

## **DEVELOPMENT OF RIVERSIDE AREAS IN THE CONTEXT OF THE ATTRACTIVENESS FOR RESIDENTS**

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### **A b s t r a c t**

The aim of this article is to analyze the tourism potential in the riverside areas of selected cities in Lubuskie Voivodeship located in the Oder River valleys. The research issue of the article was defined as a way to measure tourist potential in the development of riverside areas. In the research phase, based on the comparative multi-criteria method, special attention was paid to the accessibility of the river for the inhabitants, their usefulness for the recreation, as well as the location of the recreational infrastructures in the river valleys. The presence of infrastructure using the river's potential is marginal in the shoreline zone of the cities under analysis. Despite the rapid growth of tourist activities its river potential is still being marginalised. The research problem was to determine the tourist potential of selected cities and to identify the cities with the greatest potential, in which the advisability of investment seems to be the most relevant and necessary. The result of considerations carried out using the multi-criteria analysis method is the selection of the city with the greatest tourism potential. Among the surveyed cities, Nowa Sól has the greatest tourist potential.

**Keywords:** potential, tourist potential, river potential, development of riverside areas, riverside areas, lubuskie

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## 1. INTRODUCTION

A river is often a symbol of a city (Słodczyk, 2018), because it is owing to it that the city could be founded. It had defensive, communication and nutritional functions. The river provided drinking water and food resources. Riversides were used as defensive areas. The fortifications and representative buildings were constructed, which over time lost their function in support of industrial and agricultural development. Appearance and the uses of the river were changing with the development of technology. More and more people began to tame and exploit the river. The construction of mills, dams, irrigation systems, factories and artisanal plants took place (Hudak, Karczmar, Kołodziejczyk, Kostecki, 2018). The river channel became more and more developed, sealed, often modifying its natural course and shape. Rivers have also provided a transportation function. They are still an alternative for roads and transport of goods, but sometimes its potential is not used. It is impossible to define definitely the functions of river areas. The relationship between the river and the riverside areas are unique and specific to each city.

Changes in the use of waterfronts in the urban spaces are mainly due to economic and cultural transformations. For many years it has been possible to observe how the service economy sector is displacing the still firmly entrenched industrial sector. Water resources are playing less and less of a role in industry.

It is worth mentioning here that the problem of goods transport moving away from rivers is also a result of the deteriorating condition of port infrastructure and the variable length of the navigation period of rivers in Poland (Warcholak, Jezierska 2001).

Over centuries, these ties have been completely restructured. Progressive diversion of the cities from river areas is mainly the result of technological development, when after the construction of railroads, the vast majority of transport and trade moved to land. The gradual de-capitalization of the river areas resulted in the economic importance of the river decreasing significantly. The consequence of this was a gradual degradation of the so far developed river areas. These transformations caused that the river ceased to play its current role.

After years of stagnation, there was a gradual turnaround in recognizing the natural values of riparian areas. The strategy of using these areas has also changed. As there was no need to carry out economic functions, natural, cultural and social values became more important. The new way of using rivers and their potential forced a redefinition of their functions, and as a research gap can be defined the determination of the tourist potential of the Odra river in the middle Odra river area in medium size cities, and this assessment must take into account both natural, cultural and social values. According to O. Rogalewski (1974) the basic elements determining attractiveness are tourist-natural, tourist-cultural values and

tourist development. In turn, G. Gołębski points out that tourist attractiveness consists of tourist conditions, the state of the natural environment and forms of its protection, as well as transport accessibility. The process of development of the Odra river areas began in the XIV century, in connection with the attractive shape of the terrain and a rapid growth of the population in the river area the process of regulating the course of the river began.

In recent years, rivers and riverside areas have become the subject of many research works, which is reflected in the number of studies analyzing them from different aspects (Adynkiewicz-Piragas, Lejcuś, 2010). The river and the adjacent areas have always had important economic and natural functions, so the essence of many studies is to describe the impact it had on the identity of the city developing along it (Hudak, Paczkowska, 2011). This influence is described from different perspectives, and these studies focus mainly on natural, historical and social conditions, as well as economic and economic (Kosiński, 2000). The possibilities of using reservoirs and watercourses, as well as the benefits of their accessibility, can be considered on tourist (Muniz, Santana, Oliveira-Filho, 2020) and infrastructural aspects (Schneiderab, Duić, Bogdan, 2007). Considering the complexity of the scope in each condition, it is necessary to take into account the role and use of the river affecting urban development. The topic of the potential of rivers, their influence has been repeatedly addressed in the context of the attractions of riverside areas.

