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The Three Seas Initiative (I3M). The connection strategy between the Black Sea and the Baltic Sea, on rivers and inland canals

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Abstract. Considering the “Three Seas Initiative”, four countries from Eastern Europe, Romania, Republic of Moldova, Ukraine and Poland, can be united with the help of complex arrangements of some rivers and by the construction of navigable canals between them, for the transport of goods and passengers. In this paper I presented and analyzed the possibility of creating a connection by water, through the complex development of some rivers and the construction of navigable canals from the Danube to the Baltic Sea. We studied, analyzed and proposed the areas and places through which the canals can be built, the segments where the rivers must be developed, the ports and connection points for multimodal transport and integrated logistics. I had considered a sustainable development strategy, but which would follow the economic interests of the four countries and as a joint effort to help Ukraine in the process of economic reconstruction, as well as environmental protection.

1. Introduction

The Three Seas Initiative (I3M) is "a flexible and informal political platform, at the presidential level, that brings together the 13 member states of the European Union, located between the Adriatic, Baltic and Black seas", [1]. At the time of the launch of the Initiative, Greece was also accepted. The 13 countries are: Austria, Bulgaria, Croatia, Czech Republic, Estonia, Greece, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Hungary, and Ukraine and the Republic of Moldova are associated states. The strategic partners of the Initiative are the United States of America, the European Union, Germany and Japan. The representatives from France, Great Britain, Turkey, the European Bank for Reconstruction and Development, the European Investment Bank, the Organization for Economic Cooperation and Development, the International Monetary Fund and the World Bank were also invited to the organized summits.

This Initiative aims to "increase convergence and cohesion, in parallel with reducing the economic development gap between different areas and EU member states, by increasing interconnectivity in the region, in the fields of energy, transport and digital".

The basic principles of the "Three Seas Initiative" are the following [2]:

- Promotion of economic development.
- Increasing cohesion at European level.
- Consolidation of transatlantic ties.

The strategy of the three seas, the Aegean Sea, the Black Sea and the Baltic Sea, as an overall strategy, can be realized in several strategic directions and based on multinational business plans. Apart from the 13 states interested in this "Initiative", the Republic of Moldova and Ukraine, as associated states, can be included in the strategies and programs that will be designed and adopted. The concrete achievement of a single economic objective will make this "Initiative" attractive, and apart from the main countries, nearby countries, such as Turkey, Albania, North Macedonia and Serbia, can also be

connected. Apart from some investments in the industrial field, important investments can be made in the field of transport and digitalization. These can be oriented towards the construction of highways, connection points and logistics centers, the development of air, rail, sea and inland transport.

For the countries in the eastern part of Europe, I have in mind the following strategies:

a). Projecting (design), financing and construction of a highway. A highway to connect Thessaloniki, Greece, with Gdansk, Poland. The route for this highway can be via Sofia, Bucharest, Chernivtsi, Kiev, Lvov, Warsaw and reach Gdansk, over a distance of approx. 2300 km. From the highway in Romania, a connection can also be made to Chisinau, from there a connection to Kiev. In figure 1, you can see the network of European highways, the central and eastern area, [3]. In the 2020 Court of Auditors Report of the European Union, the lagging behind in the development of road transport, the fact that the network is not fully functional, is recognized. On some parts of this link, highway segments or modernized European terminals are being built, but a highway remains to be built over fairly long distances, as can be seen in figure 2, which connects Romania, the Republic of Moldova and Ukraine, with the highways from the center of Europe.

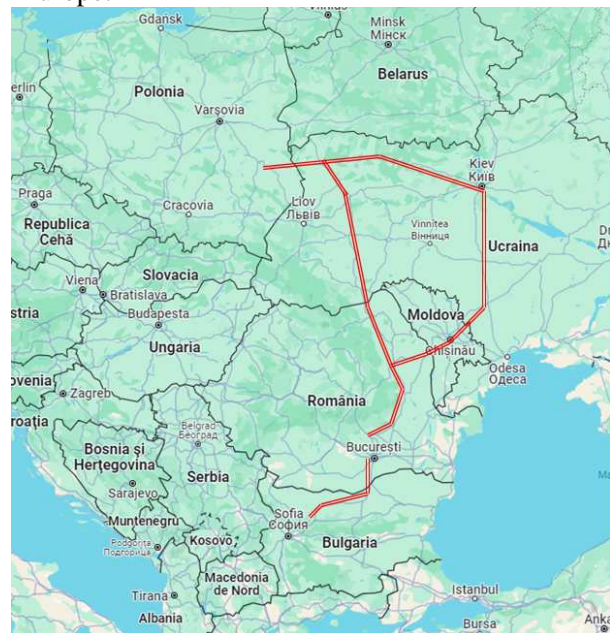


Figure 1. The network of East-European highways. **Figure 2.** Proposal regarding the construction of highways. Source: CAEU (2020).

b). Designing, financing and building a system of railway connections. The railway must ensure the movement of high-speed trains for passengers and goods, connecting Athens, Sofia, Bucharest, Chisinau, Kiev, Lvov, Warsaw and Gdansk. The main problem of the railway connection, apart from the modernizations, is the transition of the railways from the Republic of Moldova and Ukraine, from wide gauge to normal gauge. Figure 3 shows the European railway network, the central and eastern area. As recognized in the Report of the Court of Auditors of the European Union, the European high-speed rail network is "far from being a reality, it remains fragmented and ineffective", [3]. The situation of railway transport is analyzed there, at a higher level, but the countries in this area are still far from the minimum modernization of the railways.

Figure 4 shows the project for expanding the railway network for high-speed trains. From this figure it can be seen that there is no project in the countries of Eastern Europe. The main problem is the modernization of the railway networks in Greece, Bulgaria, Romania, Moldova, Ukraine and Poland and their transformation into high-speed lines, figure 5, [4].

c). Development of air transport lines. For this, investments must be made primarily for the modernization and development of the airports in Athens, Thessaloniki, Sofia, Varna, Bucharest, Constanta, Galati, Iasi, Suceava, Chisinau, Kiev, Lvov, Warsaw and Gdansk, but it is also possible in

other cities small, but economically important, such as Burgas, Brasov, Balti, Odessa, Krakow and others. Figure 6 shows the air connection between the main Eastern European capitals, [5].



