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A STUDY ON THE SPATIAL DIFFERENTIATION OF THE SOCIO-ECONOMIC AND TOURIST SITUATION OF SELECTED MUNICIPALITIES OF THE WEST POMERANIAN VOIVODESHIP

Agnieszka Brelik✉, Natalia Oleszczyk

West Pomeranian University of Technology, Poland

ABSTRACT

Aim: The aim of the article was to develop an original classification of municipalities in the West Pomeranian Voivodeship, Poland, with particular emphasis on measuring local development, taking into account the development of health tourism. **Methods:** The research procedure consisted of the following stages: collection of data and assessment of their completeness for the West Pomeranian region, calculating the values of the indicators, constructing rankings of municipalities in a one-dimensional space of characteristics-indicators and distinguishing typological groups of municipalities similar in terms of the degree of development of the socio-economic and tourist situation. The classification of sub-regions was carried out using discriminant analysis. For this purpose, the indicators characterizing the socio-economic and tourist situation in the selected West Pomeranian Voivodeship municipalities were used, taking into account the division into municipalities: urban (1), rural (2), and urban-rural (3). The preliminary classification of the objects into groups, and thus the selection of the grouping variable, was carried out using the k-means method. The study used secondary data from the Local Data Base – GUS. **Results:** As a result of the survey, the analyzed local government units were divided into three groups. However, the presented results of the classification do not indicate the dependence of the improvement of socio-economic characteristics on the provision of tourism services in the municipality (including health tourism). **Conclusions:** Empirical studies show that the placement of municipalities in the West Pomeranian Voivodeship reveals clear relationships between the territorial distribution of health tourism units and the territorial distribution of natural assets and access to the Baltic Sea.

Keywords: local development, tourism, municipality
JEL codes: Z32, R10

INTRODUCTION

The tourism sector is at the epicenter of local economic development, promoting job creation and investment in the region, as well as optimizing transport and strengthening local cultural heritage. At the state level, tourism is one of the main sources of income in the balance of payments [Panasiuk, 2011, Szopa and Szczerbowski 2013]. Health tourism is a relatively new phenomenon that has developed over the past two decades [García-Altés 2005, Szromek 2012, Bąk-Filipek et al. 2019]. Previous research on health tourism has been limited to a small range of medical tourism topics. Nowadays, the concept of health tourism has become a broader one, as medical care has changed from being 'sickness-focused' to 'health-centric' [Religioni and Religioni 2015, Lei et

Agnieszka Brelik https://orcid.org/0000-0003-0199-2040; Natalia Oleszczyk https://orcid.org/0000-0002-8441-8054;
✉agnieszka.brelik@zut.edu.pl

al. 2022]. Given the dynamics of change in the consumer market, it seems that we are increasingly attaching importance to being healthy and fit, both physically and mentally, and that this trend will continue for decades to come. This trend is the result of the aging of the population and simultaneously increasing numbers of the elderly, rising income levels, and the extension of leisure time [Nowakowska 1999]. In light of the above, the authors of the study considered the purpose of the study to be the preparation of an original classification of the West Pomeranian Voivodeship municipalities, paying particular emphasis to the measurement of local development, taking into account the development of health tourism. The authors set themselves a difficult task, as tourism is a phenomenon that is difficult to quantify due to its complex nature, which is connected with a wide range of tourist activities and other pursuits. The measurements in this area are carried out in relation to the number of tourists, the number of establishments with spa & wellness facilities, the number of accommodations or overnight stays, and the infrastructure of the study areas. There is a need to refer individual variables related to tourism to variables characterizing the area, among which there are total municipal income/expenditure per capita, unemployment rate, and population density [Sharpley and Telfer 2002, Kachniewska et al. 2012, Saarinen 2013, Balińska 2022]. Taking into account the selected values (see Table 1), indicators were created to measure the level of socio-economic and tourism development in selected municipalities of the West Pomeranian Voivodeship, Poland.

