

The importance of the transport accessibility of coastal areas in the development of the Western Pomeranian region

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Key words: transport accessibility, coastal areas, development, West Pomeranian region, Świnoujście, Kołobrzeg

Abstract

This article aims to present the results of the analysis of selected aspects of transport accessibility (from the land and water) of two coastal areas situated on the Baltic coast of the Western Pomeranian region. It was assumed that transport accessibility affects the number of tourists visiting the selected areas – Kołobrzeg County (mainly the city of Kołobrzeg) and Świnoujście. The analysis was based on econometric modeling. For the timescale investigated (1995–2016), linear and parabolic trends were estimated and, as a result of their extrapolation, tourism forecasts in both coastal areas were estimated up to the year 2020. Statistical data for the years 1995–2016 was collected by the Central Statistical Office of Poland. In addition, literature and online resource research was conducted.

Introduction

For the purpose of this article, selected aspects of transport accessibility of two coastal areas (Kołobrzeg County and the city of Świnoujście) located on the Baltic coast of the Western Pomeranian region were investigated. The accessibility of these areas from the land (by road and rail) and from the water was assessed. It was assumed that the transport accessibility of these locales, which determines the attractiveness of the locale relative to others (Spiekermann & Neubauer, 2002), influences the number of tourists visiting Kołobrzeg County (mainly the city of Kołobrzeg) and Świnoujście. It may also be the determining factor of whether a place is considered a rest stop, directly translating into profit derived from tourism. Transportation accessibility may be considered an element of the tourism potential of the area.

This article uses some elements of econometric modeling. For the timescale investigated

(1995–2016), linear and parabolic trends were estimated and, as a result of their extrapolation, forecasts for tourism in both coastal areas were estimated up to the year 2020. In addition, literature and online resource research was conducted.

Analysis of tourist traffic in Świnoujście and Kołobrzeg County

The two areas are the most popular regions in Poland with tourists. They are associated mainly with holiday and spa tourism due to the attractive geology and favorable climate and geographical location (Kasprzak, 2016, p. 134). The growing interest in active tourism and the investments in infrastructure of recent years, specifically with regard to the development of the yacht port network in the Western Pomeranian region, have made these areas increasingly popular with sailing tourism participants.

Based on the number of people staying in tourist accommodation (registered by the Central

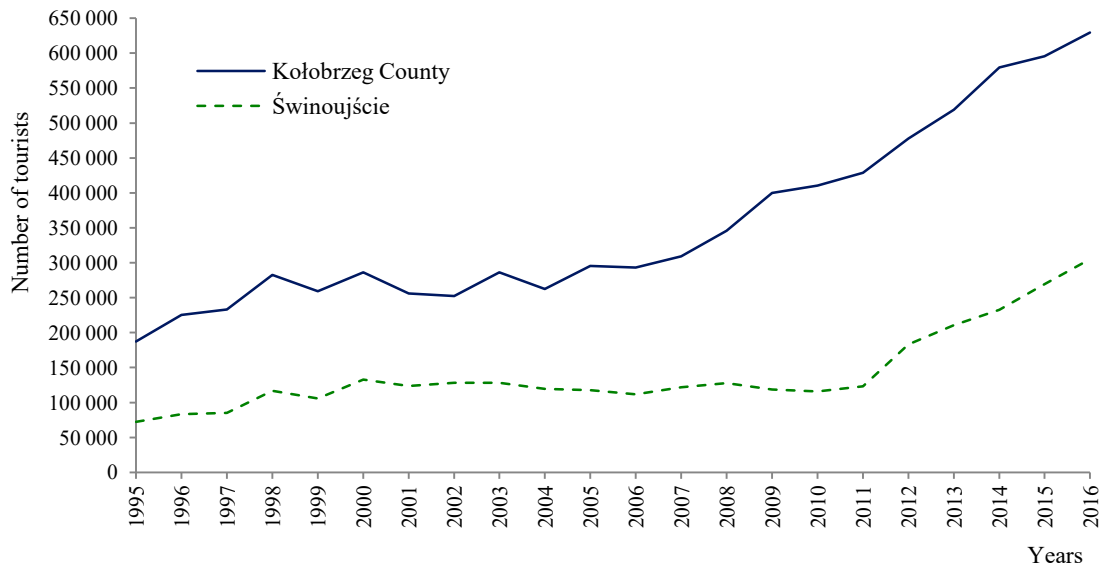


Figure 1. Tourists staying at tourist accommodation establishments in Świnoujście and Kołobrzeg County in the years 1995–2016 (Central Statistical Office, 2017)

