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Valuation of recreation-related cultural ecosystem services provided by Pirin National Park, Bulgaria

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ABSTRACT

The aim of this study is to propose a method for accounting of the recreation-related cultural ecosystem services (RRES) provided by protected areas of category National Parks on the example of Pirin National Park (Pirin NP), Bulgaria in accordance with the System of Environmental Economic Accounting – Ecosystem Accounting (SEEA-EA) framework and the System of National Accounts (SNA) principles. The suggested Tourist consumption products – based method measure the value of actual recreation-related ecosystem services (RRES) flow as a difference between demand and supply of RRES provided by a protected area. It is based on respective indicators: Total tourism products consumption by the visitors of the NP (demand) and Expenditures for maintenance of the asset's ecosystems (supply). The results show that the average value of RRES flow is estimated on BGN 170 Million for the period 2015 – 2019. The proposed method for valuation of RRES in protected areas of category National Park gives reliable results, based on a minimum of data which are public or easily accessible.

1. Introduction

Valuation of recreation-related cultural ecosystem services (RRCES) in national parks is a challenging task due to the range of reasons related to the specific definitions, methods and purposes of the valuation. The most popular definition of cultural ecosystem services (CES) states that these are the „nonmaterial benefits that people obtained from ecosystem services" (MA 2005). Haines-Young and Potschin (2018) define CES as "all the non-material, and normally non-rival and non-consumptive, outputs of ecosystems (biotic and abiotic) that affect physical and mental states of people" ((CICES) V5.1. 2018). SEEA-EA definition states that recreation-related ecosystem services represent the *contribution of ecosystems to the cultural (recreational) benefits* that humans receive through the biophysical characteristics and qualities of ecosystems that enable people to use and enjoy the environment through direct, in situ, physical interactions with the environment (United Nations et al. 2021). Some of these ecosystem services have a direct impact by creating an environment for recreational activities, while others contribute as factors influencing individual aspects of recreation (Nedkov et al. 2021b). The last definition states „recreation-related services are the ecosystem contributions, in particular through the biophysical characteristics and qualities of ecosystems that enable people to use and enjoy the environment through direct, in situ, physical and experiential interactions with the environment. This includes services to both locals and non-locals (i.e. visitors, including tourists)" (NCAVES and MAIA 2022).

According to United Nations et al. (2021), RRCES can be provided by many ecosystem types and supply of these services is determined

by ecological (extent and condition; presence of iconic landmarks or species; structural state and landscape characteristics) and societal (ecosystem management, including facilities to support access) factors. The factor determining the use of RRCES is ecosystem management, including facilities to support access. Potential physical metrics for the service are the number and length (hours) of visits. Benefits relate to the physical and mental health of the beneficiaries, and main users and beneficiaries are households, tourism and outdoor leisure service sectors. The suggested method in this study is based on these general statesmens.

The System of Environmental Economic Accounting (SEEA) provides an opportunity to incorporate protected areas assets into formal decision-making frameworks through accounting of ecosystems and the services they provide (United Nations 2019, Pelletier et al. 2021). The protected areas (PA) supply range of basic recreation benefits to the society. The sustainable use of these benefits have to be consistent with the ecosystem's capacity to provide the respective recreation-related ecosystem services. Valuation of the physical flows of recreation -related ecosystem services (RRES) to the beneficiaries would contribute to the implementation of sustainable management practices for development of nature-based tourism in the protected areas. The accounting process include a biophysical assessment of the assets ES and implementation of the SEEA valuation technique to translate the actual flow of the service into monetary units and to fill them in the accounting tables giving opportunity to analyse changes in the actual flow of the service over time (Vallecillo et al. 2019). The implementation of this approach to evaluate all kinds of ecosystem service, especially CES, meet the problem related to the low availability of data and indicators related to mapping CES (Richards et al. 2015). The choice of indicators to value the different categories of CES is also complicated by the fact that it is difficult to distinguish their benefits. Occasionally the recreation value indicators are related also to other CES mapping indicators, like it is for the aesthetic and spiritual value indicators (Abualhagag and Valánszki 2020). It is not possible to fully separate the different spiritual, intellectual, and physical links between human cultures and ecosystems (MA 2005). Existing experience in RRCES accounting includes application of different valuation methods, many of which have been used for valuation of the RRCES provided by the National Parks or other protected areas (Remme et al. 2015; Horlings et al. 2020; Barton et al. 2019, Pelletier et al. 2021, Wang et al. 2022). Pelletier et al. (2021) implement eight different accounting approaches to obtain values for the RRCES in the New South Wales (NSW) National Parks, Australia: Random Utility Method, Activity-based Method, Cost of Production Method, Simulated Exchange Value Method, Resource Rent Method, Prices from similar markets, Final Consumption Method and Mixed Contribution Method. Discussing the advantages and disadvantages of the obtained results, the authors underline the suitability of the group of consumption-based methods for accounting the RRCES from National Parks. All these methods require a lot of specific data and surveys. For example, to collect visitation data related to protected areas, 62 000 respondents were interviewed across four states over a period of six years (Pelletier et al. 2021). The most existing methods for accounting of CES are very data intensive and needs in situ data and surveys and the results are relevant for the particular site and moment and could be changed significantly sometime later.

The studies focused on the assessment of RRCES are much more in Bulgaria (Nedkov et al. 2014; Nedkov et al. 2018; Ihtimanski et al. 2020; Hristova and Stoycheva 2021; Hristova 2020; Dodev et al. 2021; Grigorov et al. 2021; Nedkov et al. 2021a; Nedkov et al. 2021b; Nedkov et al. 2022; Silvestriev et al. 2021; Zhiyanski et al. 2021; Nikolova et al. 2021a, Nikolova et al. 2021b; Nikolova et al. 2021c) than those on

the accounting of these services, and very few of them are dealing with the protected areas (Assenov et al. 2016b). However, in most of the published papers, the accounts referee the mountain ecosystems (Koulov et al. 2017; Assenov et al. 2017; Assenov et al. 2016a; Ivanova et al. 2016; Grigorov and Assenov 2015; Assenov et al. 2016b). The valuation methods used in these studies are the Contingent valuation method (Grigorov and Assenov 2015; Assenov et al. 2017) and GIS-based method (Ivanova et al. 2016; Koulov et al. 2017).

