

DICHOTOMY IN THE DISTRIBUTION OF MARITIME ACTIVITY BETWEEN MARINE SUB-REGIONS OF EUROPE

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Abstract: Coastal settlements tend to have higher population density and economic clustering compared to inland territories. The tendency of an increasing socio-economic disbalance in favor of coastal spaces – the coastalization, has attracted the attention of the global academic community. Numerous assumptions are made on the cause of the coastalization phenomenon with the maritime activity and tourism being the primary ones. The aim of this study is to evaluate the role of the coast and tourist seaport infrastructure in the distribution of the population and tourist accommodations in cities across different sea basins of Europe. The research design implies verification of the two hypotheses: the area around the tourist seaport will have H1. The highest population density and H2. The highest density of collective accommodation facilities (CAFs) in the coastal zone of the municipality, decreasing with distance. The methodology has a two-stage structure. Firstly, the quantitative evaluation is done to allocate the tourist seaports of 28 European countries using MarineTraffic database and measure the density of population and CAFs by territorial zones using statistics. Secondly, the qualitative assessment is done presenting highlights of case studies by four sea basins (Baltic Sea, Black and Azov Sea, Northeast Atlantic Ocean, Celtic Sea, and Mediterranean Sea) and six sub-basins. 43 seaports of Europe specialize on tourism (over 90% of inbound ships). Most tourist seaports belong to the Mediterranean basin (58.1%), followed by the basin of the Northeast Atlantic Ocean (25.6%), the Azov-Black (11.6%) and Baltic (4.7%) sea basins. Cities with the tourist seaports are represented by a variety population sizes: from under 50 thousand people to over a million. Despite the differences across sea basins, the general pattern suggests a decline of population density and CAFs with the distance from the tourist seaport. Tourist seaports act as the nuclei of coastalization in Europe. The spatial proximity to the seaport has a positive influence on the density of population – the highest in the territorial zone of 2-5 km distance from the seaport, and an even higher effect on the concentration of CAFs – the highest numbers up to 1 km of the tourist seaport. We should note that population structure and tourism activity of some smaller cities are skewed towards larger adjacent cities, with the agglomeration effect outbreking the role of the seaport.

Key words: sea basin, coastal area, coastalization, seaport, tourism, collective accommodation facilities, maritime activity

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INTRODUCTION

Humans have historically settled in the vicinity of large water bodies. Sea and ocean coasts, in particular, have traditionally played a significant role in human civilization, being recognized as development poles for mankind (Cantasano and Pellicone, 2014). For centuries the coastal areas around the globe have been subjected to intensified development resulting in a heavy human footprint in the modern days (Mee, 2012). As mentioned by Hinrichsen (1996, p. 40) over a quarter of a century ago, the nocturnal satellite imagery of our planet at night reveals an “uninterrupted river of light flowing along the coastlines of our continents” proving the coastal zones of the world to be over-crowded, overdeveloped, and overexploited. Human activities taking place along the coasts have reached an unprecedented scale and are rapidly expanding (Stojanovic and Farmer, 2013). Numerous observations of unbalanced demographic dynamics between inland and coastal regions and the accumulation of people settlements and economic activity near the coasts have been conceptualized in the definition of coastalization or thalasso-attractiveness.

Coastalization is broadly defined as the gradual increase in density of population, concentration of economic activities, and the development of infrastructure in coastal spaces (e.g.: Bell et al., 2013; Mikhaylov et al., 2018). Burke et al. (2001) have found that about 40% of the world’s population lives in coastal areas. An even higher estimation is given by Shi et al. (2001) – 50% of the world population. Country level studies indicate a similar pattern on a national scale. The human geography in China is notably uneven, suggesting that 94% of Chinese reside in the eastern provinces of the country with the highest density in coastal agglomerations of Shanghai and Tianjin (Hinrichsen, 1998, Shi-Qing and Rui, 2012). In the

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United States over half of population lives along the coast and the coastal states are among the fastest growing (Beach, 2002, Beatley et al., 2002). In Indonesia 60% of population live in coastal areas (Siry, 2007). In Thailand about 70% of the total population reside within a few kilometers of the coast (Tookwinas, 1999). Over 85% of Australians live in coastal settlements (Wescott, 2009). Similar patterns are found in other countries as well: Portugal (Barreto, 2002), Lebanon (Makhzoumi et al., 2012), Brazil (Wever et al., 2012), India (Sreeja et al., 2016), Croatia (Bowen et al., 2006), Greece (Sayas, 2006).

Many of the world's major cities and national capitals are in the immediate vicinity of the coast – Tokyo, Shanghai, San Paulo, Lagos, Los Angeles, London, Mumbai to name just a few. In fact, over 80% of the world's largest cities are located along the coast (Baird, 2009), and nearly 40% of all cities with a population between 1 and 10 million people (Tibbetts, 2002). Over the years the density of the population living in coastal areas has been increasing. The estimations vary depending on the research scope and the delimitation of the coastal zone in particular (Mikhaylov and Plotnikova, 2021) but the general trend has been verified – the urbanization and the sprawl of coastal cities and agglomerations (Barragan and de Andres, 2015).

Naturally the effect of coastalization is most pronounced in the southern hemisphere (Mikhaylov et al., 2020). The north-south divide plays a significant role in the unfolding of the coastalization. The southern coasts have the favorable climate for living and the diverse types of marine and maritime activities. Mediterranean Sea region in the southern Europe is a vivid example of these territorial disparities, which have become especially acute in the last century and growing in the recent decades (Salvati and Zitti, 2007). Scholars suggest that tourism explains a considerable part of coastal urbanization (Salvati and Forino, 2014). Tourism contributes to migration and concentration of population and economic activities along the coasts (Leontidou and Marmaras, 2001). International tourism has intensified the urban sprawl and the urbanization of periurban coastal zones in the Mediterranean (Antipolis, 2001; Sayas, 2006) and other marine basins of the world (Bulleri and Chapman, 2010). Salvati (2014) has found that tourism has also been one of the major causes of the gradual increase in urbanization rates on the shores of the southern European coastal cities since the 1950s. Apparently, more than half of its coastline is heavily urbanized, covered in concrete and build-up (Scoullous, 2003).

Typically, studies on the distribution of coastalization effects consider the size (or density) of the population at different distances from the coast. The assumption about the role of tourism or related maritime activities remains indirect. In this article we link the two components together – tourist seaports and tourist accommodation facilities, assessing the role of the coast and tourist port infrastructure of the city in the distribution of the city's population. The study attempts to verify two hypotheses. H1: the area around the tourist seaport will have the highest population density in the coastal zone of the municipality, which will decrease with increasing distance from the port. H2: the area around the tourist seaport will have the highest density of collective accommodation facilities (CAF) in the coastal zone of the municipality, which will decrease as the distance of the municipality from the port increases.

MATERIALS AND METHODS

1. Geography of the study

The research area covers four sea basins of Europe and six sub-basins:

1. Baltic Sea;
2. Black and Azov Sea.
3. Northeast Atlantic Ocean: 3.1 North Sea, including the Skagerrak and the English Channel;
3.2. Celtic Sea;
3.3. Bay of Biscay and the coast of the Iberian Peninsula;
4. Mediterranean Sea: 4.1. Western Mediterranean;
4.2. Adriatic Sea, Ionian Sea and Central Mediterranean Sea;
4.3. Aegean, Levantine and Sea of Marmara.

When selecting the marine basins, we relied on the Marine Strategy Framework Directive EU adopted on June 17, 2008. The basin-by-basin analysis made it possible to identify territorial contrasts between different coastal zones depending on their geographical position and economic status. We have collected a database of various statistical and geoinformation data for 28 European countries (including the EU and neighboring countries) highlighting the aspects of coastalization of tourist activity and its localization relative to seaports.

