

Value of Ecosystem Services in Mountain National Parks. Case Study of Veľká Fatra National Park (Slovakia)

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Abstract

Ecosystem services of national parks are usually not traded on markets, and thus are not attributed a market price, which may indicate a scarcity of resources. In order to ascertain the value of ecosystem services with respect to the establishment and management of protected areas (PA), a range of economic methods for valuing these non-market benefits have been developed. The current paper presents a case study of Veľká Fatra National Park in Slovakia, valuing selected ecosystem services of the park, and compares the valuation results to two other national parks in the broader region: Slovenský raj (Slovakia) and Tatra (Poland). In total, Veľká Fatra annually provides ecosystem services worth EUR 179 million (about EUR 4,400 per hectare). The national park secures manifold ecosystem services such as recreational benefits (use values) for roughly 500,000 visitors per year, and a range of non-use values (e.g., existence and bequest values) for the Slovakian population. In comparison, ecosystem services at Veľká Fatra are fewer than the benefits of the other national parks due to the smaller recreational benefits. However, the results of the study ascertain that Veľká Fatra provides important ecosystem services for the Slovakian economy as a whole. With its services the park generates value, which contributes significantly to people's well-being and the national economy.

Keywords: Veľká Fatra, valuation, ecosystem services, use values, non-use values

Introduction

The main target of overarching EU biodiversity strategy adopted by EU heads of state aims to halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and to restore them as far as possible as a major contribution by the EU to combat global biodiversity loss. The mapping and assessment of ecosystems and ecosystem services is one of the keystones of the EU Biodiversity Strategy. The initial methodological work on biophysical mapping and assessment is expected to be

delivered by 2014. The work carried out by the European Union and its Member States will also contribute to the assessment of the economic value of ecosystem services, and promote the integration of these values into accounting and reporting systems at an EU and national level by 2020 [1].

The intrinsic value of preserving nature (e.g., existence and bequest values) is still a major motivating factor for setting up protected areas (PA). There are many other benefits of protected areas besides protecting biodiversity. Natura 2000 sites count between 1.2 and 2.2 billion visitor days every year, generating additional revenue and regional income of EUR 50 to 85 billion [2]. Protected areas can

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also provide health benefits, education opportunities, clean water and air, and tourism. Protected areas thus generate considerable value. Consequently, there are many reasons for public investment in PAs [3]. A recent study by the European Commission estimated that the benefits of the Natura 2000 network would be roughly 3 to 7 times the cost of setting it up [2, 4].

Currently there are many economic valuation approaches used to determine and assess environmental goods and assets. The classification of these approaches is based on the type of value being investigated. The valuation of ecosystem services in protected areas is still in a pioneering stage in Slovakia and in the Carpathian eco-region. Previous valuations were done in Central Europe in two national parks: Tatra National Park (Slovak side; cf. [5, 6]), Tatra National Park (Polish side), and Slovenský raj National Park (Slovakia; cf. [7]). The Polish Tatra also was subject to a study with special emphasis on valuation and regional development [8].

In this paper, the ecosystem services of another national park in Slovakia, Veľká Fatra, are valued (assessed and monetized). The results are compared to those from Tatra (PL) and Slovenský raj (SK) parks. In order to directly compare valuation results, the current study is based on the same methodological framework.

Methodology and Study Site

Overview of the Applied Methodologies

There are two basic categories of benefits of protected areas such as national parks: use (direct, indirect, and option values) and non-use values (existence and bequest values). These kinds of values represent the concept of "Total Economic Value" (TEV; [9])¹⁾.

Various methods for valuing ecosystem services and benefits of the protected areas making up the TEV have been developed. One major approach is the valuation of the ecological dimensions of nature and the landscape (habitat valuation) which has been used, for instance, in the Czech Republic [10]. Nevertheless, most methods are based on deriving environmental values depending on the preferences of private households and/or companies. These methods can be divided into methods of deriving values from markets (revealed preferences elicited, e.g., by means of hedonic prices or travel costs, or avoided costs) and direct surveys (stated preferences) based on the willingness to pay or accept (WTP/WTA; contingent valuation, choice experiments, or contingent behavior). For valuing the ecosystem services of Veľká Fatra, these methods were used.

The current study takes up the methodology that was used for valuing the ecosystem services of Tatra and Slovenský raj [7]. It also takes into account new guidelines developed by the WWF [11]. The first step of ascertaining use and non-use values consists of a collection and assessment (quantification) of the existing ecological data on ecosystem services of Veľká Fatra, and on a geographical assignment of the relevant national park region. The identification of relevant ecosystem services was taken from previous studies in Tatra and Slovenský raj and adapted to the area of Veľká Fatra [12]. Some potentially significant ecosystem services could not be ascertained owing mainly to the lack of resources at a local or regional level. For instance, there was no proper access to regional data regarding energy or agricultural issues. For this reason, some important data and information had to be estimated based on expert judgments or taken (transferred) from other studies.

Short Description of the Study Site

Veľká Fatra was declared by Order No. 140/2002 Coll. on 1 April 2002 as an "upgrade" of the landscape protected area of the same name established in 1973 with the aim to protect a mountain range with a high share of well-preserved Carpathian forests. The size of the national park is 40,371 ha (in addition to the area of the buffer zone of 26,132 ha) [13].

