
**SUSTAINABLE TRANSPORT OF GOODS IN THE Odra RIVER REGION
IN THE CONTEXT OF THE GREEN ECONOMY**

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Abstract. The article addresses the issues related to sustainable inland waterway transport in the context of stimulating transformations towards a green economy. The considerations focused on the second-largest river in Poland – the Oder. The clear economic needs and benefits arising from the river's regulation and the restoration of its transport capabilities were juxtaposed with the results of a study regarding the perception of these changes by the public opinion. To clarify, these were the residents of the Oder River Basin, thus people in the immediate impact area of the river.

Keywords: inland waterway navigation; green economy; sustainable transport; Oder.

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1. Introduction

For many years, inland water transport in Poland has been neglected, and water facilities have been subject to continuous deterioration and devastation. Good traditions have been forgotten. The water fleet has aged, and the movement of goods has almost disappeared. Currently, the return and restoration of transport readiness to Polish rivers is an immensely challenging task. The problem has become multifaceted. On the one hand, climate changes caused by environmental pollution, shortages of drinking water, high costs of infrastructure reconstruction, and catastrophic events (such as floods and ecological contamination) have gained strength, undoubtedly at least partially caused by human activity. On the other hand, restoring conditions for inland water transport to Polish rivers would bring enormous economic and social benefits. Among the latter, relieving other types of transportation, especially road transport, can be included. It is worth noting that this concept aligns with the EU's policy of promoting the creation of sustainable transportation systems.

The Oder River Basin constitutes one-third of Poland's territory. It is part of the international E70 route that connects Antwerp (Belgium, North Sea coast) to Klaipeda (Lithuania, Baltic Sea coast), serving as one of the east-west European transportation corridors. Another important route is the E30 waterway, connecting the Baltic Sea to the Danube in Bratislava, encompassing the Oder River from Świnoujście to the Czech border within Poland. The economic potential is enormous, and according to the authors, such opportunities must not be squandered.

There are numerous stakeholders associated with the Oder River Basin, each with diverse perspectives on revitalizing inland water transport. These divisions also extend to the policies pursued by the countries linked to the Oder, namely Poland, the Czech Republic, and Germany. Differences at this highest level likely stem from economic competition and competitiveness against currently efficient port and transportation services.

Among the national entities interested in Oder-related issues, the following groups can be identified: business, the broader state administration, local governments, the central government, non-governmental organizations, and society. In this article, the authors aim to acquaint readers with the viewpoints of ordinary people and their opinions on the ongoing changes. They also attempt to understand the reasons behind their positions and assess the level of understanding of economic processes. For this purpose, a research hypothesis was formulated: the community inhabiting the Oder River Basin is mostly opposed to actions leading to the regulation of the river and restoring its cargo transport readiness.

2. Rivers in the context of the green economy

The green economy is based on an economic activity system that leads to improving the well-being of people while avoiding significant socio-economic and environmental threats for future generations and ecological deficits (Shah, Niles, 2016; Bilan et al., 2020; Oliinyk et al., 2023; Ntshangase et al., 2023). Another definition suggests that the green economy is an interdependent component of the natural environment in which it exists, as well as a part of the global ecosystem (Yakovleva et al., 2017; Naimoğlu, Kavaz, 2023; Rezk et al., 2023). It can be seen as an economic model engaged in sustainable and profitable development, seeking situations that generate economic, social, and environmental benefits (Grudziński, 2018). The green economy involves actions related to lower emissions of major air pollutants and greenhouse gases, limiting the consumption of electricity and water, widespread use of renewable energy sources, conscious management and use of water resources, efficient use of soil resources, analysis and assessment of human activity impact on the environment, and increasing ecological awareness among residents and entrepreneurs (Karpenko et al., 2021; Zumente, Bistrova, 2021; Andryeyeva et al., 2021; Lavrinenko et al., 2022; Aly Hussien Aly Abdou, 2023; Hrab, Minculete, 2023; Mutandwa, Vyas-Doorgapersad, 2023).

In accordance with the principles of European transport policy, the concept of sustainability is crucial in the continued development of global economies. In the context of transportation, it can be understood as a consensus between preserving mobility and the ability to transport goods and protecting the natural environment (White Paper, 2001).

Currently, the focus of inland transportation primarily relies on road transport, which is burdensome both socially (noise, congestion) and environmentally. An alternative is the even more detrimental air transport and the relatively environmentally friendly railway transport, but the latter requires substantial investments. The increasing demand for freight transportation necessitates the exploration of new environmentally friendly modes of transportation. "The low energy consumption of inland navigation is illustrated by the smaller amount of fuel consumed compared to other modes of transportation, which is also associated with significantly lower air pollution emissions than in road transport" (GUS, 2022).

