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# Transformations of Tourist Functions in Urban Areas of the Karkonosze Mountains

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**Abstract.** The article analyses and attempts to assess the transformations related to tourist functions in urban municipalities of the Karkonosze Mountains in Poland in the years 2005-2015. The study covered four member cities of the Association of Karkonosze Municipalities: Karpacz, Kowary, Piechowice, Szklarska Poręba and the most important city in the region – Jelenia Góra. The research also focused on the spatial diversification of these functions distribution in the aforementioned localities. Based on the group of diagnostic features, characterizing the tourist functions carried out by these cities (e.g. Gołębski's index, Baretie and Defert index, Charvat index, accommodation density ratio) the taxonomic density measures were constructed, which allow identifying the level of these functions' development. The presented study is significant for defining the distance between cities in terms of the selected development aspect in temporal and spatial perspective. The research can turn out useful in the planned city development and management.

## 1. Introduction

The humans' growing impact on the environment, referred to as anthropressure, imposes the analysis of space in a broader perspective than just in terms of spatial planning, spatial order or economic functions fulfilled by space for the benefit of a human being. It is also required to take into account the context of natural resources, creations and components. The Karkonosze Mountains, situated in south-western part of Lower Silesia region, represent tourist areas which are naturally valuable, relatively easy to access and thus very attractive in terms of tourism. The area of Karkonosze municipalities allows observing the specific importance of geographic determinants for the settlement system [1]. It results from the fact that the spatial planning in Poland plays a key role in the anthropogenic transformation of space. Spatial policy, determined by the smallest unit of the territorial government (municipality), constitutes the basis for the local plan development and its implementation [2,3]. In the above-mentioned municipalities, the settlement system was formed in a manner allowing the proximity of characteristics typical for cities which predestine space to be covered by the area form of nature protection. It results in the fact that the Karkonosze urban municipalities, i.e. Karpacz, Kowary, Piechowice, Szklarska Poręba and the county town of Jelenia Góra remain territorially linked with the Karkonosze National Park (KNP). Podgórzyn municipality represents the only rural municipality, a part of which was included in the KNP borders, that was not covered by the conducted research due to the purpose of the presented article. The Karkonosze National Park has a significant impact on the



functioning of the urban municipalities included in the study – primarily by influencing the development of their tourist function. It is not only due to the commonly known limitations in the economic use of space, resulting from the provisions of the Nature Conservation Act [4], but also the active measures taken by the KNP.

The purpose of the article is to analyse and evaluate the transformations of tourist functions occurring in the Karkonosze urban municipalities in Poland in the years 2005 - 2015. The research covered four member cities of the Association of Karkonosze Municipalities: Karpacz, Kowary, Piechowice, Szklarska Poręba and the largest city in the region – Jelenia Góra.

## **2. Research method. The construction of the synthetic measure of the tourist function development in the analysed cities.**

The first stage of conducted research consisted in the selection of the features characteristic for the level of tourist function development in the analysed cities. The study uses the following diagnostic variables:

1. Number of enterprises in tourism sector / number of residents x 100 (Gołębski's index);
2. Number of enterprises in tourism sector / number of all enterprises in the municipality x 100;
3. Number of enterprises in the tourism sector / 1 km<sup>2</sup>;
4. Number of accommodation places / number of residents x 100 (Baretie and Defert index);
5. Tourist occupancy rate / number of residents x 100 (Charvat index);
6. Number of accommodation places / 1 km<sup>2</sup> (occupancy density ratio).

At this stage of research the coefficient of variation  $V_j$  was calculated for every analysed feature. Quasi-permanent variables did not occur; thus, all characteristics were included in further proceedings. It should be emphasized that all variables present the nature of stimulants.

In the course of the second stage of the research, the level of tourist function development in the cities was analysed using the non-model synthetic measure  $h_i$ . Applying synthetic measures allows quantification using a single number, the status of a particular phenomenon development describing which usually requires using many diagnostic features. As a result, it is possible to carry out comparative analyses and to arrange objects in terms of their development level [5]. The application of synthetic indicator measures allows effective characteristics of socio-economic changes occurring in the analysed area [6] and facilitates inference related to the observed spatial processes.