Ecosystem Services and Monetary Value: Use Values of Veľká Fatra National Park

Timber Production

As Veľká Fatra park mainly consists of forest ecosystems, the first and most apparent ecosystem service consists of products related to this type of ecosystem, both timber and non-timber forest products. With respect to timber, it is straightforward to value the production of marketable goods by means of market prices. The value of timber production was calculated by the following equation:

$$Vt_a = St_a \cdot H_a \cdot Pt_a \quad (1)$$

...where Vt_a denotes the value of timber (EUR) produced in year a , St_a is the size of the area (ha) used for harvesting timber in year a , H_a is the average of timber harvesting (m^3/ha), and Pt_a is the price of timber (EUR/ m^3) in year a . In total, timber production is currently pursued on an area of 23,847 ha (in the national park and the buffer zone; Table 1) with an average harvest of 3.57 m^3/ha at a price of 34.26

¹⁾ The concept of TEV, based on the economic valuation of changes of the quality and/or quantity of ecosystem services, can serve as an important background for conducting benefit-cost-analyses for nature conservation projects that are assessed based on monetary values. However, nature conservation programs may also be assessed by a wide range of other non-monetary evaluation methods such as multicriteria decision aid (MCDA). In any case, it is – first of all – important to describe and quantify ecosystem services, and then value these in a common metric. With the concept of TEV (and benefit-cost analysis), this valuation takes place in monetary terms; alternatively, and also complementary, the extent of achievement of certain pre-defined objectives by means of non-monetary metrics in MCDA may also be considered as a kind of valuation exercise. Due to space restrictions, we concentrate our analysis on the monetary valuation of ecosystem services.

Table 1. Area of forests in Veľká Fatra National Park (in hectares and percentages).

Area of the Veľká Fatra NP (ha)	40,371	
Area of forests (ha)	35,719	88.5%
Commercial forests	14,158	39.6%
Protected forests	17,498	49.0%
Special purpose forests	3,357	9.4%
Other	706	2.0%
Area of buffer zone (ha)	26,132	
Area of forests (ha)	16,777	64.2%
Commercial forests	9,689	57.8%
Protected forests	5,331	31.8%
Special purpose forests	1,355	8.1%
Other	402	2.4%

Source: Authors' compilation based on information provided by the administration of the Veľká Fatra national park.

EUR/m³. This amounts to an annual value of timber production of EUR 2.917 million.

For this estimation, an average harvest amount and mean value of the national timber price was used due to a lack of detailed site-specific data. Owing to the ongoing harvesting activities in Veľká Fatra, the production of timber is one of the main ecosystem services in this protected area. Up to 88% (in total 35,719 ha) of the park area is covered by forest. With respect to timber production, Veľká Fatra is established and managed in contradiction to the IUCN management guidelines of category II of protected areas (national parks), which allows sustainable forestry only for the purpose of ecological management. Commercial forestry is thus strictly forbidden in category II national parks. Veľká Fatra manages a commercial forest on an area of 14,158 hectares (plus 9,689 hectares in the buffer zone). 17,498 hectares of forests are in the category "protected forests," and 3,357 hectares in the category "special purpose forests" (Table 1).

As there is no actual information available on timber harvesting in Slovakia, the estimation provided above includes data on average timber harvesting and timber prices of recent years. In Slovakia the sum of the annual timber harvest for round-wood production was 5,312 million m³ (2003) over a total forest area of 2,177 million hectares, corresponding to about 2.44 m³ per hectare [14]. Logging increased to 10,214 million m³ in 2005, leading to an increase in the average harvest of about 4.69 m³ per hectare per year in Slovakia [15]. It is important to emphasize that these figures have been obtained without reference to sustainable harvest rates. As an approximation, we can assume that an average harvest generally amounts to 2.44-4.69 m³ per hectare also in Veľká Fatra, with a mean logging quantity of 3.57 m³ per hectare. At the moment, international timber prices are (at the minimum) EUR 30 per m³, depending on the quality and use of the timber, with an

upper limit of approximately EUR 40 per m³ [15]. The Green Report [16] calculated an average price of EUR 34.26 m³ for both coniferous and broadleaf trees.

As shown above, taking these conservative estimates leads to an estimation of the annual value of timber production of about EUR 2.917 million; however, if we assume a much lower timber price of EUR 10 per m³ for instance due to natural disasters, a lower limit of EUR 0.851 million can be estimated. Taking an upper limit of timber prices of EUR 50 per m³, the value of timber production amounts to EUR 4.257 million.

Non-Timber Forest Products

Typical products in this category are herbs, berries (bilberries, cranberries, and raspberries), mushrooms, and natural fibres. Within the boundaries of Veľká Fatra, as well as in all the other national parks in Slovakia (with the third level of protection), the picking and collection of plants and mushrooms is prohibited. Thus, there is no direct use value with respect to Veľká Fatra, which may alternatively be valued according to market prices.

Fresh Water Provision, Water Supply

With regards to the rather high level of precipitation in Veľká Fatra, with an annual average of about 1,000 mm and a low level of evaporation (approx. 480 mm), more than half of the precipitation (approx. 520 mm) remains to be absorbed and stored as groundwater. This amount is high compared to other parts of Slovakia, and was also the reason for proclaiming the area as a protected water management area [17]. In order to value this ecosystem service, market prices are used according to eq. (2):

$$V_{w_a} = R_a \cdot U_{w_a} \cdot P_{w_a} \quad (2)$$

...where V_{w_a} denoting the annual value of fresh water provision, R_a is the number of residents using water originating from the ecosystem, U_{w_a} is the average water consumption per resident, and P_{w_a} is the current price of water in year a . Assuming a regional population of about 150,000 residents depending on water provision directly from the national park and its buffer zone, the value of water provision can be estimated to amount to EUR 5.699 million per year, assuming an average annual water consumption of 43.8 m³ and a mean price of EUR 0.87 per m³.