One of the significant attributes of river transport is its ability to move massive and oversized cargoes while maintaining relatively low costs. A large ship can effectively replace even several hundred delivery trucks. It's also worth noting that alternative river transport infrastructure can enhance road safety by reducing traffic intensity (Wojewódzka-Król, 2006).

River transport can be considered in terms of trade exchange as well as communication; both solutions can bring numerous benefits to riverside areas. Compared to road and rail transport, inland waterway transportation generates the least noise, and air pollution levels are similar to rail transport, with no soil or water pollution at all. This form of travel is also associated with the lowest number of accidents (Wojewódzka-Król, 2004). Shifting freight transport to waterways aligns with the concept of a green economy, where cities save on external costs such as combating smog, reducing noise, and soil purification. It also relieves land roads, not always adapted to the transportation of heavy goods (Adamiczka, 2016).

Regarding the transport function of rivers, which involves inland water transport of goods and passengers, facilitating the operation of river ports, transshipment points, and shipyards, it should be noted that the development of the transport function is not contradictory to its tourist function. In fact, it significantly influences it, particularly in the case of river cruises.

In the country's transportation system, inland navigation has marginal significance. Among Polish rivers, the Oder holds the greatest importance for inland water transport. The so-called "Oder Waterway" serves the transport function, constituting a historically shaped transport corridor functionally linked to facilitating trade exchange. This waterway connects the Szczecin agglomeration, maritime and river ports, as well as transshipment points at its mouth, with the Wrocław and Upper Silesian agglomerations. Additionally, indirectly, through the water connection of the Vistula-Oder and Vistula-Warta canals, it connects with the Greater Poland economic area and part of the Vistula economic area (via the Vistula-Oder connection), and through the Oder-Havel and Oder-Spree canals, it connects with the Berlin agglomeration and further with Western Europe. It is a significant component of the Central European Transport Corridor (Inland navigation, 2019).

The Oder, enchanting with its unique landscape, cultural attractions (including landmarks of water infrastructure technology), natural wonders, architectural features, and tourist and recreational development in accordance with environmental protection requirements, will be a tourist attraction not only for residents of the Oder Valley but also for tourists from other regions of Poland and other countries.

3. The conditions of cargo transport on the Oder River

Research on inland navigation on the Oder River in the context of cargo transport encompasses a broad area, involving various elements of this dynamic transportation sector. In the context of port infrastructure, researchers focus not only on physical port structures but also on operational efficiency, the ability to handle diverse cargoes, and the application of modern technologies, such as logistic management information systems (Wiśnicki et al., 2023). Optimizing these elements contributes to more efficient cargo movement on the Oder River (Szaruga, Załoga, 2022). Fleet diversification is another research area that includes the analysis of both traditional and modern floating vessels, such as container ships or specialized units transporting chemicals. Researchers seek to understand how the fleet can be flexible in transporting various cargoes while being economically and environmentally efficient (GUS, 2022). Navigation safety becomes a key research area in the context of cargo transport on the Oder (Klimek, Rolbiecki, 2017). Researchers analyze risk factors such as variable weather conditions or traffic intensity, and propose innovative technological solutions to improve safety, such as ship traffic monitoring systems or warning algorithms (Galor, 2017). Engineering aspects of water regulation involve not only the effectiveness of traditional locks but also research on modern water level regulation systems that can be more sustainable and environmentally friendly. Optimized regulation systems directly impact the possibility of free navigation and cargo movement (Szaruga, Załoga, 2022). Social research focuses on analyzing structures of international cooperation, both within the European Union and in the context of bilateral agreements. Regulatory cooperation aims to eliminate administrative barriers and facilitate smooth cargo transport between countries within the Oder River basin. Therefore, research on cargo transport on the Oder combines technical, economic, and social areas (Wiśnicki et al., 2023) to comprehensively understand and improve this key branch of inland navigation in Central Europe.

4. Methodology

Research problem focused on understanding the opinions of the community living in the close proximity of the Odra River basin. It can be assumed that this area is inhabited by 10 to 18 million Poles (estimated based on the: Plan zarządzania ryzykiem powodziowym dla obszaru dorzecza Odry, 2022). The study began in early December 2023, and data collection is still ongoing. Therefore, despite achieving sample representativeness, the presented results should be treated as preliminary and pilot. However, they allow for checking the correctness of the adopted research procedure and the consistency of the obtained results. They also enable drawing general conclusions and identifying trends related to the examined phenomena.