The challenges we are trying to answer with this research are related to the following features in the valuation of RRCES provided by Pirin NP: 1) How to obtain reliable results from RRCES valuation in accordance with the SEEA principles, if we need to work in shortage of time and data needed to implement some of the existing CES accounting methods? 2) How to distinguish the contribution of ecosystem services flow from the tourist services and related benefits In the valuation of CES from cultural heritage sites, supply and demand indicators refer most often to the same spatial unit. Indicators for the supply and demand of RRES from natural heritage sites, and in particular from Pirin NP, do not always refer to the same spatial unit. The greater share of the costs for access to the benefits from RRES provided within the park are carried out outside its boundaries, in the adjacent resorts with their tourism services as accommodation, food, entertainments and transport facilities. 3) How to represent the change of value of the actual flow of RRCES over time and in the frames of the Pirin NP boundaries.

2. Materials and methods

2.1. Case study area

Pirin National Park (Pirin NP) is situated in Pirin Mountain in the South-West part of Bulgaria on an area of 403.56 km². The highest pic in the park is Vihren (2914 m.a.s.l.). The Pirin NP is a UNESCO World Heritage site since 1983 because of its outstanding universal value and rich biodiversity with many endemic and relict species of global importance. Pirin NP is a major species-formation centre of the vascular flora at the international scale, and a main centre for the conservation of a number of rare, protected and endemic floral taxa and sintaxa of a global significance, as well as a large part of the representatives of the birds (MP 2004). In frames of the park are situated Biospheric Reserve "Bayuvi Dupki – Dzindziritsa", Natural Reserve "Yulen", and NATURA 2000 sites (MP 2004). From the park territory, 44% are high mountain areas situated on an altitude above 1800 m. Applying the MAES typology for identification of ecosystem types, Glushkova et al. (2020) determinate the following ecosystem types in high mountain territories of Pirin NP: Urban, Grassland, Woodland and Forest, Heathland and shrubs, Sparsely vegetated land, Rivers and lakes.

The tourism in the region develops mainly through activities related to the natural recreational resources of the territory. Data on potential tourist demand show the great importance for the tourist's choice of destinations of factors such as preserved nature, the possibility of walking tours, peace and quiet environment (Georgieva 2021). The most attractive for ecotourism is the high mountain part of the park with a typical alpine type of relief (the area of Vihren peak (2914.3 m), Kutelo peak (2908 m), Kamenitza peak (2822 m), Sinanitsa peak (2516 m), Dzhangala (2730 m), etc.) and the adjacent 164 beautiful lakes of glacial origin. The forests in the high mountain part of Pirin NP are represented mainly by *Pinus mugo*, *Pinus peuce* and *Pinus silvestris*. Most of these trees (88 %) are on age more than 80 years and 31,3% of them are older than 120 years (Glushkova et al. 2020). A very popular element of the natural heritage within the park is the fir Baykusheva mura (more than 1300 years old). There are 8 municipalities (Razlog, Bansko, Gotse
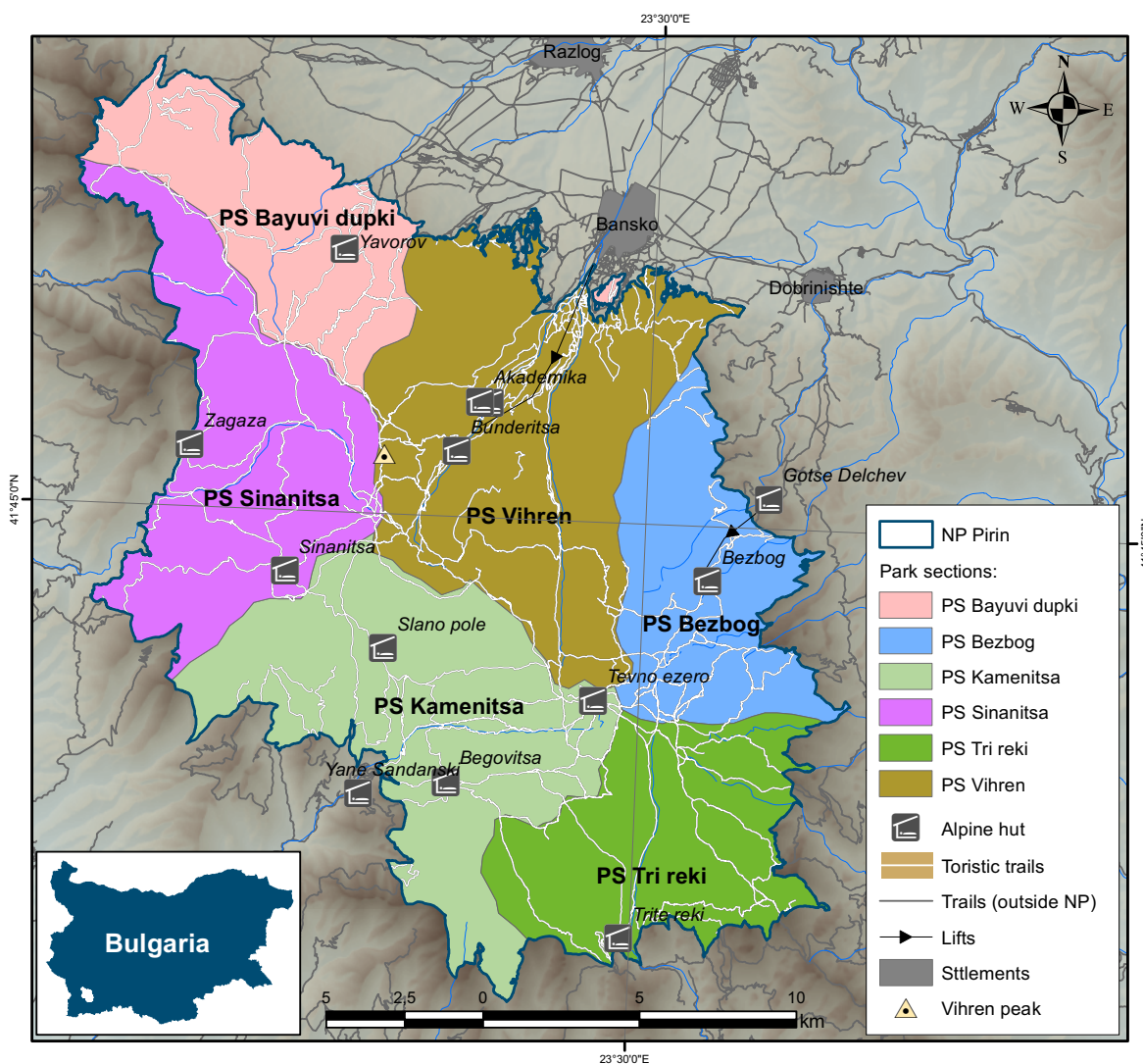
Figure 1. Pirin National Park and management sectors

Delchev, Sandanski, Strumyani, Kresna and Simitli) in frames of the park but in 4 of them are concentrated the main resorts in the area (1 resort of national significance and 8 of local significance) distributed as follow: Bansko - 3, Gotse Delchev – 2, Sandanski – 2, and Razlog – 2 (SG 2012).