2. Data collection and processing

The study has three dimensions of quantitative data that has been collected and analyzed.

2.1. Data on the location and specialization of sea and river-sea ports

The “MarineTraffic” online portal on the movement of ships and their current location in harbors and ports has been used as a single source of information. The data collection period is February 2020 – the latest period before COVID-19 pandemic global lockdown. When processing data on 330 European sea and river-sea ports, the task was to map their spatial location and differentiate them based on industry specialization, labeling a category of tourist seaports.

This category involves the ports which main functions performed is the transportation of tourists between coastal settlements, attractions at sea and the like. The data of the Marine Traffic web portal made it possible to obtain information on 12 categories of shipping, of which 5 were classified as tourist specializations, namely: High Speed Craft, Pleasure craft, Passenger vessels, Sailing vessels, Wing in Grnd. Other categories of shipping were excluded from the study, such as Fishing, Tanker, Cargo vessels, etc., which have an industrial or other purpose not directly related to tourism. In total, 163 ports were identified for European countries (49.4% of the initial sample) with a share of tourism category of maritime navigation over 50% relative to the total number of vessels represented in the port (Table 1).

Table 1. Distribution of seaports by European countries and specialization, 2020
(Source: based on <http://marinetraffic.com>, February 2020)

Country	Sea and river-sea ports		including with a share of more than 50% of shipping categories classified as tourism		
	Number	Share	distribution by country		of the total number of ports
			Number	Share	Share
UK	44	13.3	15	9.2	34.1
Italy	41	12.4	22	13.5	53.7
Turkey	37	11.2	17	10.4	45.9
Spain	33	10.0	16	9.8	48.5
France	22	6.7	14	8.6	63.6
Netherlands	22	6.7	13	8.0	59.1
Russia	21	6.4	10	6.1	47.6
Greece	13	3.9	8	4.9	61.5
Norway	12	3.6	9	5.5	75.0
Germany	11	3.3	6	3.7	54.5
Denmark	10	3.0	7	4.3	70.0
Ireland	8	2.4	3	1.8	37.5
Portugal	8	2.4	5	3.1	62.5
Sweden	8	2.4	6	3.7	75.0
Ukraine	7	2.1	3	1.8	42.9
Finland	6	1.8	1	0.6	16.7
Belgium	4	1.2	1	0.6	25.0
Poland	4	1.2	1	0.6	25.0
Albania	3	0.9	1	0.6	33.3
Croatia	3	0.9	2	1.2	66.7
Cyprus	2	0.6	-	0.0	-
Latvia	3	0.9	-	-	-
Bulgaria	2	0.6	-	-	-
Estonia	2	0.6	1	0.6	50.0
Georgia	1	0.3	1	0.6	100.0
Lithuania	1	0.3	-	-	-
Monaco	1	0.3	1	0.6	100.0
Romania	1	0.3	-	-	-
Total	330	100	163	100	49.4

Almost 67% of the 330 ports of the initial sample are located in 7 countries: UK, Italy, Turkey, Spain, France, Netherlands, and Russia. Also, these countries are leading in the distribution of 163 ports with the prevalence of tourism specialization, although leaving the UK out of the top ranking (Figure 1). On a national scale, Italy, France, Netherlands, Greece, Norway, Germany, Denmark, Portugal, Sweden, Croatia, Estonia, Georgia, and Monaco have the largest share of ports associated with maritime tourism (above 50%). Latvia, Bulgaria, Lithuania, Romania, and Cyprus were excluded from the subsequent analysis, since the share of ships classified in the tourism category was below the 50% threshold. In terms of sea basins, the leader by the number of tourist seaports is the Mediterranean basin (68 ports), followed by the North-Eastern part of the Atlantic Ocean (60 ports), and the smallest share is in the Baltic (22 ports) and the Azov-Black Sea (13 ports) basins.

Further analysis is focusing on a deeper assessment of spatial patterns in the manifestation of local effects of coastalization on the example of sea tourism. The final sample of the study was reduced from 163 to 43 ports. It includes seaports with a share of tourist shipping categories of at least 90%. Thus, the final sample was 13% of the sea and river-sea ports of the European countries that were originally identified, and 26.4% of the tourist seaports of the European countries, in which the share of shipping categories of the tourism group is more than 50%. Figure 1 shows the territorial and basin distribution of the seaports included in the main part of the study. Most tourist seaports belong to the Mediterranean basin – 58.1%, incl. 10 tourist ports in the Western Mediterranean Sea and the Aegean, Levantine Seas, and another 5 ports in the Adriatic and Ionian Seas. In second place with 25.6% of ports is the basin of the Northeast Atlantic Ocean. The Azov-Black (11.6%) and Baltic (4.7%) sea basins are also represented. We shall note that the Danish port of Roskilde was assigned to the Baltic Sea basin.

2.2. Data on the settlement of the population in coastal regions

The second type of data characterized the population settlement system in 30 coastal regions of European countries (NUTS-2 level), each represented by a tourist seaport. We estimated the density of the population by territorial zones relative to the distance from the tourist seaport: under 1 km; 1 to 2 km; 2 to 5 km; 5 to 10 km; 10 to 15 km; 15 to 20 km.

The analysis is held at the NUTS-3 level territories included in the selected NUTS-2 level regions. Data sources were Eurostat, national statistical offices of countries, the CityPopulation database. Data are for 2020 or the closets available year. It should be noted that cities with the allocated tourist seaports of the sample are represented by a variety population sizes: a) 2 cities with over 1 million people; b) 3 cities from 500 to 1,000 thousand people; c) 2 cities from 250 to 500 thousand people; d) 13 cities from 100 to 250 thousand people; e) 17 cities from 50 to 100 thousand people; and f) 4 small cities of up to 50 thousand people. This heterogeneity has made it possible to trace the effect of the attraction of the population to the sea in a differentiated way, studying the cities of different sizes, and hence the forces of attraction. The QGIS 3.14 software was used to build concentric areas from the centers of the corresponding ports. Population density per 1 km² was calculated for each territorial zone. Since the most detailed data on the population are presented at the LAU level, it was used to calculate population density, which was then converted to km zones using the Area Weighted Average tool.

2.3. Data on collective accommodation facilities (CAFs) for tourists in coastal regions

The third group of data reflects the number and geolocation of CAFs for tourists in the selected coastal regions. As in the case of settlement structure indicators, the concentration of CAFs for tourists per 1,000 people was estimated, as well as their distribution by territorial zones in relation to the tourist seaport location: under 1 km; 1 to 2 km; 2 to 5 km; 5 to 10 km; 10 to 15 km; 15 to 20 km. Data on the number of accommodation facilities were taken from public sources Booking.com (or Ostrovok.ru for Russian territories) and represent the absolute number of hotels in each concentric zone. Geoinformation processing of the data was performed using QGIS 3.14 software package. Data collection period was June 2022. Infrastructure density of CAFs for each territorial zone was calculated as the ratio of the number of facilities in the territorial zone to the area of the territory excluding waterbody.

