

Business Union of Entrepreneurs and Employers named after Professor Kunyavsky
Republican Union of Industrialists and Entrepreneurs
Belarusian Scientific and Industrial Association

ECONOMIC ASSESSMENT OF RECONSTRUCTION PLANS FOR THE INLAND WATERWAY E40

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Abbreviations

E40 Feasibility Study – The document “Restoration of Inland Waterway E40 Dnieper – Vistula: from Strategy to Planning. Final Feasibility Study Report”¹ (Russian version). Maritime Institute in Gdansk, December 2015

EaP - Eastern Partnership

EEU - Eurasian Economic Union

EU - European Union

IWW E40 – inland waterway E40

UNIDO - United Nations Industrial Development Organization

Explanations

The study contains two types of infographics:

1. Prepared by the author of this study. This infographic has sequence numbers: 1, 2, 3 etc.
2. Taken as quotes from the E40 Feasibility Study. The original numbering is retained in this infographic. We apply a mark (E40 Feasibility Study) to such infographics in our study.

¹ Embassy of the Republic of Belarus in the Czech Republic.
http://czech.mfa.gov.by/docs/e40restoration_feasibility_study_ru-29343.pdf

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INTRODUCTION

The state of the transport and logistics system directly affects the efficiency of the economy and the welfare of the country, as evidenced by the World Bank's Doing Business, Logistic Performance Index and other authoritative studies. At the same time, it is obvious that not every project in the field of transport infrastructure is a priori effective in the combination of investment / economic return. There are significant differences between road, rail, water and other types of delivery of goods and passengers. When analyzing the effectiveness of projects, industry and geographical specificity should be taken into account.

The importance of the environmental factor is growing, as globally transport is one of the main sources of greenhouse gases and other emissions, and the transport infrastructure can have a significant impact on the ecosystems of the adjacent territories.

The aim of our study is to analyze the plans for the reconstruction of the inland waterway E40 (IWW E40), which passes through the territory of Poland, Belarus and Ukraine, connecting the Baltic Sea and Black Sea. This way consists of the Vistula River, the Bug River, the Mukhovets River, the Pina River, the Pripyat River, the Dnieper River and the Dnieper-Bug channel (Fig. 1) However, despite its high status, now the E40 IWW as a holistic way exists only on the map. Some of its sections are either completely unsuitable for shipping, or have low shipping classes (I-III).



Fig. 1. Scheme of the IWW E40. Source: ZGF

The object of our assessment will be a document "Restoration of Inland Waterway E40 Dnieper – Vistula: from Strategy to Planning. Final Feasibility Study Report", prepared in 2015 by the Maritime Institute in Gdansk in a consortium with a number of institutions. The document proposes a project for the construction of a new Vistula-Mukhovets channel (three options), and also contains a lot of other information designed to justify the reconstruction of the IWW E40 throughout its length.

In our study, we will assess the economic part of the E40 feasibility study, analyze the competitiveness of inland waterway transport relative to other modes of transport in the studied region, list the most significant investment risks and environmental threats, as well as try to answer other topical issues related to the project.

I COMPARISON OF INLAND WATER TRANSPORT OF POLAND, BELARUS AND UKRAINE WITH OTHER EUROPEAN COUNTRIES

In Europe, inland water transport plays a significant, but not a key role, whereas it is in a depressed state and does not have any significant impact on the operation of national transport systems in Ukraine, and especially in Poland and Belarus.

In 2016, the share of inland water transport in EU 28 in total inland freight (tonne-km) was 6.2%, which is significantly lower than the share of road (76.4%) and rail transport (17.4%). The share of inland water transport at 10% was exceeded in 4 countries only, including Netherlands, Belgium, Bulgaria, and Romania. At the same time, statistics have not recorded a steady increase in inland waterway traffic in the EU 28 as a whole over the ten-year period (2007–2016). The indicator decreased in 2014-2016 after reaching a peak of 6.9% in 2013².

At the end of 2016, in 13 of the 28 EU countries, the share of inland water transport is either zero or not reflected in the Eurostat summary statistics due to extremely low values. Over the ten-year period, the share of inland water transport decreased in 8 countries, including quite significantly in Germany (from 10.9% to 8.8%) and slightly in the Netherlands (from 44.8% to 44.6%). The carriage of goods by inland waterways intensified only in 4 countries, including the most noticeable in Romania, where the share of this transport mode increased from 21.6 to 29.4% in the total volume of cargo traffic.

The authors of the E40 Feasibility Study cite the performance indicators of inland water transport in Western Europe as one of the rationales for the reconstruction of the IWW E40. A reference is made to the fact that in 2013 in the European Union the share of inland navigation in transport performance was 6.7% (excluding long-distance maritime, air and pipeline transport).

They notice that in the EU in 2013 the share of inland waterway transport in total surface based carriages in terms of tonne-km totalled 6,7% overland transport carriages expressed in volumes per tonnes (excluding deepwater shipping and air and pipeline carriages). It is indicated that in countries along which the IWW E40 passes, the share of inland water transport in the carriage of goods does not reach even 1%. Indicators of Western Europe are presented as a guideline, not disclosed potential for inland waterways of Poland, Belarus and Ukraine.

In our opinion, the initial conditions for the development of inland water transport in Western Europe are significantly different from those in Poland, Belarus and Ukraine. Consequently, the indicators of the Netherlands, Belgium or Germany can not be a guideline for the IWW E40 region.

In Europe, the delivery of goods by inland waterways is closely connected with the transshipment of goods in seaports, while the rivers and channels are a continuation of the sea routes. Transshipment of goods in the ports of Western Europe occurs in much larger volumes than in the ports of Poland and Ukraine. For example, in 2017 the largest in Europe port of Rotterdam (the Netherlands) handled 467 million tons of cargo³, which is eleven and a half times higher than the same indicator of the port of Gdansk in Poland (40.6 million tons)⁴, which is the northernmost point of the IWW E40. The performance of the Kherson Sea Port, which is the southern end of the IWW E40, in 2017 amounted to only 3.3 million tons, a decrease of 10% compared to 2016⁵. In total, 133 million tons of cargo were transshipped through the seaports of Ukraine, which is less than or comparable to the performance of individual Western European ports.

In 2005-2015, the transshipment of goods through the ports of the Netherlands increased from 460 million tons to 590 million tons. The increase amounted to 90 million tons, which is more than

²

Eurostat.

https://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=t2020_rk320&language=en

³ Port of Rotterdam. <https://www.portofrotterdam.com/en/news-and-press-releases/container-throughput-drives-growth-in-rotterdam>

⁴ Port of Gdansk. <https://www.portgdansk.pl/about-port/cargo-statistics>

⁵ Administrations of seaports of Ukraine. <https://ports.com.ua/spravka/infrastruktura/khersonskiy-morskoy-port>

the total volume of cargo transshipment through all ports of Poland in 2016 (about 80 million tons) and a little inferior to the aggregate statistics of the ports of Ukraine (131.7 million tons).

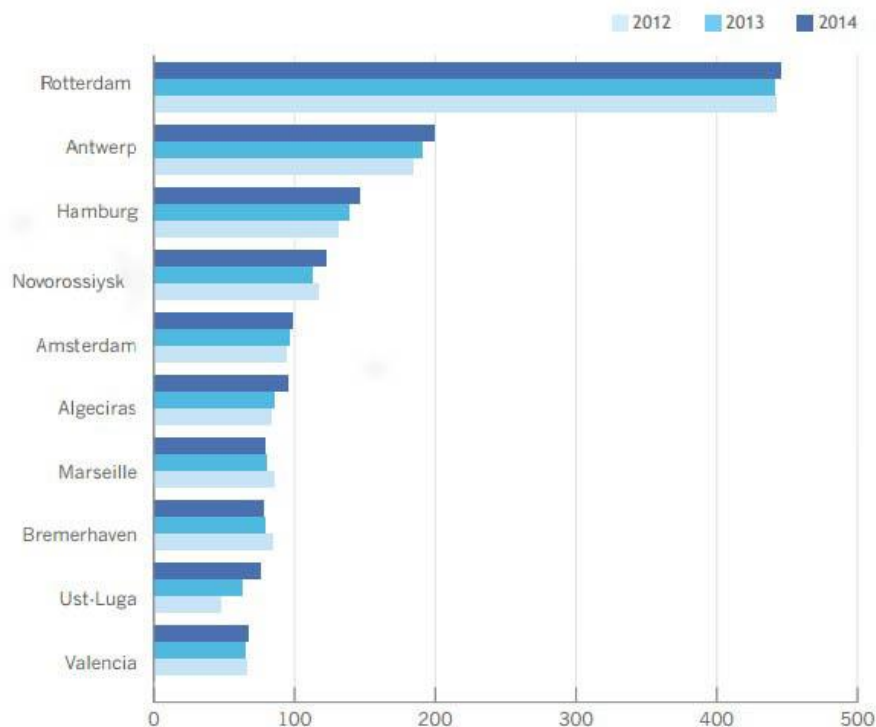


Fig. 2. Transshipment of main European ports, million tons. Source: Dutch Inland navigation Information Agency (BVB)

The significant flow of goods passing through Western European seaports is explained not only by the proximity of the largest economies of the world, but also by the fact that after transshipment a vast part of cargo follows in transit to other countries of Western and Central Europe. Taking a leading position in the Logistics Performance Index of the World Bank, countries such as the Netherlands, Belgium and Germany were able to assume the role of major logistics hubs on the European continent. Goods delivered to their seaports are reloaded and shipped almost throughout entire EU.

These circumstances created the conditions for the formation of a significant cargo traffic along the inland waterways of Western Europe. The work of the inland waterway transport of the Netherlands, Belgium and Germany has acquired a predominantly international format, while road transport (in Germany also rail) is mainly used for national delivery of commodities.

The conditions for the development of inland navigation in Poland, Belarus and Ukraine are much worse than in Western Europe:

- the size of national economies is relatively small;
- goods are transshipped in relatively small volumes in the ports of Poland and Ukraine, mainly export and import goods of national companies (export and import goods of Belarusian companies in view of the shortest delivery route and other logistics factors are mainly transshipped in the sea ports of Lithuania and Latvia);
- the commodities transit in the region mainly occurs in the direction of “West-East-West” and is due to the service trade between the EU and the EAEU, the EU and China. The waterways of the three countries are poorly integrated into this delivery chain. The transit potential of inland waterways is quite low, in particular, the E40 route passes through the territory of only three countries (for comparison, the Danube flows through the territory or is the border of ten states: Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Bulgaria, Romania, Ukraine and Moldova);

- the length of inland waterways suitable for sustainable navigation in Poland, Belarus and Ukraine is much lower than the length of roads and railways, while inland waterways do not form a full-fledged network;
- the technical condition of waterways in Poland and Belarus does not allow for sustainable navigation of vessels even with a draught up to 2 m, while the navigation period is strongly limited in all three countries, including Ukraine;
- reconstruction and maintenance of inland waterways is costly. According to the E40 Feasibility Study, the total investment requirement is estimated at 12.06 billion euros. Investments in road and rail infrastructure are more cost-effective.

Detailed arguments for this thesis are presented later in the study.

Tab. 1. Length of waterways by ECMT classes in selected countries, kilometers, 2013. Source: Dutch Inland navigation Information Agency (BVB)⁶

Country	I	II	III	IV	V	VI	VII	Total
Belgium	533	484	127	6,936	792	591		9,463
France	6,692	580	149	194	2,891	200	196	10,902
Germany	1,012	395	388	2,989	4,396	3,292		12,472
Netherlands	240	1,567	306	1,197	1,581	1,337		6,228
Austria						360		360
Poland	110	1,761	1,905	275		151		4,202

Tab. 2. Rating of world economies by nominal value of GDP in 2017⁷, compared with the Logistic Performance Index 2018⁸. Source: World Bank

Country	Size of the economy		Logistic Performance Index	
	\$ billion	rank	score	rank
Germany	3,677	4	4.20	1
France	2,582	7	3.84	16
Netherlands	826	18	4.02	6
Switzerland	678	20	3.90	13
Poland	524	23	3.54	28
Belgium	493	24	4.04	3
Austria	416	27	4.03	4
Czech	215	47	3.68	22
Ukraine	112	60	2.83	66
Belarus	54	77	2.57	103

By a combination of factors, inland waterway transport was quite marginalized in the transport system of the three countries. The dynamics have been mostly negative in recent years. Even in Ukraine, where throughout the Dnieper from Kiev to Kherson, the IWW E40 has stable depths corresponding to the IV-V classes of navigation, the indicators of inland water transport remained

⁶ The power of inland navigation. The future of freight transport and inland navigation in Europe. 2016-2017. https://www.bureauvoorlichtingbinnenvaart.nl/assets/files/WaardeTransport_spreads-UK.pdf

⁷ World Bank. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?year_high_desc=true

⁸ World Bank. <https://lpi.worldbank.org/international/global>

at the level of statistical error. In our opinion, this result indicates a systemic lack of competitiveness compared to other modes of transport.

Tab. 3. Transportation of goods by inland waterway transport. Source: Statistics Poland⁹, Belstat¹⁰, State Statistics of Ukraine¹¹

	2014	2015	2016	2017
Shipping, mln tons				
Poland	7.6	11.9	6.2	5.8
Belarus	3.7	3.0	2.1	2.0
Ukraine	3	3	4	4
Performance, mln tonne-km				
Poland	778,5	2,186.8	832.4	877.3
Belarus	49	21	21	32
Ukraine	1,358.1	1,571.7	1,465.0	1,422.9

It is extremely difficult to overcome the system limitations for inland water transport in the studied region, and some are not at all possible. Under the condition of a proper macroeconomic and investment policy, Poland, Belarus and Ukraine in the long term can increase the size of economies and improve the transport and logistics infrastructure, reducing the backlog of Western and Central Europe. At the same time, it is hardly possible to overcome the climatic limitations for navigation. The priority cargo direction West-East-West in the region will hardly ever change.

⁹ Inland waterways transport in Poland in 2014–2017. <http://stat.gov.pl/en/topics/transport-and-communications/transport/inland-waterways-transport-in-poland-in-20142017,2,3.html>

¹⁰ Транспорт. <http://www.belstat.gov.by/ofitsialnaya-statistika/realny-sector-ekonomiki/transport/>

¹¹ Транспорт і зв'язок України – 2017. http://www.ukrstat.gov.ua/druk/publicat/kat_u/2018/zb/08/zb_tr2017pdf.pdf

II ASSESSMENT OF THE ECONOMIC PART OF THE E40 FEASIBILITY STUDY

This chapter presents our comments and observations on the document “Restoration of Inland Waterway E40 Dnieper – Vistula: from Strategy to Planning. Final Feasibility Study Report” (E40 Feasibility Study). Our goal is to assess the economic feasibility of the project, as well as checking the correctness of the economic analysis of costs and benefits.

We will analyze chapter I “Analysis of transport and market economics”, section 4 “Economic analysis – cost – benefit analysis (quantitative assessment)” of the E40 Feasibility Study. At the same time, we consider this section in conjunction with other parts of the report, which is connected not only with the need to understand the whole picture of the project, but also because of the not fully thought out structure of the E40 Feasibility Study. Section 4 provides a comparative analysis of the cost-effectiveness of 3 waterway options. Thus, a comparative analysis of the economic efficiency of 3 variants of the waterway is given in section 4. At the same time, the description of these options is given only in the next chapter II “Assessment of social and environmental effects”, which certainly complicates the analytical work with the report.

1. The main methodologies used in the world in assessing the economic efficiency of projects

Since the IWW E40 development project is planned to be implemented within the framework of interstate cooperation, and its financing is to be carried out from various international sources, the feasibility study must comply with generally accepted international standards.

Currently, the main international standards for writing business plans are:

- UNIDO Standards¹²;
- TACIS Standards. TACIS has specific standards developed by the EU to assist in the conduct and organization of business, as well as in the development of various business projects between the countries of Western and Eastern Europe;
- EBRD standards. The European Bank for Reconstruction and Development has developed and proposes to use its own business plan structure for those companies that will try to attract financing from this bank;
- KPMG International Standards. As one of the leading consulting companies (one of the “big four”), KPMG offered its own vision of the structure and content of business plans for organizations planning to attract external financing for project implementation.

Each of these standards has its own structure and requirements for the content of a business plan, however, they all have a similar basis:

- Resume (a brief description of the company and the business plan);
- Products and services;
- Market and industry analysis;
- Sales and marketing;
- Production;
- Business management system;
- The financial analysis;
- Risk factor analysis;

¹² Manual for the Preparation of Industrial Feasibility Studies. [https://open.unido.org/api/documents/4690274/download/MANUAL%20FOR%20THE%20PREPARATIO N%20OF%20INDUSTRIAL%20FEASIBILITY%20STUDIES%20\(08219.en\)\)](https://open.unido.org/api/documents/4690274/download/MANUAL%20FOR%20THE%20PREPARATIO N%20OF%20INDUSTRIAL%20FEASIBILITY%20STUDIES%20(08219.en)))

- Annexes (other material information that was not included in previous sections, but was mentioned in them).

When analyzing the methodology for writing the E40 Feasibility Study, in particular the assessment of the economic efficiency of the project, which the authors applied, in our opinion, it would be most appropriate to focus on the UNIDO standards for the following reasons:

- UNIDO standards, more than other standards, pay attention to the social effect arising from the implementation of a business plan. This is all the more relevant for the analyzed project, since the authors especially emphasize its social significance;
- The key investors of the project have not been fully defined, therefore, in our opinion, when forming the E40 feasibility study, it is necessary to focus on the most universal standards, which are the UNIDO standards.