Pirin NP management is carried out by the Pirin National Park Directorate (Pirin NPD) at the Ministry of Environment and Waters (MoEW) according to the Protected Areas Act (2013) and the Pirin National Park Management Plan (MP 2004). At Pirin NPD there are 6 management units – park sectors (PS), Fig. 1, Table 1.

Table 1 Management sektors in Pirin NP (after MP 2004)

Park Sector	Area (ha)	Office place	Most popular tourist sites
Vihren	9807	Bansko	Vihren peak, Kutelo peak Koncheto ridg, Banderishki lakes, Muratovi lakes, Tevno lake, Baykusheva mura, Tipici area, Vasilashki lakes
Kamenitsa	12 352.4	Sandanski	Popina laka, Spano pole
Bajuvi dupki	4842.1	Razlog	Biospheric Reserv Bayuvi dupki - Dzhindzhiritsa
Bezbog	6445.5	Dobrinishte	Strazhite and Polezhan peaks, Gorno Poledzhan lake, Popovo lake, Kremenski lakes, Belemeto area and Tevno lake
Sinanitsa	3044.4	Kresna	Sinanitsa peak
Tri Reki	3841	Sandanski	Orelek peak

2.2. Methods

The questions that are the subject of the SEEA-EA accounting relate to the ways in which to measure the value of the elements reflecting the interaction between the provision of actual flow of ES (supply) and the actual use of RRCES (demand). The ecosystem asset in this investigation include all natural ecosystems on territory of Pirin National Park. The suggested *Tourist consumption products – based method* measure the value of actual RRCES flow as a difference between demand and supply of RRCES provided by a protected area.

Supply part is represented by the actual flow of recreation-related cultural ecosystem services. These services include both divisions of CES from the CISEC 5.1. Classification (Haines-Young and Potschin 2018), biotic and abiotic. Nedkov et al (2021b) selected 12 relevant RRCES. In the valuation process, the assessment of ecosystem capacity to provide RRCES does not characterise the supply of recreation-related ecosystem services. It is represented only by the actual services flow received (used) by the beneficiaries (Pelletier et al. 2021).

Demand part of the equation represents the actual use of recreation-related ecosystem services (RRCES) by the beneficiaries (fig. 1). The recreational benefits of nature-based recreational activities relate mainly to strengthening physical and mental health, aesthetic enjoyment, stimulating inspiration, increasing working capacity and other similar benefits that cannot be valued in monetary terms. It is the main challenge in seeking adequate RRCES accounting methods and techniques. This is very well expressed in the process of valuation of the RRCES flow from a given protected area, where the common approach is to multiply the number of visitors on the price of entrance fee because of lack of other direct measure of the RRCES demand. We assume that the value indicators for the supply part have to be linked to the maintenance of the asset ecosystems conditions, while those for the demand part should relate to the tourist services (hotels, restaurants, tourist agencies services, transport etc.), which are predominantly situated out of the PA borders because of the range of legislative limitations. So, the entrance fee would not represent the whole amount of money that tourists pay for the benefit they receive from the PA, neither the total expenditures for management and maintenance of the natural ecosystems in a given PA. Very often there is no entrance fee at all, as it is in the three Bulgarian National Parks, Pirin, Rila and Central Balkan. The accounting process needs quantitative, quantifiable indicators that reflect the actual flow and use of RRCES. They must be comparable to the data available for other protected areas, and to be easily accessible, sensitive and relatively resilient for a short period of time.

The *Tourist consumption products-based method* for valuation of the RRCES, proposed in this study, is based on two indicators. First indicator characterized the supply flow by the *Expenditures for maintenance of the asset's ES*. Source of this information is the Budget Programme "Preserving, strengthening and restoring ecosystems, habitats, species and their genetic resources" from the annual budget of the National Park Directorate. These expenditures include, in addition to the costs of maintaining the state of ecosystems and biodiversity, the pay for work of park staff, as well as the maintenance of the territory within the park.

The second indicator characterized the demand of RRCES by the *Total tourism products consumption of all visitors in the National Park*. The valuation of the actual flow of RRCES used by the beneficiaries is based on data for the number of visitors in the park for a certain period and the expenditures they have incurred in connection with their stay.

The difference between these two values, the Total tourism products consumption of all visitours and the Expenditures for maintenance of the asset, measures the contribution of ecosystems

to the beneficiaries.

The assessment of the expenditures that a beneficiary of the RRES makes is carried out on the basis of data from the Tourism Satellite Accounts. It is an internationally accepted statistical system of description, classification and analysis of tourism expenditure. Application of this statistical system is designed to estimate all expenditure related tourist trips, made before, during and after the trips (NSI 2022). In accordance with the methodology, Tourism Satellite Account includes the following expenditure at current prices for tourist trips: expenditure of the residents in the country; expenditure of the non-residents in the country and expenditure of the residents abroad, which are not relevant to the current accounting. The Internal tourism consumption is measured according to the Nomenclature on the expenditure for Tourism Sattelite Accounts (Classification of Economic Activities (CEA 2008) on the base of the following indicators: Inbound tourism consumption of the non-residents – Total; Domestic tourism consumption of the residents in the country – Total; and Internal tourism consumption by non-residents and residents –Total. The Nomenclature on the expenditure for Tourism Satellite Accounts include: *Total Consumption products, Tourism characteristic products* (Accommodation services, Food and beverage serving services, Passenger transport services, Travel agencies and other reservation services, Cultural services, Sports and recreational services) and *Other consumption products* (NSI 2022). We divide the Total Consumption Products sum on the total number of visitors in the country in the respective year to get the average expenditure of one visitor in the country. Then we multiply the average expenditures of one visitor on the number of visitors in the NP in the same year. It can be done for a range of years or for a separate management section of the NP.