Statistical Office (CSO)), the volume of tourist traffic in Świnoujście and Kołobrzeg County was analyzed. In addition, the intensity and density of tourism was assessed. Due to the availability of statistical data, the whole of Kołobrzeg County has been taken into account, although the majority of tourists use accommodation in the Kołobrzeg area. Between 1995 and 2014 this share ranged between 80 and 90%. There is no data on Kołobrzeg for the years 2015–2016, but it can be assumed that the situation is similar to that in the previous period.

Figure 1 shows the number of tourists accommodated in Świnoujście and Kołobrzeg County in 1995–2016. Approximately twice as many tourists stay in Kołobrzeg. In the studied period, a significant increase of 322.78% was observed in Świnoujście and 236.21% in Kołobrzeg. At the same time, the increase for the entire Western Pomeranian region was 108.88%. In 2016, the share of the number of tourists visiting the Western Pomeranian region who were accommodated in the analyzed areas amounted to 36.43%.

The growth trend of the number of tourists using accommodation in Świnoujście between 1995 and 2016 can be described in the form of the following functions:

$$\text{linear} \quad \hat{y}_t = 57414 + \frac{7393t}{1245} \quad (1)$$

$$\text{parabolic} \quad \hat{y}_t = 118147 - \frac{7790t}{3966} + \frac{660t^2}{167} \quad (2)$$

The linear trend model accounts for only 63.91% of the variability observed in the data. It assumes that growth has increased from year to year by an average of 7,393 tourists. A better fit for the real data is shown

by the parabolic function ($R^2 = 0.8009$). Parameters of both models are statistically significant.

Despite the low degree of correlation between the trends and empirical data, the number of tourists using accommodation in the tourist base of Świnoujście was predicted (Figure 2). The results of the extrapolation of trends (1) and (2) should be treated as estimates. Due to clear annual increases since 2012, a parabolic projection seems probable.

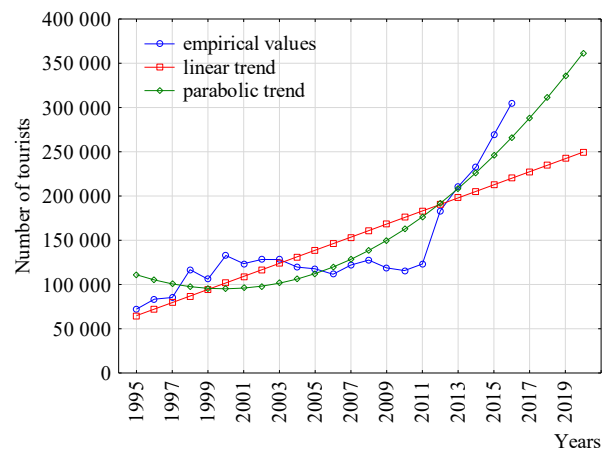


Figure 2. Tourists staying at tourist accommodation establishments in Świnoujście in the years 1995–2016 and forecast to 2020 (Central Statistical Office, 2017)

Changes in the number of tourists using accommodation in a base located in Kołobrzeg County are expressed by the following functions:

$$\text{linear} \quad \hat{y}_t = 140749 + \frac{18648t}{1686} \quad (3)$$

$$\text{parabolic} \quad \hat{y}_t = 247905 - \frac{8141t}{3520} + \frac{1165t^2}{149} \quad (4)$$

Both models correlate better with the real data than those for Świnoujście. The R^2 determinants were found to be 0.8595 and 0.9668, respectively. The linear model assumes that the increase in the number of the Kołobrzeg County tourists has been, on average, 18,488 tourists per year, indicating much faster growth than in Świnoujście.

