

CITY OF BYDGOSZCZ

BUSINESS PLAN

for a new potential shipping service in Poland on the Lower Vistula, from Tricity to Warsaw

Bydgoszcz, February 2019



ECONPROJECT Dariusz Rajczyk



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INTRODUCTION

The aim of this Study is to specify options for a possible increase in cargo transport by inland waterways from Warsaw to ports in Tricity within a short time (within 3 years), taking into account current economic conditions, on a basis of an analysis and review of specific needs of enterprises concerning increasing demand for transport services. The aim of this study is a section between Warsaw and Tricity ports, with a particular focus on the Lower Vistula waterway. It would allow to use the economic potential of centres such as: Warszawa, Płock, Włocławek, Toruń, Bydgoszcz, and Grudziądz, with an option for an increase in cargo shipping services on courses servicing the above-mentioned centres, and the Tricity ports, particularly, container terminals in Gdańsk and Gdynia.

In the study it was assumed that a target place for loading, unloading and transshipment could be a centre located at the Vistula Meander between Solec Kujawski and Bydgoszcz, with an access for traffic (national road DK-10, railway line Kutno–Piła, and nearness of the railway line Chorzów Batory – Tczew (Gdańsk), national road DK-80, and the express road S-5, as well as A-1 motorway). In the localisation study for the investment project “Multimodal platform based on water, railway, road, and air transport with a logistic centre and a river port located in a selected area of the left Vistula bank (km 766–771), taking into account the City of Bydgoszcz and the Solec Kujawski commune, prepared by WYG INTERNATIONAL Sp. z o.o. from Warsaw, localisation of the multimodal port in Solec Kujawski was specified as an optimal for the Lower Vistula section.

This study focuses on aspects related to customer needs related to transport and shipment services performed as a part of inland waterway transport, and in particular, concerns costs of this project from the point of view of customers for transport and shipment services in such way that the use of inland waterway transport services become a cost-efficient solution for them. In Western Europe, a predominating trend in contemporary inland waterway transport is transport of cargo in containers. This business plan focuses on this trend, analysing its application to the waterway transport on Vistula.

Environmental aspects and logistics operations are solely of auxiliary and supplementary nature, and as such are not a main subject of the analysis. The section of interest, from Warsaw (the exit from the Siekierkowski Port) to Gdańsk (the Vistula estuary) is 431 km long.

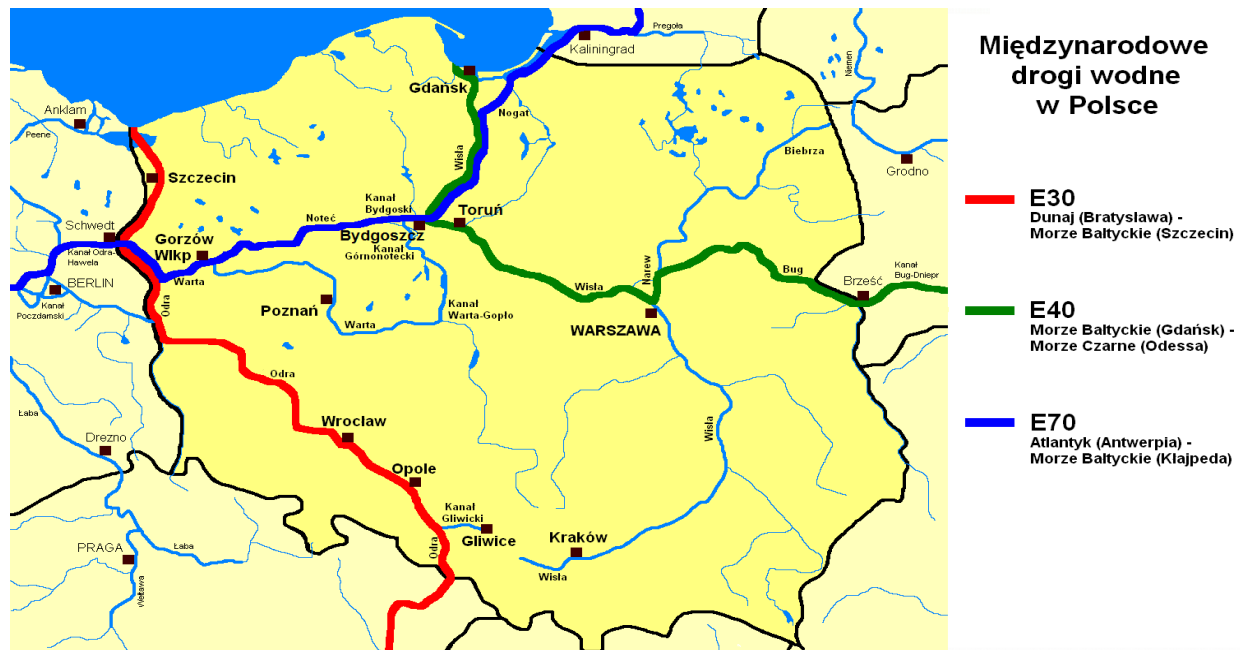
The aim of this analysis is to identify a new regular shipping service servicing container shipments, with an option for transport of -size cargo or big-bags in place of unused cargo hold.

