The National Parks in the Context of Tourist Function Development in Territorially Linked Municipalities in Poland

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Abstract: The article is divided into two parts. Its first part analyses the functions of environmental education and land sharing performed by national parks in Poland. The second part presents the transformations of both tourist and nature protection functions of 117 municipalities (gminas), territorially linked with 23 national parks in Poland. For this purpose, a statistical analysis was carried out, applying linear ordering methods—synthetic development measures (*SDM*) were used. Subsequently, a comparative analysis of municipalities in each of the defined areas was carried out, along with an assessment of the correlation between the level of the nature protection function and the tourist function development. The research covers the years 2001–2016. *SDM* of nature protection function and tourist function in the municipalities linked with national parks indicate stability of the nature protection function as well as dynamic changes in the tourist function. It allows rejecting the research hypothesis that national parks intend to block the tourist function of municipalities. The research findings indicate the need for cooperation between municipalities and national parks not only for the sake of nature protection, but also for the purpose of area economic activation.

Keywords: tourist function; municipalities; nature protection; national park

1. Introduction

The first national park, the Yellowstone National Park, was established in the United States in 1872 [1]. As [2] underline "from the very initial stages of the national park formation, park visitation and tourism have been central to the design of national parks. [...] Tourism is said to be one of the pioneering attempts for the conservation of biodiversity, because of two characteristics: one, it generates revenue which can be used for the maintenance and management of the protected areas [PAs] and, two, it creates employment opportunities for those who previously depended on the PA, which can reduce the dependency". It is important to note that national parks did not take into consideration biodiversity conservation or ecology until the 1930s at the very earliest; instead, the focus was on nature wonders and the wild landscape for tourism purposes—one can hardly call it a disadvantage, it should rather be emphasized that national parks have evolved to protect biodiversity in today's meaning of the word [3].

The concept of a national park is only one type of area protection, alongside (by the International Union for Conservation of Nature (IUCN) classification) strict nature reserve; wilderness area; national park; national monument; habitat/species management area; protected landscape or seascape; and managed resource. Most nations use multiple categories of protection, including different management objectives and where a variety of types of human use are permitted [4]. Out of these

six types of PAs, in five of them, tourism is either allowed systematically or has the potential to be developed in the rest of them (except for the strict nature reserve category). Tourism and recreation remain the primary objectives of national parks.

Nowadays, protected areas (PAs) play a huge role in the protection of global biodiversity and sustainable development, which was highlighted in the Report [5] "protected and conserved areas will be fundamental for achieving many of the Sustainable Development Goals (SDGs), and protected areas are used to track progress towards the achievement of SDG goals 14 (Life under water) and 15 (Life on land)". Next, the authors of the Report emphasize that in this context "strengthened communications of the benefits of protected areas across all sectors of society will help to demonstrate the economic and social values of PAs to existing and future generations (Aichi Biodiversity Target 1)".

In the context of modern priorities, which assign a special role to naturally valuable areas, it is important to conduct research allowing the assessment of correlations between the development of regions and local communities and the management of nature conservation forms. The existing research is focused on the impact of individual protected areas on the development of the correlated sites. The presented research, however, is one of the first attempts to respond to a more extensive problem concerning the relationship between the functioning of national parks and the possibility of developing a tourist function in the municipalities territorially linked with these parks. Thus, the study covered 23 national parks and 117 Polish municipalities.

The primary research purpose is to verify the following research hypothesis: "The establishment of a national park blocks the development of a tourist function in the municipalities (gminas) territorially linked with national parks".

In the context of the research problem formulated in this way, the tourist function is approached as a socio-economic activity aimed at serving tourists and performed by a location or an area in the system of the national economy [6]. The tourist function measures, recognized in the subject literature, are the following indicators: Baretje and Defert [7], Charvat [8], and density [9]. They characterize the scale of tourist traffic and the density of accommodation facilities in a given area (cf. [6,10,11]). Higher values of these indicators stand for a better developed tourist function in a region, which can, at the same time, indicate a stronger environmental pressure.

The research was based on statistical data collected from Statistics Poland. The time range of the research covers the years 2001–2016. The beginning of the research period is the year of establishing the youngest national park in Poland, i.e., the Warta Mouth National Park. The end of the research period is a derivative of the availability of statistical data. The applied statistical methods are described in detail in the section devoted to methodology.

2. Tourist Function vs. Environment Protection—Literature Review

In Poland, the total area of protected land amounts to 101.670 km^2 (32% terrestrial area of the country). The first national park was created in Poland in 1932. In 2016, 23 national parks were established in Poland. The entire protected area covers 3151 km^2 (1% of country) and remains territorially linked with 117 municipalities (gminas). The space covered by national parks (including the studied municipalities) remains highly diverse—within their borders, there are coastal, lake, lowland, highland, and mountainous areas. Despite the indicated differences, each national park is simultaneously valuable in terms of nature and tourism attractions (although to varying degrees), and remains a part of the local system of territorially linked municipalities. These municipalities give high priority to natural values; therefore, the role of local governments in developing local guidelines for space management is very important for the global nature protection goals [12]. In the case of these municipalities, the development of sustainable tourism is of particular importance [2,13].

It should be highlighted that the analyzed municipalities differ significantly in terms of their population wealth. Poverty does not act as an incentive for proecological attitudes [14–16]. As a result, the development of local economy allowing progress along with nature protection is not impossible;

however, it remains difficult [17] and requires taking into account many factors, including social and spatial aspects.

The functioning of all protected areas, including national parks, is determined by the Act of April 16, 2004 on Nature Conservation [18]. The aforementioned legal act not only indicates that national parks have the highest rank, but also specifies their tasks; i.e., protection activities in ecosystems, providing access to the area, and nature education. The priority was given to the protection of all nature and landscape values located within the boundaries of the referenced area. In this context, it is worth emphasizing that landscape remains the synthesis of both natural and cultural environment [19–23], whereas the other two tasks, i.e., land sharing and nature education, are directly related to human presence, and thus to anthropopressure.

The immanent feature of protected space management is striving to eliminate the existing conflict between the nature protection function and the tourist function as well as the resulting anthropopressure. The legislator has very clearly indicated that sharing park area can only be done in a manner that does not adversely affect nature (Nature Conservation Act). It is common knowledge that tourism is not indifferent to the environment—it requires tourist infrastructure (e.g., skiing lifts, tourist trails, or small architecture objects like rain shelters), whereas increased tourist traffic results in, e.g., air and surface water pollution, soil and biodiversity degradation, noise, and similar phenomena adverse to nature. Severe spatial conflicts in Polish reality concern; for example, the construction of infrastructure in mountain parks (Tatra and Karkonosze National Parks) where tourists can do downhill skiing. Due to the above reasons, tourism in national parks is allowed in the designated places only, respecting the provisions set out in the Nature Conservation Act and the regulations issued the director of an individual national park [24].