### **1.1. Tourist potential**

To begin the discussion of tourism potential and its impact on the development of urban areas, it is necessary to consider what influences on the perception of areas as interesting for incoming tourists. The term tourism potential is used to describe a concept that includes a spectrum of elements that allow the development of tourism in a given area. Following this definition (Balińska, 2009), the potential consists of structural elements - related to spatial factors, understood as tourism assets or tourism development, which are the basic factor through which an area can be considered attractive for tourism (Ozimek, Gralak, Pomianek, 2019) and functional elements, related to entities directly or indirectly related to tourism services. (Kaczmarek, Stasiak, Włodarczyk, 2005). Both these elements are treated as necessary for the growth of tourism and only their combined presence conditions its expansion (Meyer, 2010). A similar definition of tourism potential is defined by (Borkowska-Niszczota, 2014) putting forward the thesis according to which potential consists of a number of natural and landscape conditions occurring simultaneously, as well as tourism assets with tourism infrastructure, which in turn influence the frequency of use (Dziarmaga, Zieliński, 2017) and the possibilities of development of tourism areas.

The term "potential" means the possibility, ability in a given field, it is a set of components understood as means that can be used for some purpose, so as the basic groups of these elements we can distinguish sets of natural, socio-cultural and economic conditions. Using the above definitions of tourism potential, as a term which has become popular in both physical and socio-economic geography, it is clear that it is not possible to clearly define the elements which comprise it, but it is possible to distinguish particular groups of these elements. They were used in further considerations.

### **1.2. Tourist attractiveness**

Tourist attractiveness is a term often used as a synonym for tourism potential, and is described as the attribute of a given area resulting from natural or non-natural features, causing tourist interest in a given place, and furthermore the ability of a given place to attract tourism. The attraction is caused by the presence of certain natural, cultural or economic conditions in space, influencing the participants of tourism (Mika, 2011). Nitkiewicz-Jankowska (2011) points to the need for an element which attracts interest in a certain space, influencing the need to stay in a certain place, as the basic definition of tourism potential and the basis for the development of tourism and recreational functions. She refers to the non-economic aspects which contribute to tourism as a socio-economic phenomenon. An important role for tourism assets, apart from the above-mentioned tourism traffic and tourism development, was defined by Butowski (1996) in his comparative study of the tourism function of selected European cities. He paid particular attention to historical assets, showing the relationship between the size of a historical city over the years and the number and rank of historical assets present in the city. Communication accessibility with transport infrastructure and accommodation base, constituting tourist development, is indicated by the author as a connection of non-natural elements of tourist potential. Elements of the cultural or natural landscape can influence the competitiveness of areas in comparison with others and at the same time condition activities aimed at increasing the attractiveness of areas (Borkowska-Niszczoła, 2014). In the spatial aspect, specific features and elements of the natural environment, which to some extent of human activity - in terms of ensuring the degree of communication accessibility, or the state of tourism development of areas in optimal periods of using the values of the geographical environment and tourism capacity, can be considered as tourism potential, testify to tourism attractiveness and are the subject of tourism activity. The tourism attractions of geographic areas can be divided into leisure; sightseeing, being the subject of cognitive interest and specific, giving the opportunity to carry out various forms of activity.

In the literature, methods of multidimensional comparative analysis, especially taxonomic ones, are a frequently used research tools to assess tourist attractiveness (Synówka-Bejenka, 2017).

Taxonomical (synthetical) measures are used when comparing and ordering objects (e.g. provinces) due to the complexity of the phenomenon determine the diagnostic features. However, there are no studies based on the comparison of characteristics defining the local tourism potential of cities, e.g. located along the Odra River in Lubuskie Province.

The aim of this publication is to determine the tourism potential on the basis of comparison of towns located along the Odra River in Lubuskie. Apart from similar locations, Nowa Sól, Bytom Odrzański and Krosno Odrzańskie are characterised by similar size in terms of area and population (Figure 1).