The arithmetic mean of normalized values is expressed by  $h_i$  ratio. The obtained measures are normalized in  $<0;1>$  interval. The higher the given measure value the higher the object's position in the developed ranking.

In order to standardize the units of measurement of individual characteristics and their orders of magnitude, the normalization was carried out in accordance with formula 1:

$$z_{ij} = \frac{x_{ij}}{\max_i x_{ij}} \quad (i = 1, \dots, n \quad j = 1, \dots, p) \quad (1)$$

where:

$z_{ij}$  – the normalized value of  $i$ -th object for  $X_j$  feature

$x_{ij}$  – the value of  $i$ -th object for  $X_j$  feature

**Table 1.** The set of diagnostic variables and their values.

City/feature	Golebski's index	Number of enterprises in tourism sector / number of all enterprises in the municipality x 100	Number of enterprises in tourism sector / 1 km <sup>2</sup>	Baretie and Defert index	Charvat index	Occupancy density ratio
Karpacz (2005)	5.69	28.83	7.58	132.88	11 225.03	176.87
Kowary (2005)	0.54	4.72	1.73	3.6	281.97	11.57
Piechowice (2005)	0.69	5.87	1.05	6.36	974.46	9.63
Szklarska Poręba (2005)	3.86	24.95	3.61	72.43	7 098.04	67.72
Jelenia Góra (2005)	0.51	3.48	4.05	2.51	253.16	20.02
Karpacz (2015)	7.03	8.83	8.79	213.23	16933.18	266.92
Kowary (2015)	0.51	4.31	1.54	2.09	132.20	6.38
Piechowice (2015)	0.68	5.66	1.02	7.73	505.01	11.58
Szklarska Poręba (2015)	4.61	24.01	4.12	61.41	5592.14	54.88
Jelenia Góra (2015)	0.54	3.44	3.99	2.80	374.97	20.78

Source: authors' compilation based on the Central Statistical Office database.

The applied procedure allows maintaining the diversified variance of features and proportions between normalized and initial values and thus, assigning the diversified importance to them [7].

Next  $h_i$  measures for the analysed cities were calculated using formula 2:

$$h_i = \frac{1}{p} \sum_{j=1}^p z_{ij} \quad (i = 1, \dots, n) \quad (2)$$

where:

$h_i$  – the value of non-model synthetic measure in  $i$ -th object

$p$  – number of features.

It is worth pointing out that the similar methodology for the tourist function measurement was also applied in earlier studies [8,9].

### 3. Research results

As a result of the conducted research, the following values of synthetic measures were obtained for the studied cities (tab 2).

Karpacz was definitely distinctive in terms of the highest level of tourist function development, both in 2005 and in 2015. The significant importance of tourism sector was also characteristic for Szklarska Poręba. Jelenia Góra was next in the ranking both in 2005 and in 2015. The following places in the developed ranking were occupied by Piechowice and Kowary, however, the low level of the analysed function development was visible comparing to the ranking leaders.

