



AN EMPIRICAL RESEARCH ON CONNECTING PORT AND CITY INFRASTRUCTURE AND ITS IMPLICATIONS FOR THE ECONOMY – CASE STUDY: BLACK SEA PORTS

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1. ABSTRACT: The connection between port and city infrastructure is a hot topic in the global economic context, in general, and in European and Asian economic situations, particularly. In the last year, in the context of the Russian invasion of Ukraine, the Black Sea region and its ports have become a topic of interest to the European Union. The paper aims to briefly present and better understand the economic situation of the Black Sea region by presenting the connection between its ports and cities' infrastructure. The methodology approach was based on a qualitative research method. The authors focused on the description of the characteristics of the ports, as well as on the presentation of the turnover generated, by the country of origin. The paper contributes to the deepening of the theoretical framework to better understand the port and city infrastructure and its implication for the economy.

2. INTRODUCTION

In the nowadays international context, the theme of connecting port and city infrastructure is a topic of major interest. Therefore, port cities should consider the importance of competitive development (Gurzhiy, Kalyazina, Maydanova, & Marchenko, 2021). However, there are positive and negative factors that affect the connectivity between the port and the city. Thus, the positive benefits are in the economic area (Gurzhiy, Kalyazina, Maydanova, & Marchenko, 2021), but the negative consequences are environmental impact, traffic loads on infrastructure, and the needs of the port for new space (Notteboom & Rodrigue, 2008).

Taking into account the growing interdependence of the world's economies, the importance of seaports in the global supply chain raises more and more (Munim & Schramm, 2018). Consequently, the development of seaports is required by increasing trade and demand for sea transport (Bogusz & Artur, 2016).

The Black Sea area is a topic of interest in Europe, in general, and, to the European Union, particularly. This region is of importance to the European Union for a variety of reasons, from economics and security to energy and transportation (Coffey, 2020). Thus, the economic activity in the region is influenced by the major European ports – Port of Constanța (Romania), Samsun Port

(Turkey), Port of Odessa (Ukraine), Batumi Seaport (Georgia), and Port Varna (Bulgaria) (Babali, 2022).

In the shipping industry, port infrastructure refers to port competitiveness (Martinez & Feo, 2016), port connectivity (Acosta, Coronado, & Mar Cerban, 2007; De Langen, 2007), port location (Wiegman, Hoest, & Notteboom, 2008), and port charges (Tongzon, Chang, & Lee, 2009).

The paper consists of four major sections. Following this brief introduction that contains a review of the literature, the third section is dedicated to the research methodology, while the fourth presents the principal results and discussion. The paper ends with conclusions and suggestions for future research in this area.

3. RESEARCH METHODOLOGY

In order to achieve the research objective set up in the paper, the authors based their research methodology on a quantitative research method (Figure 1). For the literature review, the authors used electronic databases containing various scientific articles, books, web articles, and academic courses from the field of ports and cities infrastructure, in general, and regarding the situation through the Black Sea region, particularly. The documents were found in prestigious databases such as Google Scholar, Emerald Insight, Scopus, Web of Science, and Science Direct.