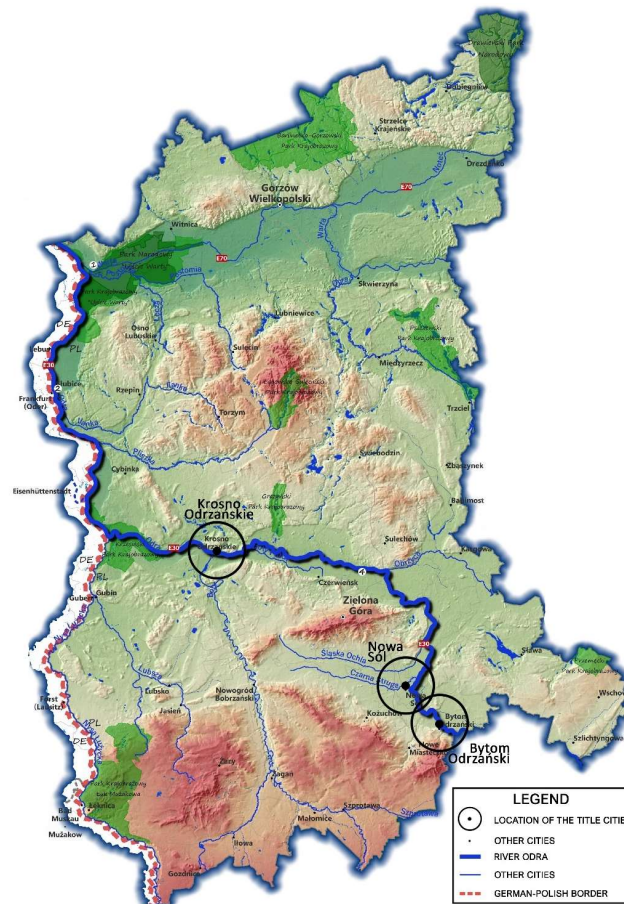


Fig.1. Cities selected for comparison, located on the Oder river in Lubuskie Voivodeship

### 1.3. Research area

The Oder River within the province of Lubuskie has a rather quiet course, avoiding major urban centers. The only urban centers in the voivodeship that lie on the Odra are Bytom Odrzański, Nowa Sól and Krosno Odrzańskie, Kostrzyn, Słubice (the last two towns were omitted in the research, due to their border character). These are not big cities, their population does not exceed 40 thousand, but undoubtedly they have been closely connected with the Odra River from the very beginning (fig. 2).

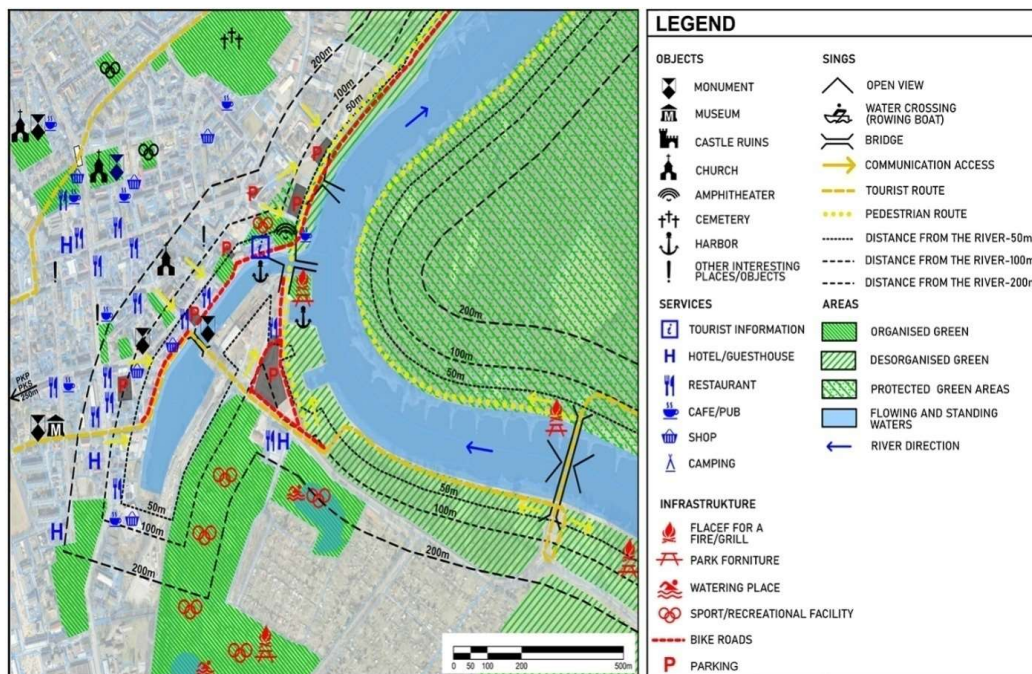


Fig. 2. Functional and spatial scheme of Nowa Sól

The dynamic development of Nowa Sól came in the mid-16th century, which was connected with the closing of the Oder branch. The following centuries witnessed an increase in the town's importance which was connected with the rebuilding and deepening of the port as well as its adaptation to receive large steam vessels. In the 19th century the quays were strengthened, flood banks and polders were built. A repair shipyard was built. At the beginning of the 20th century, a steel lift bridge was built to replace the wooden bridge previously located at this site. Industry and trade connected with the brewing and distribution of salt contributed to the enrichment of the population; besides the development of industrial infrastructure, the inhabitants' interest in the river's recreational



possibilities was noticeable. In the summer season boat cruises were organized, a rowing club operated by the harbor, and after the war - a sailing club. In front of the harbor master's office there were swimming pools hollowed out in the basins with a movable bottom, which made it possible to regulate the depth. The gradual withdrawal of the city from the river areas could be observed after the construction of the railroad and the gradual transfer of transport to land. The gradual decapitalization of river areas caused a further decline in the importance of these areas in the city.