In the suggested method indicator for demand of RRES is Total tourism products consumption (expenditure in BGN) of all visitors in the Pirin National Park. The indicator for the supply of RRES is the budget (BGN) for maintenance of protected area ecosystems. The difference between these two values measures the real contribution of ecosystems to the economy and the value of the actual flow of RRES (Fig. 2).

The accounting of the contribution of the RRES to the beneficiaries is represented by the difference between demand and supply expressed by the following equation:

$$\text{Vy RRES} = (\text{ETS } y_{1...n} \times \text{NV } y_{1...n}) - \text{ERRES } y_{1...n} \qquad (1)$$

where:
Vy   – Value of the actual flow of RRES
ETS – Total tourism products consumption per a visitor of the NP (BGN)
NV – Number of NP visitors
$Y_{1...n}$ – year
ERRES – Expenditures for maintenance of the asset's ES (BGN)
The method was applied for valuation of the actual flow of RESS from Pirin NP for the period 2015 – 2019.

2.3. Data

All data from the Tourism Satellite Accounts are accessible from NSI site on yearly base. The data for the number of visitors in the country for each year were bought from NSI after special request. The data for the number of visitors in PNP for the period 2015-2019 were provided by the PNP Directorate. Unfortunately, there are no data available for the number of visitors in PS "Tri Reki", PS "Kamenitsa" and PS "Sinanitsa" for the years 2015, 2016 and 2017. In addition to this we have to keep in mind that these data are not precise due to the fact that there are only few entrance points in the
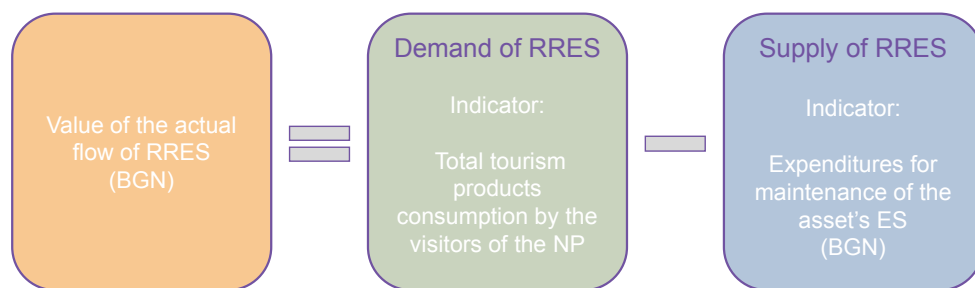
Figure 2. Tourist consumption products –based valuation method

PS which calculate the number of visitors, while they can approach the NP from many other ways. Data on the number of visitors to the park are collected and provided by the Directorates of National Parks on an annual and monthly basis, in total for the territory of the park and by park sections. The number of visitors includes visitors and non-visitors although in the terminology of tourism statistics, there is distinction between visitors (who travel outside of their usual environment) and non-visitors. Visitors can further be separated into those undertaking single day trips and those who stay overnight outside of their usual environment (NSI 2022). Since the data on the distribution of budget expenditure refer to the respective year, we use data for the total number of visitors in the same year without distinguishing between visitors and non-visitors or inboard and domestic tourists.

The data for the yearly budget of PNP are also available online from the Pirin NP website. The expenditures under the Budget Programme "Preserving, strengthening and restoring ecosystems, habitats, species and their genetic resources" include, in addition to the costs of maintaining the state of ecosystems and biodiversity, the pay for work of park staff, as well as the maintenance of the territory within the park. We also use data from the Pirin National Park Management Plan (MP 2004) and other publications and materials from our previous studies.

3. Results

3.1. Assets

In natural capital accounting ecosystems are assets that provide ecosystem services and can be measured using both physical and monetary units (Hein et al. 2016). The ecosystems in Pirin NP are source of different material, regulating and cultural ecosystem services. All of them play certain role for the quality of the provided final goods for tourism and recteation. Focusing on the recreation-related CES, we use results from an expert-based scoring of 12 cultural ecosystems services, according to the the Common International Classification of Ecosystem Services v 5.1. (CICES v 5.1), selected after prioritization in Nedkov et al. (2021a), Table 2.

The assessment result shows very high capacity of the mountain ecosystems in Bulgarian National Parks to generate flow of RRCES (Nikolova et al. 2021b). The expert-based assessment applied in the cited study use scale from 0 to 5 and the results show that 50% of the selected services exceed 4 scores, Fig. 3.

The recreational activities in the PAs correspond to their capacity to provide flow of various CES. The assessment of the recreational benefits provided by the PAs ecosystems was made according to the Classification of recreational activities proposed by Nedyalkov and Bekiyaryova (2000). An expert-based assesment was carried out using a rating scale from 0 to 5, where 0 indicates lack of conditions for practicing a given type of recreation, and 5 indicates the optimal conditions (Nikolova et al. 2021b). For the PAs of category National Parks it was found that the capacity of RRES ensure practice of all types of the main recreational activities to different extend, as it is shown on Fig 4.

Supply

The quality of the supply flow of RRESS depends very much on the ecosystems conditions, and this corresponds to theirs maintenance and protection. For the ESS accounting purposes we use as an indicator the expenditures of PNP under the Budget

Table 2. Selected cultural ecosystem services for recreation and tourism (after Nedkov et al. 2021a)