1. MARKET POTENTIAL FOR DEVELOPMENT OF WATERWAY TRANSPORT IN POLAND ON THE LOWER VISTULA, FROM TRICITY TO WARSAW

The analysed transport route is a section of two international waterway transport routes:

- E40 is an international waterway connecting the Baltic Sea with the Black Sea; it starts in Gdańsk and leads through Tczew, Bydgoszcz (Fordon), Toruń, Włocławek, and Płock to Warsaw, from Modlin it leads over the Narew and Bug to Brest (Belarus), and then over the Mukhavyets, Pina, Pripyat and Dniepr it reaches the Black Sea (Ukraine);
- E70 is an European East-West traffic route connecting the Atlantic Coast with the Baltic Coast, leading from Antwerp (Belgium) through the Netherlands, northern Germany, Poland, and Russia to Klaipėda in Lithuania.

In Poland the E70 waterway starts at a lock in the border village of Hohensaaten on the Oder leading to Kostrzyn, and then over the Warta passes through Gorzów Wielkopolski to the Noteć, the Bydgoszcz Canal and the Brda, and joins the Vistula in Bydgoszcz. Over that river it runs to the Nogat and the Vistula Lagoon to the Strait of Baltiysk (Kaliningrad Oblast in the Russian Federation) and then along the coast of Baltic to Klaipėda in Lithuania.



Map 1. International waterways in Poland
Source: Wikipedia

1.1 A geographic scope of the analysis, the studied transport routes - the area of the Lower Vistula from Tricity to Warsaw, geographical description of the analysed river waterway, taking into account physical limitations to sailing.

The analysed length of the route is 431 km. There are two locks in this area:

- at the barrage in Włocławek (at the Włocławek Barrage lock, recreational vessels are serviced at: 08:00; 11:00; 14:00; 17:00; 20:00, and when at least 3 vessels gather, the specified times do not apply; the specified times do not apply to industrial, transport, special, emergency, and similar vessels; the lock is open 24/7);

- in Przegalin near Gdańsk, at the entrance to the Martwa Wisła, where the lock services are available on an as-need basis.

On both lock, transport sets are serviced without an undue delay, and is a paid service according to uniform generally applicable lock rates.

Regulation of the Cabinet on classification of inland waterways of 07 May 2002 (Journal of Laws of 2002, No. 77, item 695) introduced a classification of inland waterways into navigability classes, where the Vistula from Warsaw to Płock was assigned class Ib, from Płock to Włocławek (to the dam on Vistula) it was assigned navigability class V, then class II from the mouth of the Tażyna river to Tczew, and navigability class III from Tczew to the Vistula estuary. The Martwa Wisła from the lock in Przegalin to the river mouth in Gdańsk is classified as navigability class Vb.