Krosno Odrzańskie developed most intensively at the turn of the 8th and 10th centuries as an important center in the middle Oder region. The city owes its importance on the map of the defensive system of the western border to its location at the fork of the Odra and Bóbr rivers. A fortified castle, around which the old town grew, testified to its importance. Later town buildings were built on the right bank of the river (fig. 3).

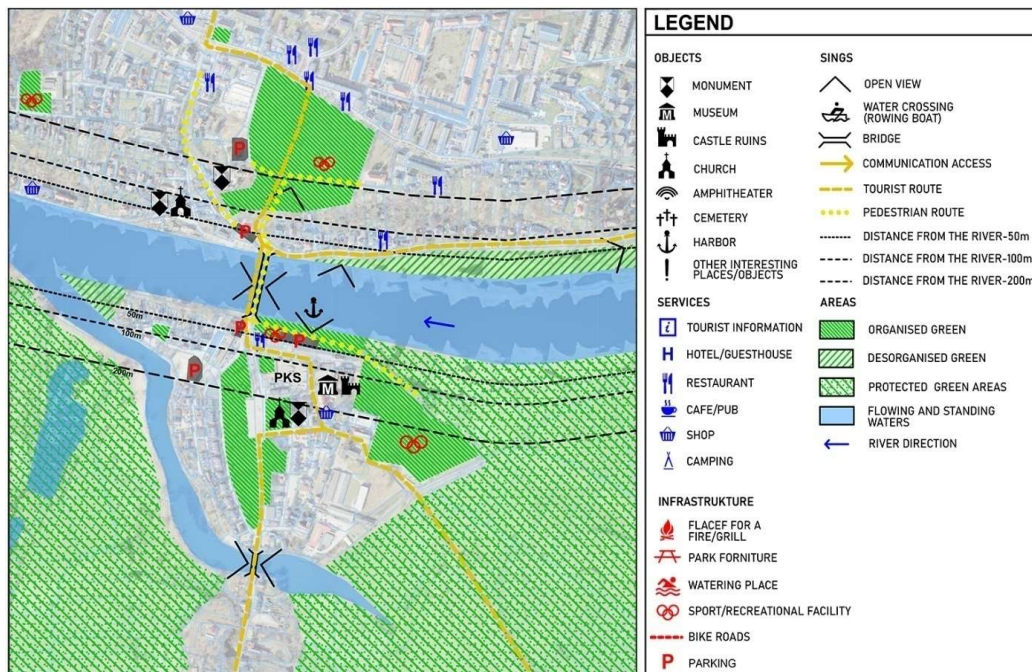


Fig. 3. Functional and spatial scheme of Krosno Odrzańskie

Nowa Sól and post-war Krosno Odrzańskie do not have a typical town square; for most of the development of both towns, most urban activity was concentrated within the port and riverfront areas in Nowa Sól and the non-historic town area in the case of Krosno Odrzańskie.

Bytom Odrzański, situated between Głogów and Nowa Sól, is a town located on the former Odra floating route. The history of the town was mentioned as early as the beginning of the 11th century; the remains of a settlement and a castellany stronghold are located about 1.5 km from the present market square. Bytom was granted city rights as early as in the mid-13th century; at the turn of the centuries the town was ruled by Silesian Piasts, Czechs, and in 1469 it was privately owned by the Glaubitz family of knights. In 1907, a bridge, destroyed by the retreating German army, was put into use, connecting Bytom Odrzański, located on the left bank of the Odra, with the castle on the other bank, now in ruins (Fig. 4).