According to the UNIDO methodology, financial analysis should include the following sections:

- Costs of the preparatory stage;
- Costs of the main period;
- Calculation of income;
- Costs associated with servicing the loan;
- Taxes;
- Other income and payments;
- Profits and Losses Report;
- Cash flow statement;
- Forecast balance;
- Assessment of the project effectiveness;
- Guarantees and risks of the company.

When considering economic analysis, we will be guided by the requirements that UNIDO makes.

2. Assessment of investment costs

According to the UNIDO methodology, project planning and budgeting should include the following main steps:

- Determining the type of work tasks required to complete the project;
- Development of a phase schedule with an indication of the exact time for the completion of all work tasks, ensuring sufficient time to complete each individual task;
- Determining the resources needed to perform individual tasks, and planning cash flows to meet the resource needs in a timely manner throughout the entire project implementation period.

The authors of the Feasibility Study E40 retreated from these requirements and provided only total amounts of project budget, without temporary stages of the project implementation, and the

amounts themselves were broken only into the costs of the sections of the waterway, without specifying their components.

At the same time, there is a clear requirement for budgeting to split investment costs at the project implementation stage:

- Pre-investment studies;
- Preliminary costs of organizing a legal entity, raising funds;
- Land preparation and construction;
- Purchase and installation of main and auxiliary equipment;
- Pre-operational checks, test starts, performance tests, acceptance.

Tab. 63 (E40 Feasibility Study). The cost of the reconstruction of the IWW E40 at selected sections

Section of the IWW E40 / task	Reconstruction costs, million €
Poland	
• Construction of locks, dredging, construction of a waterway that meets class IV according to the international classification, on the lower and middle Vistula	
Variant 1 - on the site Gdansk - Warsaw	6,648.12
Variant 2 - on the site Gdansk - Wilga	8,310.16
Variant 3 - on the site Gdansk - Deblin	9,972.19
• Construction of the Vistula-Mukhavets navigable channel, corresponding to class Va according to international classification	
Variant 1 - Neporent - Brest	
Channel construction	2,721.85
Locks construction	183.99
Variant 2 - Estuary Wilga River - Brest	
Channel construction	2,415.07
Locks construction	150.54
Variant 3 - Deblin - Brest	
Channel construction	1,825.92
Locks construction	117.08
Republic of Belarus	
• Reconstruction of the existing hydrotechnical structures of the eastern slope of the Dnieper – Bug channel	19.50
• River works on the main vessel course to ensure the navigation of vessels with draught of up to 2.4 m	5.00
• Construction of new water junctions on the Pripyat River with locks meeting Class IV according to the international classification	19.00-67.00
• Construction of the shipping section of the IWW E40 at the Belarusian-Polish border	5.00-15.00
• Modernization of the Dnieper – Bug channel water supply system, including the Zhirovskoye reservoir	11.70
Ukraine	
• Full reconstruction of the Kiev lock	2.23
• Full reconstruction of the Kanev lock	2.98
• Full reconstruction of the Kremenchug lock	3.05
• Full reconstruction of the Dneprodzerzhinsk lock	3.02
• Full reconstruction of the Zaporozhye dam	8.56
• Full reconstruction of Kakhovka lock	3.07

Only the total amounts of investment costs are indicated in the analyzed feasibility study, so it is hard to say which of these stages were taken into account and in what amount. Note that quite

often the authors of the projects forget to include the costs of pre-investment studies, although they can have a significant impact on the final effectiveness of the project because of their volumes:

- 0.2 - 1.0% - for the study of market opportunities;
- 0.25 - 1.5% - for the analysis of alternative options;
- 0.2 - 1.0% - for the feasibility study (for large projects).

Percentages are given to total investment in projects.

Thus, with investments of €1.9 billion euros in the construction of the Vistula-Mukhavets channel (variant 1), these costs can range from €12 million to €66 million. With the total estimated cost of reconstruction of the IWW E40 in three countries in the amount of €12.06 billion, the costs of pre-investment studies can range from €78 million to €422 million.

In chapter II “Assessment of social and environmental effects”, (section 2.7), the authors indicate that the total amount of compensation expenses for the Vistula-Mukhavets section will be €68 million, or 3.5% of investment costs. However, when calculating the effectiveness of the project, the authors no longer take into account these costs.

In addition, according to our estimates, the planned investment costs for the reconstruction of the Belarusian section of the IWW E40 are significantly underestimated. According to Chapter III “Technical and navigational issues” (section 1.1.2), to increase the guaranteed depths, they propose to build 6-7 new water junctions on the Pripyat River with 3 to 6 m of water height of fall. The cost of these objects is cumulatively estimated at €55-120 million.

It should be noted that in 2008-2017, three hydropower plants were built in Belarus (one on the Neman River, two on the Zapadnaya Dvina River), costing from \$118.4 million to \$190 million each. Despite the fact that the height of their dams slightly exceeds the height of the planned dams on the Pripyat River, the cost of each new water junction on the Belarusian section of the IWW E40 may be comparable to the cost of the newly built hydropower plants. Moreover, the hydrological conditions of the Pripyat River are much more complicated than in the mentioned sections of the Neman River and the Western Dvina River. The Pripyat River has a wide floodplain (3-5 km, and in some places up to 10 km) in the middle and lower reaches, which will require significant additional investments in the construction of dams and the arrangement of reservoirs.

Tab. 4. Main characteristics of modern Belarusian hydroelectric power plants. Source: Belenergo¹³, other open sources

	Years of construction	Cost, million \$	Height, m	Installed capacity, MW
Hrodna HPP	2008-2012	118.4	7	17
Polatsk HPP	2011-2017	142.7	7.8	21.7
Vitebsk HPP	2013-2017	190	9.1	40

Calculations for the Polish section of the IWW E40 also indicate a low estimate of the required capital expenditures on the Vistula River. According to the E40 Feasibility Study, the cascading of the lower Vistula, involving the construction of 8 new locks in the Gdansk - Warsaw section, is cumulatively estimated at €6.6 billion, or an average of €825 million for each lock and other associated hydraulic facilities.

It is obvious that the cost of hydrotechnical work on the Pripyat River should not be estimated on the basis of data from the Belgiprovdokhoz Institute almost 40 years ago, but on the basis of modern calculations (which, apparently, do not exist) or at least data on comparable objects. If

¹³ Белэнерго. <http://www.energo.by>

we take the average cost of modern Belarusian hydropower plants (\$ 150 million) for the estimated cost of each new lock on the Pripyat River, the costs for the Belarusian section of the IWW E40 are underestimated by about €0.9 billion.

On the territory of Ukraine, the E40 Feasibility Study assumes only the reconstruction of 6 locks, without taking into account other expenses for the arrangement of the water transport infrastructure to ensure sustainable shipping. In particular, the costs of increasing the height under two bridges on the Dnieper River are not taken into account. At present, the overall height at Dnepropetrovsk railway bridge is 8.67 m, and at the Kremenchug bridge is 9.65 m¹⁴, which can cause difficulties when passing vessels corresponding to class V. In general, the modernization of bridges across the IWW E40 was beyond the feasibility study, although this direction is very capital intensive. For comparison, according to the Indicative TEN-T Investment Action Plan¹⁵ for the Eastern Partnership countries, published on January 15, 2019, the construction of a new bridge across the Dnieper in the city of Kremenchug is estimated at €300 million, which is almost three times more than according to the same plan they want to invest in the reconstruction of the 5 dams and in the channel works in the Ukrainian part of the Dnieper (€112 million).

Work on the elimination of river rapids on the Dnieper River was beyond the scope of the summary estimate of the E40 Feasibility Study. Currently, according to the state-owned company Ukrvodput, there are 14 problem areas in the section from the city of Kremenchug to the city of Zaporozhye, where guaranteed depths are up to 2.9-3.2 m, compared to 3.6 m, which Ukraine has pledged to Dnieper River to Kiev, joining the European Agreement on Main Inland Waterways of International Importance (AGN).

In addition, estimators of the E40 Feasibility Study did not take into account the expenses required for arranging the waterway in the section from the mouth of the Pripyat River to the Belarusian-Ukrainian border. The fact that this segment of the E40 is in a deplorable state is shown by an interview with the former Minister of Transport of Belarus Anatoly Sivak to the state news agency BelTA¹⁶. "If we cross the Belarusian-Ukrainian border, the existing depths along the Pripyat River to the Kiev reservoir do not allow to transport cargo during the entire navigation period. There was a case when, due to the low water level, the Belarusian river vessel proceeded along the route for two months, cleaning the bottom with a dredger, because the company undertook to deliver large structures," said Anatoly Sivak.

Thus, in our opinion, the costs presented in the E40 Feasibility Study are incomplete and significantly underestimated. We also draw attention to the fact that the authors operate only with total amounts, without breaking them into the main stages of the project implementation (according to the time and objects of investment), which is required by international standards.

3. Analysis of the revenue part: demand assessment and calculation of tariffs

Without a detailed analysis of the market, it is impossible to properly plan the revenue side of the project. The E40 Feasibility study authors analyze the market and possible demand in the following sections of the chapter I "Analysis of transport and market economics":

- "Market analysis" (section 1);
- "Assessment of the potential for capturing the market and cargo supply flows for inland shipping" (section 2).

¹⁴ River Information Service of Ukraine. <https://ukrris.com.ua/hydraulics/bridges/>

¹⁵ Indicative TEN-T Investment Action Plan. https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/ten-t_iap_web-dec13.pdf

¹⁶ Belarusian Telegraph Agency (BelTA). <https://www.belta.by/interview/view/o-gotovnosti-k-evropejskim-igram-investproektah-i-razvitii-transportnogo-kompleksa-6286/>

This structure meets the requirements of UNIDO, where the first step is to prepare a detailed assessment of the actual capacity of the market and market potential, and the second step is the predictive assessment of market share that the project will take.

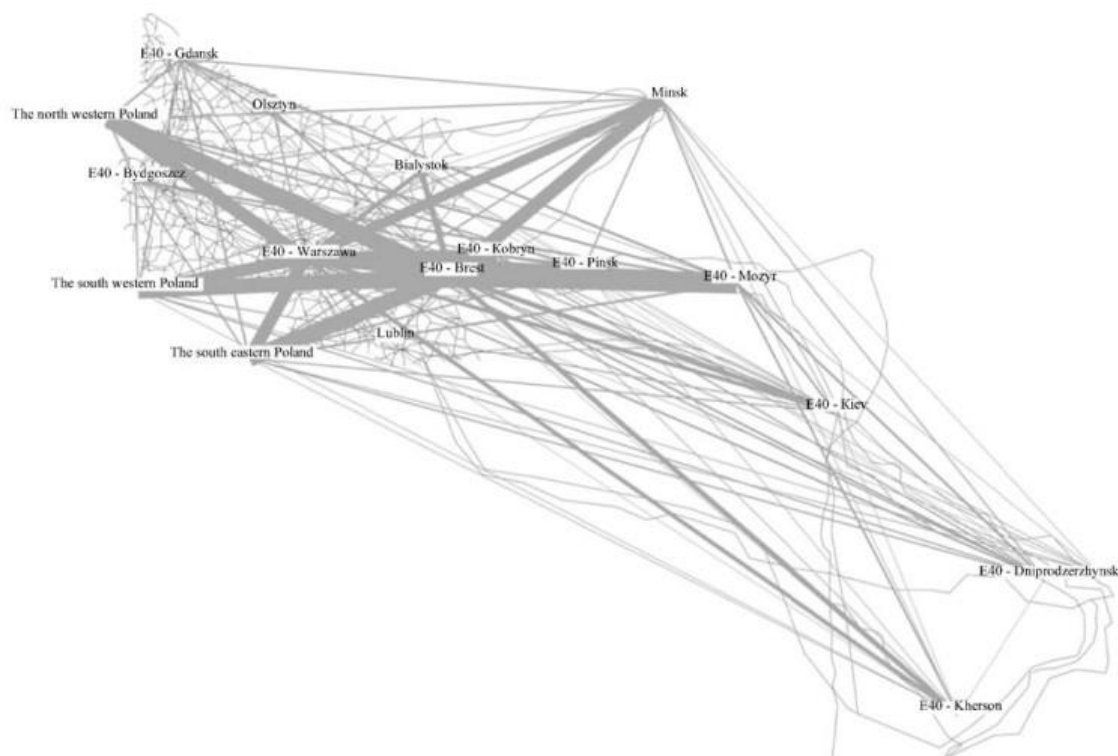


Fig. 10 (E40 Feasibility Study). The intensity of cargo flows in the catchment area of E40 waterway [tons/year].

Tab. 14 (E40 Feasibility Study). Forecast results – detail data (ton per year)

	Base scenario	+ 3 years	+5 years	+10 years	+20 years	+30 years
Gdansk	677 001	775 100	847 950	1 045 979	1 489 421	1 807 472
Bydgoszcz	589 999	675 494	738 984	911 570	1 289 030	1 575 211
Warsaw	4 817 001	5 515 025	6 033 386	7 442 450	10 597 669	12 860 695
Brest	5 128 002	5 871 041	6 422 831	7 922 786	11 281 634	13 690 714
Pinsk	1 192 999	1 365 899	1 494 294	1 843 295	2 624 744	3 185 233
Mazyr	4 538 002	5 195 783	5 684 226	7 011 831	9 984 344	12 116 409
Kiev	1 433 998	1 641 840	1 796 180	2 215 693	3 155 002	3 828 723
Dniprodzerzhynsk	836 999	958 301	1 048 379	1 293 233	1 841 491	2 234 723
Dnipropietrowsk	479 003	548 416	599 964	740 084	1 053 841	1 278 878
Kherson	1 193 998	1 367 064	1 495 577	1 844 883	2 626 983	3 187 951
Minsk	1 469 999	1 542 096	1 593 102	1 732 655	2 071 588	2 525 930
Bialystok	62 001	65 042	67 194	73 080	87 375	106 538
Lublin	118 998	124 835	128 964	140 261	167 698	204 477
Olsztyn	11 999	12 588	13 004	14 134	16 910	20 618
Kobryn	1 641 003	1 721 493	1 778 434	1 934 221	2 312 579	2 819 776
SE Poland	917 001	961 975	993 792	1 080 846	1 292 276	1 575 699
SW Poland	794 999	833 990	861 574	937 046	1 120 347	1 366 062
NW Poland	974 001	1 021 770	1 055 566	1 148 031	1 372 603	1 673 643

However, despite compliance with the structure, the content of these sections raises a number of comments and questions.

1. We have to state the general fragmentation of information, the absence of final values for the main parameters of the analyzed region of the E40 waterway:

- the total turnover of goods (in quantitative and monetary terms) in the region, regardless of the type of transport, is not clear. At first glance, this information is contained in Fig. 10 and Tab. 12 (section 2.2.3), however, according to Tab. 14 (section 2.4), the same data is taken as projected for the IWW E40;
 - the structure of the current total turnover (regardless of the type of transport) by type of goods transported is not given.
2. It is not clear from the proposed market analysis which share of the total transport performance in the first years of operation will be taken by the IWW E40. This information should also be given in the context of the types of goods.
 3. Target market shares have not been determined that the IWW E40 will take when it reaches its design capacity.
 4. It is assumed that along the Vistula-Mukhavets channel (the basic variant) 6,435 thousand tons of cargo will be transported in the first year (chapter I, section 4.3). However, it is not specified how this amount was received and what share it occupies in the commodity turnover in this region.
 5. The cost capacity of the transport and logistics services market in the region is not given. As a result, it is not clear what share in the incomes the current transport companies may lose.
 6. Consumers are poorly identified. The specificity of the commodities transported along the IWW E40 implies that the senders and receivers will be a limited number of companies. Thus, the authors should, according to the UNIDO methodology, determine:
 - largest sending / receiving companies;
 - the geographical location of these companies;
 - the companies' opinion on the possible change in the logistics chains, including taking into account a significant lengthening of the delivery time (293 hours versus 66 hours by rail along the entire IWW E40);
 - possible additional costs incurred by shippers due to the additional loading / unloading phases in water transport;
 - identify a point for making decisions about the choice of transport mode where the benefits of faster delivery begin to exceed the benefits of lower transportation costs.

When calculating the tariff, the authors of the E40 Feasibility Study proceeded from the cost method. The calculated tariffs cover only the running maintenance costs of the waterway. At the same time, the amount of capital spent on infrastructure is not taken into account. The authors justify this exception by using the “user pays” principle.

However, in our opinion, a significant methodological error was made here. In chapter I (section 3.3), the authors indicate that the project will be financed from public sources, including the national budget and the EU budget. These sources are filled with a large number of taxpayers, including those who are not from the area along the IWW E40. At the same time, the main beneficiaries (users) of the project are private companies: shippers, cargo owners and transport companies that will work on the waterway. Since the tariffs calculated in the Feasibility Study E40 do not cover the costs of infrastructure development, there is a violation of the “user pays” principle. In this part, we agree with the conclusions of economists at the University of Warsaw¹⁷.