Water prices used for the calculation above reflect the regional water price level at the time of the research (2011) of the district to which the protected area belongs. Water protection and water provision is one of the most important ecosystem services the park provides for the region. Thanks to its rich freshwater resources, the area of Veľká Fatra was declared a protected water management area in 1987 with a size of 64 km² and a potential fresh water supply of up to 3.95 m³ per second. 10 large springs are located in the park, which support the water supply of municipalities in the Turiec region (e.g., Martin, Necpaly, Blatnica, Turany, Sučany) and in the Lower Liptov region (e.g., Ružomberok,

Liptovské Revúce, Liptovská Osada). All in all, the region includes more than 150,000 residents. Specific water consumption per household is estimated at a minimum of 80 liters per day per person [18, 19]. The lower limit of the annual water consumption of households in the national park region is 4.380 million m³ (actual household water consumption could be higher; water for agricultural or commercial uses is not included for lack of data). The majority of inhabitants of the Turiec and Lower Liptov regions depend on the securing of the water supply in Veľká Fatra. If the mean consumption per resident is assumed to amount to 160 liters per day per person, the park can provide up to 8.760 million m³ of fresh water per year as an upper limit. With a mean water consumption of 120 liters per person per day (43.8 m³ per year) and the actual water price of EUR 0.8675 per m³ [20], the value of the ecosystem service of drinking water supply is the above-mentioned amount of EUR 5.699 million per year (lower limit: EUR 3.780 million assuming an average consumption of 80 liters per person per day; upper limit: EUR 7.599 million given water consumption of 160 liters per person per day).

Water Retention, Flood Protection

Water retention and flood protection are usually considered as significant ecosystem services of forests. In the current study, however, it was not feasible to conduct a primary study on valuing these services, which can generally be calculated according to market prices (e.g., real estate market prices depending on the probability of flooding, or avoidance costs of flood protection measures such as dams). We therefore refer to valuation results from other studies based on replacement and avoidance costs, and transfer these values onto a regional context.

Ecosystem services of water retention and flood control (including erosion control) were valued according to the following equation (3):

$$Vfc_{SK,a} = (Vfcu_{EU,a} \cdot Su_a + Vfc m_{EU,a} \cdot Sm_a) \cdot Id_a \quad (3)$$

...where $Vfc_{SK,a}$ denotes the value of flood control (water retention, erosion control) of Veľká Fatra national park (at Slovak price levels; EUR/ha), $Vfcu_{EU,a}$ denotes the value of these ecosystem services taken as an EU average value from different studies (benefit transfer; see below) for unmanaged forests (EUR 90 per ha per year), while the corresponding value for managed (used) forests is denoted by $Vfc m_{EU,a}$ (EUR 36 per ha per year). Su_a is the relevant area of unmanaged forest ecosystems providing flood protection and erosion control (in total 27,541 ha at Veľká Fatra both in the park and the adjacent buffer zones; cf. Table 1), while Sm_a denotes the managed forest areas (in total 23,847 ha). Id_a is the income differential between the EU average and the Slovak economy (GDP differential 64%). In total, the benefits of flood and erosion control of the forest areas of the park can be estimated at EUR 2.136 million per year.

Most forests ensure functions related to regulating the water supply (water management) or preventing soil erosion (soil protection function). In mountain areas like Veľká

Fatra these functions play a very important role for the local and regional municipalities. The mere size of the park's forests indicates that the park indeed plays an important role in retaining water run-off. However, there have been no studies carried out to examine water retention over the whole area of the park that result in a reliable quantification of the value of this forest ecosystem function. Since Veľká Fatra has 14,158 ha of managed forest (in addition to 9,689 ha in the buffer zone), this area has a comparatively lower potential for water retention than unmanaged forests. It can reasonably be assumed that the retention capacity is 40% lower than in unmanaged forests. In order to value the water retention capacity despite missing primary valuation studies for Veľká Fatra national park, mean values from 27 EU countries had to be taken as a reference. These were then adapted to a national economic context by multiplying these values with the respective relative income differential for Slovakia as the most simple method of transferring benefits between countries from a study site to the current policy site (for benefit transfer cf., e.g., the recent reviews [21, 22]). Getzner points out that the values for forest ecosystem functions related to water retention and flood protection in several international studies range from EUR 45 to 150 per hectare [7] (cf. also [23, 24]). Chiabai et al. estimate the marginal value of all provisioning services of forest ecosystems (type of biome: temperate mixed) to EUR 107 per hectare [25]. Krieger estimates the value of water regulation and erosion control to be around EUR 90 per hectare [26] and Pearce assesses the value of flood control to about EUR 45 per hectare [27]. However, as income levels are different, the average unit value (per hectare) of EUR 90 for water retention services has to be adapted. The average GDP for Slovakia is about 64% of EUR 27 average; taking this relationship as a basis for transferring the monetary value, we can approximate the above-mentioned value to amount to EUR 54 per hectare per year.

In Veľká Fatra, the area of the forests can be divided into three categories, depending on the function that the forest provides. In the national park, 20,885 ha are covered by two categories (special purpose forests and protective forests in the strict conservation zone) in addition to 6,686 hectares in the buffer zone (Table 1). We assume that the commercial forest fulfills its water retention function at only 40% compared to the untouched (unmanaged) forests [29]. Therefore, we can value an area of 14,158 hectares (plus 9,689 ha in the buffer zone) of commercial forest at EUR 23 per hectare and an area of 20,885 hectares (plus 6,686 ha in the buffer zone) of special purpose and protective forests at EUR 57.6 per hectare.

Carbon Sink and Carbon Sequestration

Regarding carbon sequestration, the valuation of forest ecosystems in the national park is calculated on the assumption that carbon sequestration can also be based on values transferred from international studies, as at Veľká Fatra there have been no primary studies in this respect. The value of carbon sequestration is reached using the following equation:

$$Vcs_{SK,a} = Vcsu_{EU,a} \cdot Su_a \cdot Id_a \quad (4)$$

...where $Vcs_{SK,a}$ denoting the total value of carbon sequestration at Veľká Fatra national park, and $Vcsu_{EU,a}$ being the average value provided by international studies. Getzner calculated an average value of EUR 12 per hectare per year for unmanaged forests [7]. Based on these estimations, the value of carbon sequestration may amount to about EUR 0.212 million per year.