Despite the aforementioned limits, the development of protected areas, such as National Parks, is perceived as an important supply of recreation opportunities in many countries and a significant pull factor for the tourism industry [4], in particular for nature tourism. However, a problem appears of proper understanding of ecotourism or nature tourism. Additionally, ecotourism is an evolving model, just like the model of national park functioning. It is primarily important given that this model of tourism requires a lot of coordinated activities—the generic process model for ecotourism standards development and implementation has as many as eight stages involving various stakeholders [25]. The International Ecotourism Society highlights that conservation of natural and cultural heritage does not exist in separation from the local capacity and personal experiences [26]. The subject literature also points to the significance of public consultations, cooperation, and partnerships with local community [27].

Nowadays, tourism is one of the more important and rapidly developing sectors of economy [28–33]; therefore, the role of ecotourism on marginalized rural areas, presenting special natural values remains highly important (e.g., related to national parks) [34]. An important problem is that national parks are predominantly associated with the conservation type of nature protection. Municipalities (understood as local communities and local governments) are, therefore, concerned with the negative effects of excluding the area of national parks from the common principles of space management. It even refers to such developed economies as the German or Swiss economies [35], where concerns about limiting the possibilities for using space resulted in rejecting the national park project in Switzerland, Parc Adula, in a public vote in 2016 [36].

In the context of the debates covering national parks, the organizational and financial involvement of institutions managing national park areas that actively create adequate conditions for the development of tourism within the protected area is often ignored. In the case of Poland, national parks are the direct responsibility of the ministry for the environment, which appoints a park director. A national park, as a financially independent entity, covers all costs of the protected area's management, such as maintaining tourist infrastructure, ensuring tourists' safety (including charges for the mountain rescue service—Mountain Volunteer Search and Rescue Service and Tatra Volunteer Search and Rescue Service) and maintaining order (including the disposal of waste left by tourists). It is worth noting that

revenue from tourism does not always cover the costs of tourism sharing. In 2016, this phenomenon was recorded only in ten out of 23 Polish national parks [24]. For the local space users, it means the possibility of developing a tourist product based on the resources created and maintained without financial involvement (private or communal). Lifts and cable cars, functioning on a commercial basis, remain outside the management of national parks.

The activities which take place in national parks are not separated and independent from the territorially linked municipalities; therefore, the development of activities in protected areas is reflected not only in space, but also in the municipal budgets. In Polish legal reality, the revenue from local taxes and local fees (paid to the municipal budget) as well as the municipality's share in income tax paid by tour operators are of key importance. The correlations between protected areas and economic success have already been emphasized during the III World Congress on Protected Areas. At that event the following slogan was adopted: "National Parks and Protected Areas in support of Social and Economic Development" [37,38].

The consequences of tourism development in protected areas—also in the understanding of spatial and social conflicts—have been widely described in the subject literature. Researchers focus predominantly on the need to maintain balance in the tourism–environment relationship [39] along with the conscious management of nature conservation [40]. The problems arising from exceeding the area reception capacity [41,42] and the correlations between the quantifiable anthropopressure [43,44] and the area economic development level [45] are emphasized. The research results clearly show that environmental education is necessary to mitigate spatial conflicts occurring in protected areas, affecting not only tourists' behaviours and needs, but also the offer of tourism managers [46,47]. The trend towards identifying the protected areas with additional, rather than the main, destination for tourists is particularly noteworthy. Moving both accommodation and catering bases out of the protected space and organizing the "main stay" in the areas surrounding national parks ensures appropriate dynamics of the region's development along with limiting anthropopressure in the naturally valuable area [48].

The need for reconciling both protection and economic functions in the protected space (primarily the tourist function) is the factor determining planning works in protected areas. Often, they require additional considerations regarding the potential forms of land development [49,50]; even more so as the approach to ecosystem services has changed in recent years. In the spatial context, the observations made by Hummel and others are significant [51]—they proved that the approach to the role of the environment has changed through paying more attention to social aspects. At the same time, it is difficult to consider this approach as a new one. This issue had already been included in the idea of the first established national park—as Bishop points out—the Yellowstone National Park was created as a public park or pleasuring ground for the benefit and enjoyment of the people [52].

3. Methodology

Referring to the initially identified purpose, the following research objectives were adopted:

1. the characteristics of national parks' area sharing function and nature education function,
2. the characteristics of nature protection function transformations in the municipalities territorially linked with national parks,
3. the characteristics of tourist function transformations in the municipalities territorially linked with national parks,
4. the assessment of correlation between nature protection function and tourism development in municipalities.

The implementation of the research objective required a library query, the application of statistical tools, and the synthesis of results along with the presentation of conclusions and recommendations.

In the first part of the study, however, the encountered problem was the lack of a uniform calculation methodology used by the individuals involved in nature education in particular national parks. In order to maintain the comparability of data, the study was limited to analyzing the number of

visitors in museums and/or educational centres, published in the Environment Protection Yearbooks covering 2002–2016.

The statistical analysis carried out in the second part of the research, using linear ordering methods—synthetic development measures (*SDM*)—requires a detailed description. It allowed constructing rankings of the municipalities in terms of the development level of both analyzed functions, to be followed by a comparative analysis of municipalities in the studied areas and the assessment of correlation between the development level of nature protection function and tourist function.

SDM construction and application are described by Hellwig [53] and then other authors [54–61]. Synthetic development measures are primarily recommended as a tool used in comparing local and regional systems, e.g., in terms of economic, social, and environmental development—as indicated, among others, by Bal-Domańska [62] and Malina [63]. Therefore, they can be applied in analyzing both the tourist function and nature protection function.

The study assumes that the municipalities linked with national parks form one set made up of 117 objects. *SDM*s for both analyzed aspects were constructed, i.e., for the nature protection function (SDM_{prot}) and the tourist function (SDM_{tur}). Due to the fact that 12 municipalities did not present tourist facilities subject to official reporting, the set of objects for SDM_{tur} was narrowed down to 105 units.

Based on *SDM* value, the position of each municipality was determined in terms of the development level of the tourist function against the background of nature protection function.

The following research procedure was adopted:

1. defining variables (indicators) for each *SDM*,
2. carrying out the unitarization with zero minimum procedure for the entire period simultaneously (2001–2016),
3. *SDM* construction with a weight system in accordance with the method of (standardized) sums with a common development pattern for the years 2001–2016,
4. defining the ranking position of municipalities in each of the analyzed years for the particular *SDM* (SDM_{prot}, SDM_{tur}),
5. comparing the ranking positions of municipalities defined by each *SDM* (SDM_{prot}, SDM_{tur}),
6. comparing changes of the situation in a municipality over time based on SDM_{prot}, SDM_{tur},
7. calculating the sequence correlation coefficient between SDM_{prot} and the supplemented SDM_{tur} measure,
8. grouping of municipalities according to *SDM* value (SDM_{prot}, SDM_{tur}) using arithmetic mean and standard deviation.

The research procedure began with defining indicators characterizing each of the thematic areas. For the purposes of SDM_{prot} determining the following indicators were defined:

1. share of national parks' area in the area of a municipality (gmina) (NP share),
2. share of landscape parks' area in the area of a municipality (gmina) (LP share),
3. share of protected landscape areas in the area of a municipality (gmina) (Protl share).