¹⁷ Mikołaj Czajkowski, Svyatoslav Volosyuk. Document “Restoration of Inland Waterway E40 Dnieper-Vistula: from Strategy to Planning. Final Feasibility Study Report” assessment. 2017. <https://stope40.org/en/pages/expertise>

On the other hand, in chapter IV “Financial, legal and institutional aspects” (sections 1.4 - 1.5) the authors point out private companies among potential investors whose main goal is to maximize the net cash flow from the investments made. This is also the rationale that the calculation of the tariff, as well as the economic efficiency of the entire project, should take into account the total amount of attracted capital.

The authors do not plan replacement investments. Instead, they add to the total cost of operating the canals and gateways, laid down at an annual rate of just 0.01% of the investment (see chapter I, section 3.3), adding repair and maintenance costs of 0.1% of the investment without transfers. Instead, they add repair and maintenance costs in the amount of 0.1% of investments without transfers to the total costs of operating the canals and locks, provided in the annual amount of only 0.01% of investments (chapter I, section 3.3). Thus, the authors allocate annually for maintenance of the infrastructure only 0.11% of the investment. In our opinion, this size is extremely small, since replacement investments belong to an autonomous type of investment, they do not depend on changes in demand and the level of exploitation of fixed assets. In this case, replacement investments are used for the overhaul and replacement of existing equipment and are funded by depreciation charges. Thus, the average annual outflow for replacement investments for such projects should be about 2.5% (while in the first years it will be lower and in the latter higher), which significantly increases the cost base for calculating tariffs.

According to the requirements of UNIDO and other international standards, the feasibility study should contain a description of the organizational structure of the enterprise, which in turn will be taken into account when calculating total costs. However, in the analyzed feasibility study, the authors absolutely did not pay attention to this block, so the administrative staff costs were not included in the total expenses.

The calculation does not take into account the costs associated with the container fleet development for multimodal delivery of goods along the IWW E40, and with the containers rental.

It is not clear how the authors took inflation into account when calculating tariffs and costs. The UNIDO method offers two possible methods of calculation - at constant and current prices. Considering that the authors are based in forecasts on the growth of the economies of the three countries, and the planning horizon is more than 20 years, we can say that the inflation factor is essential for the correct calculation of the model.

Thus, the current revenue side of a E40 Feasibility Study cannot be taken as the basis for making a decision on the effectiveness of a project for the following reasons:

- the estimated volume of goods transported is not sufficiently justified;
- the demand of shippers and cargo owners for a new transport mode has not been studied;
- the estimated tariff for the inland water transport is lowered due to the non-inclusion in the calculation of significant amounts of expenses;
- low tariffs and not taking into account the cost/ delivery time ratios lead to erroneous conclusions about the significant competitive advantage of water transport over rail and road transport in the region under consideration.

4. Assessment of financial performance calculations

According to UNIDO, the availability of basic reporting forms is an important element for assessing the financial performance of a project:

- Balance;
- Profits and Loss Statement;
- Cash Flow Statement.

In this case, the Cash Flow Statement is the basis for calculating the net present value and the internal rate of return of the project. The developers of the E40 Feasibility Study do not represent such reports, despite the high importance of such documents. Thus, there is no possibility to analyze the financial sustainability of the project, as well as net cash flows by periods.

Instead, the authors provide only Tab. 25 “Indicators of economic efficiency of options for investment projects” (Chapter I, Section 4.4), in which they are trying to compare 3 options of projects.

Tab. 25 (E40 Feasibility Study). Economic net present value (ENPV) for project investment variants (in euro)

Variant 1	ENPV €	1 715 591 294	-719 506 550	ERR %	2,003
Variant 2		1 653 582 314	-496 396 293		2,468
Variant 3		1 636 560 093	8 322 088		4,032

This table does not clarify how cash flows are formed by period, and at the same time it causes a number of fundamental remarks:

1. The social rate of discount was used in the calculation of discounted cash flows. However, the authors do not provide neither the size of the rate, nor how it turned out;
2. There are no column names in the table. Users of the feasibility study should guess what the authors meant by this or that amount;
3. As an alternative, the authors indicate only three possible variants for the location of the new Vistula-Mukhavets water channel. Thus, they a priori believe that the use of the waterway is the most effective way to deliver goods. Although for potential investors (private, public) it should be possible to compare the economic efficiency of investments in other transport modes.

Unfortunately, a more detailed analysis of the project’s financial performance cannot be made due to insufficient data. Again, the assessment of the effectiveness of the waterway reconstruction cannot be considered only in a separate section of the Vistula - Mukhavets. However, the authors of the E40 Feasibility Study did not provide even approximate calculations of payback for the whole waterway, as well as the sections on the territory of Belarus, Ukraine, and the cascading of the Vistula River in Poland. At the same time, the costs of these sections, according to preliminary estimates, make up at least 80% of the required volume of investments for the entire waterway.

In terms of the additional benefits and costs that arise during the implementation of the project (chapter I, section 4.5), it should be noted:

1. UNIDO recommends that external (indirect) benefits and costs should be given in the most digitized form and in monetary terms, if decision makers use them for project approval. In the analyzed feasibility study, these benefits and costs are not digitized by the authors;
2. In the cost structure, the authors did not take into account losses for the economy and society in the case of the redistribution of cargo flows from traditional modes of transport to water transport;
3. Costs do not take into account possible damage in the event of man-made accidents on water transport like leakage of oil products and hazardous goods. The authors mention only some of the expenses associated with the arrangement of the channel, for example, costs of degradation of land and the cost of land rehabilitation;
4. Some of benefits are inherently duplicative;
5. Some benefits are extremely general and peremptory in nature, without giving arguments and explanations, for example, improving the living conditions of the population, in particular improving health.

Thus, we can conclude that the authors of the E40 Feasibility Study could not adequately substantiate the economic and financial effectiveness of the project. The above calculations cause more questions than give answers. The amount of information provided is absolutely inconsistent with the scope of the project, and the economic component is superficial.

4. Model resilience analysis for different scenarios

Investment projects relate to a future that cannot be predicted with confidence. Therefore, financial analysis and evaluation should be carried out taking into account risk and uncertainty. The risk is present when the probability associated with various consequences can be estimated based on data from a previous period. Uncertainty exists when the probability of consequences has to be determined subjectively, since there is no data from the previous period.

The main tool that was used by the authors to determine the sustainability of the model was the sensitivity analysis of the net cash flow depending on the mass of the transported cargo and the intensity of watercraft movement (table 21, chapter I, section 3.3).

Tab. 21 (E40 Feasibility Study). Sensitivity analysis of the use of the waterway income fee for the volume of cargo and movement of vessels in the different variants of the waterway (in euro)

Variants	1,5 LOCKAGES – 750 T		2 LOCKAGES - 750 T	
	Income	Financial gap	Income	Financial gap
Variant 1	2 140 787	- 718 702	2 854 383	- 5 106
Variant 2	2 018 191	- 534 512	2 690 922	138 218
Variant 3	1 644 223	- 319 331	2 192 298	228 743
	1 LOCKAGE – 1500 T		1 LOCKAGE - 2000 T	
	Income	Financial gap	Income	Financial gap
Variant 1	2 854 383	- 5 106	3 805 843	946 355
Variant 2	2 690 922	138 218	3 587 896	1 035 192
Variant 3	2 192 298	228 743	2 923 064	959 509
	1,5 LOCKAGES – 1000 T		1,5 LOCKAGES – 1500 T	
	Income	Financial gap	Income	Financial gap
Variant 1	2 854 383	- 5 106	4 281 574	1 422 085
Variant 2	2 690 922	138 218	4 036 383	1 483 679
Variant 3	2 192 298	228 743	3 288 446	1 324 892
	1,5 LOCKAGES 2000 T		2 LOCKAGES – 1000 T	
	Income	Financial gap	Income	Financial gap
Variant 1	5 708 765	2 849 276	3 805 843	946 355
Variant 2	5 381 843	2 829 140	3 587 896	1 035 192
Variant 3	4 384 595	2 421 041	2 923 064	959 509
	2 LOCKAGES 1500 T		2 LOCKAGES 2000 T	
	Income	Financial gap	Income	Financial gap
Variant 1	5708765	2849276	7611687	4752198
Variant 2	5381843	2829140	7175791	4623088
Variant 3	4384595	2421041	5846127	3882573

The authors of the E40 Feasibility Study indicate in table. 26 (chapter I, section 4.4) on the high sensitivity of the project depending on the volume of transported cargo. They consider this aspect solely as positive, not taking into account that the change in cargo traffic can be either up or down. In the second case, fluctuations will lead to deep losses of the entire project.

Given the specifics of the project and a large share of conditionally fixed costs in current expenditures, in our opinion, the authors should calculate the operating leverage. This would make it possible to determine how much net profit changes in the event of a change in revenue (cargo traffic). This would make it possible to determine how much net profit changes in the event

of a change in revenue (cargo traffic). Besides, authors should have applied more scripts, including lockage for low-tonnage vessels (less than 750-1,000 t of cargo on board).

Tab. 26 (E40 Feasibility Study). Economic net present value (ENPV) at a higher level of traffic in the first year of operation (in euro)

Variant 1	ENPV €	2 022 773 650	-412 324 195	ERR %	2,895
Variant 2		1 955 950 569	-194 028 038		3,423
Variant 3		1 939 654 117	311 416 112		5,149

UNIDO's methodologies propose using probability analysis to assess the resilience of a model to different scenarios. This analysis would be appropriate to apply to assess the impact of external factors on project performance indicators. These factors could include changes of:

- social rate of discount;
- rates of road and railway transport;
- shipping demand.

Each factor is assigned its own probability of occurrence of the event and the effectiveness of the project upon the occurrence of the event. After that, the weighted average of project efficiency is calculated. Unfortunately, the authors of the E40 Feasibility Study ignored this analysis, despite the fact that the project is carried out at the macro level and its effectiveness depends on a large number of external factors.

Thus, it can be concluded that the feasibility study E40 did not carry out a proper analysis of financial sustainability, and the conclusions about the high sensitivity of the project are presented as its positive characteristics, which certainly contradicts the principles of conservatism used in financial analysis.

III Assessment of the competitiveness of the E40 IWW to road and rail transport

Competitiveness of transport is determined by a set of factors. The main ones include the tariff, the speed of delivery, the stability of the transport operation during the year, the possibility of using flexible logistics schemes, the possibility of door-to-door delivery and some others.

1. Analysis of price competitiveness

Tariffs are a key factor in transport competitiveness. Many shippers choose a carrier that offers the lowest price for the delivery.

As follows from the calculations of the E40 Feasibility Study, the tariff for the carriage of goods by inland waterways becomes competitive compared to rail and road transport for cargoes weighing at least 1000 tons at a distance of more than 500 km. From these calculations, we conclude that in many areas the delivery by the inland navigation, even with the maximum loading of barges, will not have an obvious advantage in terms of price factor. Including this advantage will not be when transporting goods between Warsaw and Brest along the Vistula-Mukhavets channel planned for construction.

As follows from the tariff plans of railway carriers of Poland, Belarus and Ukraine, the cost of delivery per 1 tonne-km is inversely proportional to the increase in the distance of transportation and the mass of the transported cargo. Thus, we doubt the statement of the authors of the E40 Feasibility Study that as the delivery distance increases, the difference in tariffs increases in favor of inland water transport as compared to other transport modes. (Fig. 12. TEO E40).

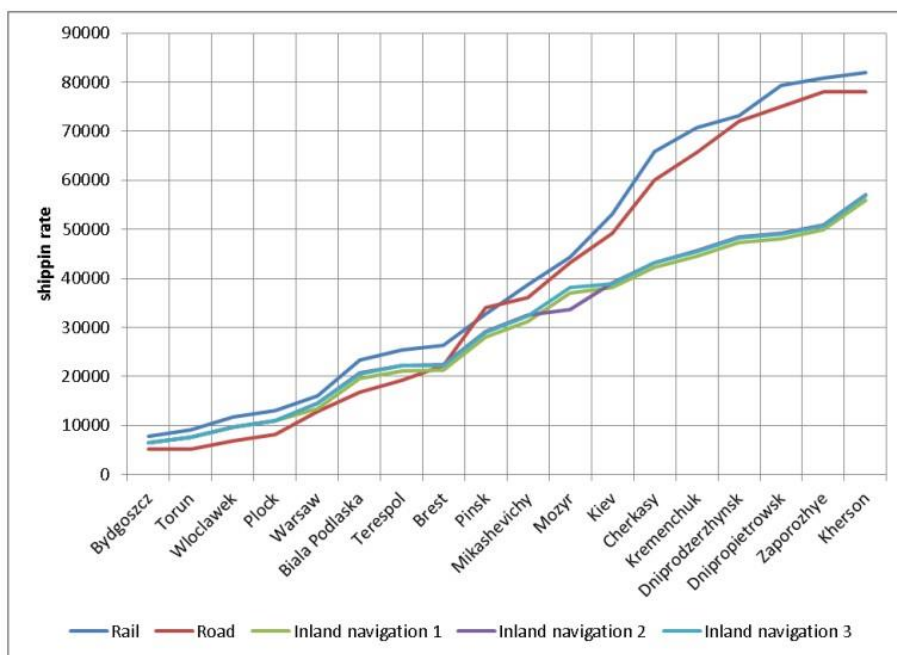


Fig. 12 (E40 Feasibility Study). Prices for the particular modes of transport for the carriage of 40 TEU on IWW E-40 route

It is also worth considering the fact that the delivery of goods between two points on the IWW E40, as a rule, is associated with overcoming a greater distance than transportation by road and rail. This statement concerns both the entire waterway and its individual sections. For comparison, the distance between Gdansk and Kherson on the IWW E40 is about 2,200 km, while on roads and railways it does not exceed 1,800 km, which is about 20% less. On the section Brest - Mazyr (Belarus), the length of the waterway is 494 km, the highway 453 (-8%), the railway 405 km (-18%).

We also note that the comparison of tariffs for water, rail and road transport proposed by the developers of the E40 Feasibility Study is overly simplistic and does not take into account the diversity of tariff schemes used by railway carriers in the three countries.

1.1. Tariffs of the Belarusian Railway

The Decree of the Ministry of Antimonopoly Regulation and Trade of the Republic of Belarus No. 8 of January 22, 2018¹⁸ established tariffs for the carriage of commodities within the country, for import, export and partially for transit.

A variety of tariff schemes is used. So, for charging for the transportation of goods in the universal containers of the carrier and shippers, cargo owners in the carrier's freight car, 10 tariff schemes are used; for transportation of goods in universal and specialized wagons - 13 schemes; for transportation of bulk cargo in tanks - 13 schemes; for the mileage with the locomotive of the carrier of empty freight car of shippers, cargo owners and goods on own axles - 4 schemes.

Payment for the commodities transportation is determined by the formula

$$P = B \times K_1 \times K_2 + T,$$

where B is the tariff of group B for the carriage of goods by the carrier locomotive in the freight car of the carrier, shippers, and cargo owners;

T – tariff of T group for technical and technological operations for carriage of goods in carrier freight car;

K₁ – a coefficient depending on the tariff class of the transported cargo;

K₂ – an additional coefficient applied to some types of commodities.

With some amendments, the tariffs of group B can be considered as an infrastructure component, the tariffs of group T – as a carriage component.

The tariff provides for the differentiation of goods into three tariff classes depending on the share of the transport component in the price of products. The carriage of goods of the first tariff class (mainly raw goods) is carried out using a reduction factor (K₁ = 0.6). For goods of the second tariff class, this coefficient is equal to one - the tariffs do not decrease or increase. The boost factor (K₁ = 1.15) is set for third-class cargo, which are finished goods and high-value commodities.

The coefficient K₂ is used for individual cargoes and regardless of the tariff class, it can be either upward or downward. For example, the minimum values of K₂ = 0.3 are set for cargoes such as sand, building clay; natural building and ornamental stones, tuff; ballast for railways, gypsum, chalk; sugar beet; wall materials; structures (prefabricated), parts and products of reinforced concrete. The maximum additional K₂ coefficients are established for the following goods: energy gases (liquefied hydrocarbon gases) K₂ = 2.80; potassium fertilizer K₂ = 2.05; steel ingots, steel billets, pipes from ferrous metals K₂ = 1.65.

The existing tariff classification of goods, depending on the share of the transport component in the final price of the goods and the system of coefficients, significantly reduce the tariffs for the transportation of low-value goods due to the increased tariffs for high-yield goods.

After applying the system of two coefficients, the Group B tariff for the transportation of building sand is reduced to 18% of the initial value, the tariff for transportation of pipes from ferrous metals is increased by almost 90%, and the tariff for transportation of potash fertilizers is more than doubled. Thus, the value of the tariff for different types of commodities may differ by more than 5 times!

¹⁸ Belarusian Railway. https://www.rw.by/uploads/userfiles/files/postanovlenie_8_22_01.pdf

EXAMPLE. A brick with a mass of a load of 1000 tons, coefficient $K_1 = 0.6$, coefficient $K_2 = 0.46$, is presented for transportation. When determining the freight charge for the carriage of goods in a universal gondola car of a carrier with a carrying capacity of 69 tons, tariff schemes B_1 and T_3 are applied. In order to organize the transportation of the entire consignment, $1000/69 = 15$ cars will be required. For a brick of construction, the calculated mass of the load in a gondola car is considered to be the carrying capacity of the railway freight car. If the distance of transportation is 400 km, the payment for the transportation of cargo in one car will be

$$P = 864.46 \times 0.6 \times 0.46 + 210.86 = 449.45 \text{ BYN (€183.7)}.$$

For the transportation of the entire shipment of goods $449.45 \times 15 = 6741.75 \text{ BYN (€2,755.0)}$.