The adopted research technique facilitating the acquisition and collection of results was a survey - the CAWI method (Computer Assisted Web Interview). The questionnaire structure underwent critical discussion within the scientific community. After verification, it was placed on a platform enabling electronic distribution and data collection - Google Forms. Statistical analysis and charts were developed using MS Excel.

In the final version, the survey contains 30 questions aimed at understanding social opinions and experiences regarding river transport along the Odra River. The results presented in this article were obtained through the analysis of responses to closed-ended single and multiple-choice questions and single-choice matrix questions based on a five-point Likert scale. In one case, an open-ended question was used, requiring coding and classification of responses into thematic groups. The study was conducted using thematic groups on Facebook.

Additionally, the correctness of the survey questionnaire was verified using the Cronbach's Alpha coefficient. This coefficient, also known as the alpha coefficient, is an essential tool in psychometrics for assessing the reliability of tests. It allows for accurately estimating the extent to which a given test accurately reflects what it is supposed to measure. This method is based on a detailed analysis of correlations between different components of the test, enabling the identification of whether individual questions are consistent with each other or whether there are potential inconsistencies. The Cronbach's Alpha coefficient is a key tool for assessing the quality of psychometric tests, and its application significantly affects the credibility of results obtained in psychometric research (Tavakol, Dennick, 2011).

The coefficient returns values in the range $<0;1>$. It is generally accepted that an alpha value above 0.7 indicates acceptable consistency, although values above 0.8 are considered more desirable (Jankowski, 2023). In the present study, a result of 0.86 was obtained.

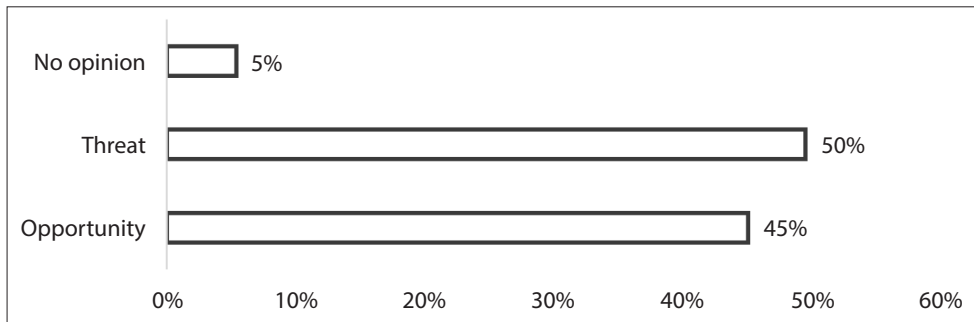
Ultimately, until the time of publication, 452 surveys were collected, of which 431 were considered correctly filled out. The average time to complete the survey should be considered average, and it amounted to 8 minutes.

A quota sampling method was decided upon. In the extreme estimate, the population size was assumed to be 18 million. Under the assumptions made: maximum error value - 5% and confidence level - 95%, the sample size was set at 384 respondents, which means that despite the ongoing study, the results obtained at the current stage are representative.

5. Research Results

Individuals who participated in the survey mostly took the position that conducting works and investments related to the development of the Odra River's transport system pose a greater threat (50%) than a developmental opportunity (45%) – Figure 1. The authors attribute such a negative stance to recent traumatic events that took place in the summer of 2022, portrayed in the mass media as a large-scale ecological disaster caused by destructive human activity (e.g., WWF, 2022). All recommendations presented in this regard consistently overlook the need for economic development and the potential for reconciling or even supporting ecology through modern transportation means (e.g., river barges with hydrogen propulsion and water quality meters).

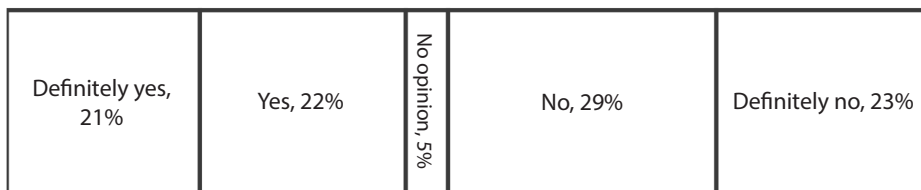
Figure 1. Opinion on the Development of the Oder River



Source: own elaboration.

The groups of opponents and supporters of investment actions on the Odra River aimed at restoring its transport function are similar, although the former is slightly more numerous (52% of the total, with 23% strongly opposed) – Figure 2.