Figure 3. The Eastern European railway network.



Figure 4. Expansion of the Western European high-speed network.

Source: CAEU (2018).



Figure 5. The Eastern European railway network.

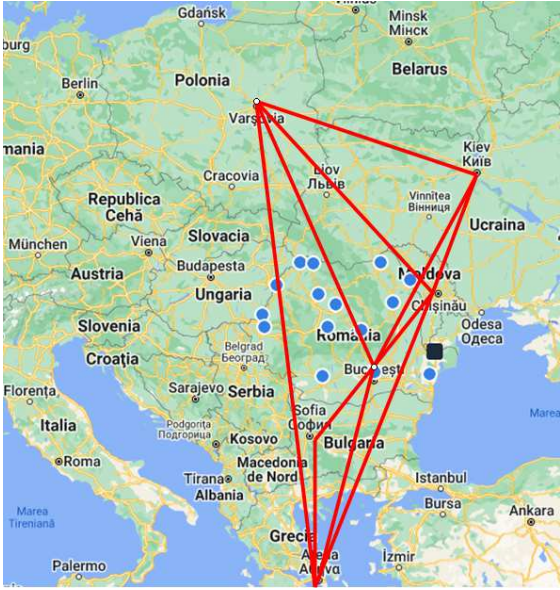


Figure 6. Air connections between Eastern European capitals. Source: author's study, google.maps.

d). The projection (design), financing and implementation of a navigation system on inland waters. This can be done from the Galati fluvial-maritime port, by developing the Prut river, then through a navigable canal, connecting the Prut river with the Dniester, developing the Dniester river, then a canal connecting the Dniester river with the San river, developing the San river, which flows into the Vistula river, then the development of this river, to the port of Gdansk, from the Baltic Sea.

e). The design, financing and implementation of a digitized IT system for the transmission of economic information. This can be achieved through a program with a database and an application system to which state authorities and economic agents interested in carrying out freight transport can access, between the partner countries: Greece, Bulgaria, Romania, Moldova, Ukraine Poland, Hungary, Slovakia, Lithuania, Latvia and Estonia. Countries in the region, such as Turkey, North Macedonia and Serbia, can also be connected to them.

2. Literature review

In the specialized literature, there is not a significant number of specialized works, to be published in publishing houses or at international conferences indexed in the databases. These are due to the fact that from the year 2022, the geopolitical situation of the area has changed, from a military and economic point of view, of military and economic alliances. In a relatively short time, steps were taken to begin the integration into the European Union of the Republic of Moldova and Ukraine, after the end of the current military conflict. In a first analyzed work, which was published in 2023, a reference is made to a project from the 19th century, from the Austro-Hungarian Empire, for the development of the Vistula River and the San River, plus a canal, which besides the economic role, it also had a military strategic one [6]. Referring to the current situation, the authors consider that a connection between the Baltic Sea and the Black Sea, in the current conditions of the war, can only be made on the Dniester River, until it flows into the Black Sea. In the second paper analyzed, published in 2018 [7], the authors performed an analysis of some factors that would make a connection between the Baltic Sea and the Black Sea possible, but the technical and logistical aspects are not analyzed in the paper, and the chosen version is the one published in Ukraine in 2015 [8]. These works do not highlight the problems and situations involved in such a project, regardless of the chosen route.

In this work, we have analyzed the possibility of developing transport on inland waters, as a continuation of the maritime link between the three seas, from the Aegean Sea, through the Black Sea, to the Baltic Sea. For the elaboration of the work, I carried out a series of studies of international programmatic documents, I studied monographs, physical and economic maps, of the area between Galați and Gdansk.

3. Research methodology

In the framework of the research methodology, the documents developed on a European level were used, relating to transports, to the development of political, economic and social relations, in the geographical area where the three seas are delimited. Based on the information and data obtained, from the study of documents developed at international conferences and meetings, we used the “concept transfer” method, which consists in taking some ideas from scientific works, from programmatic documents and from the real situations of the countries in the area, concepts and working methods for the development of the water, maritime, fluvial and inland water connection strategy. The direct research, regarding the two rivers, the rivers and the internal canals, involved studies and measurements, for various routes, which I compared and analyzed, in order to choose and propose the one that I considered to be optimal, taking into account the criteria related to distances, plain, hilly areas, near towns, navigational hazards and the need for complex facilities. Based on the criteria of integrated logistics, we conducted a study to choose the ports and areas with the best potential for multimodal transport connection, inland ports and logistics areas near them.

Then I carried out the transfer of ideas in the field of research and looked for a solution for the realization of this strategy. The subject of the research is the strategy for achieving the connection on the inland waters, between the three seas, which I propose.

4. Findings

4.1. *"The Three Seas Initiative", the development of strategic projects in the fluvial sector and on inland waters*

The main directions of action, for achieving the naval connection, I believe must be the following:

a). Maritime connection. This can be done by sea, from the port of Thessaloniki, through the Aegean Sea, the Dardanelles strait, the Sea of Marmara, the Bosphorus strait and the Black Sea, to the port of Constanta, figure 7 or to Sulina, figure 8. These sea lines exist, but the traffic of cargo from Thessaloniki to Constanta, does not have a significant weight. Considering the imports of food and agricultural products from Greece, the transfer from road transport to sea and river transport has a number of important advantages.

b). River connection. This connection can be made in two ways, figure 9:

- Variant I: from the port of Constanta, through the Danube - Black Sea Canal and then on the Danube, to the Port of Galati.

- Variant II, from the port of Sulina, on the Sulina Canal, on the Maritime Danube, to the port of Galati.

The differences between the two ports are significant, because only ships up to a certain draft can navigate through Sulina and the Maritime Danube, while large ships can unload in the port of Constanta, directly on river barges and they can transport the goods to Galati, via Canal and Danube. Which is being done to a great extent at present?

c). The connection on rivers and inland canals. This can be done from the port of Galati, on the Prut river, to Cernăuți, and from there, it is necessary to build some navigable canals, to the Dniester river. The Dniester River can be set up for navigation, up to a point where the construction of another canal is necessary, which will connect it with the San River in Poland. The San River must be set up for navigation, until it flows into the Vistula River. The Vistula River provides the minimum water volume and navigation conditions up to Gdansk, figure 10.