1.2. Tariffs of the Ukrainian Railway

In Ukraine, tariffing of rail transportation is carried out in accordance with the Compendium of Tariffs for the carriage of goods by rail within Ukraine and related services¹⁹. Tariffs were developed in 2009, currently the document is being edited with amendments and additions made by order of the Ministry of Infrastructure of Ukraine dated December 7, 2017.

The operator of the railways of Ukraine, JSC Ukrainian Zariznytsia, in determining the cost of transportation, uses 29 tariff schemes, which differ from each other mainly in the type of freight cars used:

- scheme 1 - carriage of goods in universal freight car;
- scheme 2 - carriage of goods in special (specialized) cars;
- scheme 3 - carriage of goods in isothermal cars;
- scheme 4 - transportation of oil and oil products in tanks;
- scheme 5 - transportation of liquefied gases and hydrocarbons in tanks;
- scheme 6 - transportation of alcohols and phenols in tanks;
- scheme 7 - transportation of perishable goods in tanks;
- scheme 8 - transportation of other bulk cargo in tanks;
- scheme 9-12 - transportation in containers.

For the pricing of carriages in freight car that may or may not belong to the carrier, the infrastructure and car components are highlighted. The general formula for calculating freight charges is

$$P = (I + B) \times K$$

I - the infrastructure component of the tariff for the carriage of cargo in the carrier's car or in its own (rented) car;

B - carriage component during the transportation of cargo in the freight car of the carrier;

K - coefficient²⁰ depending on the tariff class of the goods.

¹⁹ JSC Ukrainian Zariznytsia
http://www.uz.gov.ua/cargo_transportation/tariff_conditions/transportation_in_ukraine/collection_rates/

²⁰ JSC Ukrainian Zariznytsia. Coefficients to the Tariff Collection.
http://www.uz.gov.ua/cargo_transportation/tariff_conditions/transportation_in_ukraine/the_coefficients_of_the_collection_rates/

The Ukrainian railway has a rather complicated system of tariff classification of goods, modified in 2017 with minor adjustments of January 11, 2018. The principle of tariff classification is the division of goods into categories depending on the share of the transport component in the price of cargo.

There are 14 tariff classes. Each has its own coefficients, for example:

- cargo class 1 - 1,484;
- cargo class 2 - 2.118;
- class cargo 3 - 3,259;
- food products - 1.703;
- energy gases - 2.276;
- cargo in large containers and empty large containers - 1,588;
- crushed stone and ballast for roads, perlite, sand, granotsev, slags, ash, salt, mineral concentrate "Galit" - 1,179;
- oversized cargo; special cargo - 2,647;
- military cargo - 2,408.

The analysis of existing coefficients shows that tariffs for the most highly profitable cargo of the 3rd class are 2.6 times higher than the tariffs for the cheapest "out-of-class" cargo.

EXAMPLE. A brick with a mass of a load of 1000 tons, coefficient for the first tariff class $K = 1.484$. When determining the freight charge for the carriage of freight in the universal gondola car of a carrier with a carrying capacity of 69 tons, tariff schemes I1 and B1 are applied. For the organization of transportation of the entire consignment will require $1000/69 = 15$ cars. Estimated weight of shipment in the car is 65 tons. With a transportation distance of 400 km, the charge for transporting cargo in one car will be

$$P = (4016 + 709) \times 1.484 = 7011.9 \text{ UAH.}$$

For the transportation of the entire consignment of $7011.9 \times 15 = 105178.5$ UAH (€3320.8).

1.3. Tariffs of railway carriers in Poland

About 70 competing carriers have access to the railway infrastructure of the Republic of Poland. The largest carriers are PKP-Cargo and DB Cargo Polska. Each of the railway carriers independently forms its own tariffs, which reimburse their costs associated with obtaining access to infrastructure and shipping.

DB Cargo Polska

DB Cargo Polska sets and publishes tariff rates²¹ only for the transport of bulk cargoes (coal, mineral construction materials, iron ores, etc.) for batches of at least 500 tons net weight, which are transported in DB Schenker Rail Polska four-axle gondolas. The tariff rate depends on the distance of transportation and the net weight of the consignment.

²¹ Taryfa towarowa DB SCHENKER RAIL POLSKA S.A.
https://pl.dbcargo.com/resource/blob/1438572/17b373326526b83dac7cbce40676100b/taryfa_towarowa_marzec-data.pdf

Tariff rates can also be determined individually, taking into account the type of cargo, the type of car, the mass of the shipment, the total traffic volume, the frequency of delivery, the route of transportation, special requirements for transportation and rolling stock, and other parameters.

For intermodal transport, the rate for the train is applied, which is calculated individually each time. For carload shipments, the rate per freight car is applied, which is not published and is calculated individually each time. For all other cases, such as transportation in international traffic, transportation of empty rolling stock, dangerous goods, vehicles, the rate is determined each time based on individual calculations.

EXAMPLE. The freight is presented for transportation, which is rated according to DB Cargo Polska table 1 with a total shipment of 1000 tons. With a transportation distance of 400 km, the transportation charge for the specified consignment is

$$P = 76.70 * 1000 = 76700 \text{ PLN (€17,892.5).}$$

PKP-Cargo

PKP-Cargo annually publishes a tariff²², which indicates the base fee for transportation of 25 tons in a 2-axle freight car and correction factors that depend on the actual weight of the shipment and the number of axles of the car. The tariff also highlighted separate tables with rates for railway carriages on own axles, car transportation and intermodal transport unit (UTI) transportation, in particular, large-capacity containers, car bodies, and semi-trailers. The tariff stipulates the possibility of using other rules for determining prices for the carriage of goods and additional services in the case of a commercial contract.

In turn, the Terms and Conditions of cargo transport services by PKP CARGO S.A.²³ states that when concluding commercial contracts for transportation, the following criteria are taken into account:

- the type of the cargo and the type of intermodal transport unit;
- planned total transportation;
- dispatch parameters (dispatch weight, type and car ownership);
- requirements for transportation;
- the term of the contract;
- additional requirements relating to the transportation and imposed on railway vehicles;
- other economic considerations affecting traffic optimization;
- other criteria arising from the individual characteristics of the customer transportation.

EXAMPLE. Cargo is presented for transportation in a total volume of 1000 tons, rated according to Table A-1 of PKP-Cargo. The transportation is carried out in a four-axle carrier freight car with a carrying capacity of 60 tons. To ensure transportation, 17 cars are required, each car will be loaded with 59 tons.

$$P = 4351 * 2.36 = 10268.36 \text{ PLN (€2,395.4).}$$

For the carriage of the entire consignment of $10,268.36 \times 17 = 1,74562.12 \text{ PLN (€40,721.8)}$.

²² Taryfa towarowa PKP CARGO S.A.
https://www.pkpcargo.com/media/100869/taryfa_towarowa_pkp_cargo_sa__obowiazujaca_od_01_01_2015_2.pdf

²³ Terms and Conditions of cargo transport services by PKP CARGO S.A.
<https://www.pkpcargo.com/media/121178/regulamin-sprzeda%C5%BCy-j-angielski-01-01-2015.pdf>

1.4. Comparison of tariffs of water and rail transport

Speaking about the possibility of delivering a wide range of goods by waterway, the authors of the E40 Feasibility Study for some reason focused only on the analysis of tariffs for the intermodal transport of containers. As follows from chapter I, section 3.5., the proposed freight rate is 40 pieces 40-foot containers (TEU 2) by water from Gdansk to Kherson will be from €56,000 to €57,000.

If we take as a basis the cost of delivery of €56,000, and also take into account the length of the IWW E40 (2,200 km) and the maximum possible net weight of a standard container TEU 2 (26.5 tons), then the payload delivery rate will be 0.024 euro / t · km. Comparable figures are contained in the E40 Feasibility Study in relation to the tonne-km (0.024 - 0.026 euro / t · km).

The analysis of tariffs allows us to conclude that the tariff for transportation by inland water transport calculated in the framework of the E40 Feasibility Study is competitive only in comparison with the tariffs of railway carriers in Poland. In Belarus and Ukraine, the tariff for the IWW E40 is not competitive with railway tariffs for most of the transported commodities, including for containerized cargo. Shipping prices are comparable only for certain high-margin goods, such as oil products and some others.

It should also be noted that the tariffs published by the leading Polish railway carriers DB Cargo Polska and PKP-Cargo are not at all the same for all types of cargo. Tariffs are basic and can only serve as a starting point in the negotiations on the cost of services at the conclusion of commercial contracts for transportation. The actual contractual tariffs for the carriage of commodities take into account the diversity of market factors. Reservations such as “other criteria arising from the individual characteristics of the customer of the shipment” allow for very wide variation in tariff rates, discounts and conditions for their provision.

In general, the railways of the three countries, operating on a developed network of tracks and carrying a huge amount of cargo, have significant potential to use the cost transfer effect, with which it is possible to reduce tariffs for certain types of cargo and certain directions, compensating for the loss of revenue due to the higher cost of shipping other cargo on other routes. In Belarus and Ukraine, due to non-market pricing, the wide use of the cost-transfer effect is impossible, whereas in Poland there are no barriers to this.

It should be assumed that in the event of competition from inland waterway transport, Polish railway carriers will be able to offer significant discounts for certain goods and individual routes parallel to the IWW E40, for example, for the routes Gdansk - Warsaw and Gdansk - Terespol, which will exclude any price advantage of the river transport.

In June 2018, it was announced that the Ukrainian Railway is working to bring tariff classes for the transportation of goods closer together. The main reason for the change is a decrease in railroad revenues due to the outflow of high-grade 3rd class cargo to road transport. In the medium term until 2021, it is expected to reduce the number of tariff classes from 14 to 5 and reduce the price gap between tariff classes²⁴.

At the first stage, it is planned to transfer deeply unprofitable out-of-class cargoes (crushed stone, sand, slag, ash, salt) into the first class. It is declared that now their transportation is 25% lower than the profitability for own freight cars and by 37% for carrier cars. Some cargoes of the 1st tariff class, including sugar beet, timber, cement, fertilizers, are planned to be transferred to the 2nd class.

Such a reform will somewhat increase the tariff for the delivery of low-margin goods, while the cost of their delivery by rail will remain significantly lower than the estimated tariff for the IWW E40. At the same time, a reduction in tariffs for high-margin goods, including containerized cargo, will increase the competitiveness of the delivery of this group of goods by rail relative to other transport modes.

²⁴ Media Center «Марицтраль» of JSC Ukrainian Zariznytsia. <https://info.uz.ua/articles/pat-ukrzalznitsya-za-zblizhennya-tarifnikh-klasiv>

Tab. 5. Comparison of the estimated tariff for water transport, according to the E40 Feasibility Study, with the tariffs applied on the railway transport. Source: own calculations

Carrier	Type of cargo	Tariff, €
River carrier of E40 Feasibility Study	bulk cargo	9,600 – 10,400
	40 containers TEU 2	9,600 – 10,400
Railway carriers:		
Poland		
DB Cargo Polska	bulk cargo	17,892.5
PKP Cargo	bulk cargo	40,721.8
	40 containers TEU 2	43,890.2
Belarus		
Belarusian Railway	crushed granite	2,246.3
	building brick	2,755.0
	petroleum products (gasoline)	11,131.1
	steel blanks	11,347.1
	potash fertilizers	12,771.5
	40 containers TEU 2	8,234.4
Ukraine		
Ukrzaliznytsia	building brick	3,320.8
	potash fertilizers	3,791.6
	wheat	5,411.5
	steel blanks	7292,7
	petroleum products (gasoline)	11,253.5
	40 containers TEU 2	3,382.1

Condition: delivery of cargo weighing 1000 tons at a distance of 400 km., for containers - 40 pcs. TEU 2 with a usable mass of 25 tons at a distance of 400 km. (In determining the tariff, the rates of national currencies against the euro were used, set by the central banks of Poland, Belarus and Ukraine on January 23, 2019).

2. Comparison of other factors of transport competitiveness

Having no clear price advantage, inland water transport in the studied region loses in most other parameters of competitiveness.

Time of delivery. As follows from the E40 Feasibility Study (chapter I, section 3.1.), the movement along the entire length of the IWW E40 (without parking, except for rest 8 hours a day) will take about 14 days. In the case of stops, which are provided for domestic shipping in the amount of 16 hours during working hours in the ports of Warsaw, Brest, Kiev and Dnepropetrovsk, the delivery time will be longer and will be about 18 days. Between Gdansk and Kherson, the freights are delivered on the roads 14 times faster, on the railways (7 times faster) (Tab. 15 E40 Feasibility Study). Movement on separate sections of the waterway will also lose road and rail transport.

Everywhere in the world, business seeks to accelerate the delivery of goods in order to increase capital turnover and improve financial performance. For many shippers, delaying delivery by several days will be a significant deterrent to order transportation from river carriers.

Tab. 15 (E40 Feasibility Study). The distance and time of transported cargo from Gdansk to Kherson

Transport option	Distance Gdansk – Kherson (km)	Travel time (hours)	Travel time – inland navigation without stops (hours)
Road	1700	31	-
Rail	1709	66	-
Inland navigation:			
W – 1 (variant I)	2260	226	290
W – 2 (variant II)	2315	231	294
W – 3 (variant III)	2309	230	293

In addition, in the case of containerized cargo, a slowdown can lead to an increase in the cost of delivery. At the moment, to speed up rolling stock turnover, large container operators set the container rental rate on the basis that after arriving at the seaport and transshipment to another type of transport, the logistics company will return the container to the lessor (at the seaport) within 2-3 days. As a rule, returning a container after a longer period entails an increase in the cost of rent or penalties. Long-term delivery of goods by the IWW E40 may entail significant costs for logistics / transport companies during intermodal transportation, which will increase the tariff.

The stability of the transport. Roads and railways in Poland, Belarus and Ukraine provide freight movement 24 hours a day, 365 days a year. Inland waterway transport in the whole Europe and in the region under consideration has serious seasonal restrictions. The problem is exacerbated during summer droughts, such as happened in 2018. Including in Poland, the target duration of the navigation period is 240 days per year. In Belarus and Ukraine, the duration of navigation on the IWW E40 varies, as a rule, begins in April and ends in November, being about 200 days a year. At the same time, on the Pripyat River, due to unstable water levels, the movement of barges often stops during the summer low water period, as a result, navigation during the year can be reduced to 3-4 months.

Logistics schemes. According to logistic operators, in recent years a decrease in the average mass of one-time cargo delivery has been observed in the region of the IWW E40. Increasingly, carriers are delivering groupage cargoes when goods from several shippers are placed in one container or semi-trailer. Inland water transport is poorly adapted to work with small consignments.

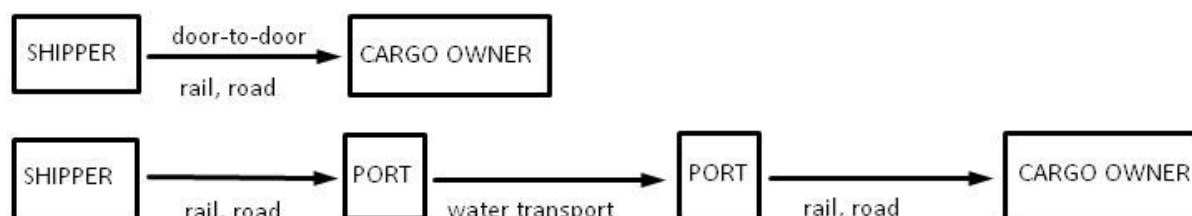


Fig. 3. Scheme of delivery of goods using different transport modes.

In the region of attraction of the IWW E40, most large and many medium-sized enterprises have railway access roads, and all companies can receive and send commodities by road. Thus, the

“door-to-door” delivery scheme is widely used in road and rail transport. Inland water transport is almost not adapted to this format, since during the carriage of goods by water there are additional stages of loading and unloading, as well as storage in ports (Fig. 3). Additional stages occur even when the shipper and the consignee are located in settlements located directly on the IWW E40.

3. Assessment of transit potential

At the moment, the main transit flow in the studied region is formed by goods delivered from China and the countries of Southeast Asia to Europe and back.

Container ships simultaneously transport up to 10 thousand containers and more. Freight escalation is dictated by the desire to reduce costs per unit of cargo being transported, as well as to ensure the competitiveness of water delivery routes in comparison with the dynamically developing railway transportation.

The IWW E40 will not be of interest to operators of international container transport between China, Southeast Asia and Northern Europe for several reasons:

- Large container ships will not be able to follow the path of the E40 due to the size of the ships and restrictions on the draught. The transshipment of containers in the ports of the Black Sea to vessels of the “river - sea” or “river” type for subsequent transportation by inland waterway towards the ports of Northern Europe will entail a loss of time and an increase in costs. For transshipment of cargo from one large container ship carrying tentatively 10 thousand TEU containers, they will need up to old river vessels, each of which is able to deliver only about one hundred TEU containers at a time;
- Transshipment with the subsequent movement of goods along the entire length of the E40 (more than 2 thousand km) in the direction of the ports of Northern Europe will take about 20 days. In a shorter period, a large container ship can go round Europe by sea and arrive at the port of final destination without any extra link in the delivery chain.