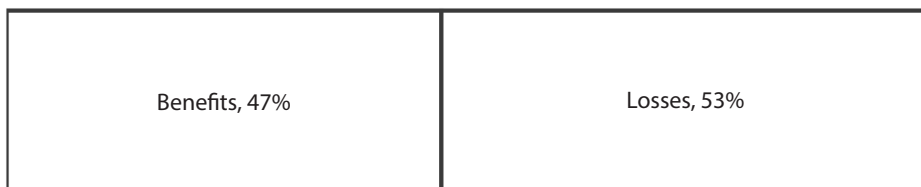
Figure 2. Support for actions aimed at restoring the possibility of cargo transportation along the Oder River



Source: own elaboration.

The conclusions drawn from the data presented in Figure 2 align with the opinions depicted in Figure 3. It confirms that communities inhabiting the Odra River basin perceive its development more as an initiator of potential losses (53%) than potential benefits (47%).

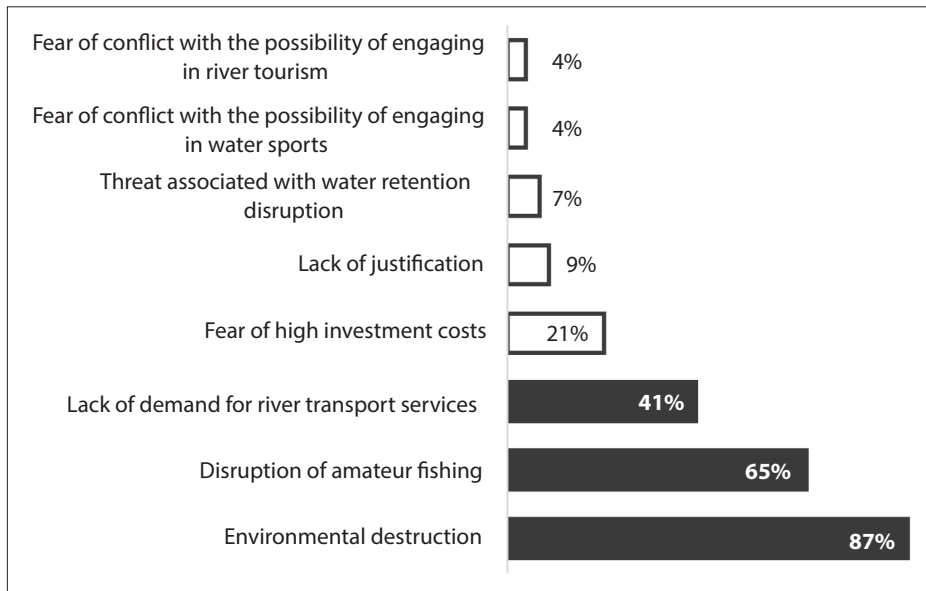
Figure 3. Opinion on the potential benefits and drawbacks resulting from regulatory measures and development of the Oder River



Source: own elaboration.

Among the assumed losses, three of them clearly dominate. These are: lack of need and demand for inland water transport (41%), destruction of conditions for amateur fishing (65%), and environmental pollution (87%) – Figure 4.

Figure 4. Anticipated losses that may result from development works on the Oder River*

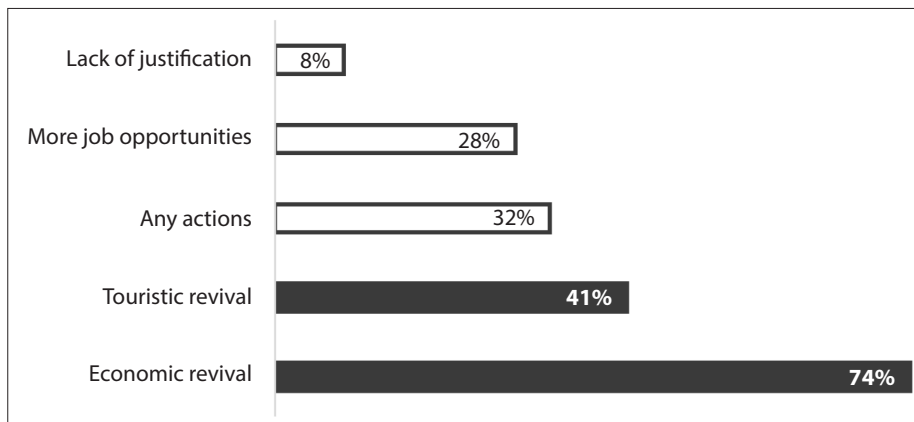


*The possibility of providing more than one answer.