RESEARCH METHODOLOGY

The paper is based on the k-means method, which has been used in the past to solve research problems [Stanny and Strzelczyk 2015, Brelik 2016, Sobolewski and Sokołowski 2017, Perdał 2018, Pomianek 2022]. The choice of research technique was based on the fact that it is one of the non-hierarchical methods used to optimize the classification of objects (in this case, municipalities) and is based on cluster analysis [Gatnar 1995, Jauhari et al. 2022, Tiwari and Tripathi 2023]. It was used to develop the original classification of municipalities in the West Pomeranian Voivodeship, taking into account the measurement of local development and health tourism.

In the case of optimization-iteration methods, the procedure refers to actions aimed at improving a given classification from the point of view of a suitably specified optimality criterion. The objects were assigned to the classes in which the center of gravity was located at the closest position of the Euclidean distance. The criterion for grouping was to minimize variation within groups, i.e., between sites that were part of a given cluster, and to maximize variation between all groups [Mazur 2004, Ikotun et al. 2023]. The sequence of operations in the classification followed a three-step process:

- first, an initial function value was determined as a criterion for clustering quality and maximum number of iterations;
- next, the distances of each object from the centroids (i.e., the vectors of the arithmetic means) of the existing groups were determined;
- 3. the final step was to change the assignment to the group with the closest centroid or to the group that gave the greatest improvement in classification quality. The k-means clustering process is considered complete if, after checking, no displacement of objects has occurred, but if this situation occurs, it is necessary to repeat the whole procedure and determine a new function criterion. However, it is important not to exceed the preset number of iterations [Grabiński 1992, Rochman and Rachmad 2019].

The *k*-means method provides a way to group a set of objects into *k* subgroups that are as different as possible from each other. Many variations of the k-means algorithm have been discussed in the literature, differing in, among other things, the way the criterion function is defined, the decision rules for the classification process, and the methods for determining the initial partitioning of objects. A method that has gained popularity in the research community is the one developed by Hartigan [1975]. The flow of this method can be illustrated using a number of key steps [Grabiński 1992, Pietrzykowski and Kobus 2006]:

1) The first step was to determine the maximum number of iterations and classes (k) to divide the n-element set of objects into:

$$k \in (2, k-1) \quad (1)$$

2) The next step was to create an initial matrix of the centers of gravity of the classification groups:

$$B = [\bar{x}_{ij}](1 = 1, \ldots, p; \mathrm{j} = 1, \ldots, m) \quad (2)$$

where: m – the number of variables.

Individual objects belonging to the set were assigned to the classes with the smallest Euclidean distance.

2) Next, the initial value of the distribution error of the units between k groups was determined:

$$e = \sum_{i=1}^{n} d_{il}^2$$

where: d_{il} – the Euclidean distance between the i-th object and the nearest l-th centroid:

$$d_{il}^2 = \Sigma_{j=1}^{m} (x_{ij} - \bar{x}_{lj})^2$$

3) The final step in the process was to determine the change in the split error for the first object caused by sequentially assigning this object to all existing classes:

$$\Delta e_l^{(1)} = \frac{n_k d_{1k}^2}{n_k + 1} - \frac{n_{k_1} d_{1k_1}^2}{n_{k_1} - 1}$$

Where: n_k – the frequency of the k-th class, d_{1k} – the distance of the first object from the centroids of the k-th class, n_{k_l} – the frequency of the class containing the first object, d_{1k_1} – the distance of the first unit from the nearest centroid.

If $min\, \Delta e_l^{(1)}$ is negative for all $l \neq l_1$, the first object is assigned to a classification group for which $\Delta e_l^{(1)} = min$. After accounting for the changes, the group centroids are recalculated, and the present value of the split error is determined. If $\Delta e_l^{(1)}$ is positive or zero, no changes are made.

The presented action process was repeated for each analyzed object – the municipality. The first iteration of the process was completed. The process was terminated after checking whether 22 objects had been moved from class to class. If not, a new iteration had to be started. The whole action cycle was repeated until the number of iterations did not exceed the target size.