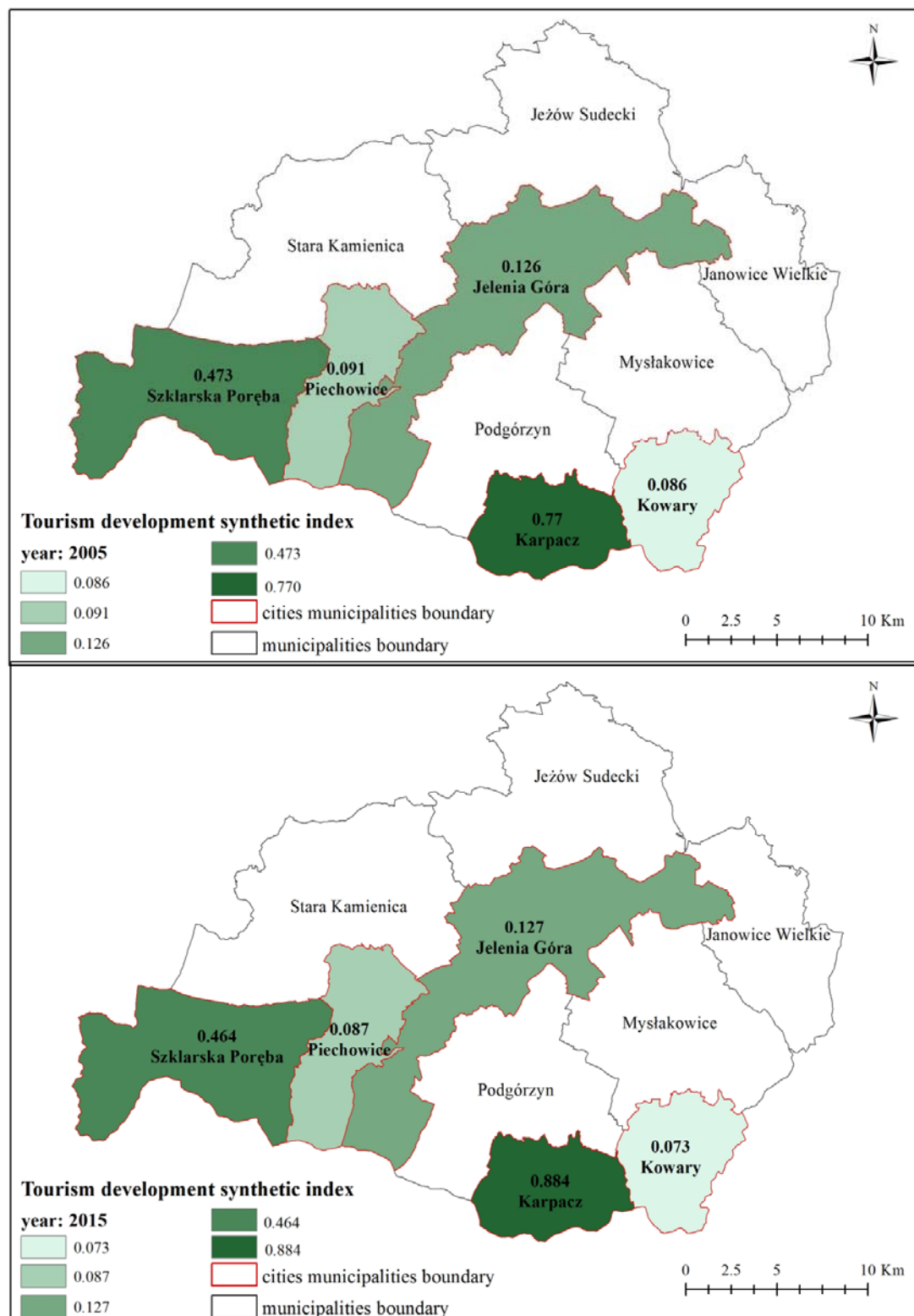
**Table 2.** The values of non-model synthetic measure  $h_i$  for the studied cities in 2005 and in 2015.

Locality / year	2005	2015
Karpacz	0.770	0.884
Kowary	0.086	0.073
Piechowice	0.091	0.087
Szklarska Poręba	0.473	0.464
Jelenia Góra	0.126	0.127

It is noticeable that in the group of the studied cities the level of tourist function development was significantly higher only in Karpacz – the synthetic measure value went up by about 15 %. A slight increase (1.1 %) was also observed in Jelenia Góra. The other localities recorded a decline of the tourist function development level measured by the non-model synthetic measure. Szklarska Poręba featured a slight decrease; the measure value for 2015 presented 98 % level of the value characteristic for 2005. The respective value for Piechowice was 95.4 % and for Kowary 85.2 %.

Attention should be paid to the spatial location of the analysed municipalities presented in figure 1. The highest level of tourist function development is achieved by urban municipalities, nonadjacent to each other i.e. Karpacz and Szklarska Poręba. At the same time these cities are adjacent to the areas characterized by the significantly lower development level of the studied function. Therefore, the phenomenon of high values presented by the synthetic indicator of tourism development cannot be diagnosed. None of the analysed cities plays a role of a growth pole exerting a positive impact on the adjacent areas. Thus, the proximity of Karpacz or Szklarska Poręba does not constitute the decisive development factor. The absence of spatial concentration also occurs in case of urban municipalities presenting the lowest values of the discussed indicator - as shown in figure 1 Piechowice and Kowary are significantly distant from each other.