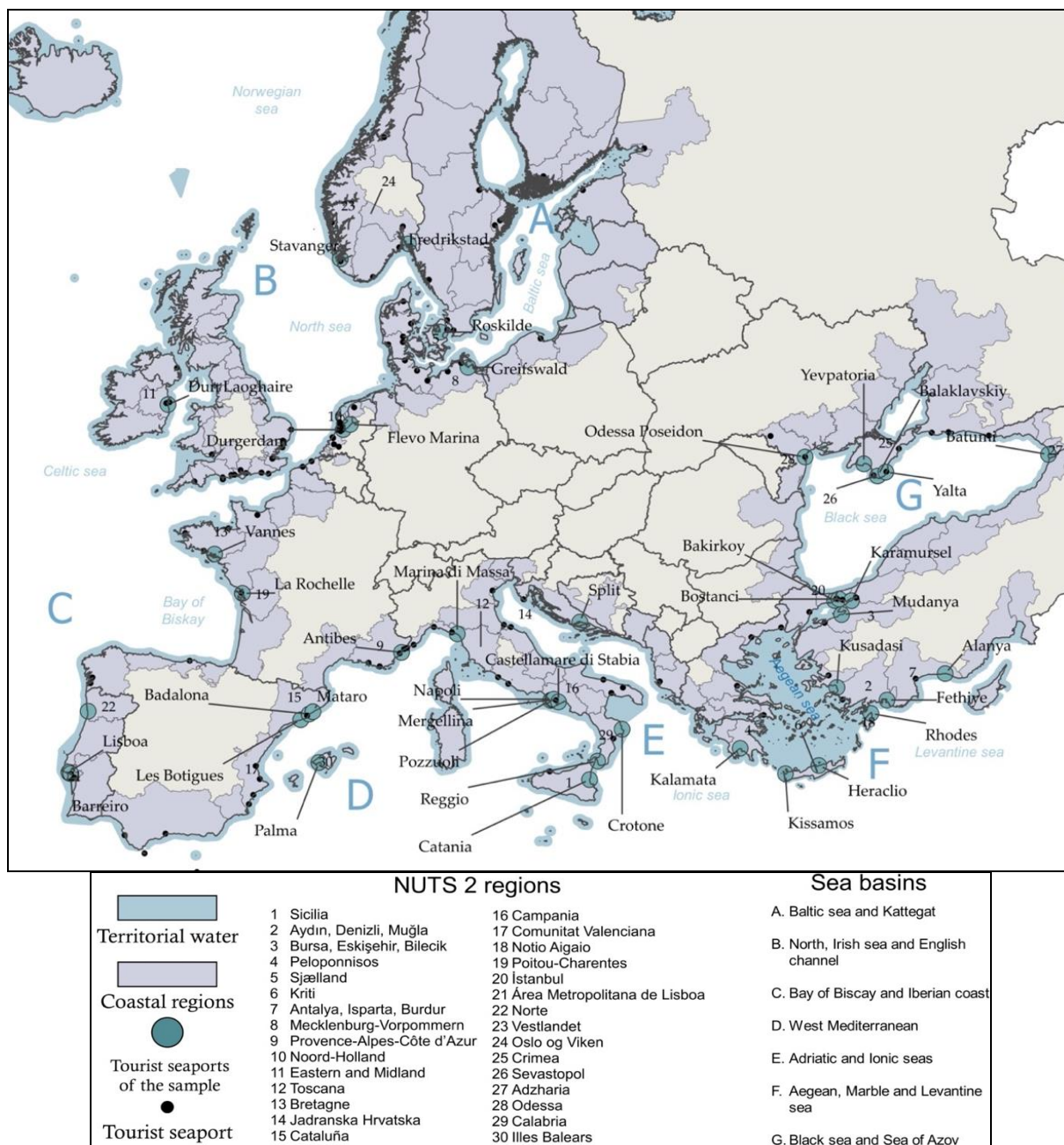
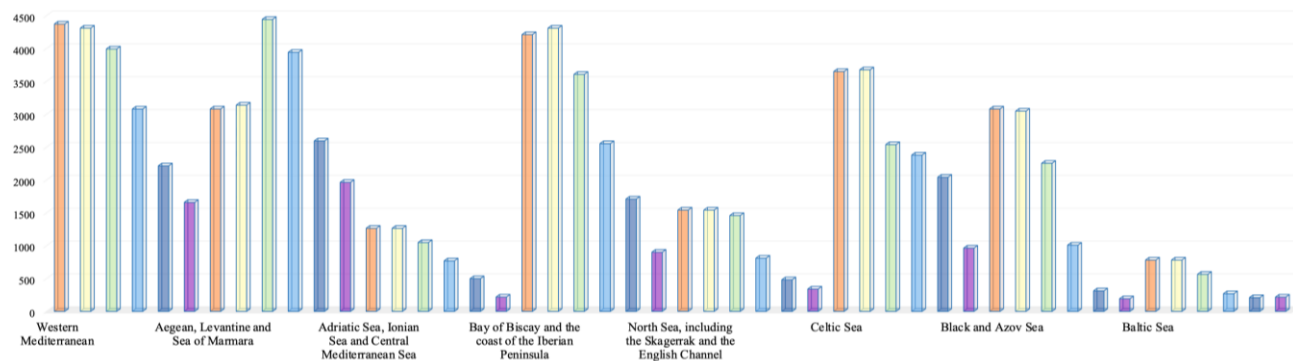


Figure 1. Geography of tourist seaports of the study by NUTS-2 regions and sea basins (Source: based on <http://marinetraffic.com>, February 2020)

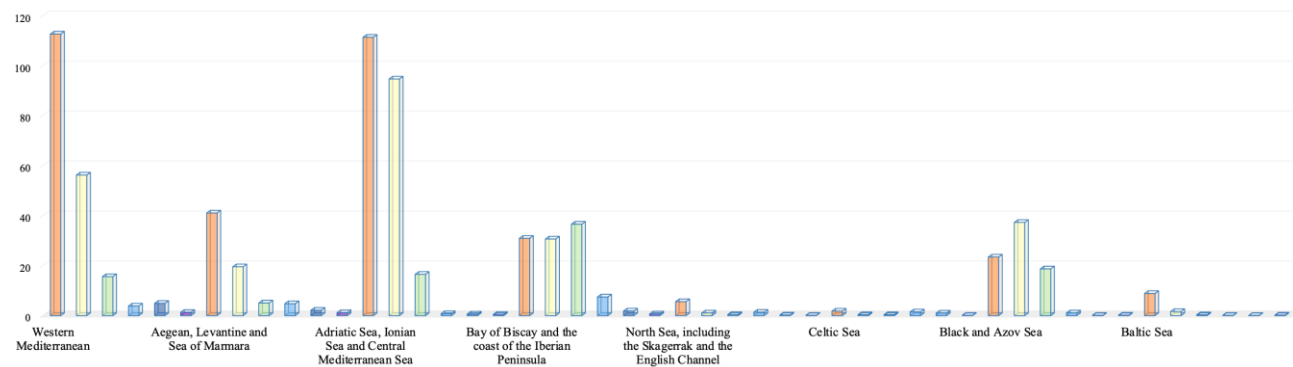
RESULTS AND DISCUSSION

We evaluated the population settlement and distribution of tourist accommodation by marine basins and calculated the average values of these indicators by territorial zones (Figure 2). In spite of significant differences in the average values of population density by sea basins, they have a general pattern in the distribution of population in the territorial zone from 5 to 20 km with a tendency to decrease. At the same time, the attraction of the population to the tourist seaport in the zone up to 5 km has different manifestation, which is reflected both in the absolute values (Figure 2A) and in the chain growth rates (Figure 2B). The concentration of CAFs relative to the tourist seaports is also uneven – Figure 2B. The developed tourist regions with high density of tourist accommodations are located in the Western Mediterranean and Adriatic Sea, Ionian Sea