Source: own elaboration.

Potential benefits, on the other hand, are fewer. In this case, respondents less frequently declared more than one or two answers, and their distribution is presented in Figure 5. A clear leader among opinions is the recognition of the association between regulatory works on the river and the economic development of the region (74% of responses). It is also interesting to note a relatively high level of awareness that a regulated river is more favorable for water tourism (41%).

Figure 5. Anticipated benefits that may result from development works on the Oder River

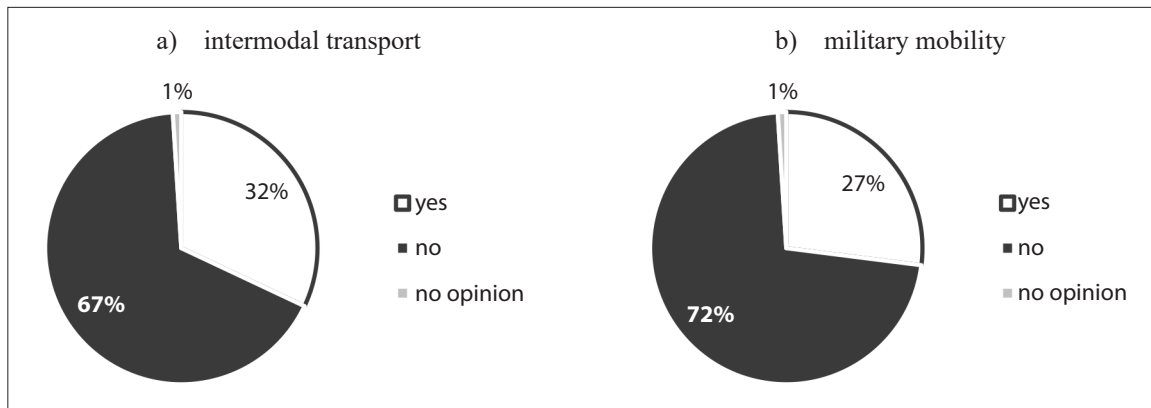


*The possibility of providing more than one answer.

Source: own elaboration.

It turns out that respondents, in most cases, lack knowledge related to freight transport and military logistics. The latter has gained particular significance since the outbreak of the armed conflict in Ukraine. Figure 6 confirms this state of affairs. Nearly 70% of respondents did not know what intermodal transport is, and 72% were unfamiliar with the concept of military mobility.

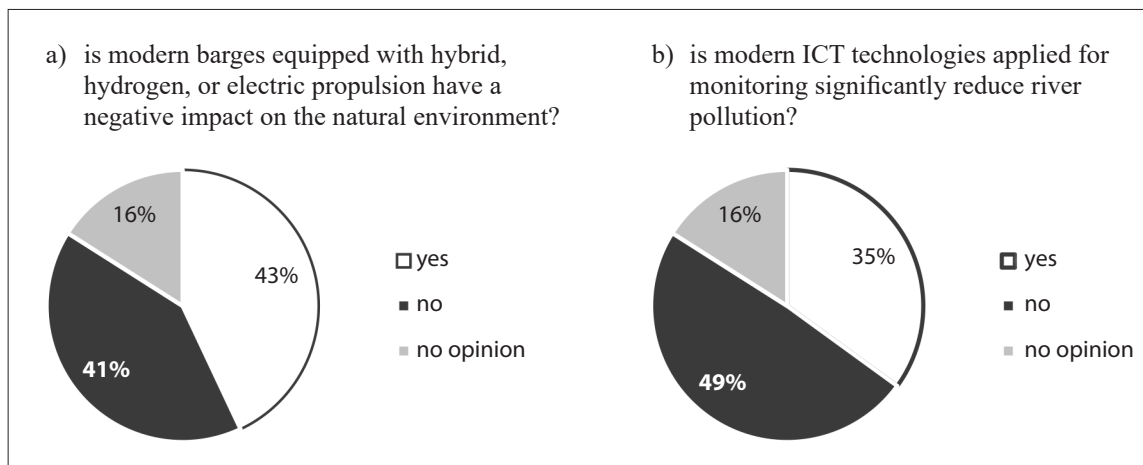
Figure 6. Understanding the concept of:



Source: own elaboration.