| Division	Code	Service
Cultural (biotic)	3.1.1.1	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment hrough active or immersive interactions
	3.1.1.2	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions
	3.1.2.1	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge, education and training
	3.1.2.2	Characteristics of living systems that enable education and training
	3.1.2.3	Characteristics of living systems that are resonant in terms of culture or heritage
	3.1.2.4	Characteristics of living systems that enable aesthetic experiences
	3.2.1.1	Elements of living systems that have symbolic meaning
	3.2.1.2	Elements of living systems that have sacred or religious meaning
	3.2.1.3	Elements of living systems used for entertainment or representation
Cultural (abiotic)	6.1.1.1	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions
	6.1.2.1	Natural, abiotic characteristics of nature that enable intellectual interactions
	6.2.1.1	Natural, abiotic characteristics of nature that enable spiritual, symbolic and other interactions
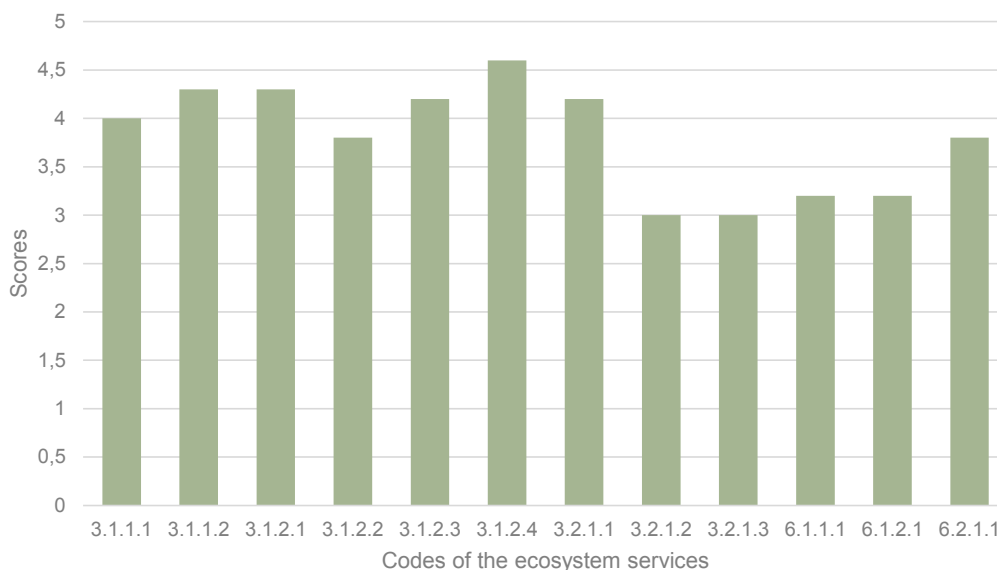
Figure 3. Capacity of the mountain ecosystems in Bulgarian National Parks to generate flow of RRCES. The codes of the ecosystem services are given in table 2. (after Nikolova et al. 2021)

Programme "Preserving, strengthening and restoring ecosystems, habitats, species and their genetic resources". They steadily increase from year 2015 to 2019 as it is shown on Fig 5.

Demand

The tourist products consumption represented on Fig. 6 shows that the inboard tourist products consumption is several times higher than the domestic tourist products consumption in the country during all five years from 2015 to 2019. The biggest amount of both, inboard and domestic consumption, is formed by the expenditures for food and beverage and accommodation services, followed by the expenditures for transport and cultural services. The smallest amount of the tourist products consumption is actually for sports and recreational services. The yearly distribution of the number of inboard and domestic visitors explain the smaller domestic tourist products consumption (Fig. 7).

This general distribution of the tourist products consumption in Bulgaria is probably valid to some extend also for the visitors of Pirin NP.

The visitor's distribution by park sectors is very different (Fig. 8). In PS "Vihren" are concentrated 84% of the average number of all visitors for the period 2015-2019, followed by PS "Bezbog" – 12%, PS "Sinanitsa" – 2%, and PS "Bayuvi Dupki" and "Kamenitsa" - per 1 %. The tourism consumption products by the visitors in Pirin NP represent the demand of RRES, fig. 9. Calculations were made
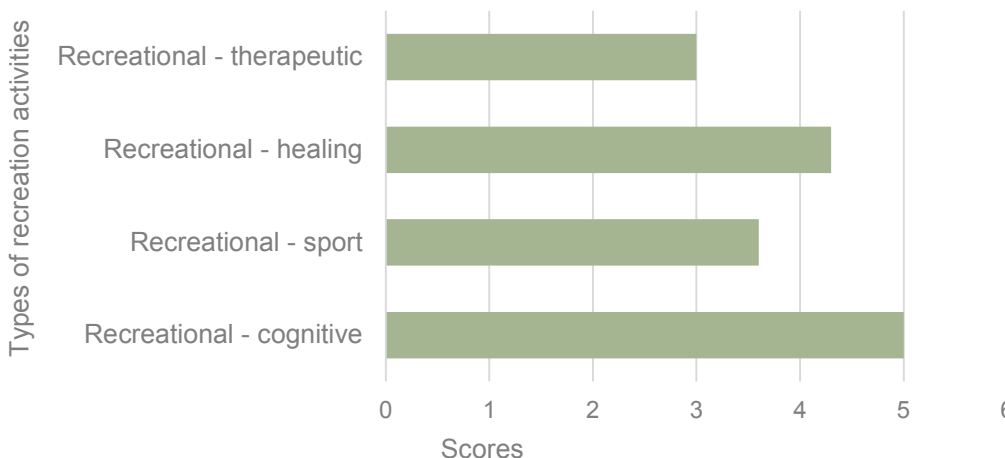

Figure 4. Assessment of the capacity of National Parks in Bulgaria to provide main types of recreation activities (after Nikolova et al. 2021)
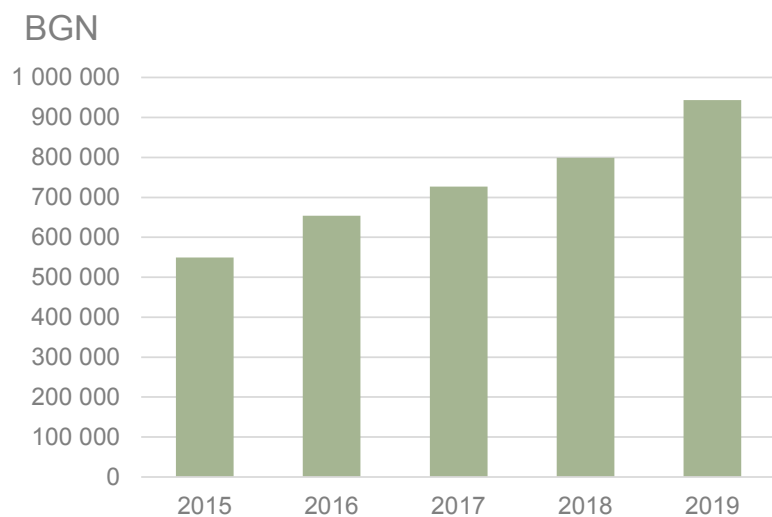
BGN

Figure 5. Expenditures from the budget of Pirin National Park for maintenance of the state of the ecosystems in the park in the period 2015-2019