As it has already been mentioned in the introduction, the characteristic features of the studied urban municipalities are their territorial links with the Karkonosze National Park. The KNP represents an important creator of the tourist function in the region – the KNP's impact is noticeable, owing to the infrastructural investments upgrading the discussed area's tourist attractiveness and accessibility. The spatial distribution of the KNP's investments indicates that the cubature objects are situated in the spots of maximum tourist traffic concentration – The Karkonosze Centre of Ecological Education in Szklarska Poręba as well as Hunter's House and Tourist Information Centre of the KNP in Karpacz. The investments in linear infrastructure (tourist trails) are implemented in the area covered by entire protection, i.e. in all municipalities included in the study and also in Podgórzyn rural municipality. It is worth pointing out that in recent years the KNP has been focused on the activation of the spots less popular among tourists – e.g. the investment located in the part of Jelenia Góra called Jagniątków and related to the adaptation of a forest-tree nursery to the tourist function [10]. Moreover, the KNP organizes events related to ecological education (happenings, picnics, workshops), as well as issues publications (folders, monographs) – which, obviously, promote the adjacent municipalities. Naturally, covering the area of municipalities by legal protection excludes certain activities and can become a source of spatial conflicts. The area forms of nature protection do not, however, result in halting the tourist function development. Karpacz is a leader in the level of the discussed function development as 53.01% of its area was covered by protection in the form of a national park. The values which characterize the area protection for the remaining municipalities are shown in the below table.



**Figure. 1.** Spatial differentiation of the Karkonosze Mountains municipalities by tourism development synthetic index in 2005 and 2015



**Table 3.** Protected areas in urban municipalities territorially linked with the Karkonosze National Park (data for 2015)

Specification	Szklarska Poręba	Piechowice	Jelenia Góra	Kowary	Karpacz
municipality area in ha	7 544	4 322	10 922	3 739	3 799
KNP area in the municipality in ha	1 035	508	1 343	134	2 014
% of the municipality area covered by protection in the form of a national park	13.72	11.75	12.29	3.59	53.01

Source: authors' compilation based on the Central Statistical Office database (Local Data Bank).

#### 4. Conclusions

The analysis covered tourist function transformations in five urban municipalities of the Karkonosze Mountains. Despite the priority importance of tourism for local economies declared in the strategic documents of all localities, the studied cities were characterized by a significant diversification of the analysed phenomenon level.

An extended analysis allows concluding that two out of five studied cities – Karpacz and Szklarska Poręba – based their development essentially on the carried-out tourist function. In Jelenia Góra and, to some extent, also in Piechowice, tourism was included in the economic landscape of the city. In Kowary, tourism did not constitute a significant component of the city economy [11, 12]. The evaluation of Jelenia Góra should emphasize its role in the administrative division of the country having an undisputable impact on the development of particular city-forming functions – till mid 1975 it was a county town and later till 1998 the capital of the region. Currently, this locality represents a polyfunctional city with county rights characterized by a definite domination of services [3].

The application of spatial analyses in the calculation of indicator-based assessments for territorial units allows extending the inference arising from the carried-out research. The knowledge of spatial arrangement facilitates the identification of the analysed characteristics' model related to a particular localization [14]. As a result of such studies it is possible to observe that the studied area is not characterized by a phenomenon of high values concentration regarding the synthetic tourism development indicator. Therefore, direct proximity of the unit which is a leader in this respect does not function as the key development factor.

Due to the fact that all analysed cities declare their desire to develop their tourism function and its significant diversity it seems appropriate to recommend that Piechowice, Kowary and also Jelenia Góra should take advantage of the KNP brand more extensively. The analysed municipalities cover a unique space – only 23 national parks have been established in Poland and cover the total of 1 % of the country area. The nature-oriented values they present have a large and frequently unique importance for the European natural heritage [15]. The KNP brand is of cross-border significance – the Krkonošský Národní Park (KRNAP) functions on the Czech side – and all investments related to the implementation of statutory goals for both parks ensure protection and/or promotion of the values on the basis of which the parks were established and therefore also the protection and/or promotion of the background for the development of the regional brand [16]. It is even more important in the context of the impact of the Karkonosze National Parks on the development of cross-border regional space [17].

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