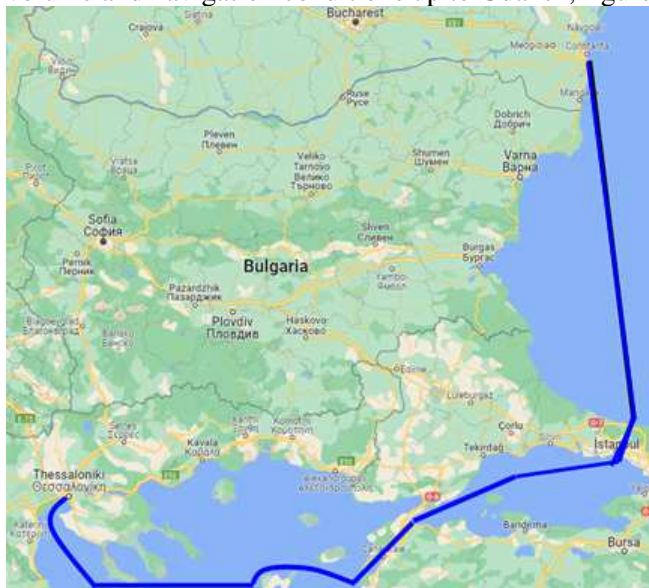


Figure 7. Maritime connection, Thessaloniki-Constanta.

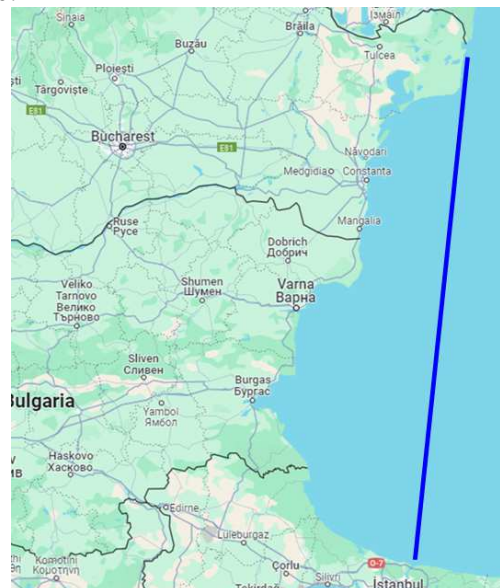


Figure 8. Bosphorus-Sulina maritime connection.

Source: author's study, google.maps.

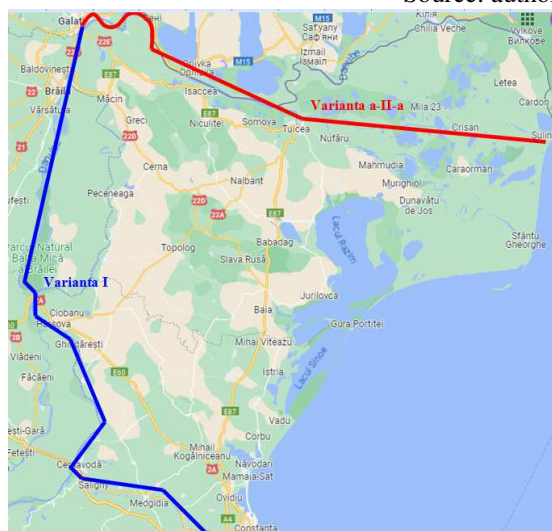


Figure 9. The river connection, on the Danube-Black Sea Canal and on the Sulina Canal.

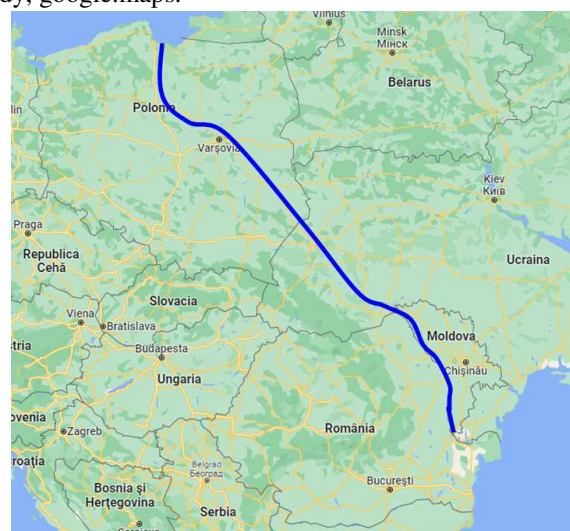


Figure 10. The connection on rivers and inland canals, between Galati and Gdansk.

Source: author's study, google.maps.

4.2. Technical and logistic projects

Due to the distance of approx. 1500 km, between Galati and Gdansk, very large investments are needed and will last a long period of time. The main hydro technical works are the following:

- The complex development of the Prut river.
- Construction of the navigable canal in Ukraine, part I.
- The complex arrangement of the Dniester river, the northern part, on the territory of Ukraine.
- Construction of the navigable canal in Ukraine, part II.
- Construction of the navigable canal in Poland, following the one in Ukraine.
- Complex development of the San River in Poland.
- The complex arrangement of the Vistula river.
- Development of existing river ports and construction of new ports and logistics centers.
- The arrangement and construction of roads and railways, for carrying out the transport of goods and people.

Apart from these, the aspects regarding the protection of the aquatic environment, the creation of "green lines", formed by planting trees specific to the areas, on one side and the other of the rivers and canals, must be taken into account. Considering the geographical configuration of the rivers, their meanders and bends, drainage works, "curve cutting", dredging of the navigable channel and even the construction of flood protection dikes will be necessary. Locks will be needed in certain sectors to maintain the water level necessary for navigation.

A challenge is the transition from fossil fuel, for powering river ships, to the construction of new ships, with electric motors powered by batteries or from the shore.

The concrete implementation of the project requires the following measures and decisions:

- The adoption of the political decision and the signing of documents between the international partners.
- Carrying out topographical studies, designing layouts, canals and installations.
- Establishment of a transnational company (or 4 national companies, in each partner country).
- Obtaining financing and starting the construction works of the naval and road infrastructure.