A relatively large lack of knowledge and understanding of the convergence and coexistence between modern logistics, economic development, ecology, innovations, and modern technologies became apparent during the analysis of data from Figure 7. As much as 16% of respondents could not take a stance on the mutual interactions between commonly known phenomena. Another argument comes from the declarations in Figure 7a, which indicates that the majority of society (43% of the total) believes that some of the most advanced and mostly zero-emission propulsion solutions, such as electrically powered engines, hybrid engines, or hydrogen-powered engines, have a devastating impact on the natural environment. Additionally, respondents are skeptical about the possibility of effectively monitoring the river's condition through ICT technologies (Figure 7b – 49%).

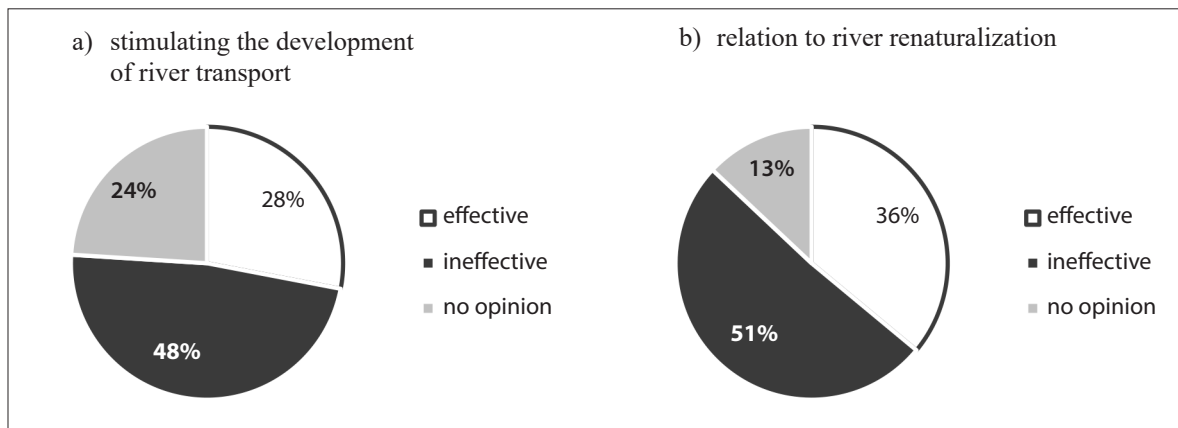
Figure 7. In your opinion:



Source: own elaboration.

Despite the negative perception of the regulation and development process of the Odra River, individuals who participated in the study perceive significant dysfunction and inefficiency in the implementation of tasks related to the river by public administration entities. This position applies to both the assessment of stimulating river development (Figure 8a) and opposing actions, such as renaturalization efforts (Figure 8b).

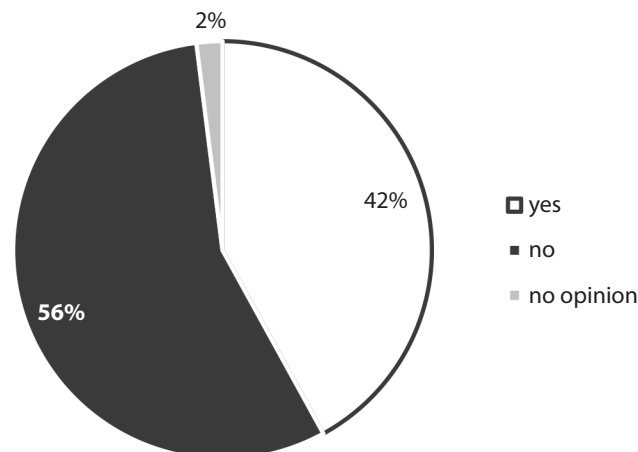
Figure 8. Assessment of the effectiveness of public administration authorities in:



Source: own elaboration.

A summary emerging from the study's findings on the trend of social reluctance toward stimulating the development of the Odra River in terms of creating conditions for mass cargo transport confirms the respondents' opinion that, for the most part, they do not see the possibility of reconciling logistical tasks with respect for the natural environment – Figure 9.

Figure 9. In your opinion, can efficient river transport be reconciled with the preservation and respect for the natural environment?



Source: own elaboration.

6. Summary and conclusions

The presented data constitute only a fragment of the ongoing research related to the development of the Odra River and the associated economic implications. After analyzing Figures 1-9, it can be unequivocally stated that the adopted research hypothesis presented in the Introduction, stating that “the community inhabiting the Odra River Basin is mostly opposed to actions leading to the regulation of the river and restoring its cargo transport capability,” turned out to be true. However, the question remains: why is this happening? There are modern technological solutions that could reconcile river transport activities with ecology and even, in some aspects, support environmental protection. Is it due to insufficient knowledge and social awareness related to economic functioning? Or perhaps there is a lack of trust in the honesty of entrepreneurs and carriers? Maybe the possibilities of modern technologies are underestimated or unknown? Are negative experiences and numerous

scandals related to groundwater contamination the reason, or is it fear and reluctance stemming from the place of residence, i.e., in the direct area of the river's impact?

