EVALUATING THE PARSĘTA BASIN COMMUNES' TOURIST SPACE USING THE SELECTED QUANTIFICATION METHODS

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ABSTRACT: Identifying differences in the factors determining tourism development in an area is crucial to utilising its natural, economic and socio-cultural resources that enable sustainable development of the tourist function. This article sets out to present and estimate factors underlying tourism development in the context of various quantification methods and the comparisons of their results. The phenomenon selected for the research is evaluated using tools such as a synthetic measure Gołembski (2002) (based on weights assigned to particular features) and two synthetic measures Perkal (z-scores) (1953) and Zioło (1985).

KEYWORDS: capacity for tourism, tourist function, Parsęta Basin, Western Pomerania, Poland

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Introduction

Factors determining tourism development were evaluated for 20 communes lying in the basin of the Parsęta River (that flows directly to the Baltic Sea). The analysis covered the rural communes as well as the rural parts of the urban and rural communes. Considered in terms of the administrative division in the country, the investigated area represents the eastern part of the Western Pomeranian voivodeship.

This article evaluates the tourism development factors using 27 diagnostic features that are discussed more in detail in the article: **Evaluation of conditions concerning the development** of tourism. Investigation into the basin of the Parsęta river (Domin *et al.* 2009).

Research methods

As already mentioned, the multivariate analysis methods are described in the article, which necessitate selecting variables and giving them appropriate weights.

The presented multivariate analysis was performed using a six-step procedure.

1. Selection of a set of the diagnostic features – see Table 1.

Table 1. The diagnostic features and their weights

Set (weight)	Subset (local/global weight)	Variable (local/global weight)
Variables describing touristic attractiveness (0.5)	Touristic amenities (0.55/0.275)	A share of forests in the area of a commune (%): 0.15/0.04125
		A share of meadows and pastures in the area of a commune (%): 0.05/0.01375
		A number of lakes per 1 km^2: 0.05/0.01375
		Lake occurrence (%): 0.05/0.01375
		Sea access. zero-one method: 0.30/0.08250
		A number of religious centres per 1 km^2: 0.05/0.01375
		A number of natural monuments per 1 km^2: 0.05/0.01375
		A number of architectural monuments per 1 km^2: 0.05/0.01375
	Transport availability (0.15/0.075)	A length of roads per 1 km^2: 0.70/0.05250
		A frequence of train stops: 0.25/0.01875
		A number of working railway stations per 1.000 inhabitants: 0.05/0.00375
	Touristic infrastructure (0.30/0.150)	Baretje/Defert's rate: 0.80/0.12000
		A number of hotels and restaurants per 1.000 inhabitants: 0.20/0.03000
Variables describing investment attractiveness (0.5)	Service infrastructure (0.30/0.150)	A number of shops per 1,000 inhabitants: 0.35/0.05250
		A number of petrol stations per 1 km^2: 0.35/0.05250
		A number of pharmacies and ambulatory care facilities per 1.000 inhabitants: 0.20/0.03000
		A number of post offices per 1.000 inhabitants: 0.10/0.01500
	Technical infrastructure (0.25/0.125)	A percentage of inhabitants served by sewage treatment plants (%): 0.35/0.04375
		A percentage of inhabitants using waterworks (%): 0.35/0.04375
		Sewage network in km per 1 km^2: 0.15/0.01875
		Waterworks in km per 1 km^2: 0.15/0.01875
	Socio-demographic conditioning (0.30/0.125)	A number of non-productive age inhabitants per 100 persons in productive age: 0.20/0.02500
		Population density per 1 km^2: 0.30/0.03750
		A share of working inhabitants among the productive age inhabitants (%): 0.30/0.03750)
		A share of the unemployed with relation to the working age inhabitants (%): 0.20/0.02500
	Economic conditioning (0.15/0.075)	Revenue per 1,000 inhabitants: 0.80/0.06000
		A share of expenditure on culture and national heritage (%): 0.20/0.01500

