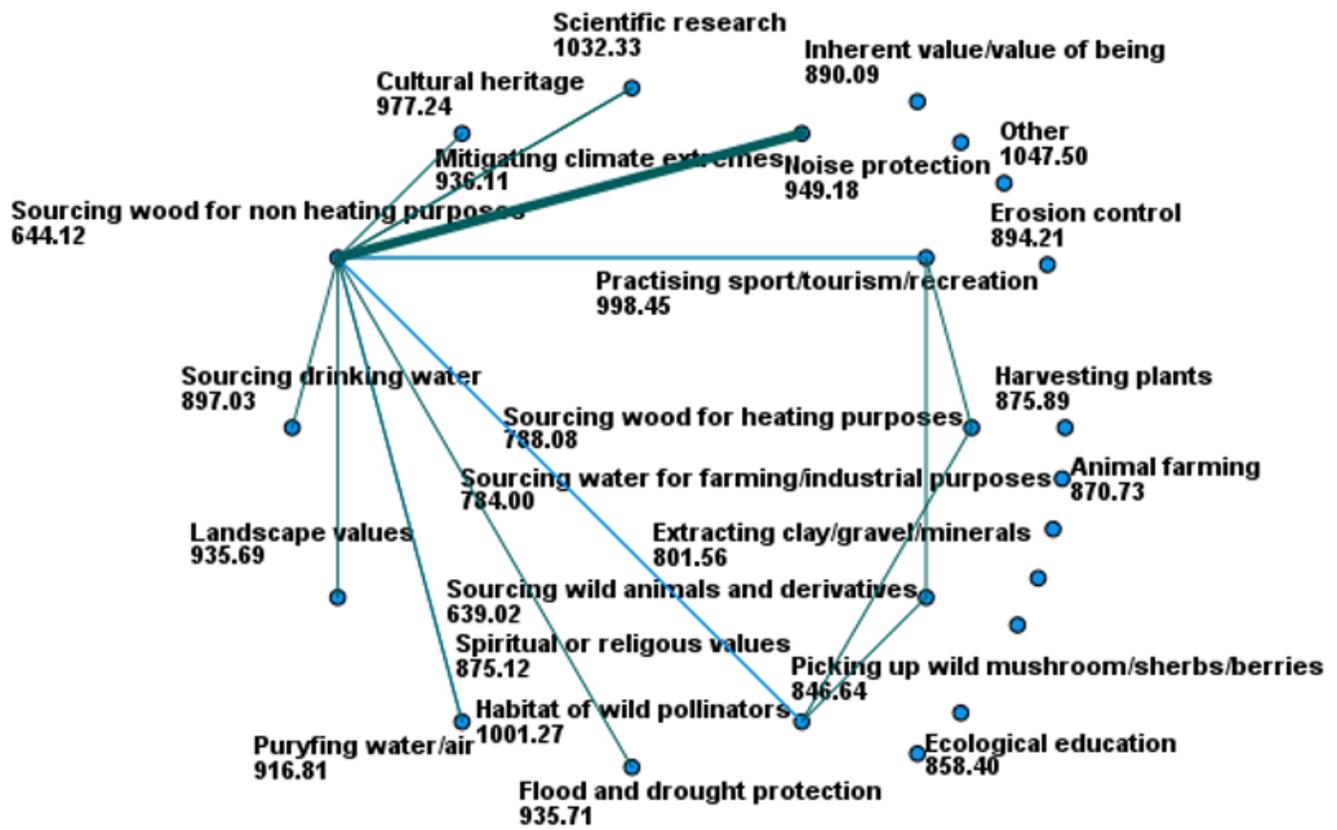
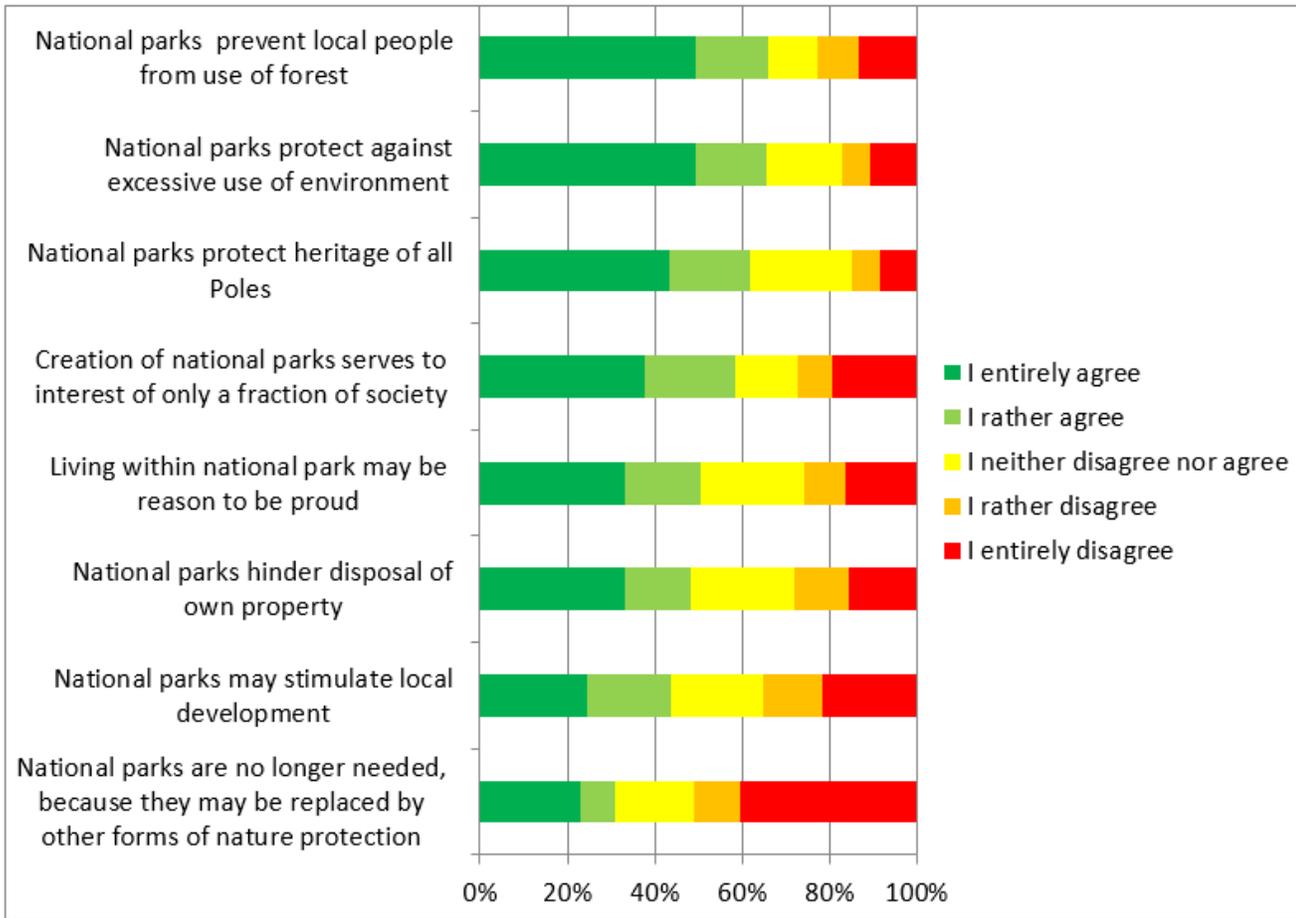