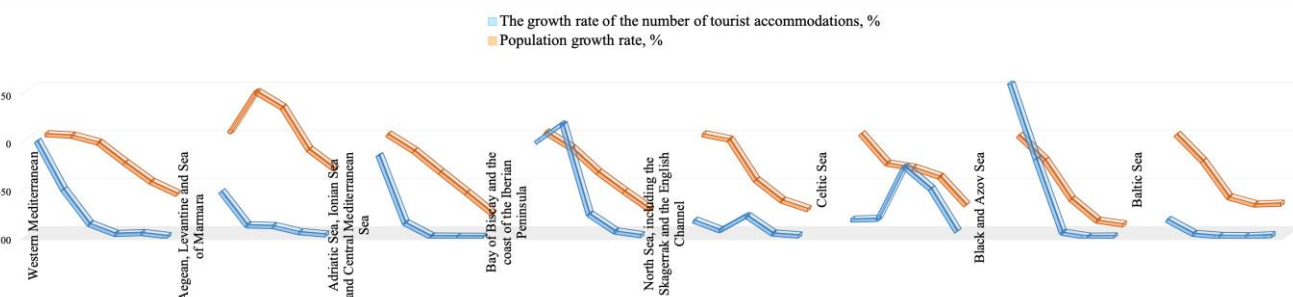
and Central Mediterranean Sea basins, which is natural due to high recreational potential compared, for example, to the Baltic Sea region. The density of CAFs around tourist seaports in other basins under our consideration is significantly lower (over 3 times behind in the area up to 5 km from the port). Also noteworthy is the different curve of change in the rate of CAFs by the territorial zones from 0 to 20 km in the North Sea and Celtic Sea basins (Figure 2B). In contrast to the other basins, there is a slight increase in the density of CAFs in the zone of 5-10 km from the seaport. Table 2 presents pair correlation coefficients between the distance from the tourist seaport and the indicators of population density and CAFs by marine basins.



A) Average population density per territorial zone



B) Average density of tourist accommodations per territorial zone



C) Dynamics in population and tourist accommodations per territorial zone from 0 to 20 km from the tourist seaport

Figure 2. Manifestation of the costalization effect in European marine basins (Note: territorial zones: orange – less than 1 km; yellow – 1 to 2 km; green – 2 to 5 km; light blue – 5 to 10 km; dark blue – 10 to 15 km; purple – 15 to 20 km)

Table 2. Coastalization effects with the distance to the tourist seaport (Source: developed by the authors)

Marine basins	Paired correlation coefficients between distance from the port and the density of ...	
	collective accommodation facilities	population
Western Mediterranean Sea	-0.290	-0.365
Aegean, Levantine and Marmara Seas	-0.408	-0.081
Adriatic Sea, Ionian Sea, and Central Mediterranean	-0.369	-0.587
Biscay Bay and the Coast of the Iberian Peninsula	-0.432	-0.626
North Sea, incl. the Skagerrak and English Channel	-0.281	-0.394
Celtic Sea	-0.342	-0.959
Black and Azov Seas	-0.415	-0.425
Baltic Sea	-0.394	-0.653

We see a significant difference between the sea basins in the strength of attraction to the port infrastructure. Thus, in terms of population, the most striking pattern of decreasing density with the distance from the tourist seaport is characteristic of the Celtic Sea basin. Next come the Baltic Sea and the Bay of Biscay, the coast of the Iberian Peninsula. The least influence of the sea on the settlement system is noted for the studied tourist ports of the Aegean, Levantine and Marmara Seas. For CAFs, the relationship with proximity to the seaport is less strong than for population. However, for

some basins it is still more prominent than for others. Given the significant differences between the sea basins in the considered indicators (including the contrast between north and south), a more accurate delimitation of coastal zones on the functional basis (in our case – the tourist function) required a qualitative analysis using the case study methodology.

1. Case study of the tourist seaports by sea basins

1.1. Mediterranean basin

Twenty-five tourist ports are located in the Mediterranean Sea basin, representing over half of the sample. This is the highest result among other European marine basins under consideration, which is expected due to the southern location of this basin, having favorable climate for the development of marine tourism. The ports are distributed across 7 countries: Italy has 8, Turkey – 7, Spain – 4, Greece – 4, and one France and Croatia. According to the distribution of tourist seaports by sub-basins, two are in the lead – the Western Mediterranean Sea (ports of Italy, Spain and France) and the Aegean, Levantine and Marmara Seas (ports of Turkey, Greece). The least represented is the sub-basin of the Adriatic, Ionian Sea and the central part of the Mediterranean Sea, in which the tourist seaports of Italy, Greece, and Croatia are located.

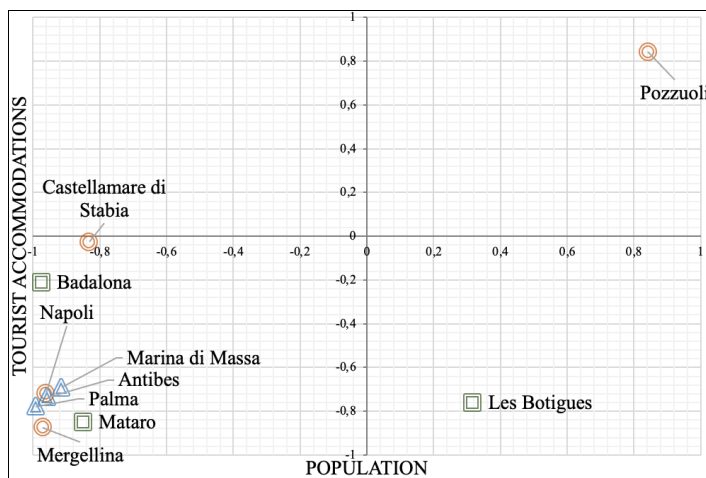


Figure 3. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the Western Mediterranean Sea basin Source: developed by the authors

1.2. Western Mediterranean Sea basin

This sea basin covers three parts of the European coast (Italian, Spanish, and French) and differs from the others in the highest rates of population density and CAFs in the area up to 1 km from the tourist port. Further, with increasing distance, these indicators decrease (the population density decreases slower than the tourist accommodations – Figure 3).

Half of the tourist ports of the sample are located on the Italian coast. In the region of Campania 4 tourist ports are studied, two in the metropolis Napoli – Naples and Mergellina, and two in the province of Napoli – Castellammare Di Stabia (Sorrento peninsula) and Pozzuoli (Pozzuoli Bay). The proximity of these ports (50 km is the distance between the most distant cities Pozzuoli and Castellammare Di Stabia by road) outlines them as an important center of maritime tourism with a cumulative impact on the surrounding municipalities. Clustering of large and medium-sized tourist seaports in the Napoli area is due to the high tourist attraction of this stretch of coast and its connection with the neighboring tourist islands and seaside cities by intensive navigation throughout the year. The port of Castellammare Di Sta has yachts shipyards and in Pozzuoli fishing boats are moored, which contributes to the development of maritime tourism in these areas through the related maritime activities. Unlike the large and medium-sized ports, the small resort port Marina Di Massa in the Toscana region does not have a permanent mooring.

Spain is represented by 4 medium-sized ports of the Western Mediterranean. The ports of Badalona and Mataro are located in the Cataluña region and the port of Les Botigues in its neighboring region Comunitat Valenciana. They are all on the same coastline as Barcelona (the capital of Cataluña), stretching a length of 58.5 km, which also allows them to be considered, as in the case of the maritime tourist ports of Naples, as a cluster of maritime tourism. Another Spanish port of the sample is Palma De Mallorca, located in Palma in Palma Bay on the island of Mallorca. It is the largest of the other 4 ports of the Balearic Islands. Its main specialization is cruise shipping, but the port also offers infrastructure for sports navigation, commercial fishing, and cargo transportation. Tourist infrastructure and attractions are presented in walking distance from the port, there is an airport. This makes the port of Palma De Mallorca an important point of maritime tourism in the Mediterranean. The French port of Antibes-Vauban, like the Spanish ports, is medium-sized and located in the western part of the Mediterranean Sea on the Ligurian coast between Monaco and Saint-Tropez. Being a port with history, it has the necessary infrastructure to receive different types of vessels: small fishing boats, pleasure boats, sailing yachts, yachts and superyachts. The port with its 1500 berths is positioned as “the largest marina in Europe”. Around the port developed tourism infrastructure. And the port itself acts as a pilot site for testing technologies developed in the European technology park Sophia Antipolis. Figure 3 shows the distribution of the ports by pair correlation coefficients between indicators of population density and tourist accommodations relative to territorial zones by distance from the seaport.