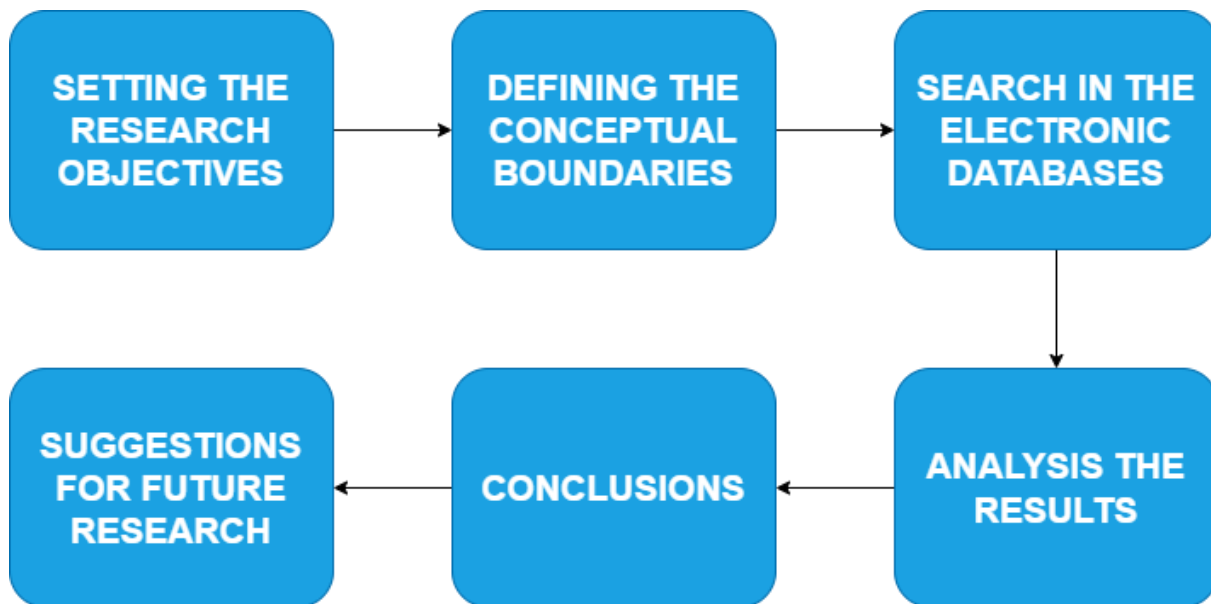


Figure 1: Phases of the research methodology

The information was synthesized highlighting the aspects regarding the topic of ports and city infrastructure. Finally, the authors concluded the paper, pointed out the conclusions, followed by the performed analysis, and provided suggestions for future research.

4. RESULTS AND DISCUSSION

In terms of geographical location, the Black Sea region enjoys a favorable position, surrounded by eastern European countries such as Romania, Bulgaria, Georgia, Moldova, Turkey, Russia, and Ukraine (Dasgupta, 2022). The major Black Sea ports are presented in Table 1.

Table 1. The major Black Sea ports

<i>Name</i>	<i>City</i>	<i>Country</i>
Port of Constanța	Constanța	Romania
Port of Odessa	Odessa	Ukraine
Port of Novorossiysk	Novorossiysk	Russia
Port of Varna	Varna	Bulgaria
Feodosia Port	Feodosia	disputed between Ukraine and Russia
Port of Hopa	Hopa	Turkey
Samsun Port	Samsun	Turkey
Batumi Port	Batumi	Georgia

In terms of economic development, is important to show the Black Sea region turnover in 2021 in comparison with 2020 by TEU (twenty-foot equivalent unit), laden containers to see to what extent these port-cities take advantage of the opportunities that this status generates. So, in the following table it is presented the data (Table 2).

Table 2. The Black Sea region turnover in 2021 and 2020 by TEU, laden containers

<i>Country</i>	<i>2021</i>	<i>2020</i>	<i>Growth</i>
Ukraine	829,725	819,958	1,19 %
Russia	660,581	589,961	11,97 %
Romania	481,210	469,664	2,46%
Georgia	247,415	283,404	-12,7 %
Bulgaria	206,742	201,346	2,68%
TOTAL	2,425,673	2,364,333	2,59%

Source: (Container News, 2022)

The authors of this paper presented some of the characteristics of each of these eight ports and the implications regarding the port and city infrastructure. Comments based on these aspects will be made in the following subsections.

4.1 Port of Constanța (Romania)

The port of Constanța is located in the southeastern part of Romania and it is the country’s largest



port (Babali, 2022). The port is a public-private seaport owned by the Romanian state through the Ministry of Transportation (Olteanu, Drăgan, & Stinga, 2022). Moreover, this is the largest Black Sea port and it is connected with all major ports of Eastern and Central European nations (Dasgupta, 2022) through Corridor IV (rail and road), Corridor VII – Danube (inland waterway), to which it is linked by the Danube-Black Sea Canal, and Corridor IX (road), which passes through Bucharest (International Port Community Systems Association, 2023). The most important types of vessels calling at Constanța are General Cargo (25%), Bulk Carrier (16%), Oil/Chemical Tanker (9%), Inland, Motor Freighter (8%), Container Ship (5%) (MarineTraffic, 2023).

The port is split into two sections known as the North and the South port (Dasgupta, 2022). Nowadays, this port is of very interest to Romania and to European Union, because in 2022, even though the port is facing some capacity issues, it is also beginning to ship Ukraine’s grain exports (Babali, 2022).