Figure 3 shows the results of the prediction based on the extrapolation of both estimated trends. Particularly optimistic is the forecast based on the quadratic function. Appropriate local and regional policies may be necessary to deal with this growth; this is particularly important in the context of the development of spas, which play a significant role in the tourism industry in Kołobrzeg which has the status of a health resort.

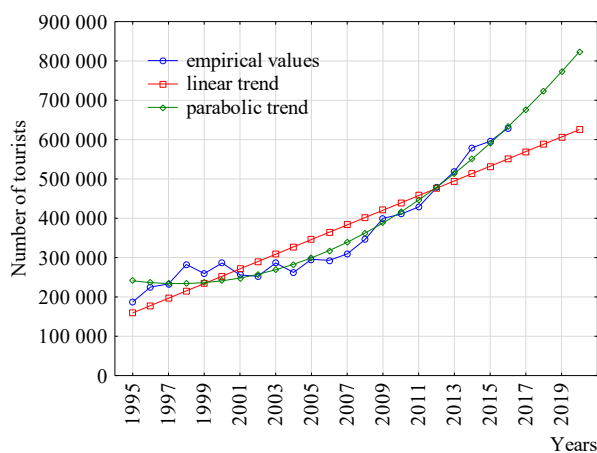


Figure 3. Tourists staying at tourist accommodation establishments in Kołobrzeg County in the years 1995–2016 and forecast to 2020 (Central Statistical Office, 2017)

In addition, an analysis of the variability of the intensity and density of tourist traffic in both areas was carried out. The intensity of tourist traffic, expressed as Schneider's rate, reflects the number of tourists accommodated per 100 inhabitants (Warszyńska & Jackowski, 1979, p. 69).

The trend of this indicator in Świnoujście in the years 1995–2016 is described by the following functions:

$$\text{linear} \quad \hat{y}_t = 130.35 + 18.49t \quad (5)$$

[39.02] [2.97]

$$\text{parabolic} \quad \hat{y}_t = 271.82 - 16.88t + 1.54t^2 \quad (6)$$

[48.16] [9.65] [1.54]

Both estimates explain changes in intensity of tourism in Świnoujście. The R^2 determinants were 0.6594 and 0.8054 for the linear and parabolic trends, respectively. A better fit is obtained by the parabolic model.

Extrapolation of both these trends is shown in Figure 4. According to the projection based on function (6), in 2020 as many as 874 tourists (per 100 inhabitants) will be accommodated in the area. This would amount to an increase of about 18% when compared with 2016. Assuming that the current slight downward trend of the population will remain at a similar level and that the number of tourists will increase, this is a likely scenario.

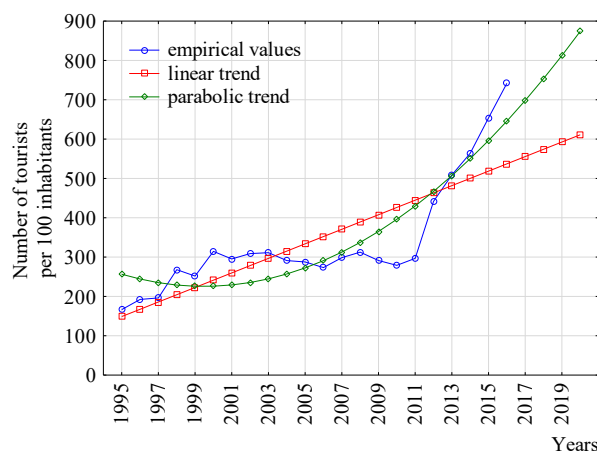


Figure 4. Number of tourists staying at tourist accommodation establishments in Świnoujście and per 100 inhabitants in the years 1995–2016 and forecast to 2020 (Central Statistical Office, 2017)

Changes in the indicator of intensity of tourist traffic in Kołobrzeg County in the years 1995–2016 are described by the following functions:

$$\text{linear} \quad \hat{y}_t = 197.02 + 22.64t \quad (7)$$

[26.27] [2.00]

$$\text{parabolic} \quad \hat{y}_t = 320.22 - 8.16t + 1.34t^2 \quad (8)$$

[22.81] [4.57] [0.19]

The obtained linear trend model correlates with the variability of the intensity of tourism in this period to 86.49%. It assumes that there has been growth from year to year by an average of about 23 tourists per 100 inhabitants. A better correlation with the real data is given by the parabolic function ($R^2 = 0.9618$).