For the tourist ports – Antibes, Palma and Marina Di Massa, not included in the clusters, regardless of their size, there is a decrease in population density and CAFs when moving away from the port. This is also true for the small port of Marina Di Massa. This indicates a clear manifestation of the costalization effect. In the case of tourist ports located close to each other, a deviation from this pattern is taking place. For example, for the port of Les Botigues, the positive correlation with population density is explained by the proximity of other large population centers, as well as for Badalona, which gravitates towards Barcelona. In this respect, Mataro, more distant from Barcelona, acts more as an independent center of ‘gravity to the sea’. The same conclusion can be made about the second cluster around Napoli, where the port cities Castellammare Di Stabia and Pozzuoli, the most distant from it, show different trends. The less touristy Pozzuoli is not a strong point of attraction to the sea, neither for the population nor for the CAFs. Castellammare Di Sta, near Pompeii, does not have a strong influence on the concentration of tourist accommodations.

1.3. Aegean, Levantine and Marmara Seas

The study area of the second sub-basin of the Mediterranean covered the waters of three seas (Aegean, Levantine and Marmara) featuring 10 tourist seaports of the sample. This basin showed atypical dynamics of the average population density in the zone of 2 to 5 km – Figure 2A. Four of the Turkish tourist ports studied are compactly located on the coast of the Sea of Marmara. The large-sized port of Bakırköy and the medium-sized port of Bostanci are located in Turkey's largest metropolis, İstanbul, the first in the Bakırköy administrative district, which performs commercial and trade functions, and the second in the Kadıköy administrative district, the cultural and educational center of the Asian part of the city. In addition to the usual commuter ferries, there is a special type of transport between the two ports: sea buses, which are a faster and more spacious type of ferry with compartments for cargo and cars.

In the eastern part of the Sea of Marmara on the southern shore of the Bay of İzmit is a medium-sized tourist port Karamürsel (Kocaeli region). Karamürsel itself is located 70 km from Bostanci and is connected to it by road. Next to Kocaeli the harbor of Bursa is located in the southern part of the Sea of Marmara, on the coast of the Gulf of Gemlik. It receives passenger ships of all kinds. Mudanya is often seen as a tourist satellite city of the larger town of Bursa, located 30 kilometers away. Since the cities offer complementary tourist products (beach and recreation) and there are good transport links between them. The difference in the location and functional affiliation of these four ports is reflected in the calculated correlation coefficients – Figure 4. The center of attraction of the population and tourist accommodation is Bostanci (especially within 1 km from it), while Bakırköy does not show the tendency of gravitation towards the sea (the main increase in population density is noted in the area of 10 km from the port). The port of Mudanya concentrates tourist accommodations, but the proximity of the larger Bursa gives a shift in terms of population. Karamürsel port does not fully act as an independent center of attraction to the sea, and the presence of several larger settlements in the 20 km zone is reflected in the increase in population density with the distance from the port.

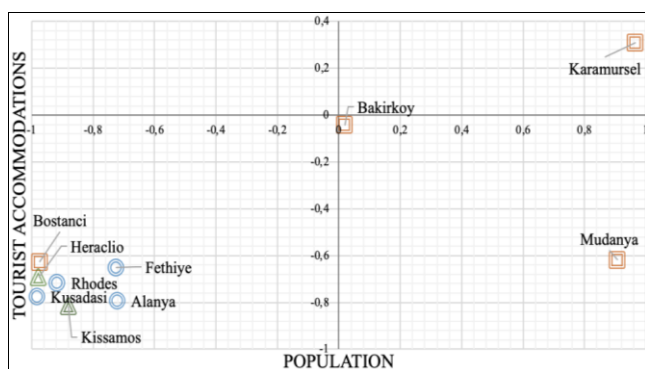


Figure 4. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the Aegean, Levantine and Marmara Seas (Source: developed by the authors)

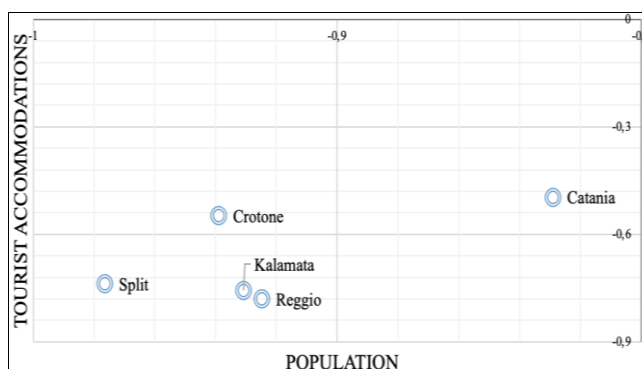


Figure 5. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the Adriatic, Ionian and central Mediterranean Source: developed by the authors

In the south of Turkey, in the neighboring coastal regions of Antalya and Muğla, there are another three tourist seaports included in the study. One of them is the medium-sized port of Alanya on the coast of Antalya Bay in the Eastern Mediterranean. Alanya resort area covers 12 kilometers of Mediterranean coast with attractions and tourist infrastructure. The port itself has a high tourist value and serves tourist ships. International cruise ships and fast ferries call at it. There are also truly tourist attractions, such as passenger ships stylized as pirate ships and ancient galleons. The role of Alanya as a center of attraction to the sea is reflected in the calculated correlation coefficients, showing the shift to the sea of both population and CAFs. The highest density of tourist accommodations is found within 2 km of the port and followed by a decrease, while the population density is distributed more evenly with a decrease after 15 km zone.

Two other Turkish ports, the large-sized Fethiye and the medium-sized Kusadasi, are part of the Muğla region, which overlooks the Aegean Sea. The distance between the ports is about 300 km. Port Kusadasi is located in the resort town of the same name at a sufficient distance (81.6 km) from one of the largest Turkish cities – İzmir, which avoids the strong influence of the neighboring city in respect of population distribution. The port is in the center of the city and is equipped to receive large cruise ships and small vessels with an infrastructure for ferry crossing and tourist services. The main tourist destination that attracts cruise ships to Kusadasi is the museum of the ancient city of Ephesus, located 20 km away. This port reflects a gradual decrease in the density of population and CAFs at a distance from it (with the highest concentration in areas up to 1 km and 1 to 2 km), indicating the port to be a pole of coastalization.

Another port Fethiye is located on the coast of the Gulf of Fethiye, which is favorable for yachting almost all year round. This has led to the creation of several marinas with adequate tourism infrastructure and yacht services. There are regular transport links between Fethiye in Turkey and Rhodes in Greece, whose port is also included in our study, with fast boats and ferries. The latter is located in the northeast of the island Rhodes. The port, the city and the entire island have a pronounced tourist specialization, attracting cruise ships as well as numerous boaters, including from the Turkish side. Both ports (Fethiye and Rhodes) can be classified as centers of attraction to the sea – Figure 4. With that, whereas Rhodes has a sharp decrease in population density with each territorial zone from the port, for Fethiye this occurs more evenly. Two more tourist ports of our sample are located on the island of Crete and face the southern Aegean Sea. They are the medium-

sized Greek ports Heraclio (north of the island) and Kissamos (northwest of the island). The distance from each other by almost 175 km makes them to act as independent coastalization poles, which is reflected in the calculated correlation coefficients – Figure 5. For the city of Heraclio, the port has city-forming importance, being in the center of the city and operating year-round. There are many historical and architectural maritime monuments, including the old port harbor with the Venetian fortress on the west side of the seaport. Another port is Kissamos, which is centrally located to the coastal area of the bay of Kissamos and is close to the small resort town of Kastelli Kissamos. There is an old fishing port and a modern, modernized port with a ferry terminal. The beach line runs for 7 miles from Kissamos, allowing the area to be the main tourist attraction, including CAFs. In general, the delineation of the coastal tourist zone around Heraclio and Kissamos by the highest density of tourist accommodations can be made in a line of 5 km from each port.