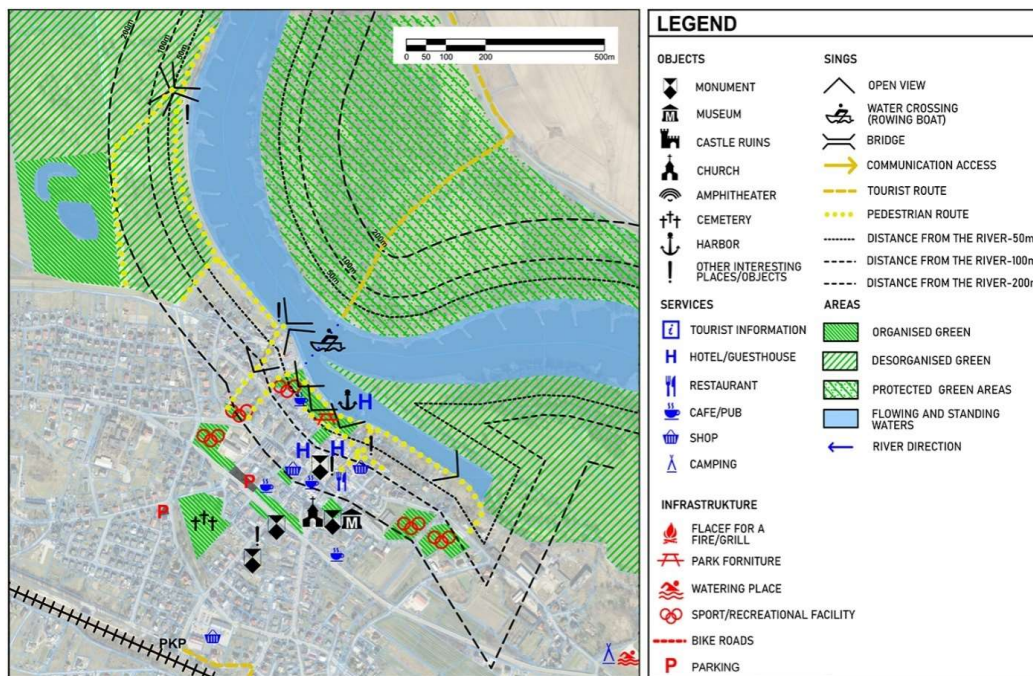


Fig. 4. Functional and spatial scheme of Bytom Odrzański

## 2. RESEARCH METHODOLOGY

The notion of tourist attractiveness as a criterion is a difficult, complex and ambiguous concept. In order to determine the tourist potential of towns and select the town with the greatest potential the comparative multi-criteria method was used, which is used to support the decision-making process when several or more factors are present. The aim of the method is to obtain a single result, which is possible thanks to the determination of criteria that allow the comparison of



standardized values. Multi-criteria comparative analysis focuses on statistical data, with comparative analysis of several objects. The comparative method involves the need to study the components, the study of the structure and individual characteristics, so the essence of the chosen method is the question of selection of evaluation criteria and their weight.

After defining the criteria to be taken into account in the evaluation of tourist attractiveness, sets of criteria were singled out that were of greatest importance in determining the tourist attractiveness of the river areas. Due to the selection of criteria from various fields, they were weighted and coded using the Neuman-Morgenstern method. This made it possible to compare the selected criteria. The final stage of the analysis is to use the weights of the selected criteria to compare the coded sub-measures of the selected criteria. The result of the multi-criteria analysis is a numerical value that indicates the city with the greatest potential.

The research used data from sources ranging from information from administrative and state institutions (Spatial Information Systems, Public Information Bulletins, Central Statistical Office, PRNG and BDOO resources of the Central Office of Geodesy and Cartography), through information available on websites including databases of monuments and services, to field inventory and local inspections. The economic, social, and natural situation of each city was assessed and the collected data was hierarchical and grouped. Analysis of the collected materials will be helpful in making right decisions that will have a positive impact on tourist competitiveness. The tourist potential of Lubuskie voivodeship is very diversified, and thanks to the river the towns could compete for tourists with larger and more developed centers. The collected materials were put in order.

For this study a comparative multi-criteria method was chosen to build rankings and to support the process of prioritizing the studied objects taking into account the applied evaluation criteria. Since the turn of the 20th and 21st century this method has been used in many fields of science. The individual stages of work are presented in Figure 5.