Extrapolation of both trends is shown in Figure 5. The intensity of tourist traffic in Kołobrzeg County was higher than in Świnoujście in all analyzed years. There are approximately twice as many people living there and the number of inhabitants is about 4% less in 2016 than in 1995. By contrast, the population of Świnoujście in 2016 was approximately 5% lower than in 1995.

According to the forecast prepared on the basis of the function (8), in 2020 as many as 1,014 tourists

(per 100 inhabitants) will be accommodated in the area, 140 more than in Świnoujście.

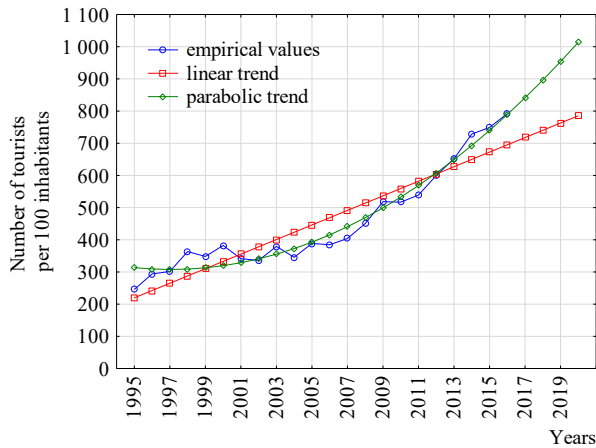


Figure 5. Number of tourists staying at tourist accommodation establishments in Kołobrzeg County per 100 inhabitants in the years 1995–2016 and forecast to 2020 (Central Statistical Office, 2017)

The density of tourist traffic was determined based on the quotient of the number of tourists staying overnight and the area’s size (Kurek & Mika, 2008, pp. 40–42). Świnoujście is characterized by a higher density of tourist traffic; however, the area is much smaller than Kołobrzeg County, where the greatest concentration occurs in the city of Kołobrzeg. In order to show changes in the size of this indicator for both areas, trends have been estimated (in the same way as before) and extrapolations have been made to 2020. The results of this analysis are shown in Figures 6 and 7. In both cases, the quadratic function shows a better correlation with the empirical data. Assuming the previously observed

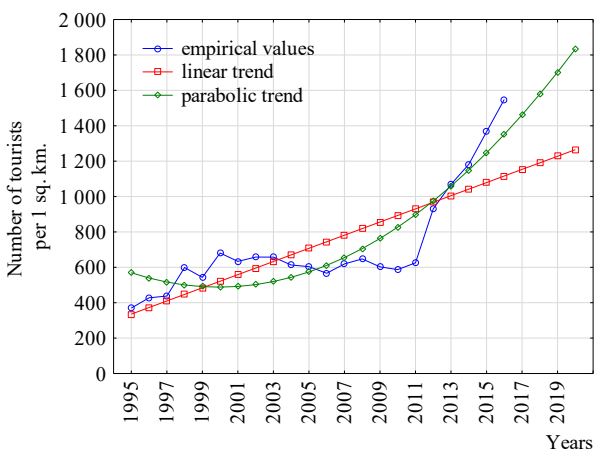


Figure 6. Number of tourists staying at tourist accommodation establishments in Świnoujście per square kilometer in the years 1995–2016 and forecast to 2020 (Central Statistical Office, 2017)

rate of growth of the number of accommodated tourists, significant increases in the index are likely to occur. According to the forecast, in 2020 the density of tourist traffic in Świnoujście may reach 1,834 (with an estimated error of about 145 tourists). This is 395.73% more tourists than in 1995, and 18.46% more than in 2016. The forecast for Kołobrzeg County suggests a value of 1,388 tourists per square kilometer (with an estimated error of about 34 tourists), 341.42% more than at the beginning of the analyzed period and 18.46% more than in 2016.