1.4. Adriatic, Ionian and central Mediterranean

The third Mediterranean sub-basin covered the Adriatic Sea, the Ionian Sea, including the Gulf of Messina, and the Tyrrhenian Sea. Here the sample included 5 ports, all of which in one way or another serve as centers of attraction to the sea – Figure 5. A large seaport of Croatia – Split, located in the central part of the Adriatic Sea, in a bay protected by islands, is an important center of maritime tourism and the leader in our sample by density of CAFs in the immediate (within 2 km) proximity. The port is within walking distance of historical sights and beaches. It is the largest Adriatic port for passenger transportation (and the leader in Croatia). The port has 10 berths for receiving cruise ships. There is a yacht marina with accompanying infrastructure. The ferry port is in the southern part of the city. Regular ferries go to Ancona (Italy), as well as to neighboring islands and the enclave Dubrovnik.

The other four tourist ports of the sample, included in this marine sub-basin, are of medium size. Greek Kalamata is located on the coast of the Gulf of Messina in the Ionian Sea in the southwest of the Peloponnese Peninsula. Kalamata is the administrative center of the district of Messinia and is of high economic and tourist importance to the Peloponnese. Kalamata is 240 km far from Athens. The city has a historical center and beaches for recreation. The port operates in summer and then there are ferry services to the Greek ports of Kissamos and Kythira. There is also a marina. The area up to 2 km from the port is the main concentration of population and CAFs, after which tends to reduce their density.

The seaport of Catania in the eastern part of the island of Sicily on the west coast of the Ionian Sea plays an important role in the development of the city and the entire province. It has numerous types of port activities: commercial, cruise, shipbuilding, fishing, yachting, recreational and sports. The port is built into the transport system of Sicily. A significant tourist destination is the volcano Etna and the historical sites of Catania. For Catania the trend of a gradual decrease in the density of CAFs and population with the distance from the port is not reflected. As far as tourist accommodation is concerned, the peak is between 1 and 2 km, as for the population, the territorial distribution is more even, with a slight increase in density between 5 and 10 km from the port and a subsequent sharp decrease after 15 km. The seaports of Reggio and Crotona belong to the Italian region Calabria. The port of Reggio belongs to the province of Reggio Calabria on the neighboring coast from the Sicilian city of Messina, which also has a port.

There are regular ferry services between Reggio and Messina through the Straits of Messina, and a maritime connection with the aforementioned port of Catania. The average annual load of the port of Reggio is 10 million passengers. According to Figure 6, Reggio can be classified as a center of attraction to the sea, concentrating most of the population around it in an area of 10 km, and tourist accommodation in an area of up to 2 km. The port of Crotona belongs to the province of Crotona and is in the city of the same name with a long history. The seaport has two parts – the old (east-southeast of the city) and the modern (north of the city). The old port is small and serves mainly pleasure boats and fishing boats. The area of the new port is much larger. It has 5 embankments and offshore platforms for hydrocarbon production. Distribution of population from the new port in the area up to 10 km is quite even, but tourist accommodation is mostly concentrated in the area from 1 to 2 km with a shift to the historical part of the city and the old port.

2. Basin of the Northeast Atlantic Ocean

The length of the coasts of the Northeast Atlantic basin is about 20,585 km. The research sample has 11 seaports of tourism referred to the Northeast Atlantic Ocean basin, of which 6 are in the Bay of Biscay, 4 in the North Sea, and 1 in the Celtic Sea. The study presents the tourist seaports of 5 countries – Portugal (4), France (2), Norway (2), Ireland (1), Netherlands (2).

2.1. Bay of Biscay and coast of the Iberian Peninsula

Portugal's ports are in the southwestern part of the Iberian Peninsula on the coast of the North Atlantic Ocean. One of the largest tourist seaports is Lisboa. It is located on the coast of the Tagus River, which flows into the Mar da Palha Bay. The port is located at the crossroads of the Mediterranean, Baltic, Transatlantic and Atlantic routes, making it an important node for maritime and oceanic connections. Lisboa is Europe's leading cruise port and one of the best international cruise ports, which has been recognized with awards and prizes over the years. The port operates three cruise terminals. The Marina de Lisboa, located on the north bank of the Tagus River, has four recreational docks with a total of 900 berths, offering various services for boats and yachts. The port of Lisboa is an important part of the Area Metropolitana de Lisboa, giving economic impetus to 11 neighboring municipalities. The medium-sized ports of Almada and Barreiro (located on the Setúbal Peninsula) are part of the agglomeration influence of the metropolitan area of Lisboa and are managed by a common port authority. Sailing Vessel, Passenger Ship, Pleasure Craft are leading in the structure of vessels received in the port of Lisboa. A similar structure of accepted vessels is characteristic of the port of Almada. The Port of Barreiro, in addition to passenger traffic, also develops cargo traffic. There is a terminal with services for the reception, storage and shipment of bulk liquid products. The impact of Lisboa on the ports of Almada and Barreiro is reflected in the calculated

correlation indices – Figure 6. While Lisboa is a major center of attraction to the sea with decreasing population density and CAFs as you move away from it, the other two ports do not show such striking trends. Almada has the highest concentration of CAFs shirting from 2 to 10 km from the port, and Barreiro from 5 to 10 km.

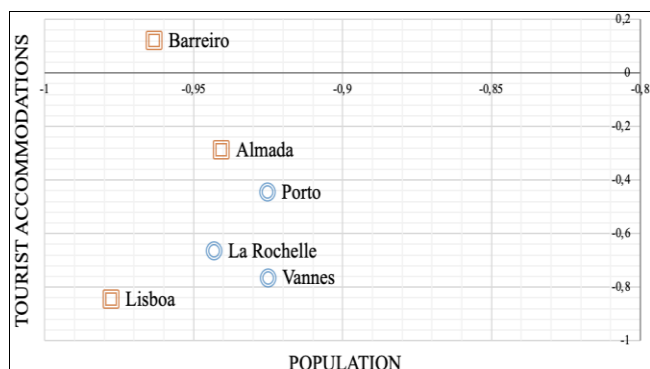


Figure 5. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the Bay of Biscay and coast of the Iberian Peninsula Source: developed by the authors

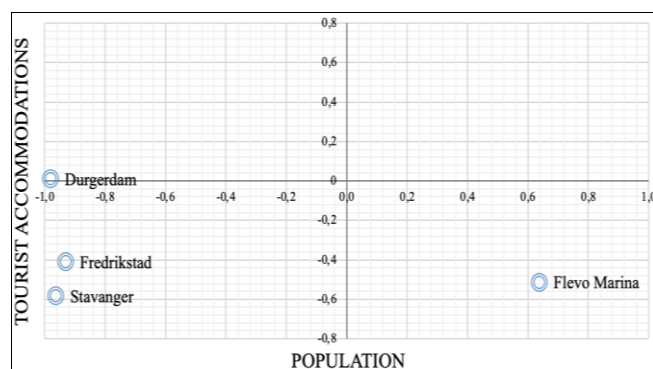


Figure 7. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the North Sea, including the Skagerrak and the English Channel Source: developed by the authors