Similarly, the logistics of the delivery of containerized cargo between the countries of Northern Europe and the Middle East is also in favor of the bypass sea route.

The authors of the E40 Feasibility Study hope that the inland waterway can be included in the intermodal container delivery chain by rail from China to Europe. However, this option is also not very attractive for shippers and logistics operators, because it will create an extra link in the supply chain and lead to an increase in travel time.

At present, the freight train travels the distance from China’s border with Kazakhstan to Belarus’s border with the EU in 6 days, and the train needs 10 to 14 days to go from the loading point in the interior of China to the unloading point at the terminal station in Europe (Germany). Rail transport operators say²⁵ that in the coming years they can shorten the travel time by another 20%.

When delivering goods to Northern Europe (Norway, Sweden, Finland), an overload on water transport may be necessary. In theory, it can be conducted at the terminals of the inland ports of the IWW E40, for example, in Brest. In this case, moving the vessel on an inland waterway towards the Baltic Sea will require an additional 5-6 days, while the freight train may arrive directly at the Baltic Sea port terminal for transshipment to the sea vessel, which will prevent additional loss of travel time.

²⁵ Statement by Alexey Grom, President of the UTLC ERA. <http://belmarket.by/million-konteynerov-na-shelkovom-puti>

IV Assessment of the socio-economic effect and the impact of the IWW E40 on the environment

1. Assessment of the socio-economic effect

As already noted in our study, the UNIDO standards pay increased attention to the social effect arising from the implementation of the business plan. The authors of the E40 Feasibility Study provide a large amount of statistical data, including on economic activity, demography, employment, but they do not make any calculations that would prove a positive effect for the regions of the IWW E40 and the economies of the three countries as a whole.

We critically evaluate many statements of chapter II of the E40 feasibility study, and some arguments, like the creation of new opportunities for the female part of the population living in the region, cause bewilderment. It seems that the authors of the E40 feasibility study customized the arguments to the set of requirements of potential institutional investors.

We will focus in more detail on the socio-economic benefits listed in chapter II, section 1.5. of E40 Feasibility Study.

a) Creation of new attractive jobs. The authors of the E40 Feasibility Study do not give any calculations for the creation of new jobs based on the results of the proposed reconstruction of the waterway. In this case, approximate calculations can be made on the basis of the data contained in the E40 Feasibility Study, as well as other publicly available information.

As follows from chapter II, section 1.3.3, footnote 27 (Russian version of the E40 Feasibility Study), there are currently 11 hydraulic structures in operation in the Belarusian part of the waterway, where 15 engineers and 76 workers work. Thus, on average, 8 people work on a hydraulic structure. Since the authors of the E40 Feasibility Study, as well as other supporters of the project, promote the idea of installing electricity generating equipment at water junction, in further calculations we will assume that no more than 15 people can operate with one such facility. Such data correspond to the number of personnel at the new HPPs in Eastern Europe, which combine the function of power plants and locks for river transport. After building 20 dams in Poland and Belarus (8 dams on the Lower Vistula, 5 dams on the Middle Vistula and 7 dams on the Pripyat), we can expect to create up to 300 new jobs, including up to 200 jobs in Poland and up to 100 new jobs in Belarus. At the same time, it should be taken into account that the use of highly automated equipment in hydraulic structures can reduce the number of new jobs.

In calculations for water transport, we proceed from an average workload of a barge of 1,000 tons, an average flight duration of 5 days (including the return movement of the craft to the port of loading) and the duration of navigation 240 days a year. In addition, we assume that 30% of the additional cargo volumes will be transported by already operated floating equipment, and 70% by new ones. With such baseline data, up to 150 vessels will be needed to transport an additional 10 million tons of cargo. If we consider that the crew of the main floating equipment consists of three persons, then we can talk about the creation of about 450 jobs. After applying the coefficient of 1.3, which takes into account the administrative and auxiliary staff of the carrier companies, we estimate the potential for creating jobs in the inland water transport of Poland within 600 people.

At the same time, we are critical of the prospects for creating new jobs in water transport in Belarus after increasing the freight traffic from the current approximately 1 million tons of cargo per year on the Belarusian section of the IWW E40 to a target value of 4 million tons per year. According to the State Control Committee of the Republic of Belarus, about 2.2 thousand people are employed in water transport organizations of the country²⁶. At the same time, according to the Belstat, in 2018 only 2.1 million tons of cargo was transported across all waterways of Belarus. In such conditions, the growth of freight traffic can take place without any creation of new jobs, but only with an increase in the workload of existing rolling stock and staff.

²⁶ State Control Committee of the Republic of Belarus. <http://kgk.gov.by/ru/news-press-center-ru/view/Komitet-goskontrolja-priznal-neudovletvoritelnoj-rabotu-Ministerstva-transporta-i-kommunikatsij-po-9489/>

In assessing the potential for creating jobs in Ukraine, we proceed from targets that are similar to those for Poland. With an increase in freight traffic along the Ukrainian section of the IWW E40 by 10 million tons per year, up to 150 vessels may be needed for delivery, and the number of new jobs to be within 600 people.

We do not consider other sectors for the creation of new jobs due to the difficulty of counting or insignificant potential. We also do not take into account temporary workplaces, mainly in the construction sector, which can be created for the period of investment and the reconstruction of the IWW E40. Thus, from 600 to 800 workplaces can be created in each country, which is comparable to the number of staff of 3-4 medium-sized companies, in accordance with EU standards²⁷ for the SME sector. This is very small for such a large infrastructure project.

Tab. 6. An exemplary assessment of the potential for creating new jobs on the E40 route. Source: own calculations

Country	Number of workplaces		
	Locks	Water transport	Total
Poland	200	600	800
Belarus	100	-	100
Ukraine	-	600	600

The authors of the Feasibility Study E40 do not substantiate the statement about the attractiveness of the planned jobs creation. At the same time, in chapter II, section 1.3.3, footnote 27 (Russian version) it is reported that at the beginning of 2015 the remuneration of personnel employed at the hydraulic structures of the Belarusian section of the E40 waterway was 4.99 million BYN for the engineer and 4.162 million BYN for a worker, or €315.8 and €262.9, respectively, at the rate of the National Bank of Belarus as of April 01, 2015.

Such income can hardly be called attractive not only for the Eastern European region, but also for Belarus. For comparison, according to Belstat, the average monthly salary in the country in I quarter of 2015 amounted to 6.23 million BYN (€393.5). This is 20% more than the salary of an engineer and a third more than the salary of a hydraulic engineer.

As we have already noted, despite the requirements of the UNIDO standards, the authors of the E40 Feasibility Study did not analyze how the arrangement of the waterway may affect the operation of road and rail transport in the region. The business plan includes interception of up to 20% of cargo from the railway and up to 10% from road transport in favor of inland water transport in a region close to the IWW E40²⁸.

We are skeptical about the interception of goods in market conditions due to the lack of competitiveness of inland water transport. Nevertheless, we assume that interception is possible with substantial subsidies and other state support of river carriers. In this case, the implementation of the scenario for the interception of goods can cause a proportional reduction of jobs in the railway and road transport. It is difficult to carry out detailed calculations. However, it can be argued that up to several thousand jobs will be put at risk, which eliminates the positive social effect of job creation on water transport.

b) Improvement in the financial situation and standard of living of the population. Sustainable economic development of cities and regions. In our opinion, the authors of the feasibility study E40 did not substantiate such statements. In the studied region, inland water transport does not have obvious advantages for shippers, cargo owners, and therefore cannot influence the improvement of their economies and the economy of the region as a whole.

²⁷ Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003H036>

²⁸ Restoration of Inland Waterway E40 Dnieper – Vistula: from Strategy to Planning. The first interim report. Maritime Institute in Gdansk.

Moreover, the inability to recoup the significant investments required for the reconstruction of the IWW E40 will lead to an unproductive use of budget funds and indirect negative results for the economies of the three countries.

c) Cheap transport. Our study findings refute this thesis.

d) Environmentally friendly transport of goods, decarbonisation of transport. Our study findings refute this thesis.

e) Improvement in energy efficiency. The authors of the E40 Feasibility Study do not confirm this statement with calculations.

f) Improvement in territorial cohesion. In our opinion, this statement is too vague to evaluate. The transport systems of the three countries are well integrated. The development of the IWW E40 does not bring any fundamentally new opportunities for improving territorial cohesion.

g) New cooperation opportunities of the countries. This statement is too vague to evaluate.

2. Losses for environment and land use

In modern society, in assessing the feasibility of investment projects, more and more attention is paid to environmental impacts. In our opinion, for the IWW E40 there should be a separate serious study on this subject. We will only analyze some aspects of increased public importance and associated with additional economic costs.

2.1. Losses on hydraulic structures

The construction of dams on flat rivers is associated with the appearance of reservoirs, the withdrawal of flooded land from economic turnover and natural heritage. The E40 feasibility study contains plans to cascade the Vistula River and the Pripjat River, however, there is no detailed information on hydrotechnical facilities, including reservoirs, which does not allow accurately assess the land loss and damage to the environment.

In our opinion, the data of a dam built near the Polish city of Wloclawek (674 km of the Vistula River) can be used for a rough estimate of the withdrawal of land from economic turnover. This is approximately the middle of the stretch of the river that is proposed to be cascaded, according to the E40 Feasibility Study. Therefore, data on this reservoir, whose area is 70 km², can be taken as the average for the entire cascade on the Lower and Middle Vistula. With such initial data, it can be assumed that about 900 km² of land may be withdrawn from the economic turnover and natural heritage as a result of the construction of 13 new dams.

Of particular public concern is the possible dams construction on the Pripjat River. This river has a low elevation and wide floodplain. Even the construction of low dams in 3-5 m can lead to flooding of a large area²⁹. Characteristic features of the Pripjat River, as well as most of the Polesia rivers, are slow flow, meandering of channels, weak severity of valleys and flat watersheds, and therefore floods reach several kilometers in width (on the Pripjat River up to 20 km and more)³⁰.

According to experts of the Institute of Land Reclamation and the Polesye State University (Belarus), before the 20th century the large-scale amelioration and the construction of flood

²⁹ Joint letter of the business unions of Belarus to the Prime Minister of Belarus of October 25, 2018. <http://belmarket.by/biznes-napravil-rumasu-pismo-s-kritikoy-obustroystva-e40>

³⁰ Nikolay Mikhalechuk. Hydrogenic-carbonate landscapes of Polissya. Genesis, state of phytobiotics, protection. - National Academy of Sciences of Belarus. Minsk "Belarusian science" 2015.

control dams was carried out, the area of the Pripjat River floodplain was 4.2 thousand km². At the moment, the flood plain of 2.7 thousand km² are not protected from flooding³¹.

Tab. 7. Status of the Pripjat River floodplain, 2010. Source: Institute of Melioration, Polesye State University

Indicators	Unit	Protected by flood	Not flood protected
Floodplain area	sq. km	1,520.3	2,729.7
including:	sq. km	1,219.7	
- reclaimed			
- not requiring drainage	sq. km	300.6	
- natural reserves	sq. km		939.4
- natural ecological niches	sq. km		107.3
- environmental coastal stripes	sq. km		1,258.2
- forests of the water protection zone	sq. km		360.0
- other	sq. km		64.8
Lands of agricultural enterprises	sq. km	1,497.0	438.0

During the spring flood of the Pripjat River, the rise in the water level usually occurs in early March. In the upper reaches of the river the water level rises up to 2 m, in the middle and lower reaches of the river up to 5 m, and in places with a narrow flood plain (near Mazyr) up to 7 m compared to the level of summer low water³².

The construction on the Pripjat River, according to the Feasibility Study E40, 6-7 additional locks with a height of 3 to 6 meters will cause artificial flood, equivalent to the peak natural water levels or above these values. With an average river slope of 0.08 m / km for 20-30 km upstream and more severe floods are formed. About 1,000 km² of floodplains will be under threat of flooding, these are mainly nature protected area, agricultural land and forests of the water protection zone.

Thus, the cumulative loss of land from the cascading of the Vistula River, the Pripjat River, the construction of the new Vistula-Mukhavets channel and the Zhyrovskiy reservoir (6 km², in the Drogichinsky district of Belarus) can reach 1.900 km² totally in two countries.

2.2. Impact on climate, greenhouse gas emissions

The authors of the E40 Feasibility Study repeatedly note that the arrangement of the IWW E40 will reduce emissions into the atmosphere without citing any evidence to prove such prospects. Inland water transport is characterized as a priori the most environmentally friendly.

Modern research refutes this myth. Thus, according to the Dutch Inland navigation Information Agency (BVB)³³, in 2009, rail freight transport had a CO₂ emissions of 9 g / tonne-km on electrified road sections to 19 g / tonne-km, when delivered on diesel power, while Inland waterway transport CO₂ emissions ranged from 19 to 38 g / tonne-km. In addition, the agency notes that inland water transport has significantly higher emissions of sulfur oxide (SO₂), nitric oxide (NO_x), as well as particulate matter less than 2.5 microns (PM_{2.5}).

³¹ A.P. Rusetski, E.A. Lukyanova, I.A. Trukhan. State and hydrological regime of the river Pripjat floodplain after land reclamation of polesye. 2010. <https://rep.polesse.by/bitstream/123456789/130/3/173.pdf>

³² Belhydromet. <http://www.pogoda.by/315/gid.html?ind=33>

³³ The power of inland navigation. The future of freight transport and inland navigation in Europe. 2016-2017 https://www.bureauvoorlichtingbinnenvaart.nl/assets/files/WaardeTransport_spreads-UK.pdf

We believe that the data of the Netherlands experts can be applied to Poland, which is a member of the EU and complies with the same environmental standards for transport as the Netherlands. In our further assessments, we will proceed from the fact that the Gdansk-Bydgoszcz-Wloclawek-Warsaw-Terespol railway section, located parallel to the E40 waterway, is fully electrified³⁴. The gas emission indicator specified by BVB for electrified rail sections can be applied to this route. Calculations of additional emission of greenhouse gases during interception in favor of inland waterway transport are given in Tab. 8.

Tab. 8. The expected increase in CO₂ emissions from the interception of goods from rail transport in favor of inland waterway transport in Poland. Source: own calculations

Cargo interception, mln. tome-km	Additional CO₂ emissions, tons per year
3,000	30,000 – 87,000
5,000	50,000 – 145,000
10,000	100,000 – 290,000

In our opinion, the extrapolation of BVB data to the railways of Belarus and Ukraine would be incorrect due to the use in these countries of other environmental standards, other locomotives (mainly inherited from the USSR), and a rather high wear of rolling stock.

At the same time, it is worth noting that the region has a fairly high rate of electrification of railways (Tab. 9), which generally ensures a high environmental safety of cargo delivery by rail. Much of the electrified railways belong to the area close to the IWW E40. Belarus and Ukraine have announced plans to continue electrification and to coordinate actions in order to increase the cross-border movement of commodities on electrical charges. Including the Belarusian Railway electrifies the Zhlobin – Kalinkavichy - Barbaraw (Mazyr) section³⁵, and the Ministry of Infrastructure of Ukraine announced the electrification of the Korosten – Ovruch - state border with Belarus section³⁶.

Tab. 9. Indicators of electrification of railways in Poland, Belarus and Ukraine. Source: Statistics Poland³⁷, Belarusian Railway³⁸, Ukrzaliznytsia³⁹.

	Length of railways, thousand km	Share of electrified lines, %
Poland	12.6	61.7
Belarus	5.5	22.0
Ukraine	19.8	47.2

³⁴ PKP Polskie Linie Kolejowe S.A. https://www.plk-sa.pl/files/public/user_upload/pdf/Mapy/2017_03_22_mapa_polski_ogolna_EN_RW_WWW.pdf

³⁵ Belarusian Railway. https://www.rw.by/corporate/press_center/corporate_news/2019/02/1_fevralja_na_beloruskoj_zhel/

³⁶ Center for Transport Strategies. https://cfts.org.ua/news/2017/04/26/omelyan_anonsiroval_podgotovku_k_elektrifikatsii_zheleznodorozhn_ogo_khoda_v_bielarus_40290

³⁷ Transport - activity results in 2017. <http://stat.gov.pl/en/topics/transport-and-communications/transport/transport-activity-results-in-2017,6,13.html>

³⁸ Belarusian Railway. https://www.rw.by/corporate/belarusian_railway/infrastructure/electricity_supply/

³⁹ Ukrzaliznytsia integrated report 2017. <https://www.uz.gov.ua/files/file/Ukrzaliznytsia%20integrated%20report%202017.pdf>

A cascade of planned reservoirs on the Pripyat River and the Vistula River can become an even more significant source of greenhouse gases. As evidenced by recent research by American scientists, waterworks on rivers become one of the main culprits in the accumulation of carbon dioxide (CO₂), methane (CH₄), and in some cases nitrous oxide (N₂O) in the atmosphere⁴⁰.

In our further calculations, we will proceed from the average values of greenhouse gas emissions for reservoirs in the temperate climate zone (tab. 10).