BGN Million

- Accommodation services
- Food and beverage serving services
- Passenger transport services
- Travel agencies and other reservation services
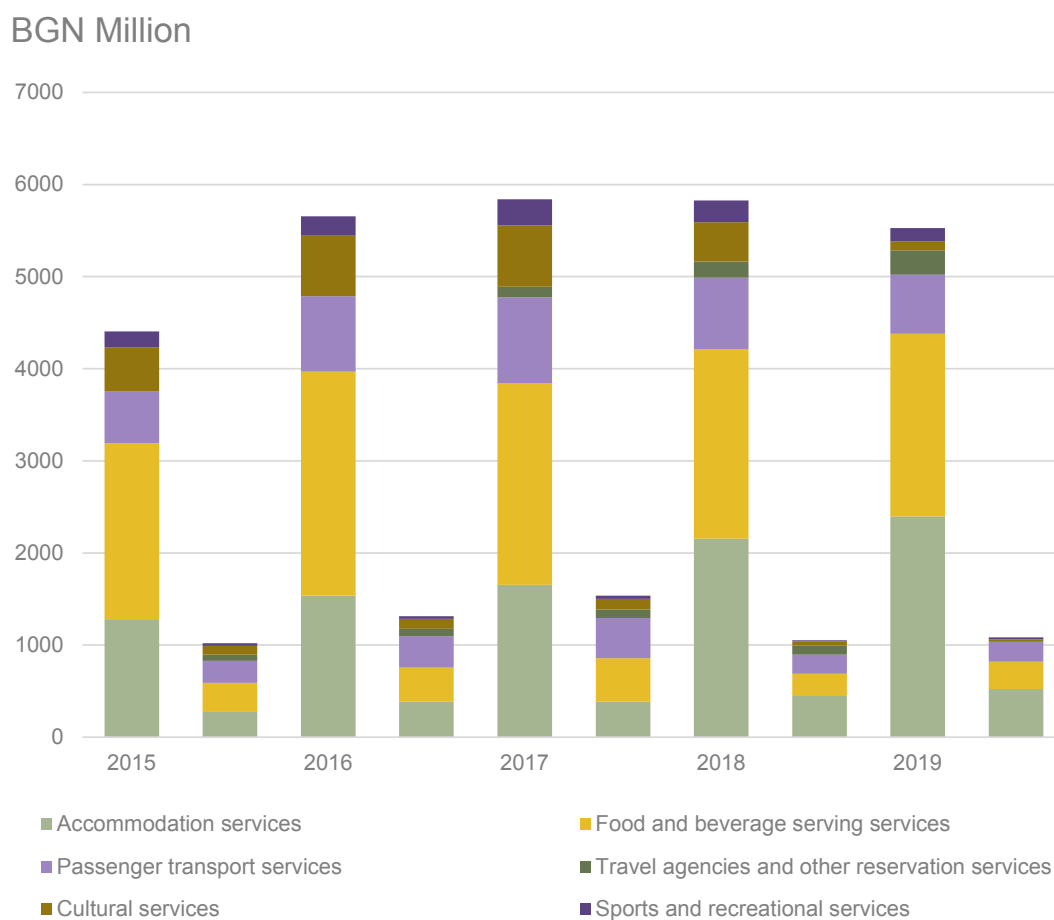- Cultural services
- Sports and recreational services

Figure 6. Inboard and domestic consumption by tourist products in Bulgaria (2015-2019) (NSI, 2022)
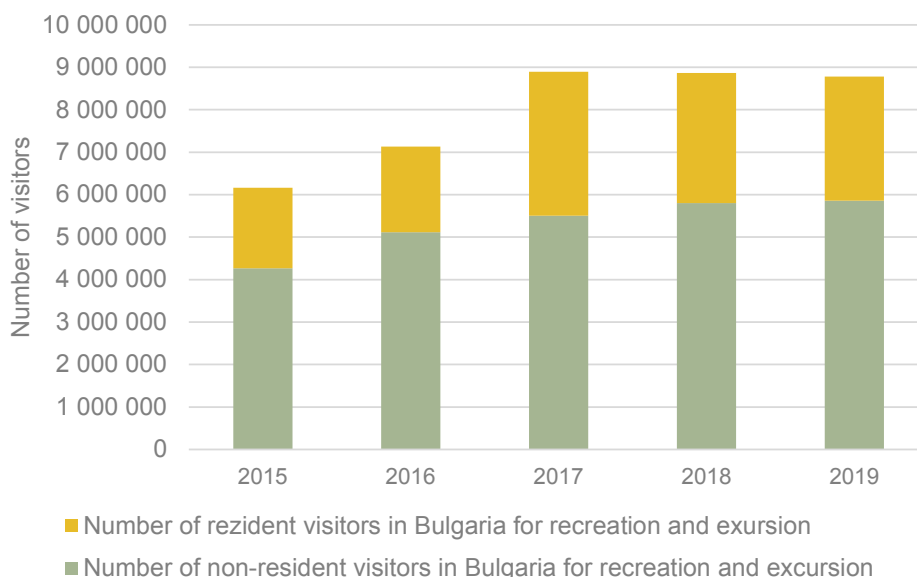
Figure 7. Number of resident and non-resident visitors in Bulgaria for recreation and excursion in 2015-2019 (NSI, 2022)

for each year and for the average consumption in five year period applying the equation (1).

Both, tourism consumption products and number of visitors show trend to decrease from 2015 to 2019, and the budget of the Pirin NP steadily increase over the years (Table 1).

Applying equation (1) we calculate the value of the actual flow of RRES for the period 2015-2019 (Table 3, Fig. 10). Change of the number of visitors and of the consumption of tourism products is well expressed from year to year due to different reasons. The average value of the provided by Pirin NP RRES vary from BGN 242, 24 Million in 2015 to BGN 108, 68 Million in 2018. The average value

of RRES flow for this five years' period is estimated on BGN 170 Million/year.

The calculations of the value of RRES actual flow from each park management sector was made for the investigated period on the base of the average number of visitors in each PS (except PS "Tri Reki"), the average tourism consumption by one visitor (BGN) and the Pirin NP average budget for one park sector. We assume that the NP budget is equally distributed between park sections because of luck of detailed information about its real distribution.