The set of indicators, apart from the ones referring to the area of national parks, also includes others covering valuable natural areas, which allowed for the comprehensive presentation of protected areas in the analyzed municipalities. Resignation from other (not listed) area forms of nature protection results from the fact that they can occur within the limits of selected protected areas, thus doubling the protected space (e.g., a nature reserve can be designated within the boundaries of a landscape park).

All indicators were considered to be stimulants without a veto threshold; i.e., the municipalities with a high share of protected area were ranked the highest.

Due to the differences in restrictions referring to the areas covered by a specific type of nature protection form provided by the Act of 16 April 2004 on Nature Conservation [18], the following

weights were arbitrarily assigned to the indicators: NP share—weight 0.65; PL share—weight 0.25; ProtI—weight 0.10. Thus, it was assumed that the highest ranked situation occurs in national parks.

For SDM_{tur} the following variables were adopted:

1. Baretje and Defert index—assessment of tourism development level [7]

$$T_{DB} = \frac{number\ of\ beds\ in\ the\ area \times 100}{number\ of\ population\ in\ the\ area} \quad (1)$$

2. Tourist accommodation density indicator—assessment of tourist accommodation saturation [9]

$$W_{GBN} = \frac{number\ of\ beds}{1\ km^2\ of\ the\ area} \quad (2)$$

3. Charvat index—assessment of the intensity of tourist traffic [8]

$$T_{Ch} = \frac{number\ of\ night\ accommodations\ sold \times 100}{number\ of\ local\ population} \quad (3)$$

All indicators were considered as equivalent stimulants without a veto threshold, which means that the municipalities achieving high values of the above presented indicators were assessed as the highest ranked units, representing the most favourable situation (the highest level of tourism development).

The aforementioned indicators, both for a natural protection and tourist assessment, were calculated based on the data collected from the Statistics Poland (special acknowledgements to the Statistical Office in Rzeszów for sharing the data used in the research, covering the period 2015–2016) (Local Data Bank). It is worth noting that the data characterizing the level of tourist accommodation infrastructure covers establishments with a capacity of ten and more beds. This means that the study took into account the part of tourist traffic associated with the development of large tourist facilities to the greatest extent affecting both the development of tourism and the region as well as generating the greatest burden for the environment.

The unitarization of values of the characteristics adopted for the research was carried out according to the following formula:

$$Z_{jit} = \frac{X_{jit} - minX_{jit}}{maxX_{jit} - minX_{jit}} \quad (4)$$

where: x_{ijt}—value of the j-th variable ($j = 1, \dots, p$) for i-th object (municipality, gmina) ($i = 1, \dots, n$; n for SDM_{prot} = 117; n for SDM_{tur} = 105) in t-th year (t = 2001, 2002, $\dots$, 2016).

This allowed for obtaining values within the range [0,1]. For each *SDM*, all variables adopted for the study were stimulants and thus the need for unifying them (preference function) did not occur. *SDM* was calculated using the standardized sum method [53,55]. *SDM* value for the analyzed municipalities was calculated using the Formula (5):

$$SDM_{it} = \frac{1}{p} \sum_{j=1}^{p} z_{ijt} \quad (5)$$

where: *SDM*—value of synthetic measure in an object (municipality).

The *SDM* value for the pattern vector (covering the most favourable situation for all *p* variable) are {1,1,1}.

In order to supplement the classification of municipalities in accordance with *SDM* values (SDM_{prot}, SDM_{tur}) two parameters were used, i.e., arithmetic mean and standard deviation of the values of the aforementioned synthetic measures achieved by the municipalities in individual years. The following class ranges (groups) were identified:

1. class A (the highest activity level)

$$SDM > \overline{SDM} + S_{SDM}$$

2. class B (medium higher activity level)

$$\overline{SDM} + S_{SDM} > SDM \geq \overline{SDM}$$

3. class C (medium lower activity level)

$$\overline{SDM} > SDM \geq \overline{SDM} - S_{SDM}$$

4. class D (lower activity level)

$$SDM \leq \overline{SDM} - S_{SDM}$$

notes:

SDM—synthetic development measure value (SDM_{prot}, SDM_{tur}) for municipalities,
$\overline{SDM}$—arithmetic mean of the synthetic development measure value (SDM_{prot}, SDM_{tur}),
S_{SDM}—standard deviation of the synthetic development measure value (SDM_{prot}, SDM_{tur}).

In the final phase, the analyzed municipalities the correlation analyses were conducted based on the Pearson's (Spearman's rank) correlation coefficient. The strength of relationship between the level of tourist function and protection function performed by the municipalities was analyzed. Correlation analysis was performed for the *SDM* value of the tourist function and nature protection, as well as for the ranks. It allowed assessing both the correlation between the municipality position in the ranking for a given function (Spearman's rank correlation coefficient) and the correlation confirmation, taking into account the existing disproportions in the intensity of individual *SDM* values (Pearson's correlation coefficient). It should be noted that the Spearman correlation coefficient is a nonparametric measure equivalent to the Pearson linear correlation coefficient. The Spearman coefficient is used to calculate rank correlations (for order data). It is a good alternative to Pearson's coefficient when the distribution assumption of variables is not met.

The following formulas were used in the calculations for *t*-th year:

- Spearman's rank correlation coefficient [64]:

$$r_s = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2 - 1)} \tag{6}$$

where: d_i—determines differences between ranks (positions) of the corresponding individual SDM_{it} values;

- Parsons's correlation coefficient [65]:

$$r_{SDMturSDMprot} = \frac{\sum_{i=1}^{n} \left(SDMtur_i - \overline{SDMtur}\right)\left(SDMprot_i - \overline{SDMprot}\right)}{\sqrt{\sum_{i=1}^{n} \left(SDMtur_i - \overline{SDMtur}\right)^2 \sum_{i=1}^{n} \left(SDMprot_i - \overline{SDMprot}\right)^2}} \tag{7}$$

To assess the significance of the analyzed correlations, the test for correlation coefficient significance with null hypothesis $r_{SDMturSDMprot} = 0$ (correlation coefficient is not statistically significant) was used. The statistics test with $n - 2$ degree of freedom was as follows:

$$z = \frac{r_{SDMturSDMprot}\sqrt{n-2}}{\sqrt{1 - r_{SDMturSDMprot}^2}} \tag{8}$$

The following scale was used to assess the strength of dependencies between variables [66]: <0.00–0.3>—weak dependence, <0.31–0.6>—moderate dependence, <0.61–1.0>—strong dependence.

4. The Function of Land Sharing and the Function of Nature Education in National Parks

Due to the priority given by the legislator to the nature protection function, the other activities carried out in national parks have to be subordinated to it. This obviously limits the possibilities of using the given park space. It is, however, debatable whether the above adversely affects the development of a tourist function as part of an economic function of the territorially linked municipalities. It should be borne in mind that national parks represent not only a certain area, but also an independent entity equipped with financial resources, earning revenue, managing space, real estate, and infrastructure related to tourist traffic [67]. Moreover, what is important for the development of the territorially linked municipalities, national parks—despite the fact that obtaining profit is not their goal—do compete for tourists [68].