At the analysed section, the Vistula flows through flourishing business centres: Warsaw (the administrative centre of Poland, over 1.7 million residents), Płock (120 thousand residents), Włocławek (112 thousand residents), Toruń (202 thousand residents), Solec Kujawski (16 thousand residents), Bydgoszcz (353 thousand residents), Chełmno (20 thousand residents), Świecie (26 thousand residents), Grudziądz (96 thousand residents), Tczew (60 thousand residents), and Gdańsk (465 thousand residents).



Map 2. Inland waterways in Poland
Source: Ministry of Marine Economy and Inland Navigation

The Vistula is a fully navigable river from the Vistula Estuary to the confluence with the Brda, then at a section to the confluence with the Tażyna the navigability class is reduced, then it is not regulated up to Włocławek, with numerous shallows and broads. The section from the Dam in Włocławek to Płock is fully navigable, then from Płock to Zakroczym there are numerous broads as the Vistula is fully unregulated here, then from Zakroczym to Warsaw the river current and its width allow for safe navigation.

Table 1 Presentation of the analysed waterway from Warsaw to Tricity, and return

Mileage ↑ (to the estuary)	Description	Mileage ↓ (from the estuary)
941.2.	Vistula River	0.
941.	The last board	0.2.
938.	Mikoszewo–Świbno	3.2.
947.5.	<i>The Martwa Wisła</i>	11.5 (-5.2 km)
936.	Przegalina Lock	5.2.
931.	Gdańska Głowa Lock	10.2.
930.	Kieźmark road bridge	11.2.
908.	The basin of the former river shipyard in Tczew	33.
908.	Tczew road bridge	33.
907.	Tczew - town harbour	35.
903.	Knybawa road bridge	38.
886.	Biała Góra Lock	55.
876.	Ferry in Gniew	65.
876.	Korzeniewo port	74.
867.	Former ferry in Korzeniewo	74.
863.	Opalenie	78.
850.	Nowe	91.
840.	Osa confluence	101.
835.	River port in Grudziądz	106.
834.	Railway and road bridge in Grudziądz	107.
813.	Świecie	128.
807.	Chełmno road bridge	134.
806.	River port in Chełmno	135.
774.	Railway and road bridge in Fordon	168.
770.	Brda confluence	172.
768.	<i>A location for the planned Multimodal Platform</i>	174.
765.	Solec Kujawski	176.
764.	SOLBET Quay in Solec Kujawski	177.
734.	Winter port in Toruń	205.
735.	Toruń road bridge	207.
733.	Toruń railway bridge	209.
725.	Toruń motorway bridge	214.
728.	Złotoria	216.
718.	Tążyńska confluence	223.
710.	Ciechocinek	231.
702.	Nieszawa	239.
694.	Bobrowniki	247.
679.	Włocławek road bridge	262.
675.	Włocławek Lock	267.
674.	A basin at the Włocławek Lock	268.
663.	Dobrzyń nad Wisłą	279.
649.	Nowy Duninów / Port in Nowy Duninów	292.
633.	The basin of the Radziwie river shipyard and port in Płock	308.

633.	Railway and road bridge in Płock	309.
630.	Płock road bridge	312.
624.	Dobrzyków	317.
617.	Troszyn Polski	324.
613.	Wiączemin Polski	328.
608.	Kępa Polska	333.
599.	Pieczyska Łowickie	343.
589.	Wyszogród road bridge	352.
588.	Bzura confluence / Wyszogród	363.
579.	Czerwińsk nad Wisłą	362.
571.	Wychodziec	370.
568.	Miączynek	373.
560.	Wólka Smoszewska	381.
558.	Zakroczym	383.
557.	Grochale Stare	384.
551.	Modlin road bridge	390.
551.	Bug and Narew confluence	390.
549.	Kazuń road bridge	392.
547.	Nowy Dwór Mazowiecki	403.
538.	Dziekanów Nowy	304.
533.	Jabłonna	408.
521.	Żerań Port in Warsaw	421.
520.	Żerań Canal	421.
510.	Gruba Kaśka	431.