However, a study by Chiabai et al. presented a much higher average reference value of EUR 240 per hectare for cool coniferous forests, and EUR 382 per hectare for temperate mixed forests [25]. Taking these values as a reference, and considering the prices as independent from national income levels, the value of carbon sequestration may amount to EUR 16.324 million per year.

The issue of carbon sequestration is debated in literature since the carbon storage capacity differs between old-growth forests and mature or young stands. In this context, Keeton et al. found that the object of study, a spruce fir old-growth forest in the Ukrainian Carpathians, stored on average 155 to 165 t/ha [26].

Concerning Veľká Fatra, carbon sequestration is an important ecosystem service in the areas with no commercial forest use (e.g., core and strict conservation zones), totaling 20,885 hectares (plus 6,686 hectares in the buffer zone). In the rest of the area (14,158 hectares in the national park, and 9,689 ha in the buffer zone), the commercial use of the forest reaches the upper level of sustainable management and the net carbon sequestration is not relevant there. The value of carbon sequestration value is also calculated according to the income differential.

Erosion Control

Erosion control is already included in the valuation of water retention and flood control above (see section *Water Retention, Flood Protection*).

Medicinal Resources and Agricultural Use

As with non-timber forest products, it is not allowed to collect medicinal products such as plants within the national park; therefore they were not evaluated in this study.

However, some pastures and meadows with sheep and cattle grazing are located in the national park. The total area of grasslands in Veľká Fatra amounts to 4,007.8 hectares, while the total area of grasslands in the buffer zone is 6,716.9 hectares. There is no available evidence of cattle and grazing products in the park. Overall, 10 agricultural cooperatives (mountain farms) operate in the national park, in addition to 8 cooperatives in the buffer zone. Detailed data referring to the value of cattle/sheep products was not available.

Food production (grains) within Veľká Fatra is of marginal importance. The area of arable land is only 18.3 hectares, and 6.9 hectares of gardens/yards. The buffer zone includes a larger area of 1,265.2 hectares of arable

land, and 47.3 hectares of gardens/yards. The most popular crops are grains, potatoes, and rapeseed oil. Benefits from food production are not relevant for the area of the national park. Consequently, they are not assessed in the current study.

Fishing and Hunting

In Veľká Fatra, fishing only plays a very minor role. There are a few fishing grounds for trout at Ľubochňanka, Gaderský stream, and Žarnovica, which are managed by National State Forests of the Slovak Republic. Fishing, however, has a negligible importance for recreation and the use of natural resources. Other fishing grounds are located in the buffer zone and managed by the Slovak Fishing Association.

In the national park, hunting is allowed pending the issue of a permit. About 56 hunting districts are registered in the Veľká Fatra region (inside and outside the national park). At the moment, no information on the price of hunting licenses, the Slovak hunting tax, or the trophy fees could be collected for Veľká Fatra. We therefore have to leave out the value of hunting services provided by the national park in this assessment.

Recreational and Non-Use Values of Visitors

Activities and Perception of the National Park by Visitors

In order to value recreation and non-use values (e.g., existence and bequest values) of Veľká Fatra National Park, a visitor survey was carried out from January to April 2011. About 500,000 tourists visit the area per year (a rough estimate by the park administration). In total, the visitor survey included 150 filled-in questionnaires from visitors from Slovakia (139), the Czech Republic (8), and Poland (3).

The main tourist attractions in the national park and its surroundings are Smrekovica, Borišov, Kráľova studňa, Havranovo (Malinô Brdo, Jasenská), and the main mountain ridge. The most important asset for visitors of the national park is the diversity of its marked hiking trails. There is, however, no regular offer of guided tours. Occasionally, rangers and tourist guides from the national park administration organize excursions for schools located in the region, as well as lectures and training. Nevertheless, there is no information or visitor centre in the park. Entry fees to the park are currently not charged.

The questionnaire²⁾ first dealt with a block of questions regarding visitors' involvement in environmental conservation activities, and ascertained the level of information on biodiversity in general, and national park aims and policies in particular, similar to the questionnaires distributed in Slovenský raj National Park and Tatra National Park (PL) in 2009 [7].

²⁾ The questionnaire, as well as all detailed data, can be obtained from the authors upon request.

The results indicate that only a small number of visitors (7%) are members of conservation or environmental organizations. A similar result was obtained from Tatra park (7%), while visitors to Slovenský raj are more frequently members of environmental organizations (17%). 11% of respondents stated that they would be regular donors to ecological organizations with a mean donation of about EUR 34 per year (standard deviation EUR 31.8). This situation is similar to Slovenský raj (14% of respondents, with a mean donation of about EUR 34). Visitors to Tatra gave higher donations of about EUR 62 per year (7%).

The information level of respondents regarding the definition of “biodiversity” seems to be comparatively high. 43% of respondents have detailed knowledge about the definition of biodiversity by the United Nations (UN), while 32% have heard “something like this.” The UN definition is new for one quarter (25%) of the respondents. These results are comparable to Slovenský raj, where 45% of respondents had detailed knowledge, while 30% had heard a rough definition. The definition was new to about 24% of respondents. In Tatra park, the information level was slightly lower (19%, 55%, 25%).