Concerning the port and city infrastructure, the railway infrastructure of this port will be modernized soon through a EUR 1 billion investment project financed by the European Union (Dumitrescu, 2022). Furthermore, the city of Constanța has a very important social, economic, political, and cultural role in Romania (Barbu, Deselnicu, & Militaru, 2022), is also one of the most famous tourist cities on the Romanian Black Sea coast (Moraru, Duhnea, Barbulescu, Juganaru, & Juganaru, 2021). Moreover, various projects are currently being performed in the port to modernize the infrastructure, such as the following (Dumitrescu, 2022):

- placing equipment;
- modernizing the fleet of technical ships for waste collection from ships;
- balancing the accessibility of rural-urban areas;
- carrying out infrastructure works for the development of specialized terminals.

4.2 Port of Odessa (Ukraine)

The port of Odessa is one of the most important ports in this region, spans 141 hectares and comprises 54 wharves (Dasgupta, 2022). It is the largest port in Ukraine, located near the city of Odessa, about 150 kilometres from the Romanian border (Babali, 2022). The port was opened in 1974 and is owned by the Ukrainian Sea Ports Authority (Joshi, 2022). The total annual traffic capacity is 40 million tonnes - 15 million tonnes of dry bulk and 25 million tonnes of liquid bulk (SeaRates, 2023).

Considering the port and city infrastructure, it is necessary to mention that Odessa is an industrial city, famous for its chemical industries producing paints, natural and artificial dyes, and fertilizers (Joshi, 2022). Moreover, regarding the connection with tourism, the port city has many serene beaches such as the Arcadia which is Ukraine’s most popular beach, close to the city centre (Joshi, 2022).

The port of Odessa is one of the most important departure points for Ukrainian cereals to international markets, which provides Ukraine with substantial revenues – in 2021, Ukraine was the fourth largest grain exporter in the world (Costea, 2022).

4.3 Port of Novorossiysk (Russia)

Situated on the northeastern Black Sea coast, Port Novorossiysk is the main port of Russia, which handled 142 million tonnes of cargo in 2020 (Dasgupta, 2022). This port is specialized in handling general cargo, bulk, containers, foodstuffs, timber, crude oil and oil products (Eisa shipping agencies,



2022).

In September 2022, following the signing of a contract the Eastern Economic Forum. Delo Group, Gazprombank and the Bamtonnelstroy-Most Group (BTS-MOST), The Port of Novorossiysk is to have improved road connections (PortsEurope, 2022).

Some of the main projects regarding the connection between the port and city infrastructure are the following (ROSMORPORT, 2023):

- project for reconstruction of berths No. 34 and No. 34a of the Cabotage Bulwark designed for serving passenger's vessels;
- project for reconstruction of the Novorossiysk seaport water area;
- project to implement the second stage of modernization of the differential global navigation satellite system in the Black Sea.

4.4 Port of Varna (Bulgaria)

The port of Varna is an important Black Sea port, situated on the western coast of the sea (Dasgupta, 2022). It consists of two main ports: Varna East and Varna West as well as some smaller ports: Balchik, Lesport, Ferry complex, Varna Power Plant (Eisa shipping agencies, 2023). Moreover, considering its proximity to the Bosphorus, and therefore high seas, Port Varna is in a strategic position, being more than a Black Sea facility (Babali, 2022).

Considering the port and city infrastructure, the port of Varna provides easy and convenient access to the Bulgarian road network. Furthermore, all berths of the Port of Varna have access to Bulgaria's rail network, and Varna Airport is the second largest international airport of Bulgaria situated 10 km away from the city centre (Port of Varna, 2023).

4.5 Feodosia Port (disputed between Ukraine and Russia)

Feodosia port of Varna is situated in the Crimea region, in the Gulf of Theodosia adjacent to the Black Sea (Dasgupta, 2022). The current status of this port is disputed between Ukraine and Russia (UkraineTrek, 2023). This port mainly handles oil and petroleum goods and derivatives (Dasgupta, 2022).

Taking into consideration the Russian invasion of Ukraine (Financial Times, 2023) and the annexation of Crimea by the Russian Federation (Britannica, 2023), it's hard to present the correlation between port and city infrastructure and its perspectives.

4.6 Port of Hopa (Turkey)

The port of Hopa became operational in 1972 and it is at the eastern border of the Eastern Black Sea (Dasgupta, 2022). The port was privatized in 1997 transferring the operating rights for a period, of 30 years, to Park Denizcilik Ve Hopa Liman İşletmeleri A.Ş. by Türkiye Denizcilik İşletmeleri A.Ş. (Hopaport, 2023).

With ongoing investments in the field, these are the major correlations between port and city infrastructure that provide opportunities for transportation to both the domestic market and other countries specified by the buyer companies (Hopaport, 2023).