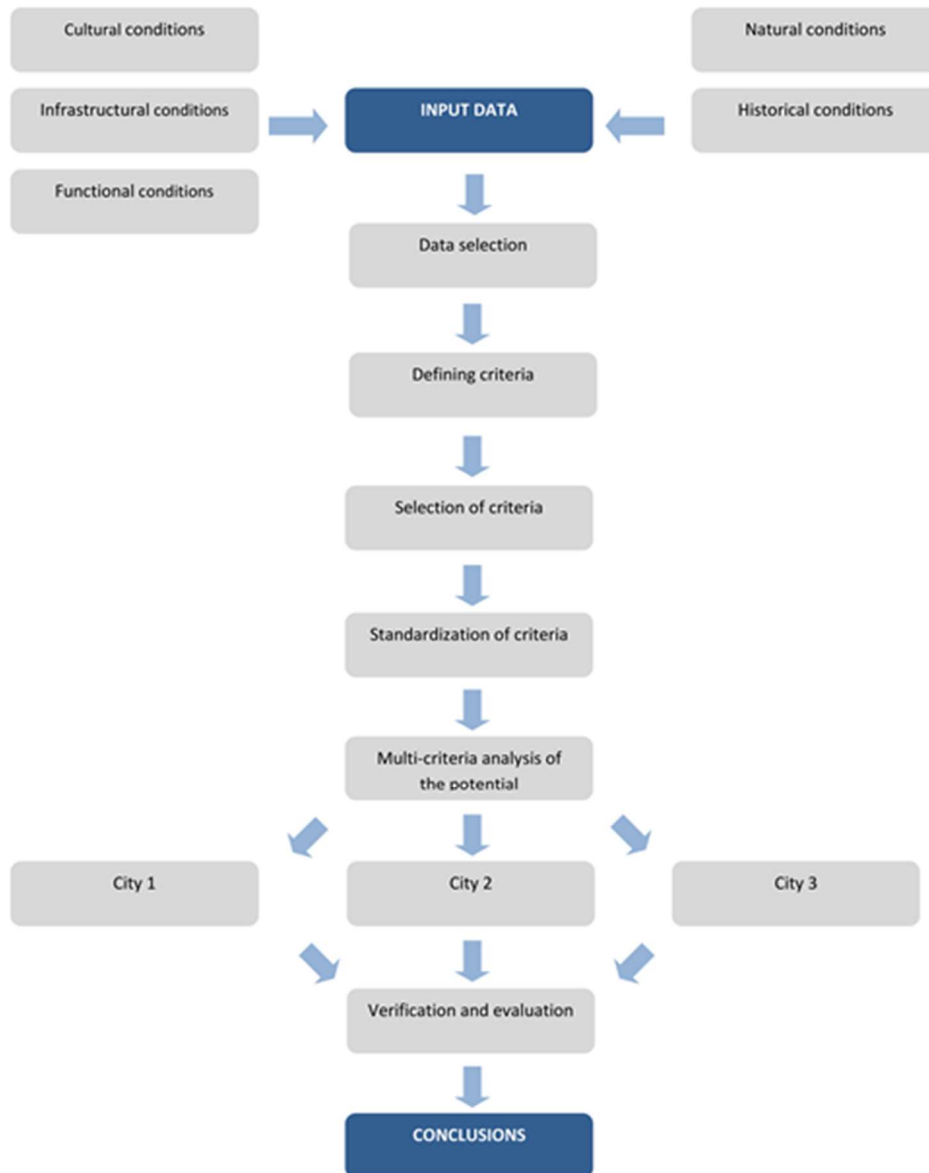


Fig. 5. Scheme of multi-criteria analysis of the studied area

The diagram of the algorithm considered for evaluating a multi-criteria task includes:

- a) the selection of criteria to be taken into account in the evaluation of the compared wharf,
- b) determination of values of evaluated features,
- c) coding of the features (performed by the Neuman-Morgenstern method),
- d) aggregation of normalized variables.

### 3. COURSE OF THE RESEARCH

In order to carry out the analysis, the selection of criteria consisted in extracting those features of the wharf presented for evaluation which are of significant importance in the process of evaluation (Table 1).

Table 1. Criteria determining the tourist potential of cities

Criterion	City		
	Nowa Sól	Krosno Odrz.	Bytom Odrz.
the number of residents	38 191	11 155	4 244
Population density [people/km <sup>2</sup> ]	1 781,8	1 396,1	1 883,0
The length of the coastline in the city [m]	1800	2800	1500
The width of the river course [m]	130	160	110
Number of river crossings	1	1	1
Transport accessibility [parking service, access road, pavement, bicycle path]	+	+	+
Number of service points within 50 m from the coastline	8	4	0
Number of service points in the strip 200 m from the coastline	16	9	3
Proximity to the city center [m]	200	500	200
Number of viewing openings in characteristic places	4	5	4
The number of dominants in the coastline	2	1	3
Oldtown / market square	-	-	+
Accommodation base (hotels / guesthouses)[pc.]	5/15	2/7	3/2