Unfortunately, the scope of the conducted research is too narrow to provide clear and conclusive answers to these questions. They do, however, constitute a good starting point and incentive to deepen knowledge on this subject for a complete understanding of the problem. According to the authors, a series of global unfortunate events that have affected almost all of humanity in recent years also remains influential. These events include the large-scale forest fires in South America, the COVID-19 pandemic, a subsequent global economic crisis, and high inflation. Shortly thereafter, the war in Ukraine erupted, posing a significant global threat that could easily escalate into an unprecedented armed conflict. However, the most significant event seems to be a more regional one. In 2022, Polish residents experienced an ecological disaster that occurred on the Odra River. Mass media and all commentators adopted a one-sided stance on the need to stop all work on the Odra and leave it in its natural state, forgetting about modern technological achievements and alternative solutions that could lead to much greater economic, social, and even environmental benefits. Achieving such results, however, is much more difficult and requires a constructive dialogue between business, politicians, management entities, and scientists.

In today's world, rivers must serve many different functions, such as military mobility. Completely abandoning the economy and development in the name of leaving nature to itself is not feasible. Nor can it be devastated; it must be protected in accordance with the principles of sustainable development. Extreme ecological positions regarding the Odra are unacceptable. It should be remembered that man exists for ecology, not ecology for man.

Referring to the presented research results, it should be noted that the data collection is planned to end at the end of February 2024. The authors then plan to conduct in-depth analyses and statistical inference, and the results will be published in a series of articles and in the form of a monograph.

References:

- Adamiczka H., 2016, *Rzeka – symbol rozwoju społeczno-gospodarczego miasta, Zagadnienia aktualnie poruszane przez młodych naukowców*, No 6, Creativetime, Poznań.
- Aly Hussien Aly Abdou, Sh. 2023. From cleaner production to green competitive advantage: evidence from Egypt. *Entrepreneurship and Sustainability Issues*, 11(1), 81-97. [http://doi.org/10.9770/jesi.2023.11.1\(5\)](http://doi.org/10.9770/jesi.2023.11.1(5))
- Andryeyeva, N., Nikishyna, O., Burkynskyi, B., Khumarova, N., Laiko, O., Tiutiunyk, H. 2021. Methodology of analysis of the influence of the economic policy of the state on the environment. *Insights into Regional Development*, 3(2), 198-212. [https://doi.org/10.9770/IRD.2021.3.2\(3\)](https://doi.org/10.9770/IRD.2021.3.2(3))
- Bilan, Y., Mishchuk, H., Samoliuk, N., & Yurchyk, H. 2020. Impact of income distribution on social and economic well-being of the state. *Sustainability*, 12(1), 429.
- Budziewicz-Guźlecka, A., Drab-Kurowska, A. 2018. *Selected aspects of corporate social responsibility in maritime freight services on the example of selected courier companies*. SHS Web Conf. 58 (2018) 01003. <https://doi.org/10.1051/shsconf/20185801003>
- Galor, W. 2017. *Sea-river shipping in Polish inland waters*. *ZNAM in Szczecin*, 50 (122), 84-90.
- Grudziński, A. 2018. Wybrane narzędzia usprawniające proces zazieleniania gospodarki. *Market–Society–Culture*, 4(30).
- Hrab, D., Minculete, G. 2023. Building tomorrow: additive manufacturing unleashing sustainable progress in the US military, *Insights into Regional Development*, 5(4), 115-134. [https://doi.org/10.9770/IRD.2023.5.4\(8\)](https://doi.org/10.9770/IRD.2023.5.4(8))
- Jankowski, A. *Analiza rzetelności Alfa Cronbacha. Teoria, wyjaśnienia, przykłady*. p.4, <https://pogotowiestatystyczne.pl/wp-content/uploads/2023/01/Analiza-rzetelnosci-Alfa-Cronbacha-teoria-wyjasnienia-przyklady.pdf>, access: December 2023
- Karpenko, L., Izha, M., Chunytska, I., Maiev, A., Hunko, K. 2021. The growth of the country's economic security level based on the investment infrastructure development projects. *Entrepreneurship and Sustainability Issues*, 8(4), 713-729. [http://doi.org/10.9770/jesi.2021.8.4\(44\)](http://doi.org/10.9770/jesi.2021.8.4(44))