Moreover, visitors to Veľká Fatra also stated lower mean information levels concerning different aspects of the park. Respondents indicated information levels about the national park at 3.59 points, about species and nature conservation programs at 3.73 points, recreational activities and opportunities at 3.22, and cultural and educational aspects of the national park at 3.70 points (with 1 point indicating “very well informed,” and 5 points “not informed at all”). These results indicate a major difference between the perceptions of Veľká Fatra park compared to Slovenský raj (2.86, 3.04, 2.69, 3.14, respectively) and Tatra (2.99, 3.04, 3.06, 3.09). It seems quite significant that the information level about Veľká Fatra as a national park is the lowest. One of the reasons why this could be the case is that Veľká Fatra is rather new (established only in 2002), and that more time and effort is needed to inform visitors in order for them to perceive the region and the ecosystem as a “national park.” The Slovenský raj region is generally perceived primarily as an area for recreational activities and sports, while Tatra is considered more of a traditional park. It seems that informational drives should be strengthened, particularly regarding the aims and functions of a national park, and less regarding the potential activities of visitors. Veľká Fatra park’s aims are “quite well known” to only 19% of respondents. On the other hand, about 54% of respondents indicated that they are “not well” or “not at all” informed. This is clearly worse than in Tatra (45%, and 40–45%) and Slovenský raj (40% and 35%), respectively.

In addition, visitors were asked to choose 4 out of 12 items that they think would be the most important national park aims. Some of the items considered to be most important are not specified in the official IUCN national park (category II) aims. Fortunately, the 4 aims of the national park considered most important by respondents were also the ones included in the IUCN management guidelines. Although it is surprising that some visitors wished that the national park should concentrate on the enlargement of ski

resorts or construction of roads, because this is in strong contradiction to IUCN aims. Comparable results, however, were achieved in the Tatra and Slovenský raj parks. All in all, the results indicate that there is still a lack of knowledge about national parks. In general, this may not only be the case at Veľká Fatra, but in all protected areas in Slovakia. There is clearly a need for an improved information policy offered not only by the national park administration. Intensified efforts for environmental education in schools and cooperation with tourist business companies are needed to strengthen public awareness toward national parks and their specific conservation goals. The huge comparative disadvantage of Slovak national parks compared to Western European countries are poor information services and the administration of protected areas owing to the lack of resources for fulfilling informational objectives. Despite that, it seems that visitors have a more-or-less clear picture of national park aims.

Regarding the actual (current) visits to the national park, a large majority of visitors said that they had visited Veľká Fatra in total more than four times (70%). Only a minority (7%) stated that the current visit would be the first one. The frequency of visits is lower in Slovenský raj (32% and 24%), and broadly similar to Tatra (61% and 6%). These differences may be explained by the surveys carried out in different seasons, as well as the location of Veľká Fatra in central Slovakia, because for many visitors it is the closest national park for shorter, but more frequent trips to the area. The duration of the current stay in the park is about 2.28 days on average (standard deviation 2.54 days). This is quite short compared to 5.51 days (standard deviation 3.5 days) in Slovenský raj and 7.86 days in Tatra (standard deviation 4.8 days). Considering that, it can be concluded that Veľká Fatra is not a typical destination for longer holidays but an attractive place for short-term visits (e.g., weekends) or one-day trips. The length of a stay might be somewhat higher during the peak season in summer.

Veľká Fatra offers several facilities for visitors. The most popular are walking and nature trails (trekking), and the cave at Harmanecká, as well as the spa at Turčianske Teplice. The high popularity of Harmanecká cave (41% of all visitors wanted to see the cave) is surprising since the cave is not open for visitors all year round. However, the survey indicates that respondents also wanted to visit the cave during the winter. On the other hand, other national park facilities (e.g., visitor centre, exhibition) are not very popular. It is important to mention that Veľká Fatra does not have a real visitor center as in other national parks, despite the general popularity of such facilities. There is also no offer of guided tours for tourists. In Slovenský raj and Tatra parks visitors and information centres or guided tours are the most popular facilities for tourists.

The main activities of visitors in the national park are certainly “typical” activities of visitors in national parks such as hiking and the observation of plants/animals. All kinds of sports also belong to the main activities. In the Veľká Fatra region there are very good conditions for skiing and cross-country skiing during the winter season. In the summer, mountain biking is very popular along desig-

nated cycling roads (e.g. in Gaderská valley). Of course, some of these activities could also be done in other places and do not necessarily have to take place in protected areas (for instance, hiking, or going to restaurants). With regards to these activities, the results from all three selected national parks are similar.

Motives for Visiting the National Park, and Travel Costs of Visitors

In order to work out the recreational value of visitors in a protected area, it is of crucial importance to differentiate between visitors who solely come to visit the national park, and those who had other motives for visiting the region and then just dropped by (trip motives).

Respondents to the current survey stated visiting motives that are closely connected to the existence of the national park. Almost two thirds of respondents (64%) stated that they came solely for the purpose of seeing the national park, while another 15% came with other motives (e.g. visiting friends or family) and took the chance to visit the park. Other motives for visiting the region were stated by around 21% of respondents, who visited the park because they made another trip and made a stop there. The number of respondents who came solely for the purpose of visiting the national park at Slovenský raj and Tatra national parks was higher (73%).

In Veľká Fatra 7% of visitors were travelling alone, while 18% were travelling with partners, family (27%), or friends (48%). In the survey nobody selected "organized tours," but we presume that there were some groups of students from schools who chose the item "friends." Especially during the summer season there are also several organized one-day trips for visitors from the hotel and spa in Turčianske Teplice. Groups include on average about 4.3 persons (standard deviation 4.7 persons). Similarly, visitors to Tatra and Slovenský raj are travelling alone (5%, 7%), with partners (32%, 39%), with family (33%, 29%), and friends (26%, 24%).

The most important mode of transport was the private car (64%); 15% travelled by bus, followed by train (12%). Some respondents chose a combination of train and bus. There is a very interesting and significant group of people who came on foot (14%) from the regions surrounding the park and its buffer zone. In Tatra respondents prefer private cars (54%) and trains (3%), and in Slovenský raj as many as 87% visitors came by private cars, followed by train (9%).

On average, the journey to the national park took 2.52 hours (standard deviation 2.99 hours); the park was about 73 kilometres (standard deviation about 113 km) away from the home of the respondents. Previous surveys carried out in Tatra and Slovenský raj indicate quite different results. For instance, in Tatra region, the journey to the national park took 7.89 hours and the park is on average about 471 kilometres away from the homes of the respondents. In Slovenský raj, travel time amounts to 5.48 hours with an average distance of 370 kilometers. These differences might be explained by the fact that Veľká Fatra is

Table 2. Travel costs (expenditure categories) of visitors per day (in EUR).