Food base		9	4	4
Number of monuments		123	37	83
Recreational infrastructure	Riverside boulevards and promenades	+	-	+
	Walking and cycling paths	+	+	+
	Cafes and restaurants	+	-	-
	Sport fields	+	+	-
Tourist infrastructure	Canoe harbor	+	-	-
	Access to electricity	+	-	+
	Access to sanitary facilities	+	+	+
Port infrastructure	Port, marina	+	+	+
	Railway shunt	+	-	-
Flood protection infrastructure		+	-	+
Occurrence of economic zones in the city		+	-	-
Inland sailing		+	-	-
Conducting cross-border cooperation		+	+	+
Natural conditions		Natura 2000: Middle Odra Valley - Ptasic areas; Nowosolska Dolina Odry - habitat areas; Protected Landscape Areas – Nowosolska Dolina Odry; 27 nature monuments	Natura 2000: Middle Odra Valley - Ptasic areas, Krośnieńska Dolina Odry - habitat areas; Protected Landscape Areas - Krośnieńska Dolina Odry; 3 nature monuments	Protected Landscape Areas – Wzgórza Dalkowskie; Natura 2000: Middle Odra Valley - Bird areas; Nowosolska Dolina Odry - habitat areas, 6 Nature Monuments

The following types of criteria were identified (Table 2): the distance of the shoreline in the city, the availability of bridges or ferry crossings; transport accessibility in terms of parking services, access roads, bicycle paths and

sidewalks; the presence and number of services within 200 m of the shoreline; the number of historical monuments in the study area; the presence of recreational and tourist infrastructure (boulevards, cafés, restaurants, sports fields, canoe marinas, or the availability of electricity and sanitary facilities in the port and marina); the presence of port infrastructure (port, marina, railroad siding).

In the analysis of the criteria selection it was limited to distinguish isochrones of distance limiting the range to 200 m, which is the distance from the center of the analyzed cities (the center of the historic city in the case of Krosno Odrzańskie).

Table 2. Selection of a set of criteria for evaluations of the compared wharf

Selected criterion	City		
	Nowa Sól	Krosno Odrz.	Bytom Odrz.
The length of the coastline [m]	1800	2800	1500
Number of rivercrossings	2	1	1
Transport accessibility [parking service, access road, pavement, bicycle path]	3	2	1
Number of service points in the strip 200 m from the coastline	16	9	3
The number of dominants in the coastline	2	1	3
Number of monuments	123	37	83
Recreational and tourist infrastructure	7	4	5
Port infrastructure	2	1	1

In this case, to determine the weighting of selected criteria, we used an incidence matrix  $\mathbf{K}(3.1)$ , in which the rows and columns are juxtaposed individual criteria, specifying their possible or mutual influence [1] or lack thereof [0]. The matrix was shaped as follows:

$$K = \begin{bmatrix} 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 \end{bmatrix} \quad (3.1)$$



From the presented list of evaluated criteria, it can be seen that these are features that we can evaluate as measurable (quantitative, quantitative) and non-measurable features (qualitative, qualitative). Coding, in the case under consideration, consists in converting the value of a partial measure (quantified) into a numerical value (unquantified) from the interval (0, 1) or  $<0, 1>$ . For this purpose, it is necessary to sum the elements of the matrix along the rows obtaining the indices of the weights of the adopted criteria. The quotient of the summed elements of the criteria weights and the sum of all elements of the matrix is presented in the form of criteria weights in Table 3.

Table 3. Weighting of the selected criteria

Mark	Criterion	Weight $v_i$
K1	The length of the coastline	0,241
K2	Number of river crossings	0,207
K3	Communication accessibility	0,069
K4	Number of service points in the strip 200 m from the coastline	0,000
K5	The number of dominants in the coastline	0,034
K6	Number of monuments	0,207
K7	Recreational and tourist infrastructure	0,103
K8	Port infrastructure	0,138

The weights of the selected criteria were used for further analyses, and their sub-measures  $x_{ij}$  ( $i=1, \dots, n$ ;  $j=1, \dots, m$ ; where  $n=3$ ,  $m=8$ ) are listed in Table 4. In Table 4, the letter S denotes criteria of stimulant nature, the letter D denotes criteria of dissimulant nature.

The partial measures listed in Table 4 were coded using the Neuman-Morgenstern method (3.2), (3.3), which consists in replacing the partial measure  $x_{ij}$ , which corresponds to a given criterion, by the ratio of the difference of this measure and the worst measure  $x_{j,\min}$  or the ratio of the difference of the best measure in a given criterion and this measure to the difference between the best  $x_{j,\max}$  and the worst measure  $x_{j,\min}$  in a given criterion.