RESULTS

For the purposes of achieving the adopted research objective, an original classification of the municipalities of the West Pomeranian Voivodeship was carried out. Special attention was given to the measurement of local development, taking into account the development of health tourism, and the research was carried out for the years 2017 and 2020. The analysis of the West Pomeranian Voivodeship municipalities in the specified years has enabled an objective assessment of the changes taking place in the studied local government units, as well as the differences or lack of them in the functioning of the economy. So far, the analysis of the socio-economic characteristics has been used by many authors, not only in relation to the development of tourism [Bartkowiak-Bakun 2017, Zawadzka and Strzelecka 2020, Bąk et al. 2021]. The classification study was carried out for three sets of diagnostic characteristics expressed as indicators. The first set contained features characterizing the socio-economic situation, the second set contained features describing the situation in the tourism market, and the third set consisted of variables characterizing the socio-economic situation and the situation in the tourism market (Table 1).

The survey covered 48 municipalities with a tourism function in the West Pomeranian Voivodeship. As a result of the analyses carried out in 2017 and 2020, slight shifts in the three-stage scale defining the type of municipality ("Type I" – best municipalities, "Type II" – average municipalities, "Type III" – weak municipalities) were visible. Based on the literature review and data analysis, it can be assumed that the municipalities defined as "Type I" were characterized by the best socio-economic situation, recording the highest total income per capita, which exceeded the value of total expenditure per capita. In addition, "Type I" municipalities had the lowest unemployment rate and the highest number of enterprises registered in the REGON register per 10,000 inhabitants. In contrast, municipalities belonging to "Type III" municipalities had, among other things, the highest unemployment rate and the lowest total income per capita. When making the classification

Table 1. Sets of characteristics of the socio-economic situation and the health tourism market in the analyzed municipalities

Designation Features	A set of characteristics describing the socio-economic situation	Designation Features	A set of characteristics describing the tourist market
X_1	Total municipal income/inhabitant [PLN/person]	X_1	Number of facilities with spa & wellness facilities/km^2 [facilities/km^2]
X_2	Total municipality expenses/inhabitant [PLN/person]	X_2	Number of facilities providing rehabilitation services/km^2 [facilities/km^2]
X_3	Unemployment rate [%]	X_3	Total number of beds in tourist facilities/km^2 [beds/km^2]
X_4	Number of people receiving social assistance benefits/1,000 residents [person/1,000 population]	X_4	Number of nights provided in the total tourist accommodation facilities/km^2 [nights provided/km^2]
X_5	Number of companies registered in the REGON register [companies/10,000 residents]	X_5	Number of beds in spa hospitals and spa sanatoriums/km^2 [beds/km^2]
X_6	Number of beneficiaries of community social assistance/ 10,000 population [beneficiaries/10,000 population]	X_6	Share of the area of walking and recreation parks in the total area [%]
X_7	Population density [person/km^2]	X_7	Share of area of protected areas in the total area [%]

Source: own study based on Local Data Bank, Statistics Poland.

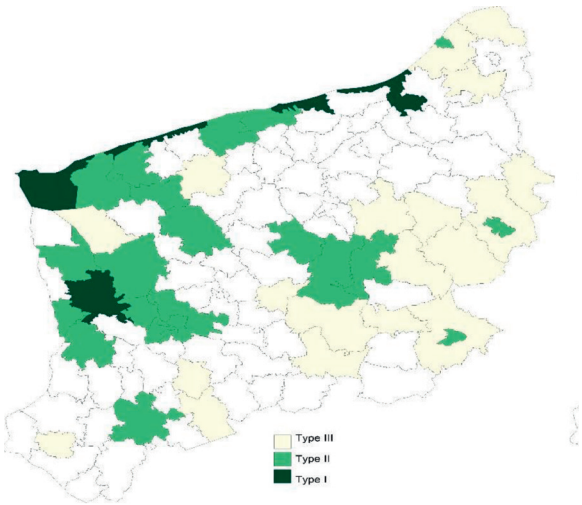

Fig. 1. K-means classification on the basis of socio-economic characteristics in 2017
Source: own study.