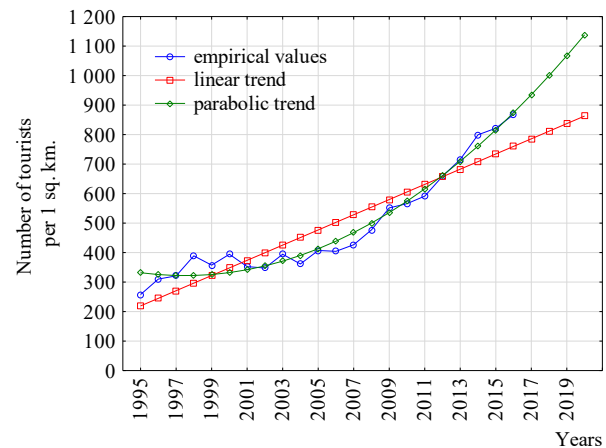


Figure 7. Number of tourists staying at tourist accommodation establishments in Kołobrzeg County per square kilometer in the years 1995–2016 and forecast to 2020 (Central Statistical Office, 2017)

As a summary of the forecasts, the results of which are shown in Figures 2–7, Table 1 shows the changes in tourist movement expected in 2020 based on the empirical values of 2016. The values in Table 1 refer to estimates from the parabolic trends,

Table 1. Predicted changes in tourist traffic in Świnoujście and Kołobrzeg County in the years 2016–2020 (Central Statistical Office, 2017)

Details	Świnoujście		Kołobrzeg County	
	change		change	
	absolute	relative [%]	absolute	relative [%]
Number of tourists staying at tourist accommodation establishments	56,764	18.61	197,504	31.39
Schneider’s rate (the number of tourists accommodated per 100 inhabitants)	132	17.79	222	28.03
Density rate (the number of tourists accommodated per 1 sq. km.)	286	18.48	270	31.11

the results of which represent an optimistic variant as they indicate higher increases in volume, intensity and density of tourist movement in Świnoujście and Kołobrzeg County.

According to the analysis, the intensity of tourist traffic in the investigated areas will increase in the next few years. The increasing number of tourists can influence changes in both areas which could be both positive and negative. It is worth paying attention to the economic impacts. Special significance is attributed to tourism links with regards to the development of the region, both as a whole, at the level of the province, and to smaller individual administrative units (*poviats* or communes).

Links between tourism and development of the region are spatially varied. Tourism traffic is also heterogeneous in terms of the type of accommodation that individual tourists choose. In addition, there are differences between tourist groups, i.e. domestic and foreign; therefore, when studying links between tourism and development of individual areas, the number of tourists has been split into the types of accommodation facilities they choose as well as whether they are domestic or foreign tourists. Also considered are the number of beds and selected variables representing the tourist economy. The strength of the variables related to tourism with the variables that measure development was checked. This study was conducted for the period 2001–2012, details of which are reported elsewhere (Hącia, 2017).

As a result of this research, a strong dependence on GDP per capita was observed in Świnoujście of the following variables: number of tourists (total) accommodated in hotels, number of overnight stays of tourists (in total) in hotels, number of beds in hotels, number of foreign tourists accommodated in hotels, number of overnight stays of foreign tourists in hotels and number of domestic tourists accommodated in hotels. In the case of Kołobrzeg County, strong dependencies with the same development measure (GDP per capita) were obtained for other variables: the total number of tourists accommodated and total number of overnight stays of tourists. With respect to other measures of development, i.e. the revenues of communities and cities with *poviat* status per capita (both areas) and the number of entities of the national economy (only for the *poviat* of Kołobrzeg), weaker dependencies with the variables representing the tourism sector were obtained (Hącia, 2017).

Both Świnoujście and Kołobrzeg are typical tourist destinations, mainly associated with spa and leisure tourism; however, their coastal locations

predestine them for the development of various forms of water tourism such as nautical tourism, which in recent years has become increasingly popular both in Poland and abroad. The cities are home to some of the largest yacht ports on the Polish coast. Tourists who come to Świnoujście and Kołobrzeg on yachts are not included in CSO statistics. This is due to the fact that they generally do not use the accommodation, opting instead to stay on-board. Nevertheless, they generate demand for all kinds of goods and services that are products of the region, which brings tangible economic results. Moreover, the marinas and yachts make up the maritime atmosphere of the city, and events related to sailing culture such as regattas or shanties can become attractions for non-sailing tourists.