Another medium-sized seaport in Portugal, Porto, is 300 km away from the port of Lisboa. Porto is one of the largest cities in Portugal after Lisboa, located in the north of the country at the mouth of the river Duero. The Área Metropolitana do Porto, part of the Norte region, was formed around the city. In 1996, Porto was inscribed on the UNESCO World Heritage List, which increased its tourist attractiveness. Five kilometers from the city center on the opposite south bank of the river Duero is the recreational port of Douro Marina. It has a marina with 300 berths and services for transient sailors and tourists, as well as various events. It is also home to the Douro Marina Sailing Academy. The territorial displacement of the port of Porto in relation to the historic center of the city has led to the fact that the highest rates of population density CAFs are found in the area from 2 to 5 km. The French port of La-Rochelle is in the city of the same name, the administrative center of the department of Charente-Maritime, contributed to the development of tourism and recreation in the region. Centuries ago, the port gave impetus to the development of La-Rochelle, which went from a fishing village to the seaside resort of Nouvelle-Aquitaine. This is reflected in the high concentration of population and CAFs no further than 2 km from the port, with a subsequent sharp decline. There are many marine-related attractions such as boat trips, ferries and sea buses; cruises to the neighboring islands of Aix, Ré, Oléron, Fort Boyard, etc.; water sports and fishing facilities; historical sites; fish auction and gastronomy; various specialty training, the Maritime Museum and Oceanarium; a significant number of themed events, etc. The port of La-Rochelle itself has three harbors, including the old port. The role of the Port of La-Rochelle as a center of attraction to the sea is confirmed by the calculated correlation values – Figure 6.

The port town of Vannes in the Morbihan department is 252 km from La-Rochelle in northwestern France. The latter is part of the Bretagne region, which occupies the peninsula, washed by the waters of the English Channel and the Bay of Biscay. The port is in a channel on the north coast of the Gulf of Morbihan, overlooking the Bay of Quiberon. The port has pontoons for oversized boats in the floating pool, as well as a marine station for high-tonnage vessels. Located in the center of the city, Vannes Port is attractive for the development of yacht tourism and boat trips. The port area is among the city's main attractions, along with the historic quarter and the fortress town. There are unique attractions such as a piano barge. The ferry terminal is a 10-minute drive from the city center. There is a ferry service to the neighboring islands of Morbihan Bay. The location of the port in the city center and its active involvement in the tourist ecosystem has contributed to the concentration of population and CAFs no further than 2 km away, and the port itself also serves as a center of attraction to the sea – Figure 6.

2.2. North Sea, including the Skagerrak and the English Channel

The North Sea is characterized by intensive shipping. Our study sample included 4 ports, including 1 large port (Norwegian Stavanger) and 3 medium-sized ports (Dutch Durgerdam and Flevo Marina, Norwegian Fredrikstad) with different coastalization patterns – Figure 7. The port of Durgerdam village is located in the municipality of Amsterdam (in its northern part, the sub-municipality of Amsterdam-Noord, 7 km from the city center). Amsterdam-Noord is separated from the rest of the city of Amsterdam by the reservoir IJ, and in the east comes out to the lakes Markermeer and IJmeer, which previously formed a bay of the North Sea before being dammed with IJsselmeer. The port of Durgerdam faces the shores of Buiten-IJ and is connected to the North Sea by a canal. There is a yacht harbor and 3 sailing clubs. It is also home to the Durgerdam Water Sports Association and hosts sports competitions that attract tourists. The incorporation of Durgerdam into Amsterdam has provided a concentration of population near the port, but the high density of CAFs is shifted to an area 5-10 km away. Flevo Marina is another port we consider in the Noord-Holland region, 66 km from Durgerdam and is located on the shore of IJsselmeer, 7 km from the resort town of Lelystad, the capital of Flevoland. The port has a marina with several berths and services for the maintenance, repair and winter storage of yachts. There is also a water sports center. The main part of the boats in the port are Sailing Vessel and Pleasure Craft, as well as in Durgerdam. Separate tourist attractions are water chalets Flevo Marina, as well as beaches and golf courses in Lelystad. The highest density of CAFs is in the area no further than 1 km from the port, with no dramatic changes in population density.

In the northeast of the North Sea, we consider two other seaports, the Norwegian Stavanger and Fredrikstad, which also serve as centers of attraction to the sea. Stavanger is a major port in the Vestlandet region in the southwest of the country. Stavanger is the administrative center of Rogaland and one of the largest cities in Norway. Stavanger harbor is one of several harbors that make up the Stavanger region, along with Risavika (serving the oil and gas cluster) and Mekjarvik (serving heavy industry). The port of Stavanger itself has year-round cruise, commercial activities and provides a local ferry service. The tourist importance of the port is great. In addition to cruises, there are attractions within walking distance of the harbor (e.g., the Norwegian Petroleum Museum, small tourist sites such as the old fireboat Nøkk, etc.), and various festivals, city festivals with water activities (incl. kayaking, sailing, paddling, recreational boating) are also held. Within 1 km of Stavanger there is the highest density of CAFs, which decreases sharply with distance from the port, confirming its coastalization effect. The second Norwegian port we consider is in the city of Fredrikstad of the municipality of the same name, which is part of the Viken county in eastern Norway (part of the NUTS-2 region Oslo og Viken). The medium-sized port of Fredrikstad is part of the port authority Borg Havn IKS, which combines port harbors in the municipalities of Fredrikstad, Sarpsborg and Hvaler. The distance between their administrative centers is less than 50 km by road. This allowed to locate the port infrastructure in a compact way and to separate the specialization of harbors, forming a universal multipurpose port complex. Fredrikstad itself is a deep-water multipurpose port. The port has four berths, and it is planned to build a fifth one in the old city. From the position of marine tourism, the port of Fredrikstad is regarded as a cruise gateway to Oslo. The main types of accepted tourist ships are Pleasure Craft, Sailing Vessel, and Passenger. Fredrikstad has a ferry pier Gamlebyen, as well as guest harbors for motor homes and boats. In the center of the city there is the promenade Tollboden (length 112 m), available for passenger traffic (including cruise ships). Like Stavanger, Fredrikstad harbor serves as a center of attraction to the sea, but to a lesser extent.

2.3. Celtic Sea

To the sub-basin of the Celtic Sea, we referred the medium Irish tourist port Dun Laoghaire, located on the shore of the shallow Dublin Bay on the west coast of the Irish Sea. The latter is connected by the Strait of St. George to the Celtic Sea. The coastal town of Dun Laoghaire is less than 13 kilometers away from the capital and the country's largest port, Dublin, and is a seaside resort in Ireland. The port harbor Dun Laoghaire has more than 200 years of history. Modern Dun Laoghaire is developing as a seaport and an important tourist destination.

Its artificial harbor consists of two piers, East and West, which are an important tourist attraction. The sailing community is an important driving force for the development of Dun Laoghaire, ensuring the attraction of visitors by organizing major international sailing events. The port of Dun Laoghaire implements a regular ferry service to the port of Holyhead in Wales. However, the use of the harbor as a ferry terminal is gradually declining. Whereas cruise shipping is in operation. From March to October, there are cruises on Dublin Bay. There are also yacht tours to Dublin.

The pairwise correlation coefficient between the distance from the port and population density is -0.959 , and between the distance from the port and the density of CAFs is much lower -0.342 . At the same time, despite the fact that the attraction of population to the seaport in Dun Laoghaire is stronger than that of CAFs, their peak concentration in the area up to 1 km from the port is also confirmed (Figure 8).