In 2001–2016, 179 million people visited national parks, of which 14 million benefited from the offer provided by educational sites. The comparison of data from the beginning and the end of the research period indicates a growing interest in both education and tourism in national parks (Figures 1 and 2). The number of visitors also shows that the offer of national parks is noticeable on the market of tourist services.
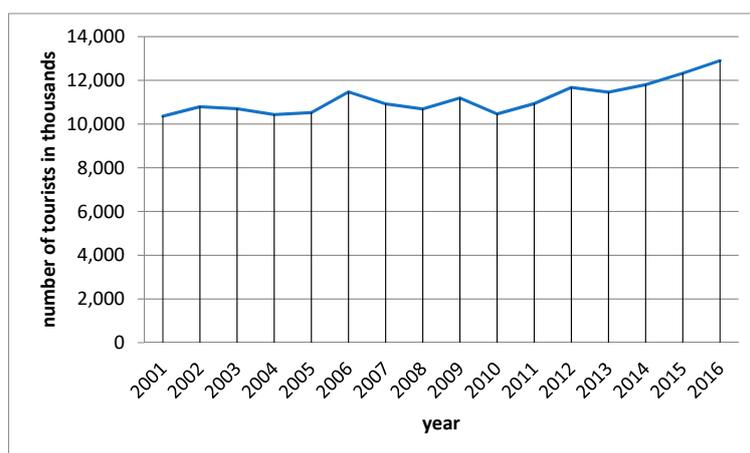
Figure 1. Tourism in national parks in the years 2001–2016; Source: author's compilation based on the Statistics Poland data—Environment Protection Yearbooks 2002–2017.
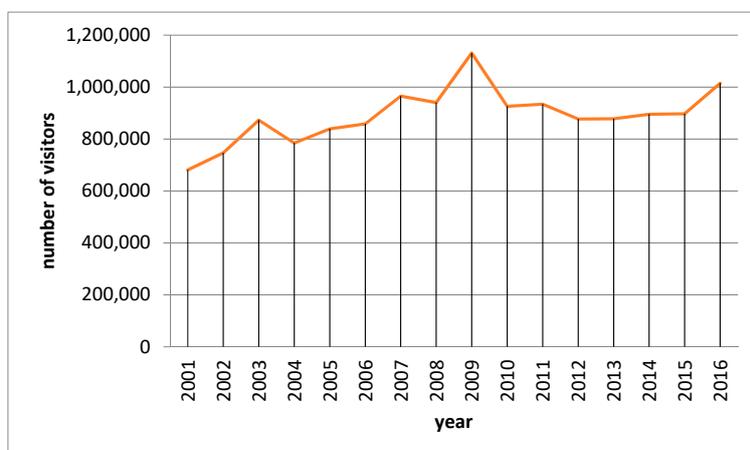
Figure 2. Number of visitors to educational sites in national parks in the years 2001–2016; Source: author's compilation based on Statistics Poland data—Environment Protection Yearbooks 2002–2017 and consultations with National Parks.

Data analysis shows significant differences in the popularity of individual parks (Table 1). Due to the fact that the number of visitors to educational sites and the number of tourists represent positive characteristics, in both cases, the highest position was taken by the unit achieving the highest values of the analyzed characteristics. The undisputed leader in terms of education was Pieniny NP (5.9 million visitors). The next ranking position was taken by the leader in the number of tourists, i.e., Tatra NP (1.3 million visitors), whereas Białowieża NP was ranked the third (1.2 million visitors). As it has already been mentioned, the leader in terms of the number of tourists was Tatra NP (42.3 million visitors). The next position was taken by Karkonosze NP (29.5 million visitors) and the third place by Wolin NP (24.3 million visitors). These three national parks formed the dominant group—the number of their visitors amounted to 54% of tourists in national parks (see Table 1).

Table 1. Education and visitors in national parks in the years 2001–2016.

National Park	Visitors		Environmental Education	
	Tourists in Thousands	Position	Visitors to Educational Sites in Thousands	Position
Babiogóra	1131	15	171	15
Białowierza	2471	12	1205	3
Biebrza	555	19	169	16
Bieszczady	5350	8	430	9
Tuchola Forest	694	18	0	23
Drawno	325	22	1	22
Gorce	980	16	96	19
Stołowe Mountains	5326	9	153	18
Kampinos	15,400	5	464	7
Karkonosze	29,500	2	356	12
Magura	768	17	205	13
Narew	156	23	93	20
Ojców	6328	7	391	10
Pieniny	11,789	6	5896	1
Polesie	351	21	190	14
Roztocze	1766	13	455	8
Słowiński	4618	10	482	6
Świętokrzyski	3171	11	956	4
Tatra	42,304	1	1290	2
Warty Mouth	443	20	85	21
Wielkopolska	19,200	4	167	17
Wigry	1730	14	381	11
Wolin	24,300	3	607	5

Source: author's compilation based on Statistics Poland data—Environment Protection Yearbooks 2002–2017.

Nature education constitutes the component of sharing protected areas. The space of national parks is small compared to the country area but, nevertheless, large enough for the national park rangers to be incapable of monitoring the behaviour of each tourist in order to anticipate and respond to every negative intention. An individual modifier of human behaviour is respective knowledge and habits. Therefore, nature education is inextricably linked to the tourist function of protected areas and preserving their attractiveness for future generations. The significance of educational processes in the discussed area is emphasized, among others, by Borys [69,70].

Summing up the research on the popularity of the offer provided by national parks, it should be clearly stressed that the visitors using their offer were not only present within the protected area, but also in the space of the territorially linked municipalities. It seems difficult to consider such visits as irrelevant for the tourist function activation in municipalities.

5. The Level and Transformations of both Nature Protection Function and Tourist Function in the Municipalities Territorially Linked with National Parks

Nature protection and tourist function are perceived differently by a municipality and a national park—this results from the statutory tasks assigned to these entities. However, it is worth paying attention to the nuances resulting from the evaluation of both functions based on adopting two prisms: the subject prism and the spatial prism.

In terms of the subject prism, both a municipality and a national park perform economic functions (among which the tourist function is also listed) and remain the participants of local development processes. At the same time, the tourist function can be carried out by a municipality, whereas in the case of a national park, it remains a derivative of obligatory access provision to the area and nature education. From this perspective, the priority of nature protection is obligatory for a national park only. In turn, the spatial approach allows separating the territory from the municipal area within which the described priority applies—it is identical to national park borders.