Transport accessibility of Świnoujście and Kołobrzeg

Full exploitation of the tourist potential of an area is possible only by providing adequate transport accessibility. It determines the presence of tourists and has a direct impact on their numbers. For the purpose of this article, selected aspects of transport accessibility of the described areas were analyzed. In the case of Kołobrzeg County, the study focused only on the city of Kołobrzeg.

Rail and road transport accessibility was analyzed. The focus was only on domestic connections with Szczecin, Warsaw, Krakow and Wrocław.

In order to complete the analysis, due to the increasing importance of nautical tourism in both areas, the availability of yacht ports in Świnoujście and Kołobrzeg, defined by the layout of waterways, their marking and the safety conditions for yachting berths, were also analyzed.

Table 2 presents the travel times from the selected cities to Świnoujście and Kołobrzeg, for different modes of transport (cars and regular bus and train connections). Wherever possible, the number of connections per day (during high tourist season) and the minimum unit costs are shown.

Table 2 does not provide unit costs for arriving in a particular city by car because it is dependent on too many variables, including: the number of people traveling, the capacity of the engine and the speed of the vehicle.

Road connections with the analyzed cities can be considered as good. Table 3 shows the main roads leading to Świnoujście and Kołobrzeg from the analyzed cities. Classes are defined in the Regulation of the Minister of Transport and Maritime Economy

Table 2. Road and railway connections of selected Polish cities with Świnoujście and Kołobrzeg (PKP INTERCITY, 2017; PKP SA, 2017; Podróżnik, 2017)

From the city of:	Mode of transport	Minimum travel time	Number of direct connections per day	Minimum fee per 1 person [PLN]
Świnoujście				
Szczecin	Train	1 h 33 min	4	32.00
	Bus	1 h 29 min	> 30	17.50
	Car	1 h 40 min	–	it depends
Warszawa	Train	8 h 06 min	4	70.20
	Bus	No connections	–	–
	Car	6 h 40 min	–	it depends
Wrocław	Train	6 h 26 min	4	70.00
	Bus	No connections	–	–
	Car	5 h 40 min	–	it depends
Kraków	Train	11 h 14 min	4	87.00
	Bus	No connections	–	–
	Car	8 h	–	it depends
Kołobrzeg				
Szczecin	Train	2 h 43 min	4	29.90
	Bus	3 h	3	20.00
	Car	1 h 40 min	–	it depends
Warszawa	Train	5 h 29 min	5	75.00
	Bus	8 h 55 min	4	80.00
	Car	6 h	–	it depends
Wrocław	Train	6 h 51 min	4	71.00
	Bus	7 h 45 min	1	75.00
	Car	5 h 34 min	–	it depends
Kraków	Train	8 h 5 min	5	80.00
	Bus	12 h 10 min	4	99.00
	Car	8 h	–	it depends

of 2 March 1999 on the technical conditions to be met by public roads and their location. According to the Regulation, expressways are marked with “S” and “A” indicates a motorway. The DK symbol represents a public national route.

Table 3. Classes of roads leading from selected Polish towns to Świnoujście and Kołobrzeg (Ministerstwo Transportu i Gospodarki Morskiej, 1999)

From the city of:	To Świnoujście road class/number	To Kołobrzeg road class/number
Szczecin	S3, DK3	DK6
Warszawa	A2, S3, DK3	A2, A1, S6, DK6
Wrocław	A4, DK3, S3, DK3	A4, DK3, S3, S6, DK6
Kraków	A4, DK3, S3, DK3	A4, S1, A1, S6, DK6

It should be noted that motorways enable faster and safer travel but the need to pay a toll increases travel costs.

It should also be noted that in Table 2, the minimum rate per person traveling by bus or train does not always correspond to the fastest routes, the

duration of which is shown in the “minimum travel time” column.

The data presented in Table 2 shows that in the case of Warsaw and Wrocław it is impossible to reach Świnoujście by bus because there are no regular connections to these cities. Other cities usually have several such connections and the route is operated by different carriers. Most bus routes are established between Szczecin and Świnoujście.