Source: developed by the authors based on Domin *et al.* (2009)

2. Focusing the direction of preferences, i.e. transforming all features being originally destimulants into stimulants. To this end, a method given by the formula below was applied:

$$y_{ij} = \max(x_i) - x_j$$

where:
i – commune's number (i = 1, ..., m),
j – variable's number (j = 1, ..., n),
x_{ij} – the value of the *j*-th diagnostic feature in the *i*-ith commune,
y_{ij} – the value of the *j*-th diagnostic feature being a stimulant in the *i*-th commune,
$\max(x_j)$ – the maximal value of the initial j-th diagnostic feature in the communes;

3. Normalization of the features. The selected research methods are at variance already at the stage of feature normalization.
– in the Perkal's (z-scores) method (1953), the data are normalized by the formula:

$$x_i' = \frac{x_i - \overline{x}}{\sigma_x}$$

– the Gołembski's method (2002) uses the normalization where the particular features are compared with the maximum value in the set:

$$x_i' = \frac{x_i}{\max(x)}$$

– the Zioło's method (1985) uses the normalization where the particular features are compared with the totalled values of variables in the set:

$$x_i' = \frac{x_i}{\sum_{i=1}^{m} x_i}$$

where:
x_i' – the post-normalisation value of a feature;
$max(x)$ – the maximal value of a feature;
$\bar{x}$ – the average value of a feature;
σ_x – the standard deviation of value;
i – commune's number in the set (i=1, ..., m)
m – the number of the communes.

4. More differences can be found when a measure's total value is calculated using the general formula:

$$w = \frac{\sum_{j=1}^{n} w_j x_j}{\sum_{j=1}^{n} w_j}$$

where:
j – feature's number(j=1, ..., n),
n – the number of the features
w_j – the weight of the j feature.

The Gołembski's method (2002) principally assumes that the particular diagnostic features and their sub-sets differently contribute to the final evaluation outcome. Hence, they receive different weights (see Table 1) that the researcher selects using their subjective judgment. Because the weights add up to 1, a simplified Gołembski's formula (2002) allowing the calculation of a synthetic measure takes the form:

$$w_G = \sum_{j=1}^{n} w_j x_j$$

On the other hand, the Perkal (1953) and Zioło (1985) evaluation methods recognise the features as having the same influence, so equal weights are given to them. Then, a simplified Perkal's formula for calculating the measure's values is given by:

$$w_P = \frac{\sum_{j=1}^{n} x_j}{n}$$

The Zioło's method employs the same equation to estimate the values of a synthetic measure. It must be mentioned, though, that the Zioło's method (1985) additionally provides an insight into data structure because the percentage shares of the particular normalized measures in their total value are calculated (Runge 2007). This aspect is only being signalled, as it is outside the scope of this article. Besides, there are a relatively large number of publications available in market, which deal with quantitative methods applied to geographical research (Kostrubiec 1977; Norcliffe 1986; Berry & Linoff 1997; Walesiak 2009).

5. The obtained results vis-à-vis the spatial dimension (Fig. 1).
6. A comparison of the method-specific results. Calculations of Spearman's rank correlation.

Results and discussion

As shown by the calculations made using the three quantification methods, the particular communes in the Parsęta Basin show considerably different values and rankings (see Table 2).

Different methods make rankings vary, with the differences ranging from 6 to 12 rankings in the extreme cases, as exemplified by the Siemyśl, Bobolice, Połczyn Zdrój and Rąbino communes (Table 2). At the same time, some rankings are a very similar, e.g. the Ustronie Morskie, Kołobrzeg, Karlino, Szczecinek and Czaplinek communes.

An analysis of rank correlation between communes' rankings obtained using different analytical methods (see Table 3) reveals strong relationships between the compared methods. In the examined situation, the choice of a variable normalization method had an insignificant effect on the final result of the analysis (Table 3). Besides, even though different weights were assigned to the analyzed features in the Gołembski's method (the weights were different even 32 times), its results were similar to those produced by the methods where feature weights were not differentiated.