The objective of providing comprehensive characteristics of both nature protection function and tourist function realisation in the municipalities territorially linked with national parks resulted in the construction of synthetic development measures (Figure 3).
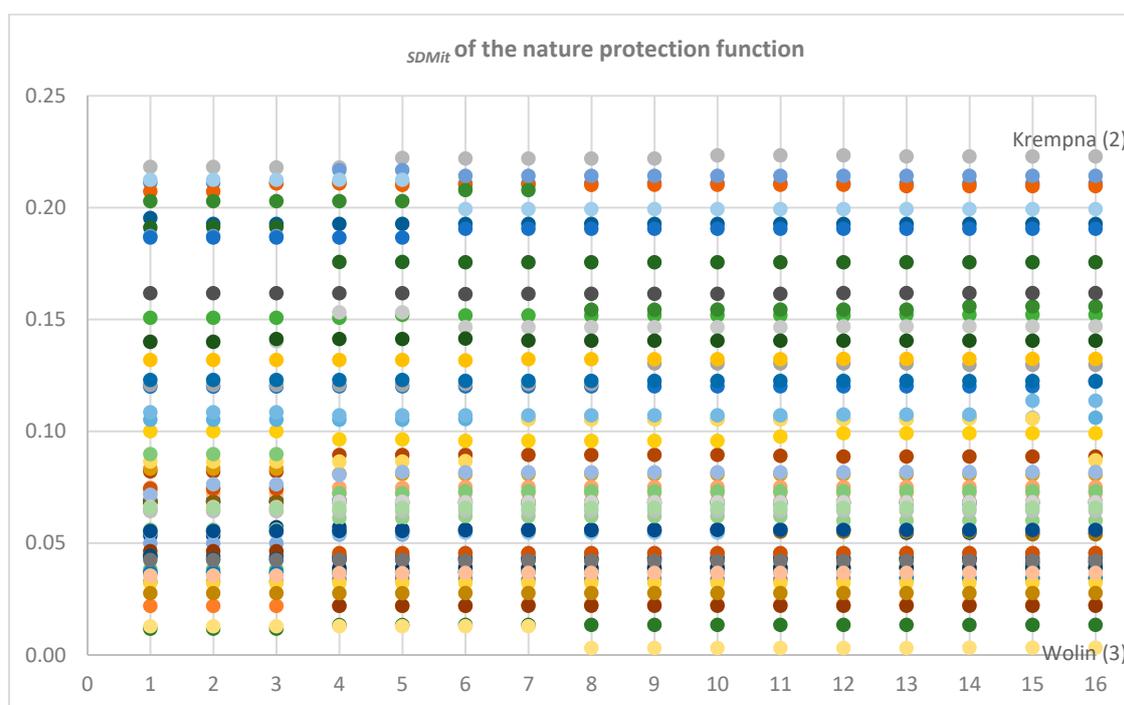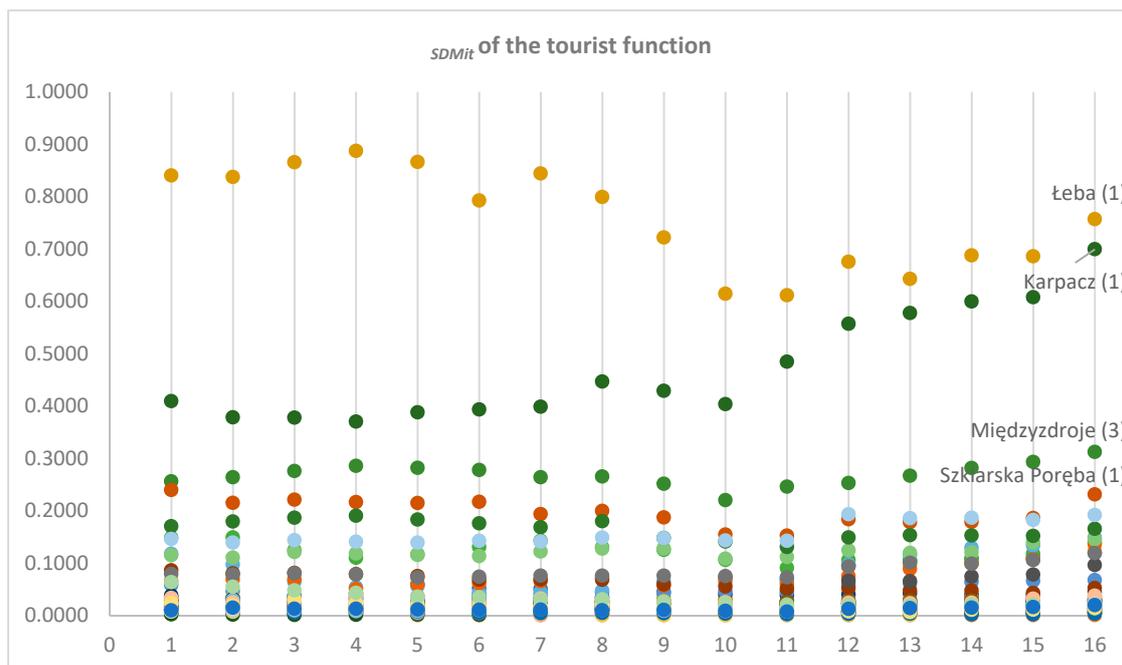

Figure 3. *Cont.*

Figure 3. SDM_{it} of the nature protection function and SDM_{it} of the tourist function for the municipalities territorially linked with national parks—data for the years 2001–2016, where: (1) urban municipality, (2) rural municipality, (3) urban-rural municipality. Source: author's compilation based on the Statistics Poland data.

5.1. The Characteristics of SDM Values' Diversification

The analyses of *SDM* values started from their distribution within four groups, performed using the arithmetic mean and standard deviation. The obtained results suggest strong diversification, primarily in the case of the tourist function.

The grouping of 117 municipalities territorially linked with national parks by SDM_{prot} value shows that the majority of municipalities (above 51%) were characterised by a medium lower level of nature protection function, i.e., class C (see Table 2). It means that at the background of other municipalities, the share of protected area including national parks in these municipalities is rather small. About 20 municipalities (16–18%) were evaluated as presenting the highest activity (class A) in the area in terms of nature protection function.

Table 2. Classification of 117 municipalities based on SDM_{prot} value in the years 2001–2016.

Specification	Number of Municipalities	
	2001	**2016**
Class A—the highest activity level of protection function	19	21
Class B—medium higher activity level of protection function	23	23
Class C—medium lower activity level of protection function	61	60
Class D—lower activity level of protection function	14	13

Source: author's compilation.

The grouping of 55 municipalities active in tourism by the SDM_{tur} value shows that the vast majority of municipalities (above 75%) were characterized by a medium/lower level of tourist function, i.e., class C (Table 3), and only 7% (4 municipalities) by the highest activity level. At the same time, the number of municipalities inactive in tourism reached the level of 62 (for more information about inactive municipalities see part *Tourist function transformations . . .*).

Table 3. The classification of 55 active municipalities in terms of tourism using SDM_{tur} value in the years 2001–2016.

Specification	Number of Municipalities	
	2001	2016
Class A—the highest activity level of tourism function	4	4
Class B—medium higher activity level of tourism function	9	10
Class C—medium lower activity level of tourism function	42	41
Class D—lower activity level of tourism function	0	0

Source: author's compilation.

It should be indicated that in the course of the entire period covered by the study (2001–2016), the standard deviation calculated for the SDM_{tur} value in a given year was always higher than the arithmetic mean, which attracts attention to the significantly higher level of tourist function among the leaders, i.e., municipalities such as eba, Karpacz, Międzyzdroje and Szklarska Poręba.