- Klimek, H., Rolbiecki, R. 2017. Financial results of the handling and warehousing companies in Polish maritime ports., *Research Journal of the University of Gdańsk, Transport Economics and Logistics*, 69 (2017).
- Lavrinenko, O., Rybalkin, O., Danileviča, A., Sprūde, M. 2022. Green economy: content and methodological approaches. *Entrepreneurship and Sustainability Issues*, 10(2), 635-652. [http://doi.org/10.9770/jesi.2022.10.2\(40\)](http://doi.org/10.9770/jesi.2022.10.2(40))
- Merino-Saum, A. et al. 2020. Unpacking the Green Economy concept: quantitative analysis of 140 definitions. *Journal of Cleaner Production*, 242.
- Mutandwa, H., Vyas-Doorgapersad, S. 2023. Public-private partnerships to improve water infrastructure in Zimbabwe. *Insights into Regional Development*, 5(2), 24-37. [https://doi.org/10.9770/IRD.2023.5.2\(2\)](https://doi.org/10.9770/IRD.2023.5.2(2))
- Naimoğlu, M., Kavaz, I. 2023. Energy use tendencies in a resource-abundant country: the case of Canada. *Insights into Regional Development*, 5(4), 65-79. [https://doi.org/10.9770/IRD.2023.5.4\(5\)](https://doi.org/10.9770/IRD.2023.5.4(5))
- Ntshangase, B.A., Makole, K.R., Msosa, S.K. 2023. Governance of state-owned companies in the energy sector of South Africa: peculiarities and challenges. *Insights into Regional Development*, 5(4), 135-144. [https://doi.org/10.9770/IRD.2023.5.4\(9\)](https://doi.org/10.9770/IRD.2023.5.4(9))
- Oliinyk, O., Mishchuk, H., Vasa, L., & Kozma, K. 2023. Social Responsibility: Opportunities for Integral Assessment and Analysis of Connections with Business Innovation. *Sustainability*, 15(6), 5608.
- Plan zarządzania ryzykiem powodziowym dla obszaru dorzecza Odry*, 2022. Ministerstwo Infrastruktury, <https://www.zpp.pl/storage/library/2022-06/1d9cd8e44a6b0646f5677b00426d4c7d.pdf>, access: December 2023
- Rezk, M.R., Kapiel, T. Y., Piccinetti, L., Salem, N., Khasawneh, A., Santoro, D., Montagnino, F.M., El-Bary, A.A., Sakr, M. M. 2023. Circular economy in Egypt: an overview of the current landscape and potential for growth. *Insights into Regional Development*, 5(3), 45-57. [https://doi.org/10.9770/IRD.2023.5.3\(3\)](https://doi.org/10.9770/IRD.2023.5.3(3))
- Szaruga, E., Załoga E. 2022 Qualitative–Quantitative Warning Modeling of Energy Consumption Processes in Inland Waterway Freight Transport on River Sections for Environmental Management, Szczecin. *Energies*, 15(13), 4660; <https://doi.org/10.3390/en15134660>
- Tavakol, M., Dennick, R. 2011. Making sense of Cronbach’s alpha. *International Journal of Medical Education*, 2.
- Transport śródlądowy, <http://eregion.wzp.pl/obszary/transport-srodladowy>, access: December 2023.
- White Paper. European transport Policy for 2010: time to decide. Luxembourg 2001.
- Wiśnicki B., Dybkowska-Stefek D., Relisko-Rybak J., Kolanda Ł. 2021. *Methodology for Determining the Location of River Ports on a Modernized Waterway Based on Non-Cost Criteria: A Case Study of the Odra River Waterway*, *Sustainability* 2021, 13(6), 3571; <https://doi.org/10.3390/su13063571>.
- Wnioski i rekomendacje dotyczące opracowania „Wstępny raport rządowy zespołu ds. sytuacji na rzece Odrze”*, 2022, Report WWF, Warszawa.
- Wojewódzka-Król, K. 2006. *Kierunki rozwoju żeglugi śródlądowej w Polsce: założenia do strategii na lata 2007-2013*, p.11.
- Zumente, I., Bistrova, J. 2021. Do Baltic investors care about environmental, social and governance (ESG)? *Entrepreneurship and Sustainability Issues*, 8(4), 349-362. [http://doi.org/10.9770/jesi.2021.8.4\(20\)](http://doi.org/10.9770/jesi.2021.8.4(20))
- Żegluga śródlądowa w Polsce w latach 2020 i 2021. 2022. GUS, Warszawa, ISSN 2353-5393, Szczecin.

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