It is worth noting that a considerable disproportion can be seen between the first and the second communes (Ustronie Morskie and Kołobrzeg, respectively) and the other communes (see Table 2), regardless of the method applied. This suggests that the first two communes have basically

Table 2. Comparison of the values and rankings obtained for the communes

Communes	Methods						An average rank
	G. Gołembski		J. Perkal		Z. Zioło		
	value	rank[1]	value	rank	value	rank	
Ustronie M.	0.67	1	1.14	1	17.9	1	1
Kołobrzeg	0.50	2	0.47	2	11.2	2	2
Dygowo	0.39	6	0.22	3	7.3	3	3
Czaplinek	0.44	3	0.13	5	7.1	5	4
Borne S.	0.40	5	0.13	6	7.1	4	5
Szczecinek	0.44	4	0.09	7	6.6	6	6
Gościno	0.39	7	0.18	4	6.1	9	7
Biały Bór	0.36	8	-0.01	9	6.1	8	8
Biesiekierz	0.35	11	0.01	8	6.5	7	9
Tychowo	0.36	9	-0.16	15	5.3	12	10
Grzmiąca	0.34	14	-0.1	12	5.6	11	11
Siemyśl	0.27	20	-0.05	10	6.1	10	12
Karlino	0.34	13	-0.1	13	5.2	14	13
Rąbino	0.30	18	-0.09	11	5.1	15	14
Rymań	0.32	17	-0.17	16	5.3	13	15
Sławoborze	0.32	16	-0.11	14	5.1	17	16
Połczyn Z.	0.35	12	-0.21	18	5.1	19	17
Bobolice	0.35	10	-0.24	20	4.4	20	18
Barwice	0.34	15	-0.2	17	5.1	18	19
Białogard	0.28	19	-0.24	19	5.1	16	20

[1] value 1 represents the best commune in the group.

different conditions, i.e. definitely better, for developing tourism than all the other region along the Parsęta river.

The cartograms show strong variations in the communes assigned to particular groups representing a specific category: very high, high, low and very low. At the same time, the stripes corresponding to the region's physico-geographical stripes remain visible (see Kondracki 2000), regardless of which research method was used. This proves that the calculations were correct and that the general trends were captured; the appearing differences (first in the values obtained and then in the rankings) are due to the variations in the mathematical calculations.

Introducing the averaged rankings seems a rational approach, as this allows formulating a more objective opinion on the linear distribution of the tourism development factors in the Parsęta Basin using the three methods. This approach produces a new ranking representing an average of the discussed research methods (see Table 2).

That somewhat different results were obtained can be attributed to the subjective selection of the features for analysis and of their weights (in the G. Gołembski's method). Particular authors use different features that are relevant to the character of the areas they examine (Milewski 2005; Pietrzyk-Sokulska 2006). Adding or removing even a seemingly unimportant single feature may affect communes' rankings (Pérez *et al.* 2006); the comparative analyses show, though, that different authors arrive at moderately similar results (Pawlicz 2008).

Table 3. The analysis of rank correlation between communes' rankings obtained using different analytical methods

Methods*	Calculations of Spearman's rank correlation	Statistically significant α
G vs P	0.71	0.0005
G vs Z	0.74	0.0005
P vs Z	0.96	0.0005
G vs population mean	0.84	0.0005
P vs population mean	0.96	0.0005
Z vs population mean	0.96	0.0005

* G – Gołembski; P – Perkal; Z – Zioło.