5.2. Nature Protection Function Transformations in the Municipalities Territorially Linked with National Parks

In the analyzed period, the top ten ranking positions, based on the value of the discussed synthetic measure nature protection function (SDM_{prot}), were occupied by the municipalities territorially linked with the following national parks (the years in which municipalities were ranked among the top ten are presented in brackets, unless they were listed as the top ten in the entire analyzed period, i.e., 2001–2016.):

- Biebrza—Goniądz Municipality,
- Bieszczady—Lutowiska Municipality,
- Kampinos—Izabelin Municipality,
- Leoncin Municipality,
- Leszno Municipality (in the years 2008–2015),
- Karkonosze—Karpacz Municipality (in the years 2001–2003),
- Magura—Krempna Municipality,
- Roztocze—Zwierzyniec Municipality,
- Słowiński—Smołdzino Municipality (in the years 2004–2016),
- Tatra—Zakopane Municipality,
- Kościelisko Municipality,
- Wolin—Międzyzdroje Municipality (in the years 2001–2007).

The analysis indicates the stability of leaders and their territorial dispersion. It is worth highlighting that in spite of the typical connection of the naturally valuable areas with the nonurbanized ones, two urban municipalities were listed among the top ones in terms of the most developed nature protection function, i.e., Zakopane Municipality (continuously among the top ten throughout the studied period) and Karpacz Municipality (in 2001–2003 in the top ten, in 2004–2016 among the second ten).

The comparison of ranking positions from the beginning and the end of the studied period allows concluding that 34 analyzed municipalities recorded a decline, 56 an increase, and 27 maintained their positions. The change in SDM_{prot} value was largely resulting from the changes in the area of protected landscapes (14 cases), national parks (9 cases), and landscape parks (4 cases). Thus, the changes occurring in the forms of lower rank nature protection prevailed.

The majority of municipalities presented slight changes of their ranking positions. Only 10% of municipalities changed their position by a two-digit value. Higher positions were recorded for the following municipalities (position increase/decline is presented in brackets): Radziłów (11

places), Sękowa (11), Nowy Targ (13), Dobiegniew (14), Górno (14), Bieliny (25), Lipnica Wielka (35). A decline was reported for the following municipalities: Międzyzdroje (by 10 places), Podgórzyn (30), Kowary (30), Szklarska Poręba (39), Piechowice (41). Changes in the position of municipalities were mainly related to either increase or decrease in the protected landscape area. Only in one of the above-mentioned municipalities (Radziłów), did the national park area increase at the same time (by 14%), and in two municipalities the national park area decreased (Międzyzdroje by 25%; Sękowa by 10%).

The absolute growth of SDM_{prot} value, calculated as the difference in SDM_{prot} value in 2016 (analyzed year) and in 2001 (base year) confirms the observed stability of nature protection function level in the majority of the analyzed municipalities. Only 26 units (i.e., 22% of the analyzed set) recorded the change in SDM_{prot} value exceeding 10% of the measure value in the base year. Among them, the measure value increase was reported in 14 municipalities territorially linked with the following national parks:

- Babia Góra: Jabłonka Municipality, Lipnica Wielka Municipality,
- Biebrza: Radziłów Municipality, Nowy Dwór Municipality,
- Bieszczady: Ustrzyki Dolne Municipality,
- Drawno: Dobiegniew Municipality,
- Gorce: Nowy Targ Municipality,
- Magura: Sękowa Municipality,
- Pieniny: Czorsztyn Municipality,
- Słowiński: Smołdzino Municipality, Główczyce Municipality,
- Słowiński: Ustka Municipality,
- Świętokrzyski: Górno Municipality, Bieliny Municipality.

A decline in the measure value was observed in 12 units territorially linked with the following national parks:

- Biebrza: Jedwabne Municipality, Wizna Municipality,
- Karkonosze: Karpacz Municipality, Jelenia Góra Municipality, Kowary Municipality, Szklarska Poręba Municipality, Podgórzyn Municipality, Piechowice Municipality,
- Ojców: Skała Municipality,
- Pieniny: Szczawnica Municipality
- Wolin: Międzyzdroje Municipality, Wolin Municipality.

The largest change of the analyzed measure (decline by 75%) was recorded in Wolin Municipality, which was an effect of smaller Wolin NP area in this municipality in 2008. A noteworthy change was recorded in Lipnica Wielka Municipality (Babia Góra NP)—due to the increase in the protected landscape areas, the absolute growth of SDM_{prot} value in case of this municipality amounted to 70% of the value of the base year. The decline in the measure value for all municipalities territorially linked with the Karkonosze NP is quite characteristic—it resulted from a decline in the protected landscape areas. It should also be emphasized that none of the analyzed 117 municipalities ceased to carry out the nature protection function.

The observations made for the period 2001–2016 show that the nature protection function reached the highest level in Izabelin Municipality (Kampinos NP) and the lowest in Zamość Municipality (Roztocze NP). It is significant that SDM_{prot} values in the studied municipalities were highly diversified. Zamość Municipality, ranked last, has never obtained even 1% of the values achieved by the leader.

5.3. Tourist Function Transformations in the Municipalities Territorially Linked with National Parks

In the analyzed period, the top ten ranking positions, based on the value of the discussed synthetic measure of the tourist function (SDM_{tour}), were occupied by the municipalities territorially linked

with the following national parks (the years in which municipalities were ranked among the top ten are presented in brackets, unless they were listed as the top ten in the entire analyzed period i.e., 2001–2016):

- Białowieża—Białowieża Municipality (2010–2011; 2013–2014),
- Bieszczady—Cisna Municipality, Lutowiska Municipality (2008; 2016),
- Stołowe Mountains—Kudowa Zdrój Municipality (2001–2002, 2009, 2012–2016),
- Karkonosze—Karpacz Municipality, Podgórzyn Municipality (2001–2007), Szklarska Poręba Municipality,
- Pieniny—Szczawnica Municipality,
- Słowiński—eba Municipality, Ustka Municipality,
- Tatra—Bukowina Tatrzańska Municipality (2012; 2015), Zakopane Municipality,
- Wolin—Międzyzdroje Municipality, Świnoujście Municipality (2003–2011).

The stability of the first three leaders should be emphasized—throughout the entire studied period the order remained unchanged: eba, Karpacz, Międzyzdroje. Territorial distribution of the municipalities with the highest level of tourist function realisation indicates the popularity of national parks located in coastal and mountainous areas.

The comparison of ranking positions from the beginning and the end of the studied period showed that 54 analyzed municipalities recorded a decline, 41 an increase, and 9 maintained their positions. The absolute growth of SDM_{tur} value, calculated as the difference in SDM_{tur} value in 2016 (analyzed year) and 2001 (base year) indicates that in the set of 105 municipalities, 54 recorded an increase in the analyzed measure, whereas 51 recorded a decline in this respect. It should be emphasized that the largest absolute growth in the value of the analyzed measure was recorded in one of the three leaders—Karpacz Municipality (Karkonosze NP). It is also interesting to observe that the leader, i.e., eba Municipality (Słowiński NP), recorded the largest absolute decline in SDM_{tur} value; however, it did not lose its occupied position. The aforementioned findings indicate that the distance between eba and other municipalities remains significant; however, it should be anticipated that it is going to lose its leading ranking position in favour of Karpacz.