Source: Own elaboration

The inland navigation on the Vistula operated after the World War II to the beginning of the 1980s', when investments in this type of transport were abandoned due to the condition of the infrastructure, and its role was taken over by the railway transport (which infrastructure was being modernised at that time). It was caused by high expenditures on the infrastructure which was already dilapidated then, and by deteriorating navigation conditions.

Due to the lack of investments, from the beginning of the 1970s, a volume of cargo transported by inland fleet went down; and already at that time vessels replacement should have been started, as the majority of barges, cutters and pushers were from before the World War II, and the significant part of them, even from before the World War I, and in some cases were 80 years or older.

In the 1990s' the actual disappearance of that type of transport was caused by a robust development of road transport and a trend for "just-in-time" deliveries in the logistic sector, which completely excluded an option of inland shipping services for nearly all types of cargo, apart from large-size transport.

It should also be remembered that, until recently, the road transport was considered the most competitive when compared to other types of transport, due to low costs of labour and fuel prices. For last few years, the situation has been significantly changing, due to the increase in costs of drivers' labour, the steady rise of fuel prices, and the increasingly stringent environmental standards, imposing more and stricter obligations on carriers, or even on vehicle users.

In the road transport, the traffic congestion (a phenomenon related to increasing road traffic, significantly and noticeably hindering functioning of the transport) is increasingly noticeable, thus the number of entities interested in inland shipping services rises, and also includes shipment companies, and many manufacturers and suppliers.

From Warsaw to Tricity the Vistula River allows for a safe and efficient navigation for about 6 months in the year. The drought in summers, and ice in winter prevent regular shipping services. The future upgrading of the infrastructure with associated financial expenditures could extend that time to ca. 10 or even 12 months.

Up to the beginning of the 1980s', the section from Warsaw to Gdańsk was covered in 4 to 5 days, depending to the navigation conditions, and required 7 to 10 days for the return journey. Nowadays, that time can be longer by 1 day, due to a poor condition of the river infrastructure.

For several years, the increasingly daring projects have been initiated to stimulate and revive the inland inland navigation, both for passenger (tourism) and cargo transport, where in this last case the future is mainly foreseen for transport of container cargo from inland to container terminals in ports of Gdańsk and Gdynia. The overloaded road infrastructure, as well as the modernised railway infrastructure prevent efficient and fast cargo transport. At the container ports in Gdańsk (DCT) and Gdynia (BTC), the number of containers transported by the marine transport increases each year. The loading and unloading infrastructure, with parking areas for vehicles and existing railway siding are becoming increasingly insufficient. The container terminals (especially DCT in Gdańsk) are continuously expanded, and the need for transshipment from a barge to a ship or to a mooring quay is more and more noticeable.

However, insufficient number of vessels, together with limitations related to the river infrastructure will not allow an easy and fast taking over of a large share of the road transport (thus a solution of "Trucks on barges" is not proposed, due to limitations in equipment and insufficiently maintained river infrastructure requiring high investment expenditures). The number of river vessels available will allow to increase the number of shipments and to initiate regular line shipments on the analysed section, and this is the subject of our Study.



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1.2 Cargo transshipment capacities in monthly periods, characteristics of goods covered by the study, a potential for increase in the shipped cargo.

The Lower Vistula is characterised by a transport potential due to the existing organised and efficiently operating transport and logistic services for the vehicle transport sector in the analysed area along the north–south axis. Sectors selected for the analysis are mainly those which are not sensitive to the issues of transport duration, yet robustly developing, f.e., steel and metal trading, manufacturing of products from steel and non-ferrous metals, manufacturing of construction prefabricates, trading in construction materials and aggregates, transport of oversize products, and engineering constructions.

Opportunities are visible for inland waterway transport services for manufacturers of serial metal structures of various sizes, as this sector has been robustly developing in the Lower Vistula region for several years. There are chances to interest in inland waterway transport operators of large batches of materials and long series manufacturers of furniture for large commercial chains, as well as the automotive sector, which recently opened many factories in Poland, manufacturing increasingly larger subunits and parts for passenger vehicles and trucks.