As mentioned above, due to the growing importance of both cities with regards to nautical tourism, chosen aspects of water-side availability for yacht users have also been analyzed. For marinas, this is just as important as land-side availability. Particularly important in this regard is the entrance to the port. Comparing ports in Świnoujście and Kołobrzeg, it is clear that the entrance to the port of Świnoujście is safer. There are several yacht ports in the city, the most important of which for the development of nautical tourism is the North Port. It offers 350 berths, 300 of which are designed for yachts visiting the port (Olszanowski et al., 2015, p. 74).

The entrance to the port of Świnoujście is an approach track. Both are well marked which provides trouble-free entrance into the harbor no matter the time of day or weather conditions (Rund Rügen ..., 2009). The eastern entrance leads along a slope called the Western Shoal; however, from the point of view of yacht navigation, the depths there can be considered safe. The entrance is covered by two breakwaters: one, 1400 m long to the East, the other, 300 m long and to the west (Locja Bałtyku, 2016, p. 153). Due to the closeness of the gasport, there is a third breakwater, 3000 m long. Sailors must correctly select the entrance to the yacht port between the western and central breakwaters. The marina is on the right side of the waterway for yachts sailing from the sea. The entrance is located on the western bank of the Świna River and is well marked with a green flashlight on its right bank (Heinrich, 2011, p. 88).

As for Solna Marina, the yacht port in Kołobrzeg, the ease of entering this port depends on the direction of the wind. If the wind blows from the land, no matter its strength, it does not affect the ease of entry. On the other hand, winds from E to NE are considered safe if the wind does not exceed 8 °B (Heinrich, 2011, p. 99). Particularly dangerous are the currents present during such winds between the breakwater heads; in long-term storm conditions, these currents can reach up to 3 knots (Locja Bałtyku, 2016, p. 141). This is especially dangerous for small vessels and attempting to enter the port in such conditions requires a well-functioning engine. The marina itself is much smaller than that in Świnoujście, comprising 100 berths, only 30 of which are for visiting yachts (Olszanowski et al., 2015, p. 95).

Conclusions

For the purposes of this article, a hypothesis was made that transport accessibility of an area affects the number of tourists visiting that area. Selected aspects of transport accessibility of Kołobrzeg and Świnoujście were analyzed, focusing on the availability of roads and selected aspects of water routes for yachting tourists. It should be noted that the availability for other tourists travelling by sea has not been investigated.

As a result of the research, it was found that both analyzed areas are characterized by relatively good transport accessibility. In the tourist season, towns selected for the needs of the analysis are connected with Świnoujście and Kołobrzeg with at least a few regular railway connections within a 24 hour period.

The situation with regard to bus routes is much worse. There were no regular connections between Świnoujście and Warsaw, Wrocław or Krakow during the studied period. On the other hand, the duration of the existing bus routes between Kołobrzeg and the selected towns is considerably longer than the train connections and the average time of car travel. The price comparison is also disadvantageous; therefore, it can be assumed that bus travel is the least attractive solution for potential tourists.

As far as car trips are concerned, there are no full motorway connections between the analyzed towns. As a result, this may lead to difficulties caused by increased tourist traffic in high tourist season. This will increase the duration of travel, which reduces the attractiveness of choosing car travel. Taking all these aspects into account, it can be said that trains remain the best and most reliable solution.

This article also analyzes selected technical and navigational elements of the availability of yacht ports in Świnoujście and Kołobrzeg on the water. These ports may be the destination of travelers who, after mooring their yachts, go inland and make use of the tourist attractions of the area. In both cases, this availability is good. Ports are appropriately marked and safe when complying with shipping rules.

The tourist traffic forecast made in this article indicates that the number of tourists visiting the regions is expected to increase further. In this case, it will be necessary to take action to improve transport accessibility, mainly in the area of bus services. As with passenger cars, the state of the roads will play a key role. In light of the expected growth of the number of tourists, it will probably be necessary to increase the number of railway connections.

To sum up, an accurate study on the relationship between transport accessibility and the tourism movement that translates into development of the region would require in-depth qualitative research.

Acknowledgments

The results of this research were generated within the framework of the research work entitled *Badanie wybranych aspektów logistycznych turystyki żeglarskiej* No. 9/S/IZT/2017 financed by subsidies from the Ministry of Science and Higher Education for the financing of statutory activities.

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