Expenditure category	Mean	Standard Deviation
Meals	13.6	16.4
Accommodation	8.7	15.8
Others	6.8	20.7
Transport	5.8	11.3
Shopping	4.4	15.3
Sports	4.3	15.3
Entrance fee	1.8	5.0
Museums	1.6	5.4
Total	46.5	64.6

considered a place to stay mostly for a short time as opposed to the two other national parks, where tourists spend their entire holidays in the park.

The travel costs of visitors were measured by daily expenses for certain expenditure categories [7]. In total, visitors spent on average about EUR 46.5 per day per person during their stay in the national park (standard deviation EUR 64.6, median value EUR 27). Table 2 presents detailed expenditure categories suggesting that most money was spent on meals, accommodation, and other expenses. If we only take transport costs, entry fees, and museum costs into account (expenditures that are directly connected to a national park visit, while other costs can be assumed to accrue in one way or the other during everyday life or at other tourist destinations), visitors spent about EUR 9.3 per person per day (standard deviation EUR 3.5). In Slovenský raj visitors spent on average of about EUR 54.1 per person per day during visits to the park. In Tatra, daily expenses amounted to EUR 45.4 per person per day. Taking only transport costs, entry fees, and museums costs into account, visitors spent about EUR 11 per person per day in Slovenský raj, and EUR 10.5 per person per day in Tatra park. These numbers indicate that visitors' expenditure in national parks is rather similar between the three national parks.

Total expenditure per visit per person is valued based on mean travel costs (EUR 46.5; resp. EUR 9.3 per day), assuming that only those visitors who solely came for the purpose of visiting the national park are counted, and that the average duration of stay was 2.28 days in the region. Based on these assumptions, total expenditure can be estimated to amount to EUR 106 per person per visit. Taking only transport costs into account, the expenditure amounts to EUR 21.2 per person per visit. For assessing the potential economic significance of the park for the region [8], a further question was asked about overnight stays. While 58% of visitors only stayed for the day, the rest used accommodation close to the park, in particular in places such as Borišov (29%), Hotel Kráľova studňa (16%), and

Smrekovica (14%). As mentioned before, the total number of visitors in Veľká Fatra amounts to roughly 500,000 visitors per year, while the number of tourists in the other two parks is higher (Tatra national park: 2,000,000; Slovenský raj national park: (600,000 to 800,000). Total travel can be calculated by the following equation:

$$TC_a = N_a \cdot D_i \cdot (TC_{i,1} + TC_{i,2}) \cdot M_a \quad (5)$$

...where TC_a denotes total travel costs of visitors in year a , N_a is the number of visitors at the national park in year a , D_i is the mean duration of stay of visitor i , $TC_{i,1}$ are travel expenses based solely on transport costs, $TC_{i,2}$ denotes other costs of the visit (e.g. expenses for accommodation or souvenirs), and M_a is the average share of visitors who visit solely for the purpose of seeing the park. Based on the results discussed above, total recreational value amounts to EUR 53.010 million per year; if only transport is taken into account, travel costs amount to EUR 10.602 million per year.

Willingness-to-Pay for a National Park's Policies and Environmental Values

In order to derive an indication of potential value in terms of existence, of the (quasi-) optional and bequest value of biodiversity conservation, and to facilitate a comparison with other studies in national parks, the willingness-to-pay (WTP) question was formulated as concretely as possible. The policy program offered consisted of maintaining species conservation programs in the park by an annual (hypothetical) earmarked payment. The question also explained that the funds provided by the government may be insecure, and that citizens might have to pay directly for national park policies. Respondents were also warned that their stated WTP comes on top of their expenses during the visit [8].

On average, respondents were willing to pay EUR 26 (standard deviation EUR 84.4, median EUR 10) for securing the financing of national park programs. Fig. 1 shows the distribution of WTP of respondents with a range from "Zero" to a WTP "over EUR 500". Similarly, in Slovenský raj respondents were willing to pay EUR 23 (standard deviation EUR 52.4, median EUR 10; 95% confidence interval:

EUR 13.4 to EUR 32.6) for securing the financing of national park programs. In Tatra National Park visitors were willing to pay EUR 13.8 (standard deviation EUR 39.9, median EUR 4.4; 90% confidence interval of the mean lies between EUR 9.8 and 17.6). These results indicate that for at least two Slovakian national parks, mean WTP bids of respondents were broadly in the same order of magnitude.

The survey also included questions about the motives for payments and the financing of conservation activities in particular. The questionnaire included a range of statements that visitors were asked to agree or disagree with along a 5-point scale (1 = "fully agree" to 5 = "completely reject"). One question was specifically drafted for respondents who did not exhibit a positive WTP for conservation policies, in order to explore reasons for zero WTP. The results presented in Table 3 indicate that the share of protest bids is rather low. The main reason for rejecting WTP was the opinion that nature conservation should be a public expense, and should not depend on individual contributions. Moreover, respondents also stated that they already pay high taxes, or that their income is too small to afford additional expenses. Comparable results were achieved in previous studies in Tatra and Slovenský raj.

The questionnaire also elicited general preferences toward biodiversity conservation policies. Many respondents stated that nature and species conservation would be important regardless of the cost. On the other hand, respondents had not thought about their willingness to pay prior to the survey. Results from Tatra and Slovenský raj are broadly similar with the exception of a higher number of respondents willing to donate to nature conservation causes.