Figure 5

Post hoc pairwise comparisons between choices of benefits against the score of attitude towards Turnicki National Park

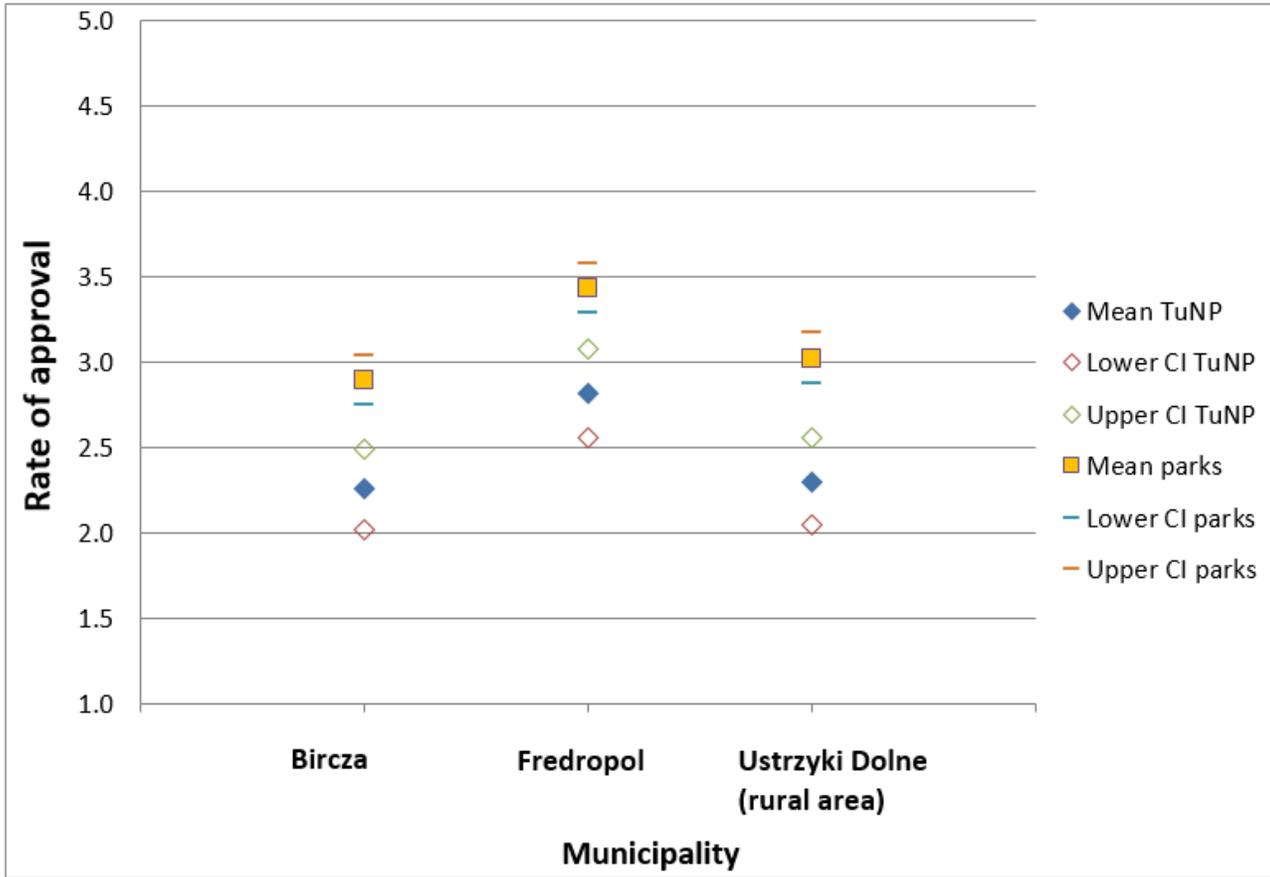
Notes: Each node shows the sample average rank of a given choice of benefit.