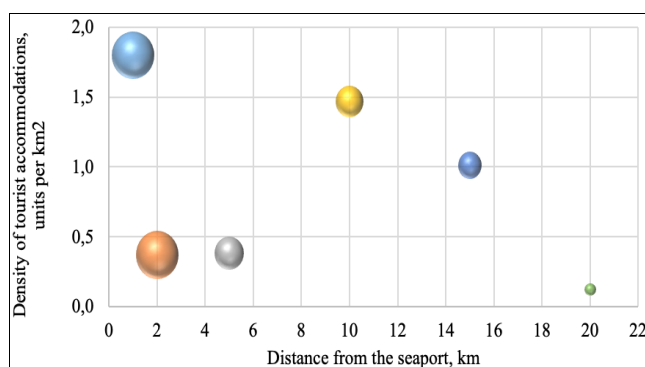


Figure 8. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the Celtic Sea (Source: developed by the authors)

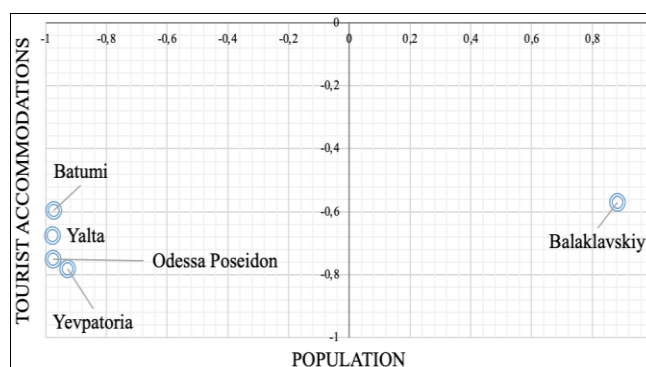


Figure 9. Dependence of population density and tourist accommodations on the distance to the tourist seaport in the Azov-Black Sea Basin (Source: developed by the authors)

3. Azov-Black Sea Basin

The sub-basin of the Azov and Black Seas is represented in this study by 5 ports of tourist orientation. Four of them (except Balaklavskiy port) can be attributed to the centers of attraction to the sea, which is reflected in Figure 9. At the same time, the highest density of CAFs in relation to these ports is noted in the territorial zone up to 2 km, and the population – up to 5 km. The large multi-purpose port of Odessa located in the Northern Black Sea coast in the southwestern part of the Gulf of Odessa. The port is a cargo-passenger port with 54 berths. Passenger complex of the port has the capacity to take up to 4 million tourists a year. There are sea and river cruises from the port of Odessa, but they are not regular. There are cruises on the Black Sea, in the Caucasian direction (Georgian port Batumi), and several cruises to the Mediterranean and North Sea are available. The already mentioned port of Georgia is Batumi, another large-scale Black Sea port. It is located in the southeastern part of the Black Sea in Batumi Bay and has 11 berths.

The passenger terminal with the sea terminal is in the center of the city. The city of Batumi itself is the resort center of Georgia and its Republic of Adjara. Stretching along the Black Sea coast for 20 km, the city has a significant number of attractions for tourists (including beaches and developed infrastructure for seaside recreation, water park, seaside park, historical sites, etc.). Another three year-round ice-free seaports (Yalta, Yevpatoriya, Balaklavskiyi) are located on the southern and southwestern coast of the Crimean Peninsula. The peninsula is a resort and recreational area, with actively developing infrastructure for tourism. There is a significant amount of historical and cultural attractions, there are health resorts, as well as natural treasures and more than 400 beaches.

Leading positions are taken by sanatorium treatment and recreation, beach vacations, cultural and educational and active tourism. Yalta and other ports of Crimea host cruise ships sailing on the Black Sea. While Yalta and Evpatoria classify as the centers of gravity to the sea on the two considered indicators, the port of Balaklavskiyi, influenced by the large coastal city of Sevastopol, located no further 20 km, cannot be considered as such in terms of the concentration of people. However, the trend of decreasing density of CAFs with distance from the port is true.

4. Baltic Sea basin

The Baltic Sea is characterized by a high density of ferry traffic, especially between Denmark, Sweden, and Germany. In this basin we consider two tourist ports – small Roskilde in Denmark and medium-sized Greifswald in Germany. Both ports are centers of population attraction: the pairwise correlation coefficients between port distance and population density are -0.962 for Greifswald and -0.842 for Roskilde.

Roskilde port is located on the shore of Roskilde-Fjord (its lower part), overlooking the Kattegat Strait. Due to its biodiversity, Roskilde-Fjord has an international conservation status. The town of Roskilde is the administrative center of the municipality of Roskilde, part of the Sjælland region. Roskilde is connected to the Danish capital of Copenhagen (located less than 40 km away) by road and rail. Roskilde harbor has an old and a newer part with a total of 370 berths. Roskilde is a center for cultural and musical events, including those held in the marina and the adjacent museum harbor. The main attractions in and around Roskilde, making their tourism potential and attracting tourists are the Viking Ship Museum and Skjoldungelandet National Park, the Cathedral, the Museum of Stones. The highest density of tourist accommodations is noted in the zone of 1 to 2 km, but its size is not comparable with the ports in the south of Europe.

The second port is the German Greifswald, located in the region NUTS 2 Mecklenburg-Vorpommern. The city of Greifswald is a Hanseatic city. It is located in the southern part of the bay of Greifswald at the mouth of the river Ryck. Part of the city, directly overlooking the Baltic Sea is called Wieck after the name of the fishing village. Stadthafen Greifswald Wieck has free piers for boats and yachts on the north and south banks of the river Ryck. For larger vessels, space is available at the pier on the north and south sides of the river. There is also a pier reserved on the north side of the river for passenger vessels and river cruise ships that sail on the Ryck River. This port accommodates a small fishing fleet. There is a small beach near Wieck, equipped for families. Between Wieck and the central historic part of Greifswald (Marktplatz Greifswald) about 7 km by road, you can also get here on the river Ryck on a yacht or a boat. The bay Greifswald is a recognized sailing and surfing. There are also many tourist attractions related to the sea, such as a wooden drawbridge in the Dutch style, the port museum with a collection of old fishing boats and cargo sailing ships (located in the old city port), the traditional fishing festival Gaffelrigg. Greifswald with the islands of Rügen and Usedom, as well as the seaside town of Stralsund represents an important recreational marine center on the German Baltic coast. The tourist functions of the port are reflected in the high density of tourist accommodations directly near the port (the territorial area up to 1 km), which allows to consider the latter as a center of attraction to the sea.

CONCLUSION

Numerous regional and national level studies, as well as global observations, point to a worldwide shift toward the sea. For example, Small and Nicholls (2003) testify to the accelerated development of the coastal lowlands. Barragan and de Andres (2015) write of the rapid growth of cities in the coastal zone. Data on population dynamics, as well as the location of economic activity, suggest the so-called coastalization phenomenon, that is, the attraction of people and human activity to seashores. Projections claim a population imbalance would soon reach 75% in the littoral zone versus 25% in the rest of the land area (El-Sabh et al., 1998). At the same time, these statements are generalized. There is a lack of understanding about the causal relationships. In particular, what is the role of proximity to the coast and seaport in modern life and whether the agglomeration effect is fundamental. In this article, we focused on the study of the impact of tourist seaports on the location of collective accommodation facilities (CAF) for tourists and the concentration of the city's population. Having studied 330 sea and river-sea ports of 28 countries in Europe, we identified 43 ports of tourist specialization. The territory of the city was divided into sectors depending on the distance from the port: 1 to 2 km; 2 to 5 km; 5 to 10 km; 10 to 15 km; 15 to 20 km. The results of the study indicate that tourist seaports – the ports in which more than 90% of shipping is directly related to tourism and passenger traffic, have a significant impact on the distribution of population and tourist accommodations. The greatest number of the population of cities with tourist seaports lives in the 2-5 km zone from the port, and CAFs are located even closer – the highest concentration is within 1 km of the port.

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