In the context of WTP for conservation, it is also important to ascertain whether respondents perceive the recreational experience in the Veľká Fatra as unique, or whether there are substitutes for their visit. If respondents perceive other areas to be adequate substitutes for Veľká Fatra, their WTP might be lower. In general, respondents accepted temporal or spatial restrictions necessary for conservation objectives, and would also visit the national park in the future if such restrictions were put in place. Only a minority of respondents would spend their holidays at other locations or even change their activities. Table 4 presents the respondents' perception toward restrictions on access to the

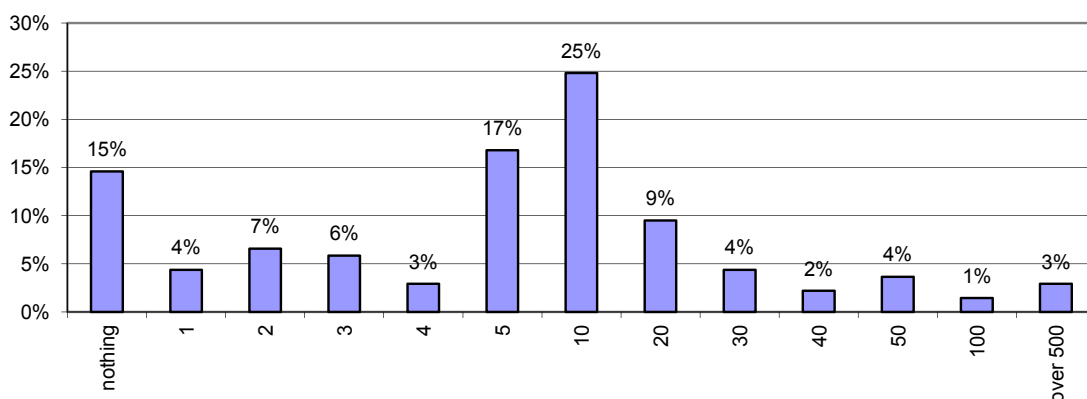


Fig. 1. Distribution of WTP bids of respondents (EUR).

Table 3. Statements regarding payment for nature conservation programs.

Question 21 (Value with 1=agree fully 5=reject completely)	Points (mean)
"My income is too small to be able to contribute."	2.67
"It is a public expense to conserve nature, and should not be dependent on individual contributions."	1.99
"I would like to see others' contributions, and then decide."	4.02
"I already pay too much in taxes."	2.60
"I would like to donate money for other programs."	3.33
"Nature conservation programs are not worth enough to me that I would be willing to pay."	3.75
Question 22 (Value with 1=agree fully 5=reject completely)	
"Nature and species conservation is important regardless of the cost."	2.27
"I had not thought before this survey how much I would be willing to donate."	1.86
"I would also be willing to donate even if a majority of respondents would not be willing to support the program."	2.90
"I talk a lot about nature conservation with my friends and family."	2.76

Table 4. Preferences regarding temporal or spatial restrictions on access to the park, and substitutes for national park activities.

Question 23 (Value with 1=agree fully)	Points (mean)
"I would in any case visit the national park."	2.42
"I fully accept temporal/spatial restriction on access to habitats in order to conserve nature."	1.93
"I would not like to visit the national park any more."	4.41
"I would choose another area for hiking."	3.17
"I would generally abstain from hiking and would like to spend my holidays at another location in Slovakia."	4.03
"I would spend my vacation abroad."	3.74

national park necessary for conservation purposes. It is interesting that the acceptance of restrictions on access was higher in Veľká Fatra and Slovenský raj than in Tatra (Poland). This result may suggest that visitors to Slovakian national parks are used to some restrictions due to nature conservation. This acceptance might be a heritage from the past when nature conservation was built on a strict legal system of restrictions and command-and-control policies. We assume that this might broadly be the case also in other Slovakian national parks. Visitors also perceived recreation in Veľká Fatra and Slovenský raj as being rather unique without many substitutes such as staying in another holiday resort.

In Veľká Fatra a major motive for respondents to express a WTP for the financing of the national park was "the right to exist" (existence motive; 17% of respondents). In order to conserve nature for their children (bequest motive), 76% of respondents are willing to pay and therefore state that the bequest motive would be the strongest motive for their WTP. The optional value (i.e. a potential personal benefit in the future) is the main motive of 7% of respondents. The conservation of nature for their children (bequest motive) is also the strongest motive of respondents

in Slovenský raj and Tatra; however, the existence motive was weakest in Tatra national park.

The individual WTP elicited in the visitor survey may be aggregated to account for the total willingness-to-pay for the existence, option, and bequest values (non-use values) of Veľká Fatra in terms of the value of the whole population of Slovakia. Total WTP for each of the separate payment motives can be summed up by the following equation:

$$WTP_{j,a} = NP_a \cdot WTP_i \cdot PM_{j,i} \quad (6)$$

...where $WTP_{j,a}$ denoting total WTP in year a for payment j ($j=1$ to 3 , for the existence, bequest, and optional values, respectively); NP_a is the total population of Slovakia in year a , WTP_i is the total willingness-to-pay of respondent i (EUR), and $PM_{j,i}$ denotes the share of respondents stating that their main payment motive would fall under category j . Assuming the above-mentioned importance of payment motives, and a national population of Slovakia of roughly 4.5 million inhabitants, existence amounts to EUR 19.890 million per year; the bequest value can be estimated to be EUR 88.920 million, and the optional value to be EUR 8.190 million.

Table 5. Values for ecosystem services provided by Veľká Fatra national park; Tatra and Slovenský raj national parks (EUR million per year, total, and per hectare).