The main technical and logistical works are the following:

- a). The complex arrangement of the river Prut. From the Prut river, the part between the mouth of the Danube, figure 11, and Cernăuți, figure 12, is important.
- b). Construction of the canal in Ukraine, part I. Part I between Chernivtsi and Vasilău, to connect the Prut and Dniester rivers, figure 13.
- c). The complex development of the Dniester river. From Vasilău to Ustea, figure 14.
- d). Canal construction in Ukraine, part II. Part II, from Ustea, to the border with Poland and the continuation of the canal in Poland, to Michalowka (San river), figure 15.
- f). The complex development of the San river. From Michalowka to Dabrowka Pniowska, at the confluence with the Vistula river, figure 16.
- g). Complex development of the Vistula River. From Dabrowka Pniowska, in Warsaw, from figure 17, the development of the river in the crossing of the capital Warsaw, figure 18 and the development of the river downstream of Warsaw, to the bay of Gdansk, figure 19. In Gdansk, sea and river port, there are a number of possibilities for the integration of naval transport, within this connection of the three seas, figure 20.

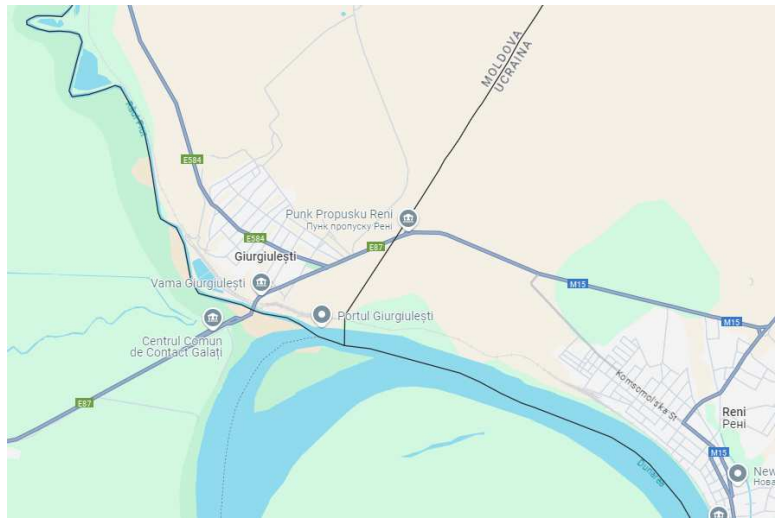


Figure 11. Entrance area from the Danube to the Prut.
Source: google.maps.

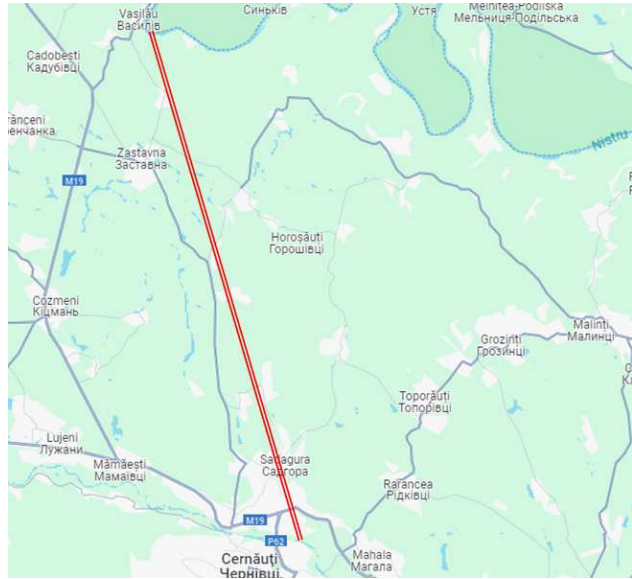
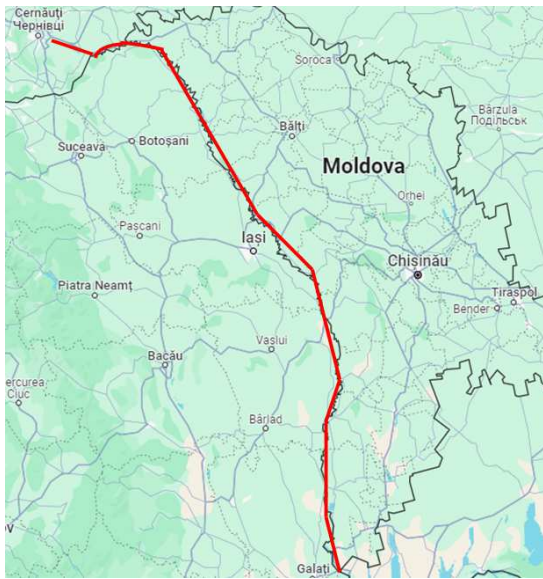


Figure 12. The complex arrangement of the river Prut. **Figure 13.** The canal between Cernăuți and Vasilău, part I

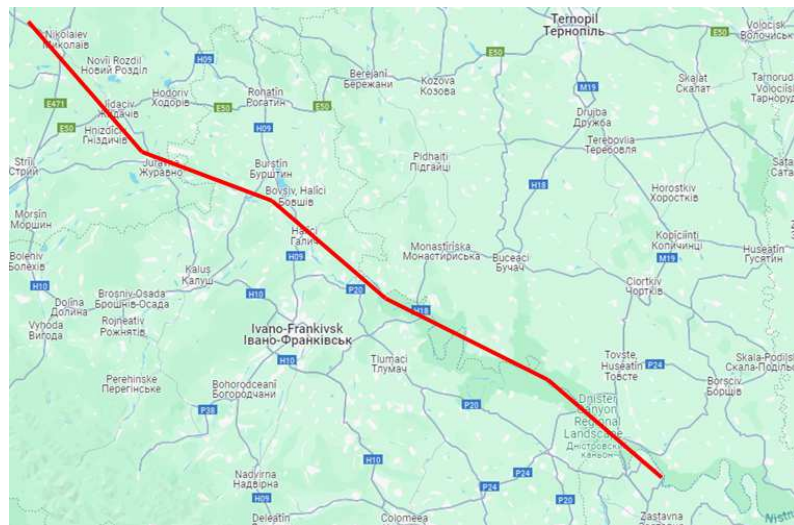


Figure 14. The complex development of the Dniester river.