The bigger share of the value of RRCES actual flow is formed by two sectors of the park – PS "Vihren" and PS "Bezbog" which are
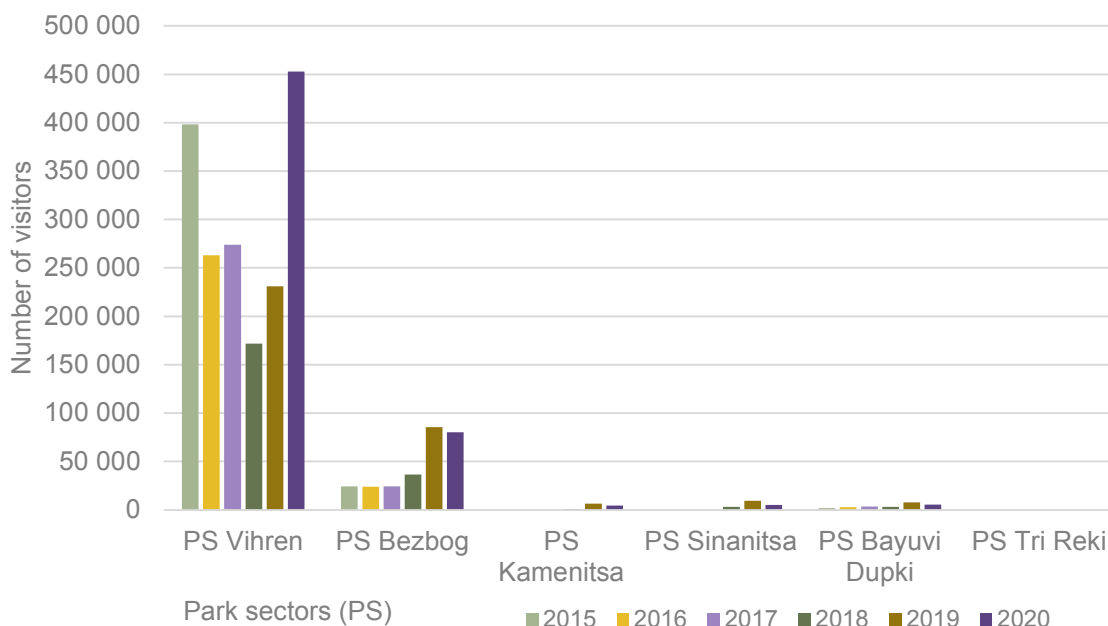

Figure 8. Number of visitors in Pirin NP by park sectors (2015-2019), (Data source: DPNP, 2022, no data for PS "Tri Reki")
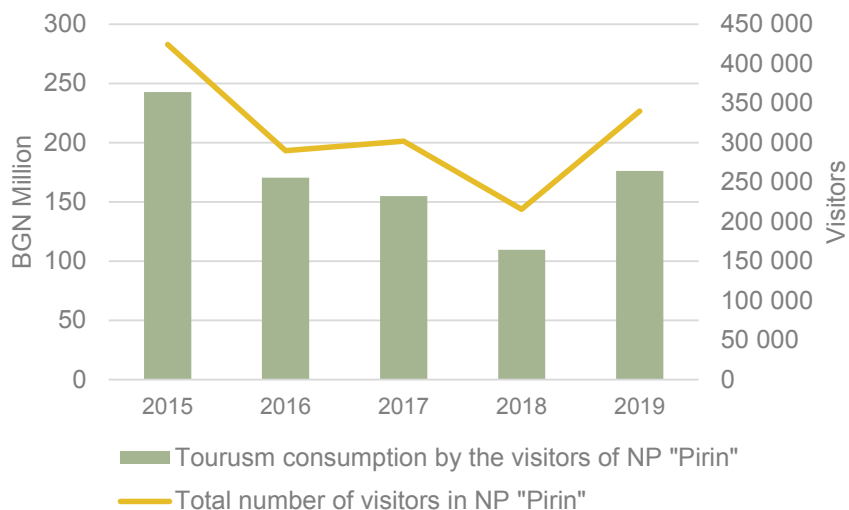
Figure 9. Tourism consumption products by the visitors of PNP (2015-2019)

Table 3. Valuation of RRCES provided by Pirin NP (2015-2019)

| Year	Internal tourism consumption by non-residents and residents – Total (BGN million)	Number of non-resident and resident visitors in Bulgaria	Total average tourism consumption by one visitor (BGN)	Total number of visitors in NP "Pirin"	Tourism consumption by the visitors of NP "Pirin" (BGN)	Budget of NP "Pirin" (BGN)	Value of RRES from NP "Pirin" (BGN Million)
2015	7436.46	12 997 021	572.17	424 337	242 791 416	549 381	242.24
2016	8759.55	14 895 478	588.07	289 728	170 379 689	653 723	169.73
2017	9624.56	18 765 325	512.89	301 941	154 862 720	727 178	154.14
2018	9593.79	18 897 391	507.68	215 646	109 478 734	799 077	108.68
2019	9583.44	18 499 701	518.03	340 162	176 214 854	943 236	175.27
Average	8999.56	168 109 83.2	539.77	314 363	170 745 482	743 519	170.01
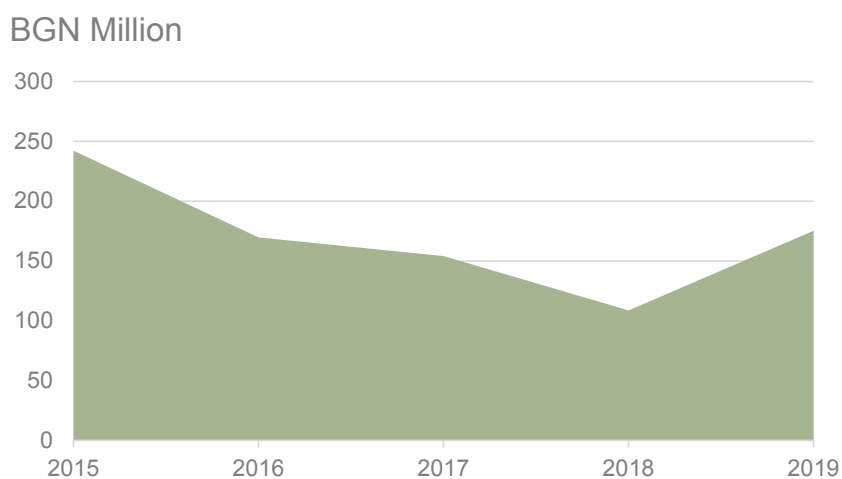
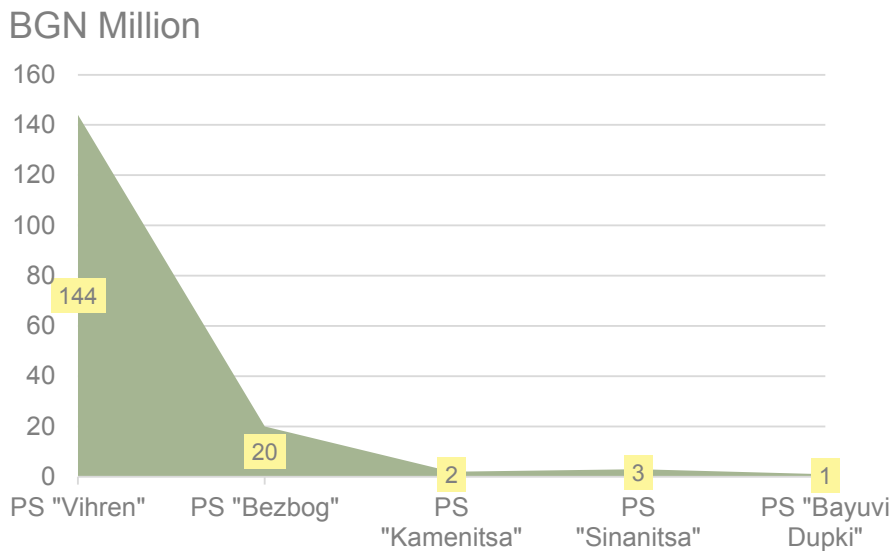**Figure 10.** Value of actual flow of RRES provided by Pirin NP