The potential for transshipment is of uniform nature during the year. The amplitude of transports does not differ between individual months, and this is a serious obstacle, taking into account the navigation conditions resulting from hydrological limitations (low level of waters in the summer, and ice in the winter), creating ideal conditions for... competitive vehicle transport. This will represent a challenge for launching of this service, as the companies using the inland waterway transport will need manoeuvring yards and storage areas.

Further in the Study, limitations for storage and manoeuvring areas near the transshipment quays will be indicated.



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2. POTENTIAL FOR NEW INLAND SHIPMENT SERVICES

The potential of new inland waterway cargo transport services comes from development of the metal sector, manufacturing of devices from metal sheets and steel, production of materials from acid proof steel and PVC, and ready construction prefabricates, as well as transport of large-size and oversize cargo. These sectors of the economy have been robustly developing, generating demand for cargo transport, are also less sensitive to transport duration than food, retail or small supplies sectors. For several years, the metal industry has been developing so robustly, because production of metal products has been brought back from Asia (mainly China) to Europe, especially to countries having a sufficient well-qualified labour force and competitive remuneration rates. This situation occurred after the financial crisis in 2008, when first movements of the companies from this sector from China to Poland and Romania were observed. These companies were owned by investors from the Western Europe and the United States. This process have intensified for last several years, resulting in the increase in production orders. Another factor that contributed to the increase in production, were funds obtained from the EU for implementation of infrastructure projects. Thus, the turnover and transport of materials and products in relations with other countries of the Western Europe, particularly Germany and the Benelux countries (Belgium, the Netherlands, and Luxembourg) have increased. Many companies in Poland performers orders for companies from the Western Europe, where the manufacturing potential was either reduced or liquidated. This fact significantly influenced an increase in turnover of the TSL (transport - shipment - logistics) sector, and the vehicle transport sector in particular.

The increasing traffic on the road network (the A1 motorway, the express road S5 currently under construction, and the national road DK5) and the railway route (the railway lines Chorzów Batory – Tczew and Warszawa – Gdynia), which are increasingly congested despite the modernisations (the said traffic congestion phenomenon begins to be noticeable) leads to difficulties in goods transport due to the priority of passenger traffic. This results in problems with transport, and disrupted balance between the transport sector and the environment surrounding them. Railway carriers are forced to transport cargo at times not interfering with the passenger transport. This mainly concerns railway routes on which the cargo transport during the day is difficult due to an intense traffic of passenger trains. This negatively affects the transport time, and leads to selection of a different transport route, by vehicles. Intensification of this process leads to further problems related to the phenomenon of occurring and increasingly noticeable traffic congestion. At the same time, the Tricity ports foresee further development of port areas, due to the increase in a volume of goods arriving to them in the nearest future.



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In the coming years, large investments are planned in the Tricity ports aiming at development of infrastructure ensuring access to the ports, to increase their transshipment capacities. The investments will mainly concern modernisation of the fairway (dredging) and expansion of quays in the Port of Gdańsk (Oliwskie Quay, Obroncow Poczty Polskiej Quay, Seagulls Quay, Dworzec Drzewny Quay and Zbozowe Quay, with fragments of the quay near the Wisłoujście Fortress) at the Inner Port. In the coming years, the modernisation of the Martwa Wisła fairway (for which dredging is planned) and modernisation of quays along the port channel will be continued. Investments planned and conducted by private companies will also significantly influence the increase in transshipment levels. The most important of them include the second stage of construction of the oil terminal - PERN Terminal, and the construction of the deep-water terminal by the company OT Logistics. The first stage of the investment will focus on the Deep-water Bulk Terminal mainly servicing grain and feed cargo, of a total transshipment capacity of 4 million tonnes.

The construction of the Central Port can definitely be perceived as the largest expansion investment in the Port of Gdańsk since the construction of the Northern Port. The modern and daring concept, developed recently, foresees creation of ca. 600 ha of new port areas, which will be created by reclaiming for land the sea area located between the mouth of the Port Canal and the existing Liquid Fuel Terminal, with 150 ha of the inner water reservoirs. The land obtained this way will be used for construction of terminals: general cargo, of planned transshipment of 4 million tonnes/year, and the passenger for 2 million people per year. The container transshipment terminal is also to be constructed.