Tab. 10. Greenhouse gas emission from reservoirs of various greenhouse zones. Source: St. Petersburg State Polytechnic University⁴¹

Climate zone	mg CO ₂ ·m ⁻² ·day ⁻¹				mg CH ₄ ·m ⁻² ·day ⁻¹			
	avg	min	max	n	avg	min	max	n
Moderately cold	1,870	85	5,750	50	17	-5	113	39
Temperate	550	-1,190	4,980	43	9	3	21	10
Subtropical	780	-1,180	4,790	36	7.7	4.2	10	5
Tropical	4,000	-860	10,400	20	127	-137	1,140	22

n – number of reservoirs investigated

Construction on the Vistula River and the Pripyat River reservoirs with a total area of 1,900 km² can lead to additional CO₂ emissions of 1,045 tons per day (381,425 tons per year) and CH₄ of 17.1 tons per day (6,241.5 tons per year). The increase in CO₂ emissions can also be associated with the drainage of peatlands in the areas adjacent to the IWW E40 in the downstream dams, as well as in the drainage zone of the Vistula-Mukhavets channel. As a result, greenhouse gas emissions at the IWW E40 facilities can significantly exceed emissions directly related to the operation of water transport.

Tab. 11. Expected greenhouse gas emissions in new reservoirs along the IWW E40. Source: own calculations

	Approximate area of new reservoirs, km ²	CO ₂ emission, tons per year	CH ₄ emission, tons per year
Poland	900	180,675	2,956.5
Belarus	1,000	200,750	3,285.0

In recent years, several methods have been developed for estimating the economic value of greenhouse gas emissions. In our further calculations, we will proceed from the recommendations of the European Commission⁴²: 129 euro / ton CO₂ in 2025 and 225 euro / ton CO₂ in 2050. Evaluation of the annual value of the issue are given in Tab. 12.

Thus, by 2050, the annual cost of CO₂ emissions can reach 1% of the investment value of the Polish section of the IWW E40 (variant 3) and exceed 4% of the investment value of the Belarusian section adjusted in our study.

If we take into account that artificial reservoirs will become a zone of methane emission and the fact that the CH₄ molecule absorbs infrared radiation ten times more efficiently than the CO₂

⁴⁰ Greenhouse Gas Emissions from Reservoir Water Surfaces: A New Global Synthesis. BioScience, November 2016 <https://academic.oup.com/bioscience/article/66/11/949/2754271>

⁴¹ V.V. Elistratov, V.I. Maslikov, G.I. Sidorenko, D.V. Molodtsov. Greenhouse gas emissions from hydroelectric reservoirs: analysis of research experience and organization of research in Russia // "Альтернативная энергетика и экология" № 11 (151) 2014

⁴² Update of the Handbook on External Costs of Transport. 2014. https://ec.europa.eu/transport/sites/transport/files/handbook_on_external_costs_of_transport_2014_0.pdf

molecule, the cost of greenhouse gas emissions threatens to increase significantly. In terms of climate impact, the reconstruction of the IWW E40 can be comparable to the construction of a new coal power plant in the region. Such prospects clearly conflict with the task of building a low carbon economy and reducing the impact on the environment.

Tab. 12. Estimation of the cost of additional CO₂ emissions for the Polish and Belarusian sections of the IWW E40. Source: own calculations

	CO ₂ emission, tons per year	Cost, million €	
		2025	2050
Poland	280,675 – 470,675	36.2 – 60.7	63.1 – 105.9
Belarus	200,750	25.9	45.2

2.3. Risks of petroleum products transportation

The authors of the E40 Feasibility Study do not focus on the prospects for the petroleum products delivery. However, according to our estimates, petroleum products are one of the most likely cargoes for the IWW E40.

Mozyr Oil Refinery JSC is located directly on the IWW E40, producing about 10 million tons of petroleum products per year and showing interest in the project. Ukraine and Poland are fairly large sales markets for Belarusian refiners. According to Belstat⁴³, in 2017, 3.58 million tons of petroleum products were exported to Ukraine, and 0.58 million tons to Poland. Tariffs for the delivery of petroleum products by railways are high compared with other types of commodities and are comparable to the estimated tariff of the E40 Feasibility Study for water transport (Table 5).

In 2017, two oil-loading barges of 750 tons capacity each were built in Belarus as part of the State Innovation Program. In the ports they try to equip oil terminals.

Note, transportation of petroleum products by inland waterways in a significant amount and for a long distance is not practiced in Europe and Asia, especially where there is a developed network of railways. One of the reasons is high environmental risks. On land, an accident with petroleum products can be easily localized, but it is almost impossible on flowing river water. Once in the river, oil products will spread over tens and hundreds of kilometers, which can lead to an environmental disaster.

⁴³ Belstat. http://www.belstat.gov.by/upload-belstat/upload-belstat-pdf/oficial_statistika/6znak-2016-2017_god/tt100e05.pdf

V Investment risks and economic threats of the IWW E40

The authors of the E40 Feasibility Study describe various benefits for investors and society. However, in our opinion, many risks and threats of the project are not taken into account.

1. Risks to segment the project

The estimated in E40 Feasibility Study cost of the project of €12.06 billion is very significant, even without adjusting for unaccounted expenses. There is a serious risk of not attracting capital in this amount and, therefore, not carrying out the reconstruction of the waterway in the planned amount. The risk is most relevant for Poland, whose investment needs for variant 3 are estimated at €11.9 billion.

The authors of the E40 Feasibility Study expect that a significant part of the investment will come from European funds. However, as follows from the letter of the Herald Ruijters⁴⁴, Director of Investment, Innovation and Sustainable Transport of the European Commission, to the NGO “Bahna”, Poland currently cannot receive large-scale financial support for the project from the EU (from the Connecting Europe Facility, CEF), since the IWW E40 is not included in the Trans-European Transport Network (TEN-T). In order to qualify for inclusion in TEN-T, the IWW E40 must comply with at least Class IV navigation. Another financing instrument, which is the European Structural and Investment Funds (ESIF), also cannot be widely used for the reconstruction of the waterway.

In such circumstances, Poland, Belarus and Ukraine are at risk of severely fragmenting the implementation of the project. Without building a new channel of the Vistula - Mukhavets, the IWW E40 as a complete way will remain only on paper. With such prospects, the effectiveness of investments in some sections of the waterway will be greatly reduced.

It is also necessary to take into account the high uncertainty around the 50-kilometer section of the Pripyat River, which passes through the impact zone of the Chernobyl NPP. As noted in the E40 Feasibility Study, the land works in this area cannot be carried out without eliminated elements that were in the cooling pond and in the Pripyat River after the accident of the power unit No. 4 of the NPP. Works in the riverbed may cause disturbance of bottom sediments, resulting in increased migration of radioactive elements.

Thus, there are high risks that even in the long run it will be impossible to equip this part of the river at least up to class IV shipping. Accordingly, it will be impossible to provide a steady navigation of vessels and barges with a draught of 2.5 m, which will not allow to develop the proper water transport connection between Poland, Belarus and Ukraine.

To overcome the limitations of navigation, the authors of the E40 Feasibility Study proposed to build an intermediate port on the Dnieper River in the village of Nizhniya Zary (Belarus). It is assumed that cargoes delivered to this port by river-sea vessels can be transhipped onto barges with a draught of up to 2 meters and further transported along the Pripyat River.

In our opinion, such an approach will further complicate the delivery chain, increase the cost and increase the time of transportation, which will further reduce the competitiveness of the waterway compared to roads and railways.

It is necessary to take into account the investment aspect. The port in Nizniya Zary is a green field construction. There is no railway connection there, which is quite fatal for the port. In order to integrate the port into the Belarusian railways system, it is necessary to build a new branch line to the Khoyniki station with a length of about 100 km. Significant investments may be required to improve navigation to the Vb class at the Kiev HPP - Nizhniya Zary section passing through the Kiev reservoir in order to ensure the passage of river-sea vessels. (Corresponding plans are enshrined in the Roadmap for improving navigation on the Dnieper River and the Pripyat River⁴⁵.)

⁴⁴ Google Drive. https://drive.google.com/open?id=1M_czZNTINBKt8649aevnbvjnsHzuT-cl

⁴⁵ Google Drive <https://drive.google.com/open?id=15mdxHLKvk9CxsCv4G7mU1q7hyADKwXs1>

You should also take into account the environmental aspect. After the accident at the Chernobyl NPP, the Kiev reservoir became a kind of radionuclide burial ground. Active dredging threatens to significantly enhance the migration of radionuclides from the bottom layers into the waters of the Dnieper River.

In our opinion, there is an alternative, more reasonable solution to the development of water connection between Ukraine and Belarus, which allows to avoid unnecessary costs and environmental threats. The role of an intermediate port for transshipping from river-sea-class vessels to river barges can be performed by the Kiev port, where the infrastructure has already been created, there is a road and rail connection.

2. The threat of cargo interception from rail and road carriers

Again, we are skeptical about the prospects for mass interception of cargo from rail and road transport in favor of inland waterway under market conditions. River transport is not competitive enough, especially in Belarus and Ukraine. Nevertheless, under certain conditions, for example, with significant government subsidies and other measures of state support, we allow the implementation of the scenario of intercepting goods. Thus, in our opinion, it is advisable to at least roughly estimate the possible losses for rail and road transport in three countries.

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In our further estimates, we will proceed from the interception target level for the zone close to the IWW E40 in the amount of 20% of cargo from railways and 10% of cargo from road carriers. (These are the milestones mentioned in the first interim report of the E40 Feasibility Study). We also take into account that about 50% of the GDP of Poland, Belarus and Ukraine is formed in the area close to IWW E40. In this case, the interception in the framework of the national transport systems will be 10% in rail transport and 5% in road transport.

According to the Belarusian Railway⁴⁶, in 2017 its revenues from core activities amounted to €1.353 billion. Freight transportation accounted for 79% of this amount, or €1.069 billion. Thus, if we take the revenue for 2017 as a basis, the carrier's annual loss may amount to about €110 million.

The collection of data on the revenue of the road transport industry is difficult due to the large number of business entities and the lack of generalized statistics. Nevertheless, an approximate calculation can be made on the basis of the data of Belstat, according to which, in 2017, the road carriers performance made 55.6% of the rail performance, or 26,987 million tonne-km. Based on these figures, as well as from the fact that the tariffs on these two transport modes are similar, we can conclude that the loss of road carriers can reach €30 million per year.

The revenues of the Ukrzaliznytsia JSC from cargo transportation in 2017 amounted to 60.1 billion UAH or €2 billion at the average rate for 2017⁴⁷. Thus, it can be assumed that in case of interception of 10% of cargo, the lost income of the carrier may reach 200 million euros per year.

According to the State Statistics Service of Ukraine⁴⁸, in 2017 in this country the road transport performance amounted to 32.46% of rail transport performance, or 62.3 billion tonne-km. Applying

⁴⁶ Belarusian Railway. Annual Report 2017. https://www.rw.by/uploads/userfiles/files/annual_report_2017.pdf

⁴⁷ Consolidated Financial Statements of the Ukrzaliznytsia JSC, 2017. http://www.uz.gov.ua/about/investors/financial_statements/kfz_msfz/

⁴⁸ Statistical compilation «Транспорт і зв'язок України» http://www.ukrstat.gov.ua/druk/publicat/kat_u/publ8_u.htm

the same approach in the assessment as for Belarus, we can assume that the revenues of Ukraine's road carriers may be reduced by about €30 million per year.

According to the Polish Office of Rail Transport⁴⁹, in 2017, revenues from operating activities of freight railway carriers in the country amounted to 7.54 billion PLN (€1.77 billion at the average annual exchange rate). Thus, it can be assumed that in case of interception of 10% of cargo, the lost revenues of carriers may amount to about €180 million per year.

The peculiarity of Poland is that a significant part of road transport performance is formed on international routes in various parts of Europe, which makes it unlikely to intercept these cargo flows in favor of the IWW E40. In our calculations, we will proceed from the national road transport performance, which in 2017, according to the Statistics Poland⁵⁰, amounted to 15.9% of the total performance on all transport modes, or 69.1 billion tonne-km.

Applying the same approach in the assessment as for the previous two countries, we can assume that the annual loss of revenue of road carriers in Poland can reach about €110 million per year.

Tab. 13. Assessment of the possible interception of cargo and reduction of revenue on rail and road transport. Source: own calculations

Transport mode	Performance 2017, billion tkm	Target interception, billion tkm per year	Revenue loss, million €
Belarus			
Rail	48,5	4.8	110
Road	27.0	1.3	30
Ukraine			
Rail	191.9	19.2	200
Road	62.3	3.1	30
Poland			
Rail	54.8	5.5	180
Road	348.3	3.4	110

Analysis of the data shows that in the case of the implementation of the cargo interception scenario rail and road carriers of the three countries may suffer serious financial losses. Losses can be especially noticeable in Poland. With such a reduction in revenue, an artificial crisis can be caused in the railway and road transport modes.

It should be noted that thousands of companies work in the railway and road sectors of the three countries, hundreds of thousands of jobs have been created there. Interception of goods threatens to reduce employment in these sectors, which may surpass any increase in employment in inland waterway transport. In our opinion, this circumstance must be taken into account by the authorities of the three countries, as well as by investors when discussing the prospects for the IWW E40.

⁴⁹ Sprawozdanie z funkcjonowania rynku transportu kolejowego w 2017 r. <https://utk.gov.pl/pl/raporty-i-analazy/analazy-i-monitoring/sprawozdania/14357,Sprawozdanie-z-funkcjonowania-ryнку-kolejowego-w-2017-r.html>

⁵⁰ Transport - wyniki działalności w 2017 roku <http://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-wyniki-dzialalnosci-w-2017-roku,9,17.html>

3. The threat of cargo interception from the Baltic ports (Lithuania, Latvia)

At the moment, transshipment of goods through seaports has an established character in the region under study. Polish cargo owners prefer the ports of Poland, the Ukrainian ones prefer the ports of Ukraine, while the transshipment of Belarusian goods is carried out mainly through the ports of Lithuania and Latvia due to the smallest delivery distance.

The result of the reconstruction of the IWW E40 can be not only the interception of goods from roads and railways in favor of inland waterway transport, but also a change in delivery routes. In particular, a partial interception of Belarusian cargo from the Baltic ports of Lithuania and Latvia may occur in favor of the Black Sea ports of Ukraine.

The ports of Lithuania, Latvia and Estonia are already under economic pressure⁵¹, as Russia began to administratively intercept cargoes in favor of the Russian ports of the Baltic Sea. According to expert estimates, the annual losses caused by such actions of Russia for the maritime logistics sector of the Baltic countries may exceed €1 billion per year. Belarusian transit cargo remains one of the last hopes for seaports of this region. Interception of potash fertilizers, oil products and other commodities in favor of the Black Sea ports can be fatal for the port business of Lithuania, Latvia and Estonia.

Institutional investors have invested heavily in the development of the port infrastructure of the Baltic countries. Reconstruction of the IWW E40 threatens to reduce the effectiveness of previous investments and cause a regional conflict of economic interests.

4. The threat to water-dependent sectors of the economy

The main threat to water-dependent sectors of the economy comes from changes in the hydrological regime in river valleys, as well as in adjacent territories. Losses are associated not only with the withdrawal of land from economic circulation due to possible flooding, but also from drainage (lowering of groundwater level) in the downstream and irrigation (rising groundwater level) in the upstream of dams on the land adjacent to the IWW E40. First of all, agriculture and forestry, natural objects, and also households are in the risk zone.

Despite the fact that almost the entire Polish and Belarusian part of the waterway is supposed to undergo a significant reconstruction, the E40 Feasibility Study contains a more or less informative hydrological project only for the new channel Vistula-Mukhavets. This circumstance does not allow one to estimate the scale of the impact of the reconstruction of the entire IWW E40 to the adjacent territories, and, consequently, to calculate the impact on the economy of water-dependent industries. At the same time, as the study of the Zoologische Gesellschaft Frankfurt (ZGF)⁵², conducted with the involvement of a group of independent hydrologists, shows, the impact can be quite significant for any of the three variants for arranging the Vistula-Muhavets channel.

First, in all three variants, the length of the channel sections, which will be affected by drainage or irrigation, is significant (Fig. 4, Tab. 14). In some places, the difference in groundwater levels with the water level in the channel reaches 10 m. Secondly, the intake of water to feed the channel can lead to a severe shortage of water in the rivers (Table 15). Thus, six large rivers can be used to provide water to the channel: the Vistula, the Bug, the Wieprz, the Tyśmienica, the Wilga, and the Bystrzyca. The diversion of water from the Wieprz, Tyśmienica, Vilga and Bystrzyca can be fatal for these rivers due to the small water flow. The use of the Bug River will lead to significant

⁵¹ Битва за грузы на Балтике. "Belarusians and the market" Weekly. <http://www.belmarket.by/bitva-za-gruzy-na-baltike>

⁵² Mateusz Grygoruk, Ewa Jabłońska, Paweł Osuch, Paweł Trandziuk. Analysis of selected possible impacts of potential E40 International Waterway development in Poland on hydrological and environmental conditions. – ZGF, 2018

shallowing, while the water from the deepest Vistula River is unlikely to be used for the channel due to significant additional supply costs.