4.7 Samsun Port (Turkey)

The Samsun Port is Turkey’s greatest access point to the Black Sea, linking Turkey to all five other countries in the Black Sea region (Babali, 2022). It is frequented by large bulk carriers carrying heavy bulk and general cargo, fishing boats, oil and chemical tankers and ro-ro ships (Dasgupta, 2022). The most important types of vessels regularly calling at Samsun are General Cargo (58%), Fishing (10%), Bulk Carrier (9%), Ro-Ro Cargo (5%), Oil/Chemical Tanker (4%) (Samsun Port, 2023). Samsun Port is a multi-purpose port which serves any kind of ship and freight. Most of the freight at the port is for international business (Yilmaz, 2006).

Some of the main facilities regarding the connection between the port and city infrastructure are the following (Invest Samsun, 2023):

- logistic facilities;
- industrial infrastructure;
- human resources.

4.8 Batumi Port (Georgia)

The Batumi Port is one of the oldest ports, with a history that dates back to Roman times (Babali, 2022). It is an important Georgia’s port and it is situated on the southeastern coast of the Black Sea (Dasgupta, 2022). It is specialized in purifying oil, and fuel, but it also handles shipments of metals, grains, cement, fertilizers, corn, wood, construction equipment and sugar (Dasgupta, 2022). Moreover, the port is connected to the nearby republic of Azerbaijan through the Baku-Tbilisi-Kars railway, thus creating an on-land logistical corridor between the Black Sea and the Caspian Sea (Babali, 2022).

5. CONCLUSIONS

The paper contributes to the deepening of the theoretical framework to better understand the port and city infrastructure and its implication for the economy. It also shows that the Black Sea region is very important in nowadays international context. Moreover, the presentation of the Black Sea ports’ characteristics and their implication for the economy can be considered an added value.

There is a need for future research related to ports and city infrastructure in Europe and on other continents. Moreover, another field of interest should be the implication of the COVID-19 pandemic on the infrastructure of ports and cities.

6. REFERENCES

1. Acosta, M., Coronado, D., & Mar Cerban, M. (2007). Port competitiveness in container traffic from an internal point of view: the experience of the Port of Algeciras Bay. *Maritime Policy & Management*, 501-520.
2. Babali, B. (2022, May 24). *Top 5 Black Sea Ports*. Retrieved from thebusinessyear: <https://www.thebusinessyear.com/article/top-five-black-sea-ports-in-2022/>
3. Barbu, A., Deselnicu, D., & Militaru, G. (2022). Sustainable travel and tourists' satisfaction. The Case of Constanța, Romania. *The International Maritime and Logistics Conference “Marlog 11” Towards a*



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- Sustainable Blue Economy* (pp. 24-35). Alexandria: Arab Academy for Science, Technology and Maritime Transport.
4. Bogusz, W., & Artur, K. (2016). Conditions for developing a port city transport infrastructure illustrated with the example of Szczecin agglomeration. *Transportation Research Procedia*, 566-575.
 5. Britannica. (2023, January 3). *The crisis in Crimea and eastern Ukraine*. Retrieved from <https://www.britannica.com/place/Ukraine/The-crisis-in-Crimea-and-eastern-Ukraine>
 6. Coffey, L. (2020, March 24). *Europe has a vested interest in a safe, secure, and prosperous Black Sea*. Retrieved from MEI @ 75: <https://www.mei.edu/publications/europe-has-vested-interest-safe-secure-and-prosperous-black-sea>
 7. Container News. (2022, February 22). *Black Sea Container Market Review 2021: 2M Alliance partners remain the leaders of the region*. Retrieved from <https://container-news.com/black-sea-container-market-review-2021-2m-alliance-partners-remain-the-leaders-of-the-region/>
 8. Costea, C. (2022, March 25). *The strategic importance of the port of Odessa*. Retrieved from Romanian Centre for Russian Studies : <https://russianstudiesromania.eu/2022/03/25/the-strategic-importance-of-the-port-of-odessa/>
 9. Dasgupta, S. (2022, February 14). *8 Major Black Sea Ports*. Retrieved from Marine Insight: <https://www.marineinsight.com/know-more/major-black-sea-ports/>
 10. De Langen, P. (2007). Port competition and selection in contestable hinterlands; the case of Austria. *European Journal of Transport and Infrastructure Research*, 1-14.
 11. Dumitrescu, R. (2022, November 9). *Port of Constanța to receive EUR 1 bln makeover of railway infrastructure*. Retrieved from Romania-Insider.com: <https://www.romania-insider.com/port-constantina-makeover-railway-infrastructure-2022>
 12. Eisa shipping agencies. (2022, January 2). *Novorossiysk*. Retrieved from Eisa shipping agencies: <https://www.eisa-moscow.ru/port/novorossiysk/>
 13. Eisa shipping agencies. (2023, January 2). *Varna*. Retrieved from Eisa shipping agencies: <https://www.eisa-varna.com/port/varna/>
 14. Financial Times. (2023, January 3). *Russia's invasion of Ukraine in maps — latest updates*. Retrieved from <https://www.ft.com/content/4351d5b0-0888-4b47-9368-6bc4dfbccbf5>
 15. Gurzhiy, A., Kalyazina, S., Maydanova, S., & Marchenko, R. (2021). Port and City Integration: Transportation Aspect. *Transportation Research Procedia*, 890-899.
 16. Hopaport. (2023, January 3). *Description and history*. Retrieved from https://www.hopaport.com.tr/?page_id=454&lang=en
 17. International Port Community Systems Association. (2023, January 2). *Port of Constanta, Romania*. Retrieved from International Port Community Systems Association: <https://ipcsa.international/about/members/members-europe-and-north-america/678-2/>