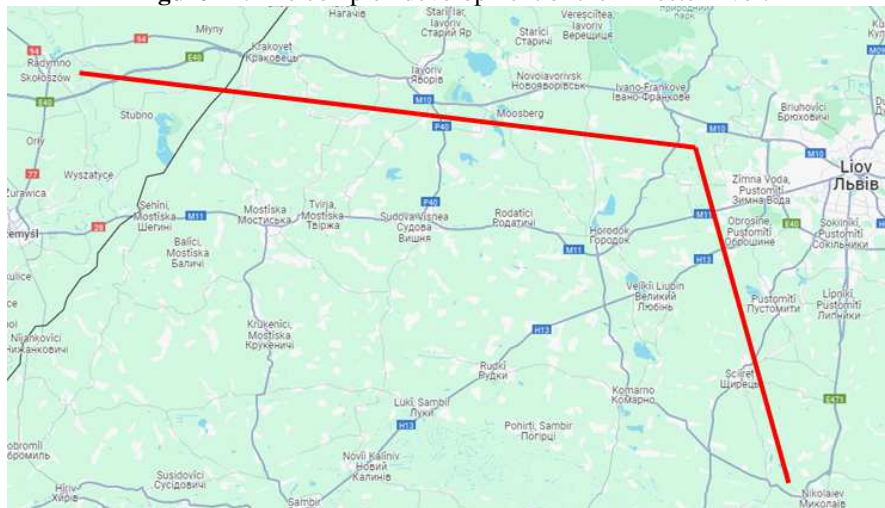


Figure 15. Construction of the canal in Ukraine, part II, between Ustia and Michalowka.
Source: author's study, google.maps.

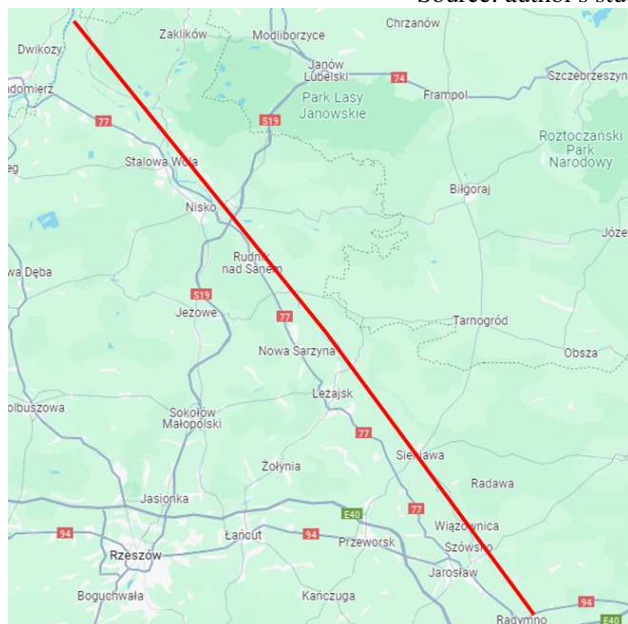


Figure 16. The complex development of the San river.

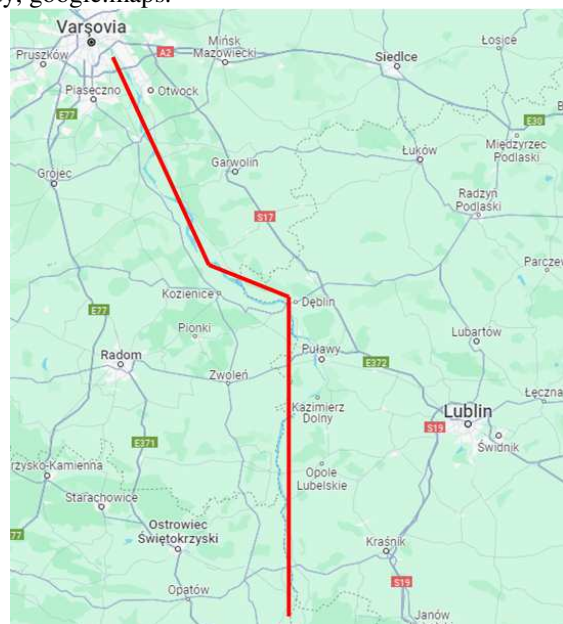


Figure 17. The complex development of the Vistula river part I, up to Warsaw.

Source: author's study, google.maps.