Investment projects planned by Port of Gdynia in the coming years focus on improving the internal and external access to the port from the sea and the land. The plans include continued modernisation of the Helskie Quay, expansion of the turning basin, and broadening of the inner entrance to the port, as well as dredging of the port basins.

The regular increase in transshipment in the sea ports of Gdańsk and Gdynia allows to forecast that the transport capacities of the existing transport system within the Tricity ports will soon be exhausted. With a lack of alternatives, this will result in significant obstacles for goods transport, both extending times of deliveries and significantly increasing their cost.

In this respect, operations of the Port of Elbląg, particularly, considering the planned construction of the ship canal across the Vistula Spit, may provide necessary support. This investment will remove limitations to the navigation within the Vistula Lagoon, thus leading to development of the Port and an increase in the transshipment of cargo, resulting in greater transport needs. In the current conditions, development of a competitive, rather than a complementary transport route can be expected. In the long-term perspective, when the parameters of the waterway E70 at the Elbląg–Bydgoszcz section are improved, it will be possible to take over some of cargo transshipped in the Port of Elbląg, where there are significant areas available for use and development.

The presented problems concern the entire transport route from Warsaw to Tricity, and thus they

also adversely affect the economic development of the Kujawsko-Pomorskie Voivodeship. The time lost in transport, resulting from insufficiently developed transport systems, is one of the most important costs borne by companies operating in Poland. Lack of a sufficiently efficient transport system significantly reduces the attractiveness of Poland for investors, representing a barrier to entry for foreign entrepreneurs. In terms of implementation of the presented business plan, activities of the Pomeranian Special Economic Zone should be noted, as its development may be limited due to the inefficient transport system.

2.1 Potential customers (goods owners)

For the purpose of implementation, a so-called pilot list of companies was created, to which questionnaires were sent (Appendix No. 2). The list below presents companies, mainly from the Kujawsko-Pomorskie Voivodeship, being manufacturers of products from the above-mentioned sectors. These companies are also responsible for export, ordering at least occasional transports of containers to the ports (container terminals) DCT in Gdańsk and BCT in Gdynia.

Table 2 List of selected entities (so-called pilot list)

Item	Entity name	Location	Main line of business
1.	ATS S.A.	Toruń	trading in steel and metals
2.	DEMARK Sp. z o.o.	Toruń	trading in steel and metals
3.	Invest-Tech Sp. z o.o.	Toruń	production of stainless and acid-proof products (equipment and systems)
4.	MTL S.J.	Toruń	production of stainless and acid-proof products (equipment and systems)
5.	Nova Trading S.A.	Toruń	production of stainless and acid-proof products (equipment and systems)
6.	AUSTENIT Stal Handel Sp. z o.o.	Bydgoszcz	production of stainless and acid-proof products (equipment and systems)
7.	DSS Interacciai Sp. z o.o.	Bydgoszcz	production of stainless and acid-proof products (equipment and systems)
8.	STALEX Hurtownia Stali	Bydgoszcz	trading in steel and metals
9.	PBM STABUD-Przemysłówka sp. z o.o.	Bydgoszcz	trading in steel and metals
10.	ODMET S.A.	Bydgoszcz	trading in steel and metals
11.	STALER S.A.	Włocławek	trading in steel and metals
12.	IMPOSTAL Sp. z o.o.	Tuczno	trading in steel and metals transport of large-size goods
13.	SWIMER	Toruń	production of tanks
14.	WARMA Sp. z o.o.	Grudziądz	steel structures
15.	TASKOMONT 3 Sp. z o.o.	Grudziądz	steel structures