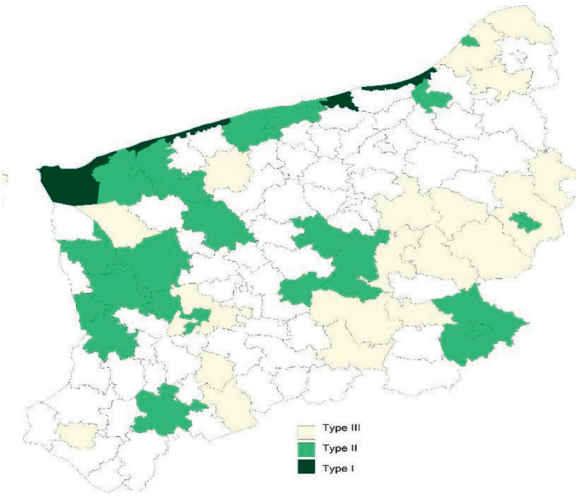

Fig. 2. K-means classification on the basis of socio-economic characteristics in 2020
Source: own study.

on the basis of socio-economic characteristics (Table 1), no significant relationship between tourism (especially health tourism) and local development in the selected municipalities was confirmed, as one of the municipalities in which health tourism is cultivated (with health tourism) was identified as a "Type III" (the weakest) territorial unit, while Kołobrzeg, the capital of health tourism in the West Pomeranian Voivodeship, and Kamień Pomorski were identified as "Type II", characterized by an average level of socio-economic development.

Based on the results of the classification of municipalities (Fig. 2) according to socio-economic characteristics in 2020, it can be noted that the municipalities with the best characteristics for local development were, among others: Rewal, Świnoujście, and Mielno – where forms of health tourism are implemented, i.e., both therapeutic and rehabilitation activities, but also spa & wellness.

Based on the analysis of municipalities in the West Pomeranian Voivodeship, slight changes in the results of the typology of municipalities in 2020 (Fig. 2) are noticeable in comparison with 2017 (Fig. 1). The changes in the last study year (2020) mainly concerned the improvement of the position of the municipality in the typology according to the three-level division.

Subsequently, an analysis of the municipalities of the West Pomeranian Voivodeship was carried out on the basis of a set of characteristics of the tourism market (Table 3). The classification was carried out using the k-means method for the same group of municipalities and showed that the best ("Type I") was the municipality of Kołobrzeg; another spa municipality – Połczyn Zdrój – was classified as "Type II"; the remaining spa units studied were in the last collection of communities (of the studied spa units assigned to the last group of municipalities) – "Type III", which was identified as the worst due to the lowest values of the indicators used for the study.

Changes between the municipalities classified as "Type III" and "Type II" are also clearly visible due

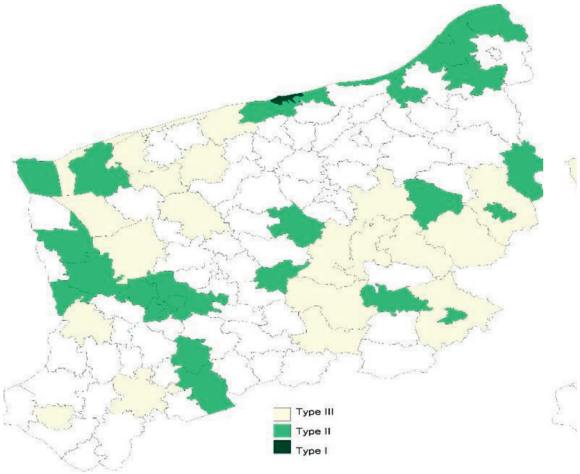

Fig. 3. Classification of municipalities by the k-means method on the basis of characteristics of the tourism market in 2017

Source: own study.