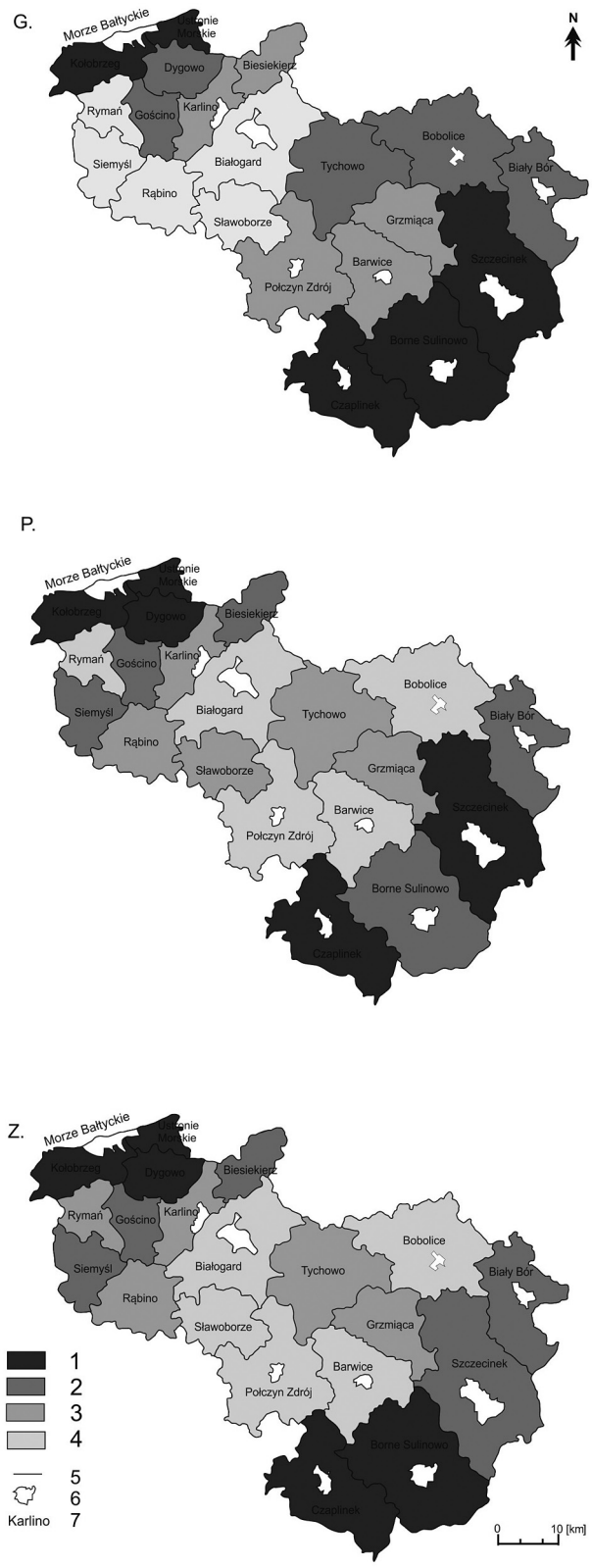

Fig. 1. Evaluation of the tourism development factors in the Parsęta Basin communes with respect to the three quantification methods.
Note: G. – Gołembski`s method, Z. – Zioło`s method, P. – Perkal`s method, 1 – very high, 2 – high, 3 – low, 4 – very low, 5 – commune borderline, 6 – town area, 7 – name of a commune

Conclusions

The research results lead to the following final conclusions:

1. The tourism development factors in the Parsęta Basin are distributed in relation to the physico-geographical stripes in the region.
2. The northernmost communes in the region that touch the sea (Ustronie Morskie and Kołobrzeg) have much better conditions for developing tourism.
3. The natural factors (few lakes or none at all, lower forest cover indicator) in the central communes in the region make them less suitable for developing tourism, likewise their relatively low level of socio-economic development compared with the areas in northern and southern parts of the Basin, etc.
4. As shown by the research results, trying to estimate the tourism development factors using the outcomes of only one quantification method may overly simplify the reality and even distort it. The methods are generally not found to be different, yet considerably different estimates can be produced for the particular evaluated units. It is therefore recommended that all analyses (in both tourism geography and other fields) use at least several quantification methods to substantiate a more objective final evaluation

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