Figure 11. Average value of the flow of RRES provided by each PS in NP "Pirin" for the period 2015-2019

characterized by very well developed tourist services in all categories and attract 96% of the park visitors (Fig. 11).

5. Discussion

Areas providing tourist services and those providing RRES do not always overlap spatially. An essential part of the visitors of the National Park stay in the near resorts and other settlements outside the boundaries of the protected area, where they use the accommodation, places of dining, relax and entertainment. Georgieva (2022) found that tourists choose the destinations from the Rila-Pirin Tourist Region because of the preserved nature and beautiful landscape (75% of the respondents) and because of the opportunities to practice ecotourism there (41%).

Thus, a relatively small share of the cost of tourists, mainly in form of fees for entrance to the park, if any, for accommodation and feeding in the huts and for the use of lift facilities, come as direct payments for the use of the recreational benefits generated by the natural ecosystems in the park. The capacity of the accommodation base and the places of feeding inside the park boundaries is many times lower due to the restrictive regimes of use of these territories. For example, the territory of the PS "Bayuvi Dupki" almost overlaps with that of the Biosphere Reserve "Bayuvi Dupki– Dzindziritsa", in which the access of tourists is severely restricted, as well as a number of other activities. As a result, the RRES value for this PS is the lowest, in spite of the valuable ecosystems there. That is why the applied method is not very sensitive to the ecosystems conditions.

The number of visitors in Pirin NP can vary greatly in different years and seasons for different reasons. For example, during the COVID-19 pandemic in 2020, the number of visitors in PS "Vihren" increased by 51% compared to 2019, while in the other PS's there was a decrease of visitors in the same years. This is explained by the fact that the hotel base of the town of Bansko has significant capacity and large number of owners of holiday properties in the area, including foreigners, have preferred to use them during the lockdown, when in many economic sectors it was possible to work remotely. The impact of the well-developed tourist infrastructure on the growth of tourist flow should be taken into account when analyzing the data on the value of RRES from Pirin NP and it's park sections. Well-developed tourist infrastructure in the buffer zone of the park may be a prerequisite for greater tourist pressure in the adjacent park sector and respectively to influence the results for the actual demand of RRES. With the same quality of the RRES provided in different sectors of the park, the number of visitors in those with convenient accommodation, entertainment and transport infrastructure in the immediate vicinity increases much faster over time. This is very well expressed in the sustained growth of the number of visitors in PS "Vihren" and PS "Bezbog", which includes tourists who have visited the ski areas to the town of Bansko and Dobrinishte.

It should also be taken into account the indicative nature of visitor data, which are collected from only a few designated points for the territory of the entire park, and in some years for some PS's no such observations have been carried out at all (Sinanitsa and Kamenitsa for 2015, 2016 and 2017), which further reduces the accuracy of the results. The accuracy of the measured RRES value by the proposed method is not high enough and because the "Total average tourism consumption by one visitor" is retrieved from the Tourism Sattelite Accounts which are calculated on the national level. The problem with the accuracy of the valuation of CES exist in most accounting methods and it is due partly to the fact that the benefits from RRES have no monetary expression and cannot be subject to accounting on their own. Pelletier et al (2021) test eight SEEA-EA methods proposed for valuation of recreation-related services in the New South Wales National Parks Estates in Australia and conclude that "none of the existing methods is perfect". Prodanova and Varadzhakova (2022) also discuss the uncertainty of the expert-based ecosystem services assessment due to different reasons.

However, the results confirm reliability of the suggested method when we have to work with limited data and want to get reliable results in short time or lack of funding. It works with public data and is appropriate for comparative analyzes on the change of RRES value during the time and not only in frames of the country but also on the EU level. The method is appropriate especially for the valuation of RRES provided by the PA due to the fact that the greater share of the expenses for access to the RRES benefits is formed outside the park's boundaries, in the adjacent accommodation, dining and entertainment areas, as well as the expenses for transport.

The value of the actual flow of RRES from PNP used from the beneficiaries shows that it is significantly higher compared to the expenditures for maintenance of the natural ecosystems in the

PA. However, it is very unevenly distributed between the PS's. The higher RRES value in PS "Vihren" is a function of the concentration of significant number of visitors in this section and very well developed tourist services there. It could be expected that such an intense use of RRES may affect the esosystem condition. The availability of diverse and better developed tourist services near to the rest five park sections could spread the RRES demand more evenly in frames of the PNP.

6. Conclusions

The proposed method for the valuation of RRES in protected areas of category national park gives reliable results, based on a minimum of data that is public or easily accessible. The Tourism Satellite Accounts data are comparable in respect of the most difficult comparable data – those for the expenditures of the beneficiaries of the RRES. They are particularly relevant for the valuation of the RRES within the same country, where the mechanisms for financing the NP's and forming their budget are the same.

Tourist consumption products-based valuation method measures the actual contribution of ecosystems to human wellbeing, but the limitations associated with its application should also be taken into account. We believe that with more precise data for the number of visitors in the studied asset, the accuracy of the valuation of the RRES will be significantly increased.

The results of the valuation of RRES provided by Pirin NP show that the value of RRES vary from year to year and it is recommended to implement the suggested method looking for an average value for relatively short period of time of about 5 years. This would help to reduce the impact of some random events on the number of visitors and their consumption of tourist products. It is also better base for comparative analyses.

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