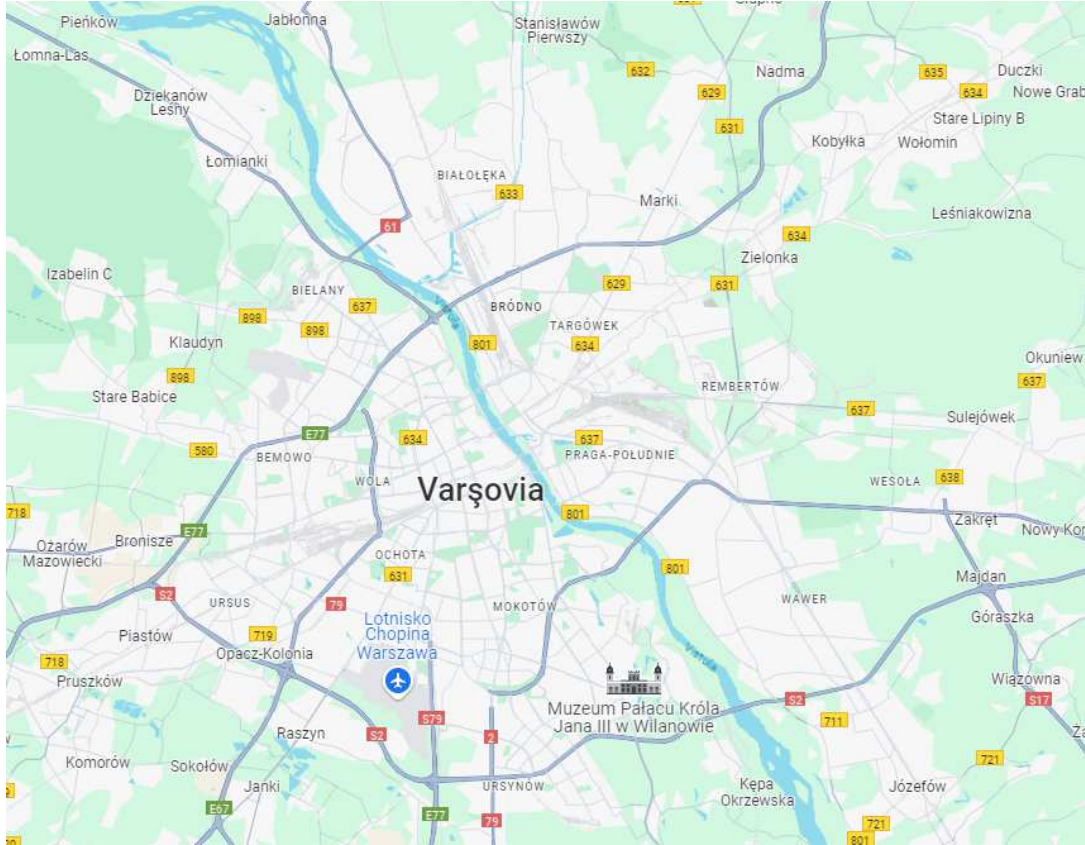


Figure 18. The Vistula River crossing the capital Warsaw.
Source: google.maps.

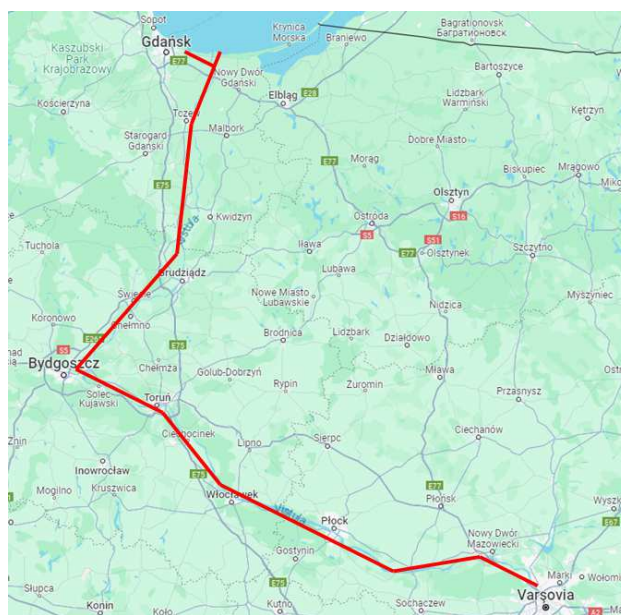


Figure 19. Development of the Vistula River, up to the Bay of Gdansk.

Source: author's study, google.maps.

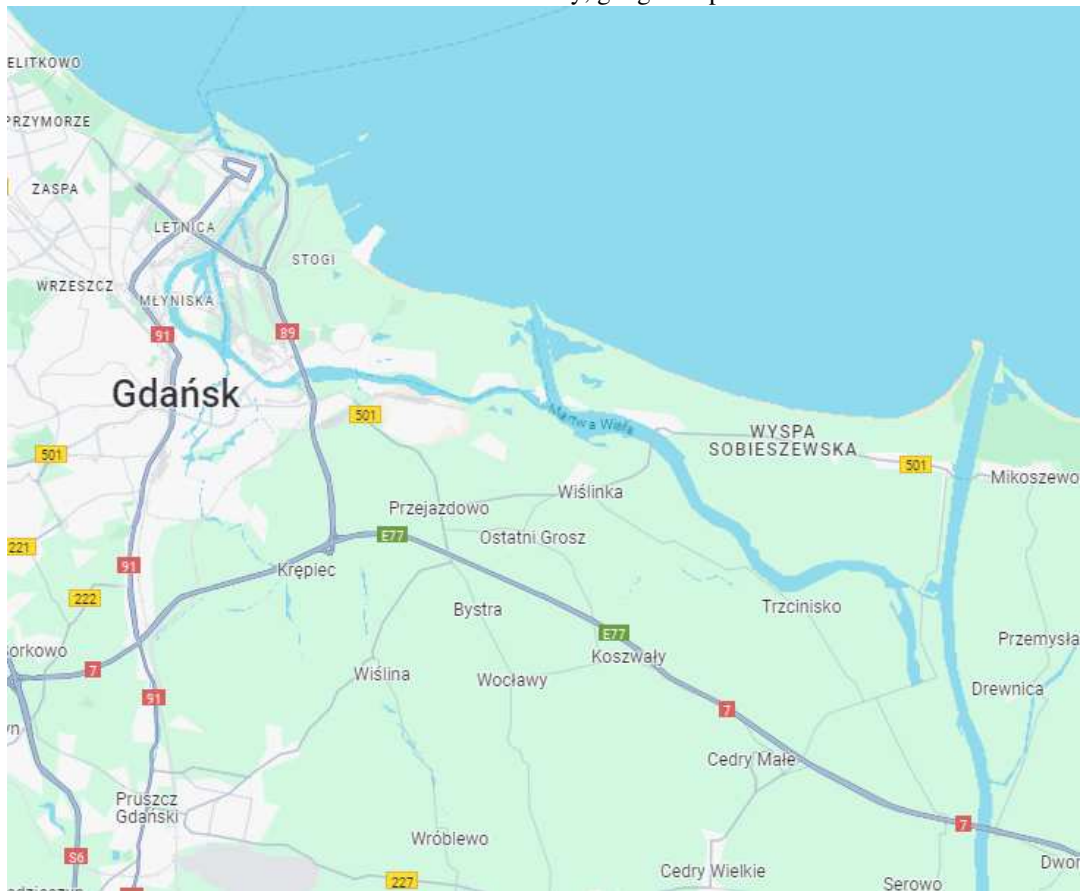


Figure 20. Gdansk port area.