Blue lines mark statistically significant ( $p < .05$ ) differences between items.



**Figure 6**

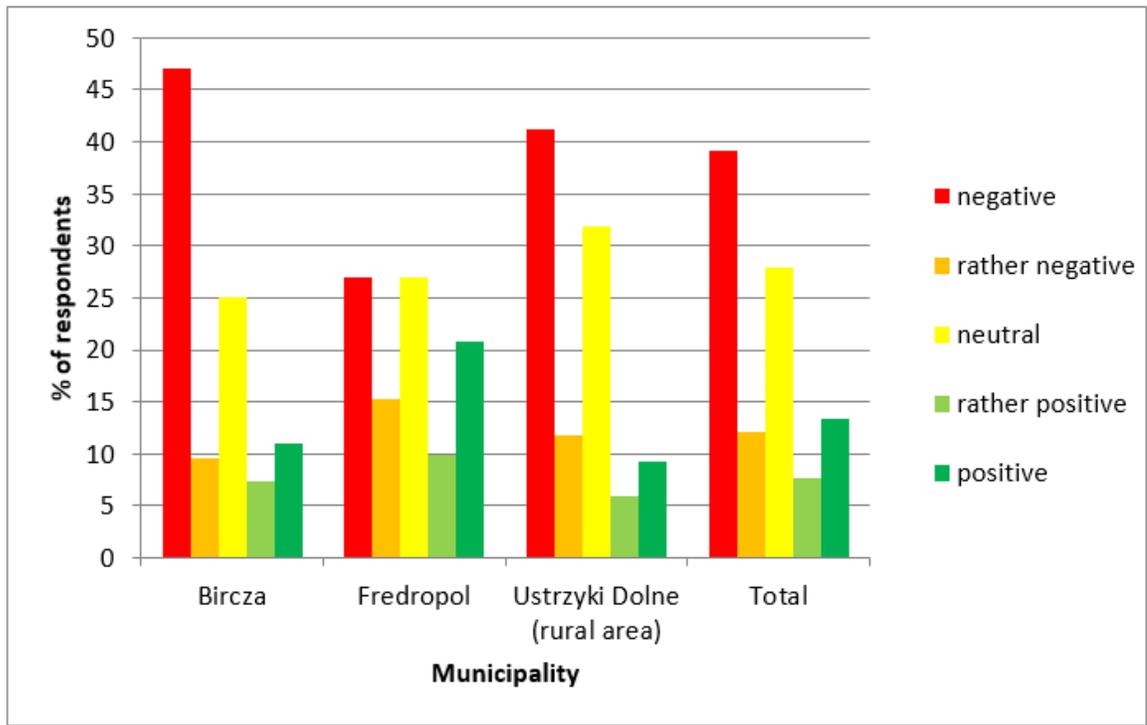
Opinions on statements concerning the relationship between humans and national parks in the entire area of the study



**Figure 7**

The degree of general support for national parks and planned TuNP in the three surveyed municipalities

Notes: Measured on scale 1-5 where 1 is strongly negative, 3 is neutral and 5 is strongly positive. The overall mean for all municipalities: national parks = 3,12, Turnicki NP = 2,44.



**Figure 8**

Approval for the Turnicki National Park in division on municipalities and particular choices

## Supplementary Files

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