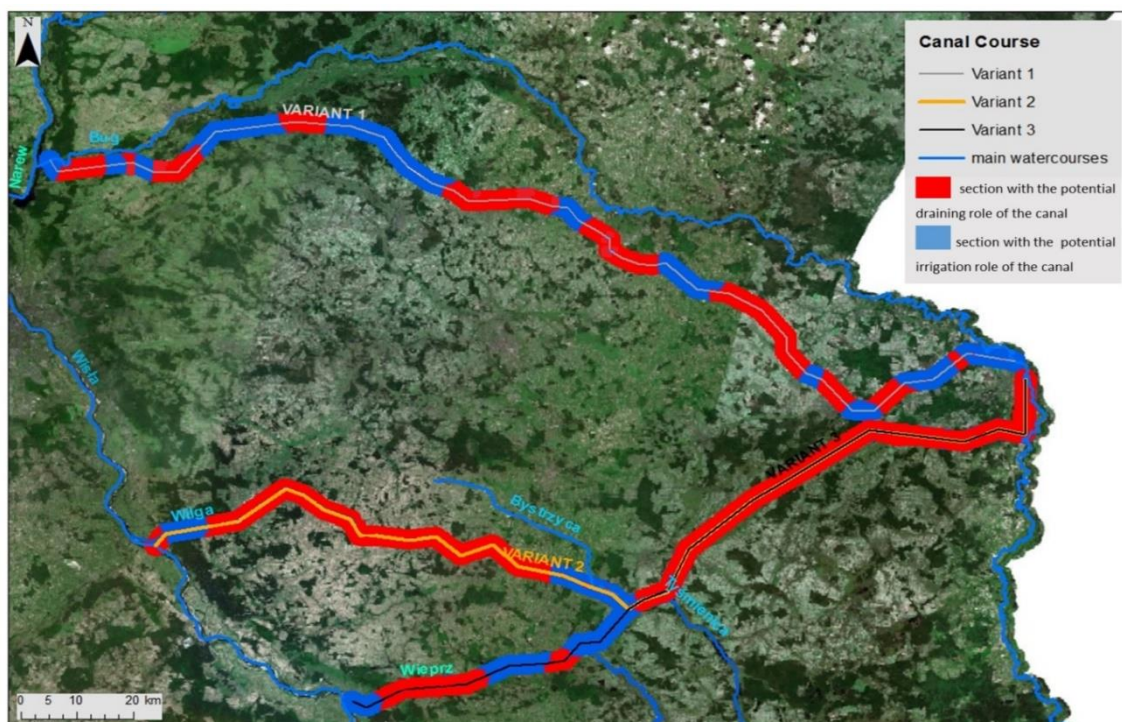


Fig. 4. Possible drainage and infiltrating sites of the Vistula-Muhavets channel. Source: ZGF

Tab. 14. Total length of potential drainage (the channel drain adjacent groundwater) and irrigation (the channel supplies adjacent groundwater) sections in 3 variants of channels. Source: ZGF

Variant	Total length of drainage sections [km]	Total length of irrigation sections [km]	Total length of the canal [km]
1	113,3	94,5	207,8
2	119,5	76,4	195,9
3	107,8	51,8	159,6

Tab. 15. The size of water needs in% ratio to TQ (TQ – median of daily discharges from a multi-year period). Source: ZGF

Water gauge	River	TQ (50%)	Needs [%TQ]		
		m ³ /s	V1	V2	V3
Dęblin	Vistula	385	-	3%	3%
Krzyszew	Bug	46	30%	27%	24%
Lubartów	Wieprz	20,4	-	62%	54%
Tchórzew	Tyśmienica	7,75	-	162%	143%
Wilga	Wilga	1,47	-	854%	752%
Borki	Bystrzyca	2,25	-	558%	491%

Reducing the water level in rivers can lead to a decrease in groundwater in large areas, worsen the productivity of agricultural land, reduce the potential of fish farming and fisheries in the region, and have a negative impact on the state of forests.

In addition, in the E40 Feasibility Study there is no analysis of losses associated with the reduction of the ecosystem services, covering the vital relations between people and the environment (water supply, tourism, carbon retention and other components). The use of the C\$N assessment model by experts (Co\$ting Nature)⁵³ shows an exceptionally high value of ecosystem services in the valleys of the Vistula River, the Dnieper River, and the whole Polesie, which can mean increased losses for water dependent industries along the IWW E40.

Given these circumstances, there is a risk that the compensation costs for the territories along the IWW E40 will seriously exceed the level of 3.5% of the investment costs estimated in the E40 Feasibility Study. In addition, it becomes obvious that the reconstruction of the waterway should be preceded by more serious hydrological studies and studies of the impact on water-dependent sectors of the economy than those presented by the Maritime Institute in Gdansk.

5. Risks of political decisions

Despite the lack of a detailed project, the lack of proper economic, hydrological and environmental impact assessment, the authorities of the three countries are already supporting the idea of arranging a waterway. On December 5, 2017 in Kiev, the Minister of Transport and Communications of Belarus and the Minister of Infrastructure of Ukraine signed a Roadmap detailing and stages of projects for the development of navigation on the Pripjat River and the Dnieper River⁵⁴. A similar agreement is planned to be concluded between Belarus and Poland.

The Order of the Deputy Prime Minister of Belarus of November 15, 2017 No. 37/22np⁵⁵ implies the inclusion of the IWW E40 into the State Investment Program. An attempt is being made to channel budget funding to work in the riverbed of the Pripjat River, as well as to reconstruct the Dnieper-Bug channel. The Ministry of Transport was entrusted with working out the issue of raising funds for the development of the IWW E40 from the EBRD and other international financial organizations. An order was given to organize a meeting with the Polish side at a high governmental level.

By order of the Prime Minister of Belarus of August 2, 2018 No. 226p⁵⁶, an interdepartmental working group has been set up, tasked with preparing a concept for developing the potential of the Pripjat River, envisaging the use of its transport and energy capabilities.

Top officials of the Belarusian government refer to the presidential Order of February 28, 2008 No. 133⁵⁷. According to this document, the Republic of Belarus joined the European Agreement on Main Inland Waterways of International Importance and now must maintain dimensions for passing along the IWW E40 vessels with a draught of 2.5 m during 60% of the navigation period. In addition, officials refer to the implementation of the top-level agreements reached during the meeting on July 21, 2017 in Kiev between President of Belarus Alexander Lukashenko and President of Ukraine Petro Poroshenko⁵⁸.

The Ministry of Infrastructure of Ukraine has been actively supporting the IWW E40, having organized in recent years a series of events with the participation of representatives of the transport sector and potential international donors. Officials of the Office of the Prime Minister of Poland also repeatedly expressed support for this project.

Top government officials distribute binding instructions, pushing institutions to adopt conclusions with a given content. Including conditions for revising some of the previous conclusions. For example, at the stage of preparation of the State program of construction in 2011-2015 of hydroelectric power plants in the Republic of Belarus (approved by the Council of Ministers on

⁵³ Ecosystem services analysis along the E40 inland waterway. ZGF, 2018

⁵⁴ Ministry of Infrastructure of Ukraine. <https://mtu.gov.ua/news/29348.html>

⁵⁵ Google Drive. https://drive.google.com/open?id=1BRL6NpTaPL5cuFj7bsFxlhs-qW_WMBJW

⁵⁶ Google Drive. <https://drive.google.com/open?id=1n2ymRW-Kfa5I619pviGiK-77gdnPqNJR>

⁵⁷ National legal Internet portal. <http://www.pravo.by/document/?guid=3961&p0=P30800133>

⁵⁸ Site of the President of Ukraine. <https://www.president.gov.ua/en/news/ukrayina-i-bilorus-mayut-bagato-spilnih-interesiv-ta-proekti-42558>

December 17, 2010 No. 1838⁵⁹), a conclusion was made about the economic inexpediency of building a hydropower station on the Pripyat River. For this reason, this river does not figure in any way in the program for the construction of hydropower plants. The Order of the Prime Minister number 226p pushes the institutions to revise the previously made conclusions about the inexpediency of building dams.

The risk of biased conclusions is exacerbated by the desire of some institutions to obtain long-term budget or grant funding. By issuing positive conclusions for the project of the IWW E40, they, in fact, form an order for their services.

Additional risks are created by the lack of public dialogue and the opacity of decision making on the IWW E40. For example, on April 3, 2018, six leading business unions of Belarus sent a joint analytical letter⁶⁰ to the Presidential Administration and the Council of Ministers of Belarus. This letter contained the reasoned opinion of the country's business community on increased investment risks and environmental threats to the project, but the responsible authorities unfortunately did not answer the letter.

By a joint letter dated October 25, 2018⁶¹, three business unions asked to include their representatives in the working group that was established by Order of the Prime Minister dated August 2, 2018 No. 226p to develop a Concept for developing the potential of the Pripyat River. This request is ignored. In a response letter, the Ministry of Transport only informed that the Concept has already been developed.

At the time of the economic assessment of plans for the reconstruction of the IWW E40, the Concept text was not published and was not presented to the business community. The Roadmap with details and stages of projects for the development of navigation on the Pripyat River and the Dnieper River⁶² has not been published either. (This document was made available to the authors of this study through unofficial channels).

Some EU initiatives also pose risks. According to the White Paper⁶³, which is a strategic document for the development of the Union's transport system, 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050. The desire to achieve these indicators, coupled with initiatives of the Eastern Partnership (EaP) can push European officials to take political decisions in favor of the IWW E40.

Thus, we see the risk of double political pressure, both from national governments on local institutions, and from European officials on European institutional investors. In such conditions, it is difficult to count on the objectivity of further economic and environmental assessments by official institutions. The likelihood of making erroneous investment decisions increases, and any further development of the project only exacerbates the risks.

6. Risks of competitive distortion with subsidies

As we have already noted, in the studied region, inland waterway transport does not have obvious competitive advantages over rail and road transport. Rather, delivery by river loses most of the modern logistics parameters.

Evaluating Tab. 16 of the E40 Feasibility Study, we came to the conclusion that the settlement tariff laid a fairly small profitability of the river carrier at about 10%. At the same time, the calculated

⁵⁹ State Committee for Standardization of the Republic of Belarus. <http://energoeffekt.gov.by/programs/basicdocuments/221--20112015->

⁶⁰ Google Drive <https://drive.google.com/drive/folders/1OXb8uCN88Q9pzOKRXRezKh1BIWSScbtc?usp=sharing>

⁶¹ Google Drive <https://drive.google.com/drive/folders/18cKBIsC41xOM7rp1VmNdBctXcRQlcVqT?usp=sharing>

⁶² Google Drive. <https://drive.google.com/open?id=15mdxHLKvk9CxsCv4G7mU1q7hyADKwXs1>

⁶³ WHITE PAPER. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144>

financial result corresponds to the optimistic scenario, including the maximum loading of barges, work without significant downtime during the navigation period and high tariff calculation.

Tab. 16 (E40 Feasibility Study). Economic parameters of selected vessel

Specification	€
Cost of 16 hours of navigation during the cruise	2,263
Cost of eight hours standstill during the cruise	679
Cost of one day during the cruise	2,942
Operating cost during the navigation season	765,003
Standstill cost during the off-season	2,971
Total annual costs	867,973
Gross profit	102,421
Net profit	86,797
Indispensable annual revenue	970,394
Average daily revenue during season	3,732

In our opinion, one should take into account the high probability that transport companies will not be able to reach the desired traffic volumes. In this case, the presence of such constants as parking costs and depreciation deductions will reduce the profitability of work up to negative values. If we take into account that the tariff of river transport calculated within the framework of the E40 Feasibility Study is uncompetitive for most types of cargo with the tariffs of the railways of Belarus and Ukraine, then the possibility of profitable operation of inland water transport is in doubt.

Tab. 15. Comparison of transport performance and the volume of state support for various transport modes in Belarus. Source: Ministry of Finance⁶⁴

	Transport modes	Performance, million tkm	Subsidies, million dollars
2014	rail	44 997	5,4
	road	26 587	4,0
	inland waterway	49	4,4
2015	rail	40 785	4,2
	road	24 523	2,7
	inland waterway	21	3,1
2016	rail	41 107	3,7
	road	24 683	2,5
	inland waterway	21	3,1

The expected financial difficulties of water carriers will push economic authorities to use subsidies and other measures of state support, especially if significant funds are invested in the reconstruction of the IWW E40. The scenario of using subsidies seems to be very likely if we take into account the current financial support in Belarus, where water transport, due to its low competitiveness, is the most subsidized transport sector per unit of performance. Thus, according to the report on the execution of the republican budget for 2016, \$3.1 million in equivalent at the weighted average annual rate of the National Bank was allocated to support water transport, which is more than the amount of state support for road transport (\$2.5 million) and is comparable to budget spending on the rail (\$3.7 million).

In 2016, specific budgetary subsidies for river transport in Belarus amounted to \$146 thousand (€132 thousand) per 1 million tonne-km of performance. This is about one and a half thousand times more than for road or rail modes!

⁶⁴ Ministry of Finance of Belarus.
http://minfin.gov.by/ru/budget_execution/legislative_acts/e59779ce8f468cea.html

The distortion of competitive conditions in the freight market in a region close to the IWW E40 can be the result of subsidizing inland waterway transport. This process has already begun. For example, the construction of the previously mentioned two oil barges in Belarus was carried out with funds from the State Innovation Fund, which are allocated on preferential terms, including grant funds.

The most likely subsidy tool is to reduce or completely abandon the fees for moving along the IWW E40, which would be contrary to the “user pays” principle.

7. The risk of a general negative effect on the economy

The inability to recoup capital investments in infrastructure threatens to turn investments into the IWW E40 into a financial minus for the budgets of the three countries and individual private investors. In this case, there is a risk of a zero or even a negative result for national economies.

There are three main reasons why the implementation of the project on the IWW E40 reconstruction can lead to a general negative economic result:

1. Feasibility Study E40 does not imply recoument of capital expenditures for infrastructure

As the experience of implementing other infrastructure projects shows, one of the main sources of investment is the state budget. In addition, for the budget serves the debts raised by public companies. Without guarantees of payback, the costs of the reconstruction and maintenance of the IWW E40 will be borne by the taxpayers and the national economy as a whole.

2. Subsidies for inland waterway transport, companies and infrastructure facilities (we include possible grants from EU funds as subsidies)

Subsidizing river carriers will distort competitive conditions and worsen the economy of rail and road transport in a region close to the IWW E40.

3. There are no guarantees of a positive synergistic effect for other sectors of the economy.

A positive synergistic effect can be expected only during the reconstruction of the IWW E40, since it will create contracts for construction companies, create jobs in this sector and stimulate demand for building materials and equipment. The authors of the E40 Feasibility Study do not prove that a positive macroeconomic effect will be achieved in the medium and long term operation of the waterway.

Inland water transport does not reduce the cost of cargo delivery (especially in Belarus and Ukraine, where there are low railway tariffs). There is no way to speed up delivery or provide other logistical benefits. At the same time, for most industrial companies of the three countries, the IWW E40 is either not at all of interest as a delivery route, or the involvement of their goods on this route cannot be of a systemic or mass character.

There are no guarantees of attracting even those goods that are hypothetically suitable for transportation by waterway. For example, supporters of the project argue about the possible delivery of potash fertilizers along the E40 route. However, the key markets for Belarusian potash are geographically remote regions: China, India, South America, Southeast Asia, Australia. Delivery of fertilizers by vessels of the “river - sea” type with a carrying capacity of 2-3 thousand tons directly from river ports to final consumers in remote markets is likely to lose significantly in the cost per unit of cargo in comparison with transportation by large sea bulkers from the Baltic ports, as it is It is happening now. Under such conditions, operating the IWW E40 will not bring economic benefits to a wide range of companies and national economies as a whole.

It should also be noted that transport can create additional added value in the national economy only if its activity is related to the export of services. The railway and road transport modes of the three countries are quite successfully increasing their export of services. The export potential of

inland water transport services remains limited, including due to the low transit potential of the IWW E40. This circumstance also makes one doubt the possibility of obtaining an additional effect for the national economy.

VI Assessment of E40 IWW compliance with the criteria of the Trans-European Transport Network (TEN-T)

The Trans-European Networks (TENs) in Transport, Energy and Telecommunications have existed as an EU policy since 1993. They are based on Title XVI, Articles 170 – 172, of the Treaty on the Functioning of the European Union. TENs support the functions of the internal market, linking European regions and connecting Europe with other parts of the world. The ultimate aim of the TENs is to interconnect national infrastructure networks and ensure their interoperability, setting standards for the removal of technical barriers⁶⁵.

The legal basis for the functioning of the Trans-European Transport Network (TEN-T) are also Regulation (EU) No 1315/2013⁶⁶ and Regulation (EU) No 1316/2013⁶⁷ of the European Parliament and of the Council. Another strategic document defining the EU transport policy is the White Paper⁶⁸, approved by the European Commission in 2011.

Currently, the IWW E40 is not included in the priority projects of the TEN-T. However, the fact that of the three countries in whose territory IWW E40 is located, only Poland is an EU member, is not an insurmountable obstacle to joining the Network.

An analysis of the EU legal framework shows that the development of the E40 path formally corresponds to some of the strategic objectives of the EU. In particular, according to the White Paper, 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050. According to Article 8 of Regulation (EU) No 1315/2013, the EU may support, including financially, projects of common interest in order to connect the TEN-T with infrastructure networks of neighbouring countries, including the promotion of inland waterway traffic with third countries.

At the same time, as our research shows, the project on the reconstruction of the IWW E40 on some its sections and even along its entire length does not correlate well with the requirements for TEN-T projects or contradicts these requirements (Tab. 16). Among the main reasons are insufficient economic efficiency, high investment risks, as well as a significant negative impact on the environment and climate.