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18. Invest Samsun. (2023, January 3). *Why Samsun?* Retrieved from <https://www.investsamsun.com/en-US/content/why-samsun>
19. Joshi, R. (2022, April 12). *8 Facts of Odessa Port You Might Not Know*. Retrieved from Marine Insight: <https://www.marineinsight.com/know-more/8-facts-of-odessa-port-you-might-not-know/>
20. MarineTraffic. (2023, January 2). *MarineTraffic*. Retrieved from Constanța Port: <https://www.marinetraffic.com/ro/ais/details/ports/67?name=CONSTANTA&country=Romania>
21. Martinez, M., & Feo, V. M. (2016). Port choice in container market: a literature review. *Transport Reviews*, 1-22.
22. Moraru, A., Duhnea, C., Barbulescu, A., Juganaru, M., & Juganaru, I. (2021). Residents' Attitude toward Tourism - Do the Benefits Outweigh the Downsides? The Case of Constanta, Romania. *Sustainability*, 882.
23. Munim, Z., & Schramm, H.-J. (2018). The impacts of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade. *Journal of Shipping and Trade*, 1-19.
24. Notteboom, T., & Rodrigue, J. (2008). Port Regionalization: Towards A New Phase In Port Development. *Maritime Policy And Management*, 297-313.
25. Olteanu, A., Drăgan, C., & Stinga, V. (2022). Strategic Management of Constanta Port. *Postmodern Openings* , 105-123.
26. Port of Varna. (2023, January 3). *Clients*. Retrieved from Port of Varna: <https://port-varna.bg/en/Clients/Access-info>
27. PortsEurope. (2022, September 7). *Port of Novorossiysk to have improved road connections*. Retrieved from Port News & Information - the Mediterranean, Caspian & Black Seas: <https://www.portseurope.com/port-of-novorossiysk-to-have-improved-road-connections/>
28. ROSMORPORT. (2023, January 2). *Development of Port Infrastructure Facilities and Fleet of the Azovo-Chernomorsky Basin Branch*. Retrieved from Azovo-Chernomorsky Basin Branch: https://www.rosmorport.com/filials/nvr_developmentofports/
29. Samsun Port. (2023, January 3). Retrieved from Samsun Port: <https://www.marinetraffic.com/en/ais/details/ports/788?name=SAMSUN&country=Turkey>
30. SeaRates. (2023, January 2). *of Odessa*. Retrieved from SeaRates: https://www.searates.com/port/odessa_ua
31. Tongzon, J., Chang, Y.-T., & Lee, S.-Y. (2009). How supply chain oriented is the port sector? . *International journal of production economics*, 21-34.
32. UkraineTrek. (2023, January 3). *Feodosia, Crimea (Feodosiya)*. Retrieved from UkraineTrek: <https://ukrainetrek.com/feodosia-city>



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33. Wiegmans, B., Hoest, A. V., & Notteboom, T. E. (2008). Port and terminal selection by deep-sea container operators. *Maritime Policy & Management*, 517-534.
34. Yilmaz, A. (2006). The Port of Samsun-Samsun Limanı. *Turk Coğrafya Dergisi*, 85-100.