The analysis of SDM_{tur} values shows extensive diversification in the level of tourist function realization in the studied municipalities—the measured value in the first studied year is in the range [0–0.8931]. In the last year studied, the range spread dropped to [0–0.7641]. The municipalities of eba and Karpacz are the dominating ones. In the final year of the study, Karpacz Municipality reached 91% of the measure value respective for eba, whereas Międzyzdroje Municipality, ranked third, achieved less than half of the leader's value (40%). It should be highlighted that Lutowiska Municipality, closing the top ten in the ranking, achieved only 16% of the value of eba.

Adopting relative values for assessment purposes (base year 2001, analyzed year 2016) highlights the impressive change in SDM_{tur} value which was repeatedly related to the municipalities carrying out the tourist function in an insignificant manner. It results in identifying two sets of municipalities, i.e., active and inactive municipalities in terms of tourism, and then focusing analyses on the municipalities included in the first set. The division was made based on the principles for interpreting the Baretje and Defert index in the M. Boyer scale [71]. Therefore, the inactive tourist municipalities were considered the ones for which the value of the above-mentioned indicator has never reached the level of 4 or more units in the period under consideration.

In the examined set of 105 municipalities, as many as 50 municipalities did not meet the above criterion. As it has already been mentioned in the methodology section, in case of 12 municipalities no tourist facilities subject to official reporting were demonstrated. As a result, these municipalities were not presented in Table 3 and they were considered inactive in terms of tourism. For clarity, Table 4 presents inactive municipalities in terms of tourism.

Table 4. Inactive municipalities in terms of tourism in the years 2001–2016.

National Park	Name of the Municipality
Babia Góra	Jabłonka (2), Lipnica Wielka (2),
Biebrza	Bargłów Kościelny (2), Sztabin (2), Grajewo (2), Jedwabne (3), Wizna (2), Jaświły (2), Trzcianne (2), Dąbrowa Białostocka (3), Suchowola (3), *Lipsk (3)*, *Radziłów (2)*, *Nowy Dwór (2)*,
Tuchola Forest	Brusy (3),
Drawno	Człopa (3), Dobiegniew (3), Krzyż Wielkopolski (3),
Gorce	Kamienica (2), Nowy Targ (2),
Kampinos	Czosnów (2), *Leoncin (2)*, Brochów (2), Kampinos (2), Leszno (2), omianki (3), Stare Babice (2), *Izabelin (2)*,
Karkonosze	Jelenia Góra (1),
Magura	Dębowiec (2), Nowy Żmigród (2), Dukla (3), *Lipinki (2)*, *Osiek Jasielski (2)*, Sękowa (2),
Narew	Choroszcz (3), apy (3), Turośń Kościelna (2), Tykocin (3), *Kobylin Borzymy (2)*, Sokoły (2),
Ojców	Jerzmanowice-Przeginia (2), Skała (3), Sułoszowa (2),
Polesie	Stary Brus (2), *Wierzbica (2)*, *Hańsk (2)*,
Roztocze	Józefów (3), Zamość (2), *Adamów (2)*,
Słowiński	Główczyce (2),
Świętokrzyski	Bieliny (2), Górno (2), ączna (2),
Warty Mouth	Kostrzyn nad Odrą (1), Witnica (3), Górzyca (2),
Wielkopolska	Komorniki (2), Mosina (3), Puszczykowo (1), *Dopiewo (2)*,
Wigry	Krasnopol (2),

Notes: (1) urban municipality, (2) rural municipality, (3) urban-rural municipality, the names of municipalities in which tourist facilities subject to official reporting were not demonstrated in the period 2001–2016 are presented in bold-italics. Source: author's compilation.

Among the 62 inactive municipalities in terms of tourism, the ones linked with Biebrza NP stand out (12 out of 14 municipalities linked with Biebrza NP). In the above group, a large representation of municipalities linked with Wielkopolska NP and Kampinos NP is interesting, as with the Parks adjacent to the metropolis of Poznań and Warsaw. It should be observed that the areas of both Parks are dominated by one-day tourism, indistinguishable from the classic measures of tourist function. The relative growth of SDM_{tur} value (base year 2001, analyzed year 2016) in the municipalities active in terms of tourism indicates that only six out of 55 units recorded differences in the level of SDM_{prot} not exceeding 10% of the measure value for the base year. The following municipalities were listed in this group: Rajgród (Biebrza NP), Ustka and Wicko (Słowiński NP), Kościelisko (Tatra NP), Kudowa Zdrój (Stołowe Mountains NP), Międzyzdroje (Wolin NP). This shows dynamic changes in the development of the discussed function. It should be emphasized that the differences above 50% of the measure value for 2001 were recorded by as many as 23 municipalities. The increase exceeding the indicated level occurred in the following municipalities: Radków (53%), Karpacz (54%), Lutowiska (70%), Zwierzyniec (73%), Nowa Słupia (76%), apsze Niżne (132%), Wielka Wieś (137%), Czorsztyn (149%), Białowieża (207%), Słońsk (210%), Bukowina Tatrzańska (294%), Goniądz (344%), Poronin (633%), Nowinka (878%). The indicated decline referred to the following municipalities: Suraż (51%), Wolin (54%), Krościenko nad Dunajcem (59%), Tuczno (63%), Ludwin (63%), Zawoja (70%), Krempna (72%), Urszulin (75%), and Bierzwnik (total absence of the analyzed function). The majority of upward over downward trends should be assessed positively—the above-mentioned increase was recorded in 14 municipalities, whereas a decrease was only recorded in nine. Territorial dispersion of the indicated municipalities makes it impossible to establish the regularities related to their location.

6. The Relationship between Nature Protection Function and Tourist Function in the Municipalities Territorially Linked with National Parks

The comparison of the top ten ranking positions in the entire period 2001–2016 based on the synthetic development measure values of the nature protection function SDM_{prot} and the synthetic development measure values of the tourist function SDM_{tur} shows that four leading municipalities in terms of nature protection were simultaneously the leading ones in terms of the tourist function. Seven leaders in nature protection were not included in the set of dominating municipalities regarding the level of tourist function realization. Ten municipalities dominating in terms of the tourist function have never been ranked as leaders regarding the level of nature protection (Table 5).

Table 5. The leaders of SDM_{prot} and SDM_{tur} rankings in the years 2001–2016 (positions from 1 to 10).

National Park	SDM_{prot} **Ranking (*)**	SDM_{tur} **Ranking (*)**
Białowieża	x	Białowieża (2010–2011; 2013–2014)
Biebrza	Goniądz	x
Bieszczady	**Lutowiska**	Cisna **Lutowiska** (2008; 2016)
Stołowe Mountains	x	Kudowa Zdrój (2001–2002; 2009; 2012–2016)
Kampinos	Izabelin, Leoncin, Leszno (2008–2015)	x
Karkonosze	**Karpacz** (2001–2003)	Szklarska Poręba Podgórzyn (2001–2007) **Karpacz**
Magura	Krempna	x
Pieniny	x	Szczawnica
Roztocze	Zwierzyniec	x
Słowiński	Smołdzino (2004–2016)	eba Ustka
Tatra	**Zakopane** **Kościelisko**	**Zakopane** Bukowina Tatrzańska (2012; 2015)
Wolin	**Międzyzdroje** (2001–2007)	Świnoujście (2003–2011) **Międzyzdroje**

Notes: * the years in which a municipality was included in the group of ten leaders are presented in brackets, the absence of indicated years means the period 2001–2016 (bold when the same municipality is in the both rankings). Source: author's compilation.