Source: google.maps.

h). Development of river ports. The main river ports are the following:

- Romania: Galati, Ungheni, Stînca, Rădăuți Prut, Darabani.
- Republic of Moldova: Giurgiulesti, Cahul, Costesti, Ungheni, Lipcani.
- Ukraine: Reni, Negreni, Chernivtsi, Ivano-Frankivsk, Lviv, Shehinni Mostîska.
- Poland: Medyka, Jaroslaw, Sandomierz, Warsaw, Bydgoszcz, Gdansk.

i). Construction of logistics centers. These will be made in the river ports and from here the road and rail connections will be made between these centers and the interior of the territory. It is not possible to discuss the development of ports, without considering the places where the logistics centers must be built and then connected, which connect the cargo and passenger river ships with the cities and towns in each area. Logistics centers have the advantage that larger quantities of goods can be concentrated in them, waiting for the ships to be transported or after they have been unloaded in the port, they can wait for the road and rail carriers to take the goods to their final destination.

The main logistics centers that can be realized within the project can be the following:

- In Romania: Galati figure 21, Albita figure 22, Ungheni figure 23, Rădăuți Prut figure 24.



Figure 21. Galati, Reni and Giurgiulesti area.



Figure 22. Albița and Leușeni area.

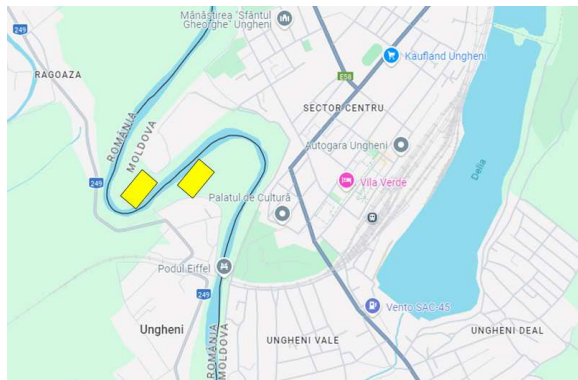


Figure 23. Ungheni area.

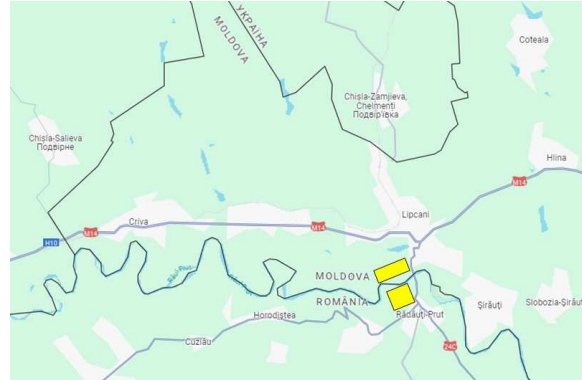



Figure 24. Rădăuți Prut and Lipcani area.

Source: author's study, google.maps.

Caption:

 - Logistics center.

- In the Republic of Moldova: Giurgiulesti figure 21, Leușeni figure 22, Ungheni figure 23 and Lipcani figure 24.

- In Ukraine and Poland, depending on the important economic areas, these logistic centers will be built, which will make the connections between canals, rivers and the Vistula river, with the adjacent or interior areas.

Another important economic component for river and inland water transport is tourism. The eastern area of Romania, the Republic of Moldova and the south-west of Ukraine have a very high tourist potential, due to the areas and tourist objectives of great interest for these countries, which can lead to the design of tourist circuits starting from the transport of tourists by water and then, making trips to the interior areas, where there are touristic objectives of international recognition.

Final considerations

Following the results of the 9th edition of the Initiative Summit, we found that the topics discussed and probably negotiated were centered on "improving the connecting infrastructure on the North-South Axis", meaning "road, railway, connectivity on gas, electricity, digital and so on", [5]. On behalf of Romania, President Klaus Iohannis emphasized "two projects that connect the Black Sea to the Baltic, and these two projects are of particular importance to us". Another idea presented and emphasized is that of "public-private partnerships, which take all things forward".

The main problem, after carrying out the political steps, the achievement of strategic partnerships between the countries in the area, is that of demand and supply, of their existence or non-existence. If there is a demand, then the situations can be started more easily, but if it does not exist or is in a latent state, steps must be taken to inform the potential partners, about the political and economic intentions, about the essence of the collaboration and the realization of the project.

Informing in time all the countries in this area and the important economic agents for the fields presented, about the steps and initiatives related to the projects that can be carried out, can lead to the intensification of the collaboration, of the links between the partners. Some of the projects in the field of transport are easier to achieve, others much more difficult, due to the related costs.

The most expensive is the project of creating connections by water, because the complex development of rivers and then the creation of connecting channels between them, of stables, bridges, ports and logistic centers, can temper the momentum and reduce the initiative only to certain political, social and less economic aspects, i.e. on a much smaller scale.

After the end of the war in Ukraine, the first effort of this country will be related to the reconstruction of the social infrastructure (blocks, schools, high schools, etc.), then the transport infrastructure (road, air and railway) and the entire industry and economy. So, on the part of Ukraine, no estimates can be made for the start of projects on its territory, but from the point of view of interest, this country can benefit a lot from this project, being in the center of the geographical area of project implementation .

If we only follow the situation of goods imports from China, by Poland, we find that this country is the second trading partner, after Germany, [10]. The commercial relations between the two countries are considered "strategic and long-term, [11]. If Poland's interest in the development of relations with China is easy to understand, we must take into account the fact that China is equally interested in the development of this relationship, [12].

The fact that the relations between the two countries are very important is also revealed by China's special interest in Poland's economy, and Chinese representatives follow developments in Poland and look for development opportunities, [13].

If we follow the situation of world maritime transport, of maritime lines, we find that there is a direct maritime line between Shanghai and Gdansk, due to these special relations between the two countries, [14]. Even some of the largest shipping companies, Maersk Line and CMA-CGM, carry out weekly container transport from Shanghai to Gdansk. But some of these goods end up in Central European countries.

If we take into consideration the difference between the sea line from Suez to Gdansk, through the Mediterranean Sea, the Atlantic Ocean, the Baltic Sea and the one from Suez to Galati and then to Gdansk, we will notice that this route shortens a lot, and the distribution of the goods will be done "on the road", not only from one port, to the inland, figure 25.

This is a very important economic argument to propose shortening the transport route.