		Veľká Fatra NP (Slovakia)	Slovenský raj NP (Slovakia)	Tatra NP (Poland)
1.	Ecosystem services			
1.1	<i>Forest products</i>			
1.1.1	Timber	1.732	0.856	0
1.1.2	Non-timber products	n. a.	n. a.	n. a.
1.1.3	Water provision, supply	5.699	1.480	3.700
1.1.4	Water retention/flood protection	1.527	0.808	0.726
1.1.5	Carbon sink, climate regulation, CO ₂ sequestration	0.160	0.090	0.091
1.1.6	Erosion control	see 1.1.4	see 1.1.4	see 1.1.4
1.1.7	Medicinal resources	n. a.	n. a.	n. a.
1.2	<i>Agricultural products</i>			
1.2.1	Cattle, grazing	0	0	0
1.2.2	Grains, food production	0	0	0
1.3	<i>Fishing</i>	n. a.	0.002	0
1.4	<i>Hunting</i>	n. a.	n. a.	0
1.5	<i>Recreation</i>	53.010	152.325	519.000
1.6	<i>Recreation opportunities (national park policies)</i>	10.602	30.972	21.000
	Rough estimate of use values	62.128	155.561	523.517
1.7	<i>Biodiversity conservation values</i>			
1.7.1	Existence values	19.890	15.938	92.100
1.7.2	Option / quasi-option values	8.190	7.083	48.900
1.7.3	Bequest values	88.920	53.479	75.810
1.8	<i>Cultural values</i>	n. a.	n. a.	n. a.
	Non-use values	117.000	76.500	216.810
	Rough estimate of TEV (Total Economic Value)	179.129	232.061	740.327
	Rough estimate of TEV (Total Economic Value), EUR per hectare	4,437	10,964	22,596

Source: own calculation, [7].

Results

The results of the study show that Veľká Fatra provides important ecosystem services for the local, regional, and national economies. With its services the park generates value, which contributes significantly to human well being and the national economy as a whole. Table 4 as well as Fig. 2 summarize the valuation results and present a direct comparison between Veľká Fatra on the one hand, and Slovenský raj and Tatra parks on the other. One apparent result in all three cases is that ecosystem services in the narrow sense, such as timber production, water provision, flood protection, and erosion control, are not that important on a national level when compared to total benefits, including recreational and non-use values, but they certainly provide important benefits for the local population, for instance in the Turiec and Lower Liptov regions.

The valuation of ecosystem services in Veľká Fatra National Park amounts to around EUR 179m. As we can see (Table 5) the total economic value of Veľká Fatra national park is lower compared to Tatra or Slovenský raj national parks, both in absolute and relative (per hectare) values. This is, first, due to the fact that the ecosystem services provided are different since the services depend on a concrete location and ecosystems. Second, due to the lower number of tourists and the shorter duration of stays, the recreational value is smaller. Veľká Fatra national park is a typical destination for weekend holidays or one-day trips, while tourists in the other national parks stay much longer in the region. Third, differences also stem from the extrapolation of the values related to the visitors' WTP – in connection with non-use values – to the national population, which is higher in Poland. On the other hand, Veľká Fatra has the highest value of timber production, but this commercial harvesting is cer-

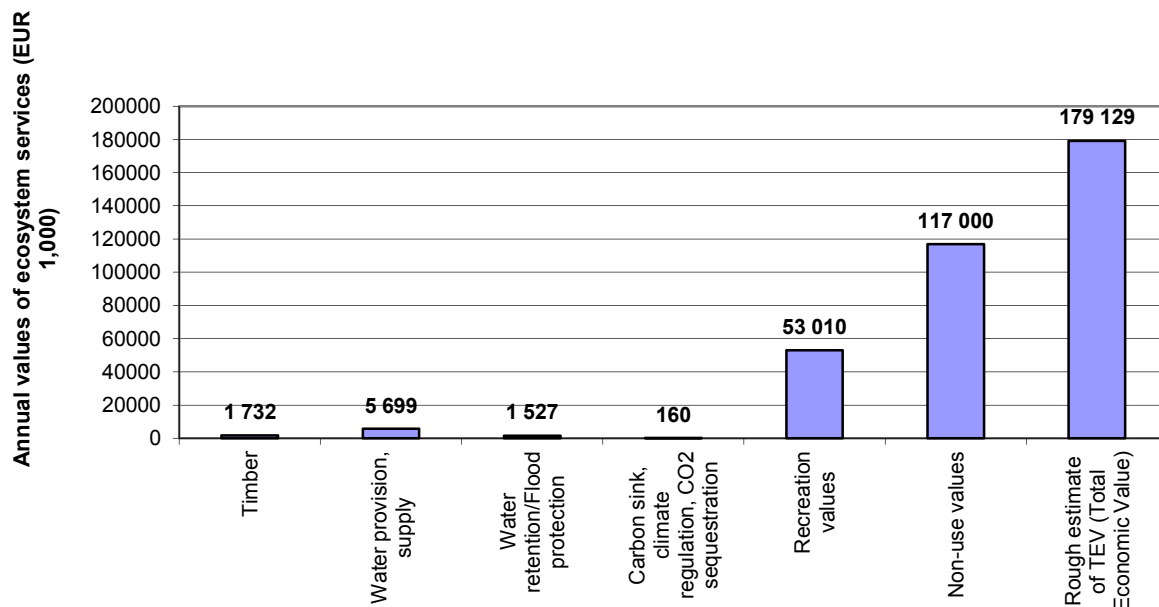


Fig. 2. Valuation of the ecosystem services of Veľká Fatra National Park (EUR 1,000, annual values). Source: own calculations.

tainly not compatible with the international concept of a national park, and does not conform with IUCN management categories. Veľká Fatra is clearly dominant with respect to water provision and water retention (flood protection) when compared to the other national parks. This is also the reason why Veľká Fatra was designated as a national park as well as protected water management area.

Conclusion

The results of the study show that it is worthwhile for the national government to sufficiently fund the establishment and ongoing management of national parks in order to secure a broad range of benefits delivered by ecosystems. The ecosystem services provided by the protected areas are certainly higher than the investments in the long term. This significance of the ecosystem services should be kept in mind when developing management policies within the context of sustainable development.

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