Izabelin Municipality (Kampinos NP), which throughout the entire research period (2001–2016) was ranked as first regarding nature protection and simultaneously had never played the tourist function in that period, is an example showing clearly that mere establishment of nature protection area forms does not ensure municipality activation in terms of tourism. The statement about blocking the development of tourist function by area forms of nature protection is most strongly contradicted by the examples of Karpacz Municipality (Karkonosze NP) and Międzyzdroje Municipality (Wolin NP) ranked—after eba Municipality (Słowiński NP)—respectively, as second and third in terms of tourist function realisation throughout the entire studied period.

In order to measure the strength of the relationship between the level of performing tourist function and nature protection function by 117 municipalities, the Spearman's rank correlation was calculated between the ranking positions assigned on the basis of SDM_{prot} and SDM_{tur} values (Table 6).

Table 6. Correlation coefficient of SDM_{prot} and SDM_{tur} in the years 2001–2016.

Specification	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
						SMR_{tur} and SMR_{prot}										
Spearman	0.33	0.32	0.33	0.28	0.29	0.30	0.30	0.28	0.30	0.30	0.29	0.29	0.29	0.28	0.26	0.29
Pearson	0.18	0.18	0.17	0.13	0.14	0.15	0.15	0.14	0.15	0.17	0.17	0.19	0.20	0.20	0.20	0.21
p-value	0.05	0.05	0.07	0.16	0.14	0.10	0.11	0.14	0.11	0.07	0.06	0.04	0.03	0.03	0.03	0.03
						Charvat index and SMR_{prot}										
Spearman	0.32	0.33	0.33	0.28	0.28	0.29	0.31	0.28	0.31	0.30	0.28	0.29	0.29	0.27	0.24	0.27
Pearson	0.25	0.25	0.24	0.19	0.20	0.20	0.20	0.17	0.19	0.20	0.21	0.22	0.23	0.24	0.23	0.24
p-value	0.01	0.01	0.01	0.04	0.03	0.03	0.03	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01	0.01

Source: author's compilation.

The Spearman's rank correlation results for the years 2001–2016 based on the ranking of municipalities indicate, among others, the occurrence of a moderate and positive relationship between the studied functions. It should be emphasized that the highest correlation coefficient value was recorded in the lower part of the range and amounted to 0.33 (at the beginning of the period 2001–2003).

Similar conclusions can be drawn from the values of Pearson's correlation coefficient based on the *SDM* values. The results indicate the occurrence of low but significant correlation, at the level of 0.07 in the years 2001–2003 and from 2010 until the end of the period. The highest correlation level was recorded for the final period (after 2012). The highest level of dependence was recorded for the final period (after 2012). Difficulties in identifying correlations were recorded in 2004–2009, which resulted from the tourist function decline in selected municipalities (see Figure 2) along with only slight changes in the nature protection function. The reported tourist function decline is related to problems in the process of collecting statistical information (many entities showed reduced interest in accommodation services) [24]. Finally, it can be seen that there is a positive correlation between the analyzed functions, which means that the development of the nature protection function is accompanied by the development of tourism functions. The low value of Pearson's correlation coefficients results from large disproportions in the development of particular functions in individual municipalities. This is confirmed by higher values of rank correlation coefficients based on the ranking positions (not taking the actual distance into account).

The conclusions about the positive correlation between the development of tourism and the nature protection function are confirmed by the correlation results between the SDM_{prot} measure and one of the SDM_{tur}, components, the Charvat index, showing the intensity of accommodation base use. In this case, the statistically significant correlation coefficients (Table 6) were obtained throughout the entire analyzed period, indicating higher correlation strength than in the case of SDM_{tur} aggregate measure. SDM_{tur} measure depends, to a greater extent, on the accommodation base size indicators (Baretje and Defert index and tourist accommodation density indicator), for which low or even statistically insignificant values of correlation coefficients were obtained. Higher values of the correlation coefficient between the nature protection function and the intensity of accommodation base use, measured by the Charvat index (rather than the general measure of tourist function development), result in rejecting the statement about the protected areas as factors preventing the development of the tourist function.

7. Discussion

It is difficult to relate our work to previous research. This is due to both the scope and type of research and the comparability of the situation. Even though national parks are widely known in the world, this term is associated with different security regimes in various countries [72], as well as organizational and legal differences resulting from the functioning forms of such parks, as well as the rights and entitlements of local authorities. These differences often result from the size of the park [24].

It is also worth emphasizing that any comparison of the situation observed in Polish national parks and the municipalities territorially linked with them against the situations occurring in Western countries (or, more broadly, economically developed countries) is difficult due to historical reasons [73]. It should be remembered that until 1989, Poland was included in the bloc of socialist countries adopting, in the organization of national economy, concepts according to which the natural environment had to overpower. It resulted in a long-term, even multigenerational (from the society perspective, i.e., the direct user of space) object-oriented approach towards nature—a human being was supposed to try to control and conquer it, rather than conserve and protect it [74]. Considering the period following the principles of Marxist economic theory in Poland (1945–1989), the problems of reconciling nature protection functions and any other economic functions in one space (in this study, the tourist function) takes on a completely different character than in countries with multigenerational environmental education traditions and due respect for the environment. It is worth highlighting that research covering the problems of sustainable development in Central and Eastern European countries indicates an improvement of the situation in this area, even though it is still far from ideal [75]. It should, however, be recognized that Poland is on the right path towards sustainable development [76,77] despite changes in the way land is used [78].

The developed nature protection solutions brought about the establishment of various park models, from "hard-park" (parks with strict policies to prevent human encroachment) conservation policies to people-oriented park designs, in order to curb the adverse effects of humans on the environment [79]. However, integrating nature protection and socio-economic development of the area remains difficult [80–83].

8. Conclusions

The adopted research objectives allowed presenting municipal space through the prism of national parks and the tasks carried out by municipalities. The research results indicate the growing interest in both education and tourism in national parks. In the years 2001–2016, 179 million people visited national parks, of which 14 million benefited from the offer of educational sites. Twenty-three national parks differ significantly in terms of popularity—Tatra NP, Karkonosze NP, and Wolin NP are the dominating ones. Synthetic development measures of nature protection function and tourist function in the municipalities linked with national parks indicate stability of the nature protection function as well as dynamic changes in the tourist function. It is important that among 117 municipalities territorially linked with national parks, 12 have never performed a tourist function, and another 50 did not meet the criterion of being recognized as active in tourism. It proves that the mere fact of legal protection coverage does not ensure automatic development of the tourist function. The research results also indicate that these functions are not mutually exclusive. It allows rejecting the research hypothesis that national parks block the tourist function of municipalities. It does, however, initiate the discussion on how to take proper advantage of the natural value located in a municipality for the benefit of its sustainable development. Tourists are becoming increasingly sensitive to natural values and landscapes [84]. The research findings indicate the need for cooperation between municipalities and national parks not only for the sake of nature protection, but also for the purposes of economic activation.

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