For Romania and the Republic of Moldova, the complex and navigable arrangement of the Prut River has a series of mutual advantages as follows:

- Moving transport from roads and highways, which are still poorly developed, to water, with direct consequences on the costs per ton of transported goods, [15].
- Reduction of pollution generated by road transport.
- The formation of large reserves of potable water necessary for the population's consumption and agriculture, the drying and development of ponds and lakes near the river.

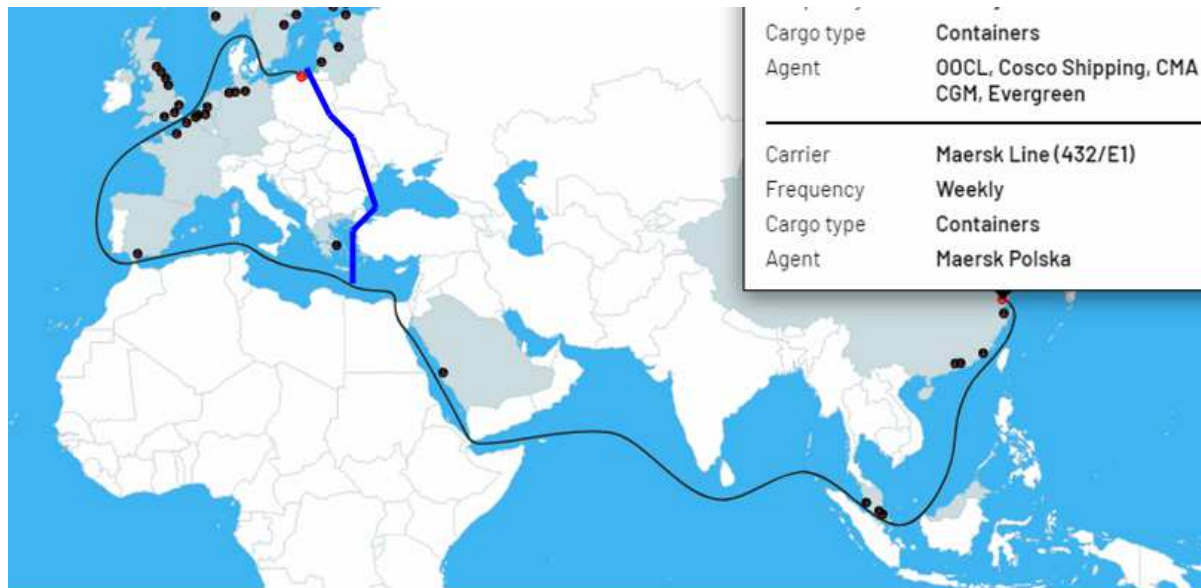


Figure 25. Shanghai Gdansk shipping line.
Source: author's study, GPA (2024).

- The formation of protective green curtains, by planting trees, near the banks of the river, as a continuous line, along the entire length of the river, on both banks.

- Realization of river transport based on electric current, through the design and construction of electric river ships.

- The creation of a large number of jobs for the development of the river, the construction of locks, bridges, ports, logistics centers and access roads to them.

After the works are finished, a large number of people will be needed to work within the monitoring, signaling, warning and security systems in the ports and logistics centers.

Between Romania and Moldova, this project can start very quickly, the two states being the most interested in realizing a joint project. The costs for the navigable development of the Prut River are high, but they can be planned for several years, with the provision of financing sources from the state budget, from the European Union, from the strategic partners of the Initiative, [16]. Concretely, it is necessary to establish a large, transnational company, through a public-private partnership, as a joint-stock company or autonomous management with state capital.

The steps necessary to know the Project are the following:

- Informing the managements of the partner countries, at the level of the presidents, of the ministries of foreign affairs and of transport.

- Launching contacts, to obtain financing agreements from strategic partners, to carry out technical studies. After obtaining financing for the start of specialized studies and the realization of technical projects, for all hydro-technical and logistic works, by the specialized institutes from the partner countries. Realization of ship projects based on electric motors, with electricity obtained from the shore and from alternative sources, [117].

- Starting negotiations and creating official partnerships between countries, national companies with state capital in related fields and companies with private capital.

- Obtaining financing to start the works.

- The launch of tenders for the employment of construction companies, for each type of work, the construction of river ships, depending on the type of cargo or passengers.

- With the putting into operation of the landscaped portions of the Prut river, the construction of ports and logistics centers, the transport of goods and passengers can begin.

Conclusions

In this paper I have presented the optimal route, which I have chosen based on studies of river navigation, inland waters and geographical areas, using accurate maps and detailed information. From these studies and analyses, it follows that this project is reliable, that it meets a series of economic conditions, environmental protection, making direct connections and shortening the distances between the main cities and between the three seas.

The chosen route is a direct alternative to transporting goods through the Mediterranean Sea, the Atlantic Ocean and the Baltic Sea.

Compared with the proposals in the works of other authors, regarding:

-The route through the Dniester river, from Gdansk to the Black Sea, is 2130 km, compared to 1560 km to Giurgiulesti (the confluence of the Prut river into the Danube), to which 134 km (72 nautical miles) are added, to Sulina, a total of 1694 km, resulting in a difference of 436 km.

- Romania's involvement in the project, which does not appear in the previously mentioned work. The involvement is a positive factor, considering the role played by Romania in economic terms and international relations, with the initiators of the "3 seas" project. But also the fact that Romania, along with Poland, is part of the European Union and can bring large funds for the realization of the project.

The construction of inland waterways will also solve other problems, such as those related to water consumption for agriculture, population, in fact, becoming large water storage basins, at a level that allows navigation even when it is dry and the flow on the waters decreases interiors.

Further research directions for this project are related to:

A. The technical, hydrographic, geodetic study and then the design of the distinct elements, which are divided as follows:

- Development of the Prut, Dniester and San rivers.

- Development of the Vistula River.

-The development and expansion of current ports, the construction of new ports.

-Construction of internal canals, sluices and other ancillary facilities.

B. The economic study, to calculate the costs for each area and stage.

C. The study regarding the environmental impact, due to the different ecosystems, between the Danube and the Baltic Sea.

D. The legal study, to solve the border problems, considering that in certain places, landscaping works will be necessary on the Prut river, which will pass through the border line between the two countries and on lands that may be owned by state or private.

This complex project can relaunch the economy of eastern Romania and that of the Republic of Moldova.

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