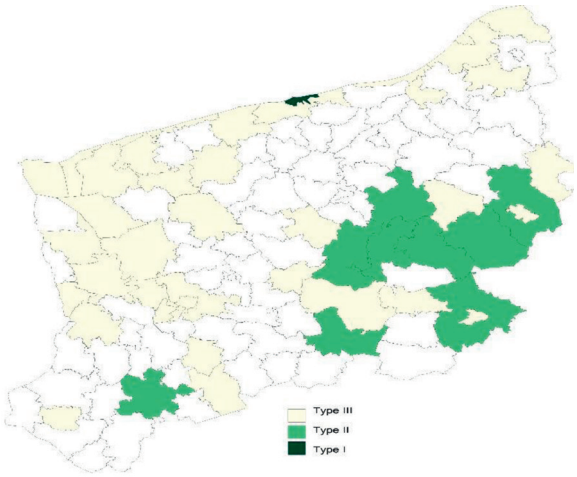

Fig. 4. Classification of municipalities by the k-means method on the basis of characteristics of the tourism market in 2020

Source: own study

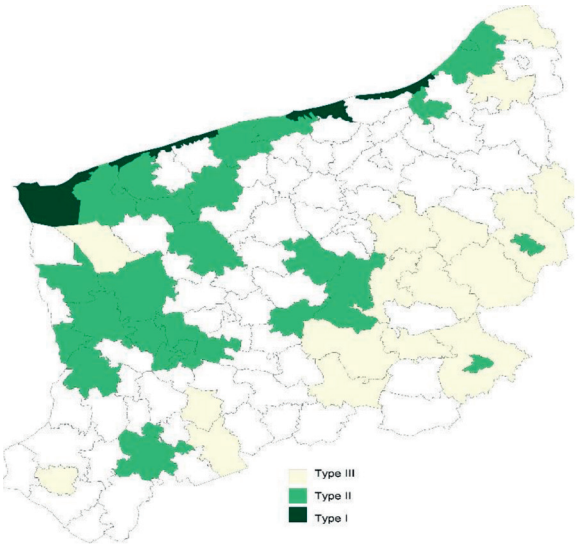

Fig. 5. Classification of municipalities by the k-means method on the basis of characteristics of the socio-economic situation and the tourism market in 2017

Source: own study.

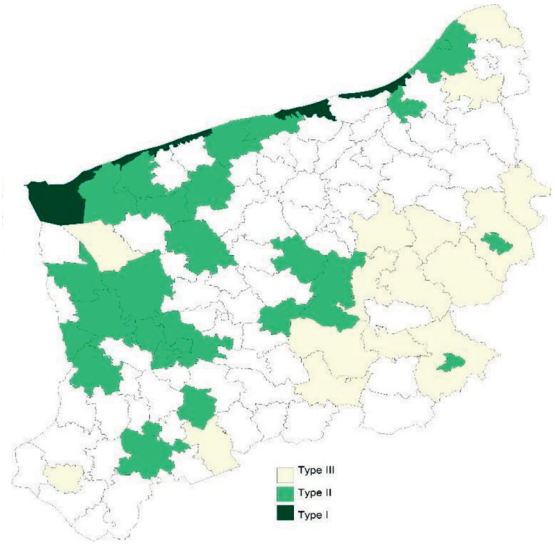

Fig. 6. Classification of municipalities by the k-means method on the basis of characteristics of the socio-economic situation and the tourism market in 2020

Source: own study.

to the ongoing changes in the functioning of tourism entities. The majority of municipalities classified as an average group found themselves in the latter group in 2020, which is particularly evident in Fig. 3, where the typologies of municipalities for 2017 are presented, and in Fig. 4, where the result of the classification of TSUs in 2020 is included.

When analyzing the results of the classification presented in Figures 1–4, it can be noted that among the units classified, for example, as "Type I" in the case of both lists (based on the characteristics of the socio-economic situation and the tourism market), the list of municipalities is not the same, which indicates that there is no link between a high level of socio-economic development and the operation of health tourism facilities in the area.