Table 4. Partial measures  $x_{ij}$  of  $M$  cities

City	K1 (S)	K2 (S)	K3 (S)	K4 (S)	K5 (S)	K6 (S)	K7 (S)	K8 (D)
M1	1800	2	3	16	2	123	7	2
M2	2800	1	2	9	1	37	4	1
M3	1500	1	1	3	3	83	5	1

The signs  $i, j$  are indicators of variants and criteria. This transformation can be written according to the following formula:

$$z_{ij} = \frac{x_{ij} - x_{j,\min}}{x_{j,\max} - x_{j,\min}} \quad (3.2)$$

and

$$z_{ij} = \frac{x_{i,\max} - x_{ij}}{x_{j,\max} - x_{j,\min}} \quad (3.3)$$

The coded measures are presented in Table 5.

Table 5. Coded partial measures

City	K1 (S) $v_i=0,241$	K2 (S) $v_i=0,207$	K3 (S) $v_i=0,069$	K4 (S) $v_i=0,000$	K5 (S) $v_i=0,034$	K6 (S) $v_i=0,207$	K7 (S) $v_i=0,103$	K8 (S) $v_i=0,138$
M1	0,231	1,000	1,000	1,000	0,500	1,000	1,000	0,000
M2	1,000	0,000	0,500	1,125	0,000	0,000	0,000	1,000
M3	0,000	0,000	0,000	0,000	1,000	0,535	0,333	0,000

The final stage of the analysis of the considered solutions is aggregation (4), which leads directly to obtaining a synthetic variable. In the case under study, aggregation has the character of a rank describing the value of the considered variant of assessing the tourist potential of the selected quay, in accordance with the formula:

$$J_i = \sum_{j=1}^m (z_{ij} \times v_j) \quad (3.4)$$

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#### 4. RESULTS

The results of the evaluation are summarized in Table 6.

Table 6. Assessment of the tourist potential of cities

City	Name of the city	Result
M1	Nowa Sól	<b>0,659</b>
M2	Krosno Odrzańskie	0,448
M3	Bytom Odrzański	0,179

## 5. DISCUSSION AND CONCLUSIONS

For each element of tourism potential there is a minimum of requirements or a set of characteristics that determine the attractiveness and value of an area and the possibility of its increase (Wyrzykowski, 2010). The differences in the attractiveness of some areas compared to others increase the interest in selected areas and may be related to taking action to increase their competitiveness (Klasik, 1999). Considering the fact that tourism-related travel can be counted among the main elements of the modern lifestyle, it is reasonable to stimulate processes in the market economy through which in tourism areas methods are sought to compare the possibilities of providing specialized services and to identify features that prove the uncompetitiveness of areas (Zajadacz, 2004). Competitiveness of a certain spatial unit means the ability to build distance in relation to other units, taking into account certain criteria. Areas with different levels of investment and maintenance of riverside infrastructure can vary significantly within the study areas, the determination of the components of the potential of the studied region can be an important research problem (Kusa, 2005).

In recent years, there has been a notable trend of looking for new investment sites within the city itself. This has influenced the slow but noticeable transformation of the riverside zones. Such efforts have caused the riverbanks to take on new forms. Cities, which for years had their backs to the river, began to turn their gaze towards it again. With economic aspects playing less and less of a role, influenced by private capital investment and public-private partnerships, friendly and open forms of public space began to emerge in degraded and unattractive areas. The landscape and aesthetic values of riverside areas began to be used in a planned and purposeful way. Boulevards and green areas were built. It is observed that social interest in the use of rivers has intensified considerably in recent years, not only from a practical but also from a scientific point of view. The aim of this paper was to perform a multi-criteria analysis of the collected data and to determine the tourism potential in the development of riverside areas in selected cities of the Lubuskie Province located in the Odra Valley – Nowa Sól, Krosno Odrzański and Bytom Odrzański. The methods as well as the results of research and analysis used to determine the indicated topic have been synthetically presented in the study, therefore, it should be considered that the assumed research thesis has been realized.

Considering the final analyses and based on the results of the adopted Neuman-Morgenstern coding method, it was noted that the criteria that had the greatest influence on the evaluation were: the length of the coastline, the number of river crossings, and the number of monuments available in the city. Recreational and tourist infrastructure as well as port infrastructure did not have much influence on the comparative assessment.

According to the selected criteria defining the elements of tourism potential, the city of Nowa Sol was indicated as having the highest tourism potential. The city of Bytom Odrzański received the lowest score. This is probably due to the lack of a bridge, which is not compensated for by crossing the Oder with a passenger boat.

The developed theme gives a lot of possibilities for further analysis in the field of examining the uneven level of investment and maintenance of structural elements, thus indicating the directions of cities' development in order to increase their tourist attractiveness.

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