Tab. 16. Assessment of the compliance of the E40 road with EU transport legislation. Source: own assessment

Legal rule	Assessment	Arguments
Regulation (EU) No 1315/2013		
<i>Preamble</i>		
(17) The trans-European transport network covers only part of the existing transport networks. In the framework of the review of the implementation of the core network by 2023, the Commission should evaluate, in cooperation with the Member States concerned, whether other parts, such as certain class III inland waterways, should be integrated into the network. <...>	Contradiction	The Polish section of the E40 waterway in some sections corresponds only to I-II classes of navigation.

⁶⁵ Infrastructure - TEN-T - Connecting Europe. Legal basis. https://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/legal-basis_en

⁶⁶ Regulation (EU) No 1315/2013 of the European Parliament and of the Council. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1315>

⁶⁷ Regulation (EU) No 1316/2013 of the European Parliament and of the Council. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1316>

⁶⁸ WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144>

(36) The protection of the environment and of biodiversity, as well as the strategic requirements of inland waterway transport, should be taken into account.	Contradiction	Along the IWW E40 there is a large number of specially protected natural areas, while the reconstruction and operation of the waterway is a direct threat to the environment.
<i>Article 4. Objectives of the trans-European transport network</i>		
(b) efficiency through: <...> (iv) the promotion of economically efficient, high-quality transport contributing to further economic growth and competitiveness; (v) efficient use of new and existing infrastructure; <...>	Weak correlation	We critically evaluate the economic efficiency of water transport in the studied region due to lack of competitiveness in terms of tariffs, delivery speed and other logistical factors, as well as the risks of negative impact on other transport sectors, water-dependent industries and the national economies of the three countries in general.
(c) sustainability through: <...> (II) contribution to the objectives of low greenhouse gas emissions, low-carbon and clean transport, fuel security, reduction of external costs and environmental protection; (III) promotion of low-carbon transport with the aim of achieving by 2050 a significant reduction in CO ₂ emissions, in line with the relevant Union CO ₂ reduction targets; <...>	Contradiction	According to modern studies, emissions of greenhouse gases and a number of other hazardous substances in inland waterway transport are higher than in railways. Especially this difference is evident in regions where the railways are largely electrified. Poland, Belarus and Ukraine have a high share of electrified railroad tracks. In addition, one should take into account the emission of greenhouse gases on the infrastructure of the IWW E40 (in reservoirs and channels). Changes in the hydrological regime of lands close to the waterway can also lead to an increase in total emissions. In addition, arranging the IWW E40 can cause serious damage to numerous specially protected natural territories and reduce important ecosystem services in the region.
<i>Article 7. Projects of common interest</i>		
<...> 4. Member States shall take all necessary measures to ensure that the projects are carried out in compliance with relevant Union and national law, in particular with Union legal acts on the environment, climate protection, safety, security, competition, state aid, public procurement, public health and accessibility.	Weak correlation, contradiction	In terms of climate impact, arranging the E40 route can be comparable to the appearance of a new coal-fired power plant in the region. Subsidies to inland waterway transport can distort competition in the transport sector.
<i>Article 8. Cooperation with third countries</i>		
1. The Union may support, including financially, projects of common interest in order to connect the trans-European transport network with infrastructure networks of	Weak correlation	Formally, the IWW E40 connects the transport infrastructure of the EU with its neighboring countries (Belarus and Ukraine) and can facilitate transport by inland waterways. However, we are in

<p>neighbouring countries in so far as such projects:</p> <p><...></p> <p>(f) facilitate inland waterway transport with third countries.</p> <p>Such projects shall enhance the capacity or utility of the trans-European transport network in one or more Member States.</p> <p><...></p>		<p>doubt that the reconstruction of the waterway will increase the carrying capacity or utility of the TEN-T, primarily because such carrying capacity and utility are already provided by the existing network of roads and railways.</p>
<p><i>Article 15. Transport infrastructure requirements</i></p>		
<p>3. Member States shall ensure that:</p> <p>(a) rivers, canals and lakes comply with the minimum requirements for class IV waterways as laid down in the new classification of inland waterways established by the European Conference of Ministers of Transport (ECMT) and that there is continuous bridge clearance, without prejudice to Articles 35 and 36 of this Regulation.</p> <p>At the request of a Member State, in duly justified cases, exemptions shall be granted by the Commission from the minimum requirements on draught (less than 2,50 m) and on minimum height under bridges (less than 5,25 m);</p> <p><...></p>	<p>Contradiction</p>	<p>The Polish section does not comply with the entire length of Class IV shipping ECMT, including does not provide a guaranteed draught of 2.5 m.</p> <p>The statement of the E40 Feasibility Study that the Belarusian section of the IWW E40 along the entire length meets the parameters of class IV shipping does not correspond to reality. On the Pripjat River, it is impossible to have stable movement of vessels with a draught of 2.5 m.</p>
<p><i>Article 16. Priorities for inland waterway infrastructure development</i></p>		
<p>In the promotion of projects of common interest related to inland waterway infrastructures, and in addition to the general priorities set out in Article 10, priority shall be given to the following:</p> <p><...></p> <p>(e) paying particular attention to free-flowing rivers which are close to their natural state and which can therefore be the subject of specific measures;</p> <p><...></p>	<p>Contradiction</p>	<p>Much of the Vistula River, as well as almost the entire Pripjat River, are with free flow, close to their natural state. Reconstruction of the IWW E40 threatens to seriously disrupt the hydrology and state of the rivers.</p>
<p>White Paper</p>		
<p>2.5. Ten Goals for a competitive and resource efficient transport system: benchmarks for achieving the 60% GHG emission reduction target</p> <p>Developing and deploying new and sustainable fuels and propulsion systems</p> <p><...></p>	<p>Weak correlation, contradiction</p>	<p>The E40 Feasibility Study does not imply a return on investment in infrastructure, at best, it will be possible to achieve operating expenses. This violates the “user pays” principle.</p> <p>Increasing emissions in case of interception of goods in favor of water transport without financial</p>

<p>(10) Move towards full application of “user pays” and “polluter pays” principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments. <...></p>		<p>compensation will not allow to observe the “polluter pays” principle.</p> <p>The need of inland water transport for state support will increase the risk of subsidies that have a negative effect.</p>
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Thus, now the IWW E40 cannot be included in TEN-T, because throughout its length, particularly in Poland, it does not correspond to class IV navigation. This circumstance is also indicated by Herald Ruijters, Director of Investment, Innovation and Sustainable Transport of the European Commission. The waterway does not match the requirements of expanding the TEN-T by 2023, since it does not even comply with Class III navigation. In addition, plans for the reconstruction of the waterway are in conflict with EU requirements for environmental protection.

VII ALTERNATIVE E40 IWW INVESTMENT DIRECTIONS

At the Eastern Partnership Summit, held on November 24, 2017 in Brussels, it was decided to expand TEN-T to Belarus and Ukraine⁶⁹. Indicative maps for the inclusion of roads and railways of the EaP countries in the TEN-T core network⁷⁰ have been identified. This political decision opens up broad opportunities for further negotiations and attraction of funds from European institutional investors for the modernization of roads and railways in the studied region.

The publication by the European Commission, together with the World Bank on January 15, 2019 of the Indicative TEN-T Investment Action Plan for the EaP countries⁷¹, is a movement in the right direction. In our opinion, the planned investments in the modernization of roads and electrification of railways in the area close to the IWW E40 will improve transport connection and increase environmental safety.

At the same time, despite the lack of an IWW E40 to TEN-T, the Indicative Plan includes the reconstruction of five locks, dredging and other channel works on the Ukrainian part of the Dnieper River. In the short term until 2020, the EIB and the EBRD were invited to invest €49 million in work on the lower and middle reaches of the Dnieper River, and in the long term until 2030, invest another €63 million in the upstream which is total of €112 million. Taking into account the analysis presented in our study, such investments seem to be quite risky.

In our opinion, the carriage of goods by inland waterways was faced with systemic non-competitiveness compared with delivery by rail and road. In the studied region, rivers and canals have lost their former importance as transport arteries as the network of roads and railways has developed, which should be considered as a natural result of the sector transformation.

Significant capital expenditures, high investment risks and negative environmental consequences raise doubts as to the feasibility of implementing a project on arranging the IWW E40 in Poland and Belarus. Only for Ukraine, in view of the relatively low level of investment costs, current and prospective transportation volumes and relatively minor environmental impact (with the exception of the section upstream of the Kiev lock), investments in the waterway, in our opinion, can represent some economic sense.

We believe that governments and investors should come to terms with the limited role of inland waterways in the three countries and focus primarily on further improving the road and rail sectors, where hundreds of thousands of jobs have already been created and whose importance for the sustainable development of economies cannot be overestimated.

In our opinion, the most promising projects of high importance for the development of cross-border trade and the transport system in Poland, Belarus and Ukraine include:

- Modernization of border crossings and customs terminals. This task is key to creating barrier-free movement of goods between the EU and the EEU, the EU and Ukraine, as well as the EU and Asian countries. Unfortunately, queues are still lining up regularly at the border, and it can take up to two days to complete all procedures, including customs clearance of goods. The appearance of modern customs and logistics terminals at the border will help speed up the transportation;
- Modernization of existing and construction of new roads, increasing their speed limit;
- Modernization of railways in order to increase the capacity and speed of trains movement. Electrification. The development of rail freight, including container trains, in the framework of the New Silk Road project. According to expert forecasts, by 2025 the railway transit of containerized cargo in the direction of China - Western Europe - China will reach 1 million

⁶⁹ European Commission - Press release. http://europa.eu/rapid/press-release_IP-17-4845_en.htm

⁷⁰ Eastern Partnerships Indicative TEN-T maps. https://ec.europa.eu/transport/themes/international/european_neighbourhood_policy/eastern_partnership/tent-maps_en

⁷¹ Eastern Partnership: new Indicative TEN-T Investment Action Plan for stronger connectivity. https://ec.europa.eu/neighbourhood-enlargement/news_corner/news/eastern-partnership-new-indicative-ten-t-investment-action-plan-stronger_en

TEU, which is equivalent to about 20 million tons of cargo. The maintenance of this cargo traffic will allow the transport sectors of Belarus, Poland and other European countries to form additional value added, in contrast to the IWW E40, within which it is possible to rely mainly on the redistribution of value added between various transport modes;

- Improving logistics infrastructure adapted to handle goods involved in cross-border trade.

SUMMARY

After analyzing the E40 Feasibility Study and comparing other data of the transport sector, we concluded that the reconstruction of the waterway does not have obvious economic feasibility throughout the entire length. The project is associated with significant investment and economic risks, as well as environmental threats, including the threat of a negative impact on the climate, which is not consistent with the principles of sustainable development.

We assume that the reconstruction of the IWW E40 may have a certain economic meaning in the Ukrainian part of the Dnieper River, mainly in the lower reaches, due to relatively insignificant investment costs, no need to build new reservoirs, which does not entail a significant change in the hydrological regime of the adjacent territories. A prerequisite for a positive economic assessment for the Ukrainian part of the route is the refusal to subsidize inland waterway transport, including by lowering the charges for moving along the Dnieper River below the level covering the cost of maintaining the infrastructure and providing at least a partial return on infrastructure investments.

At the same time in the red zone of economic and environmental risks are the Ukrainian section upstream of the Kiev lock, the entire Belarusian and Polish sections of the IWW E40.

Indicators of inland water transport in such countries of Western Europe as the Netherlands, Belgium and Germany cannot be a guideline for assessing the potential of transport mode in Poland, Belarus and Ukraine due to significant differences in development conditions. It is extremely difficult to overcome the system limitations for inland water transport in the studied region, and some are impossible at all.

According to our estimates, the E40 Feasibility Study is not a justification for the IWW E40 reconstruction along its entire length. The document prepared by the Maritime Institute in Gdansk, fragmentary, does not contain a sufficient amount of data, allowing to draw unambiguous conclusions. It also does not fully comply with international standards used in writing business plans for socially important infrastructure projects. Including the document does not comply with UNIDO standards, which, in our opinion, are most relevant for this project. The E40 Feasibility Study contains various methodological and factual errors.

The authors of the project indicated only the total amount of investment costs, so it is impossible to estimate which of the required cost components were taken into account and in what amount. In addition, some investment costs for the E40 route are not taken into account or significantly understated. Including there is no estimate of the cost of creating additional port infrastructure, reconstruction of bridges. Investment costs for the Ukrainian part of the Dnieper River, excluding the reconstruction of bridges, are understated by almost €100 million. The cost of reconstruction of the Belarusian section of the IWW E40, taking into account the possible cascading of the Pripyat River, is underestimated by at least €0.9 billion.

In our opinion, the E40 Feasibility Study does not properly analyze the transport market of the three countries, the possible interception of cargo in favor of inland waterway transport, and most importantly, it does not examine the readiness of shippers to use the services of river carriers.

As our study showed, the estimated tariffs for river transport presented in the E40 Feasibility Study are conditionally competitive with the tariffs of railway carriers only in Poland and are not competitive with tariffs for railway delivery in Belarus and Ukraine for most commodities. In addition, inland water transport loses due to low delivery speed, the presence of seasonal restrictions, and additional stages of overload.

Reconstruction of the IWW E40 is associated with significant environmental threats, as well as potentially dangerous for water-dependent sectors of the economy. The E40 Feasibility Study contains more or less detailed hydrological data only for the new channel Vistula-Mukhavets, which does not allow for a detailed analysis for the entire waterway. Nevertheless, approximate calculations show that under the threat of flooding there are cumulatively about 2,000 km² of land in Poland and Belarus, located mainly in the valleys of the Vistula River and the Pripyat River. In this case, the losses are not limited only to the withdrawal from the economic circulation of agricultural land, forests and the violation of land productivity in adjacent territories due to changes

in the hydrological regime. Serious damage may be caused to specially protected natural areas, as well as to the potential of ecosystem services in the region.

Anxiety is caused by the possible increase in greenhouse gas emissions due to interception of cargo from rail to inland waterway transport, as well as the appearance of new reservoirs, which are additional sources of emissions. Calculations show that on the Polish and Belarusian sections of the IWW E40, emissions may exceed 600 thousand tons of CO₂ per year. According to the assessment methods recommended by the European Commission, by 2050 the damage from such an impact on the climate can reach €150 million per year, which will be up to 1% of the investment value of the Polish section (option 3) and exceed 4% of the adjusted in our study investment value of the Belarusian section of the waterway.

The project is associated with numerous investment and economic risks. Due to the significant investment value, as well as uncertainty for the section located in the zone of radiation contamination from the Belarusian-Ukrainian border to the Kiev lock, it is highly probable that the waterway cannot be reconstructed along its entire length even in a remote perspective. In our opinion, the construction of an intermediate port in Nizhniya Zary (Belarus) proposed by the authors of the E40 Feasibility Study is not a proper solution in terms of logistics, cost and environmental threats.

We are skeptical about the commodities interception in favor of the IWW E40 under market conditions due to inadequate competitiveness of inland water transport. Nevertheless, we assume that the interception scenario is possible with substantial subsidies and other state support of river carriers. In order to create conditions for intercepting goods in favor of inland waterway transport, the governments of the three countries will have to use subsidies, which will distort the competitive conditions in the transport services market. Such actions of the authorities can lead to a reduction in revenue from railway and trucking companies by tens or even hundreds of millions of euros per year, which can cause an artificial crisis in these transport sectors.

Reconstruction of the IWW E40 can lead to the interception of cargo, which is now being transshipped in the seaports of Lithuania and Latvia, in favor of the Ukrainian seaports on the Black Sea. Such prospects will reduce the effectiveness of previous investments by institutional and private investors in the port infrastructure of the Baltic countries and may provoke an artificial crisis in the transport and logistics sectors of these EU countries.

The E40 Feasibility Study does not imply a recoupment of capital expenditures for the reconstruction of the waterway, but only provides for covering operating expenses at the river infrastructure objects. This approach grossly violates the principle of "user pays". The impossibility of recouping capital expenditures will mean that the budgets of the three countries will cover the losses, as well as the EU budget, that is a large number of taxpayers.

On the basis of a combination of factors, a positive impact on the economies of the three countries should be expected only at the stage of the use of investment funds. The medium and long-term economic effect of the reconstruction of the IWW E40 may be zero or even negative.

An analysis of the EU legal framework shows that the development of the IWW E40 formally corresponds to some of the strategic objectives of the EU. At the same time, the waterway correlates poorly with the requirements for TEN-T projects or even contradicts these requirements. Thus, the IWW E40 cannot be included in the TEN-T, since throughout its length, in particular in Poland, it does not correspond to class IV shipping. There is no possibility for the waterway to join the TEN-T by 2023, since it does not even comply with Class III navigation. In addition, plans for the reconstruction of the waterway are in conflict with EU requirements for environmental protection and climate change.

At the same time, it is necessary to state the political and administrative pressure that increases the risk of making erroneous investment decisions. On the one hand, top officials of the government structures of the three countries distribute binding instructions, pushing institutions to issue economic and environmental assessments with the required content. Many decisions are made opaquely, without the participation of the business community. On the other hand, according to the EU White Paper, 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050. The desire to achieve

such indicators, coupled with the Eastern Partnership initiatives, may also encourage European officials to make political decisions in favor of the IWW E40.

Based on the above, we conclude that the authorities of Poland, Belarus and Ukraine, as well as institutional investors, should accept the limited role of inland water transport in the region. At the same time, investors still have the opportunity to focus on the development of other, more competitive transport modes in order to achieve sustainable development goals in this part of Eastern Europe.