Figure 5 shows the results of the classification of municipalities on the basis of socio-economic features and the tourism market for 2017, and Figure 6 shows the results for 2020. Despite the diversity in access to the Baltic Sea and other natural assets, not all municipalities where health tourism is practiced were identified as "Type I". The classification carried out on the basis of socio-economic and tourism characteristics showed that the first group – rated as the best – were coastal municipalities (including Rewal, Świnoujście, and Kołobrzeg), but not exclusively specializing in health tourism. However, no dependency on the improvement of socio-economic characteristics on the provision of tourism services in the municipality (including health tourism) was found.

CONCLUSIONS

The presence and arrangement of natural resources is uneven, which affects the distribution of health tourism facilities. Empirical studies show that the placement of municipalities in the West Pomeranian Voivodeship reveals a clear relationship between the territorial distribution of health tourism entities and the territorial distribution of natural assets and access to the Baltic Sea. The area is characterized by favorable climatic conditions due to the presence of deep water springs and deposits of medicinal raw materials.

West Pomerania has deposits of mud and brine and is characterized by a mild climate, which makes the West Pomeranian spas, for example: Kołobrzeg, Świnoujście, Kamień Pomorski, or Połczyn Zdrój, places that attract tourists and patients, as well as those willing to use – especially in the coastal strip – the dense network of wellness and spa centers. The aforementioned advantages are conducive to the development of sanatorium and spa facilities, as well as the practice of recreational and leisure tourism and various forms of active tourism. However, after making the classification on the basis of selected socio-economic parameters, the significant impact of health tourism on local development in selected municipalities of the West Pomeranian region was not confirmed.

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BADANIE PRZESTRZENNEGO ZRÓŻNICOWANIA SYTUACJI SPOŁECZNO--GOSPODARCZEJ I TURYSTYCZNEJ WYBRANYCH GMIN WOJEWÓDZTWA ZACHODNIOPOMORSKIEGO

STRESZCZENIE

Cel: Celem artykułu było opracowanie autorskiej klasyfikacji gmin województwa zachodniopomorskiego, na podstawie pomiaru rozwoju lokalnego uwzględniając rozwój turystyki zdrowotnej. **Metody:** Postępowanie badawcze składało się z następujących etapów: zebranie danych i ocena ich kompletności dla wojewódz-

twa zachodniopomorskiego, obliczenie wartości wskaźników, budowa rankingów gmin w jednowymiarowej przestrzeni cech-wskaźników oraz wyodrębnienie grup typologicznych gmin zbliżonych pod względem stopnia rozwoju sytuacji społeczno-gospodarczej i turystycznej. Klasyfikacji podregionów dokonano za pomocą analizy dyskryminacyjnej. Do tego celu wykorzystano wskaźniki charakteryzujące sytuację społeczno-gospodarczą i turystyczną w wybranych gminach województwa zachodniopomorskiego, z uwzględnieniem podziału na gminy: miejskie (1), wiejskie (2) i miejsko-wiejskie (3). Wstępnej klasyfikacji obiektów na grupy, a tym samym wyboru zmiennej grupującej, dokonano stosując metodę k-średnich. W badaniu wykorzystano dane wtórne pochodzące z Banku Danych Lokalnych – GUS. **Wyniki:** Efektem przeprowadzonego badania był podział analizowanych jednostek samorządu terytorialnego na trzy grupy. Przedstawione wyniki klasyfikacji nie wskazują jednak na zależność poprawy cech społeczno-ekonomicznych od świadczenia usług turystycznych w gminie (w tym turystyki zdrowotnej). **Wnioski:** Badania empiryczne wskazują, że rozmieszczenie gmin w województwie zachodniopomorskim ujawnia wyraźne zależności między terytorialnym rozmieszczeniem jednostek turystyki zdrowotnej a terytorialnym rozmieszczeniem walorów przyrodniczych i dostępem do Morza Bałtyckiego.

Słowa kluczowe: rozwój regionalny, turystyka, gmina