16.	EUROMONTAŻ	Toruń	steel structures
17.	Necks IMP Sp. z o.o.	Toruń	steel structures
18.	KAMTECH Sp. z o.o.	Toruń	steel structures
19.	MAGNA	Toruń	steel structures
20.	BUDREM Sp. z o.o.	Toruń	steel structures
21.	BUDKRUSZ Sp. z o.o.	Aleksandrów Kujawski	processing of aggregates steel structures
22.	METALBARK	Bydgoszcz	steel structures
23.	BIN Sp. z o.o.	Aleksandrów Kujawski	production of silos
24.	STALNOX	Golub-Dobrzyń	steel structures
25.	HUSAR	Włocławek	engineering constructions
26.	NOMET Sp. z o.o.	Toruń	construction and furniture fittings
27.	GAMET S.A.	Toruń	construction and furniture fittings
28.	KARGON	Ząbki	steel structures
29.	WPM MOSTY S.A.	Warsaw	steel structures
30.	ABM SINEVIA Sp. z o.o.	Nowy Dwór Mazowiecki	engineering constructions (special, mainly for the army)
31.	CENTROMOST S.A.	Płock	river shipyard steel structures
32.	SOLBET Sp. z o.o.	Solec Kujawski	construction materials construction aggregates construction prefabricates steel structures
33.	ALKOR	Bydgoszcz	trading in steel and metals
34.	ELSTAL	Bydgoszcz	steel structures
35.	PROJPRZEM S.A.	Bydgoszcz	steel structures
36.	ROCKFIN	Bydgoszcz	steel structures
37.	TOMET	Bydgoszcz	steel structures
38.	KOTŁOREMBUD	Bydgoszcz	boiler overhauls
39.	CGH Polska	Bydgoszcz	production of tanks
40.	STROBUD	Bydgoszcz	construction prefabricates
41.	BAUMAT	Bydgoszcz	construction prefabricates
42.	JMBP PREFABRYKATY	Bydgoszcz	construction prefabricates
43.	PREFABET Białe Błota	Bydgoszcz	construction prefabricates
44.	KOBYLARNIA S.A.	Bydgoszcz	construction prefabricates
45.	GRUSTAL	Grudziądz	construction prefabricates
46.	MELBUD S.A.	Grudziądz	water and environmental protection constructions
47.	PRZEMYSŁÓWKA	Toruń	construction prefabricates
48.	STROPEX	Toruń	construction prefabricates
49.	TROPS	Toruń	construction prefabricates

50.	WIWATOWSKI	Raciążek	window joinery
51.	KOTŁOINWEST	Świecie	steel structures
52.	FORMPLASTIC	Ciechocinek	PVC garden and ornamental products
53.	BUDIZOL S.A.	Włocławek	construction prefabricates
54.	ANWIL S.A.	Włocławek	production of fertilisers
55.	KUJAWIAK	Brześć Kujawski	production of agricultural machines
56.	BETONMAX	Płock	construction prefabricates
57.	MAKRUM	Bydgoszcz	steel structures
58.	BMB TECHNOLOGIE I AGREGATY MALARSKIE	Warsaw	construction prefabricates
59.	PBM POŁUDNIE	Warsaw	construction prefabricates
60.	WIFABET Sp. z o.o.	Warsaw	construction prefabricates
61.	ZREMB	Warsaw	production lines for construction prefabricates
62.	KONSMETAL	Warsaw	strongboxes, safes, heavy security devices
63.	TECHMATIK S.A.	Radom	production lines for concrete products
64.	PREFABET KURZĘTNIK Sp. z o.o.	Kurzętnik	production lines for construction prefabricates
65.	Henkis sp. z o.o.	Ząbki	production lines for construction prefabricates, block making machines
66.	UNIA Sp. z o.o.	Grudziądz	production of agricultural machines
67.	HYDRO-VACUUM	Grudziądz	production of industrial pumps and compressors
68.	WEM ELEKTROMECH Sp. z o.o.	Grudziądz	production and assembling of switchboards production of supporting structures
69.	EKOBUD Sp. z o.o.	Grudziądz	production of construction materials
70.	STALWIT	Świecie	trading in steel and metals
71.	PLASTCHEM	Świecie	injection products
72.	POL-OSTEG	Bydgoszcz	production of containers
73.	BALTICUM FRINAB	Bydgoszcz	production of containers
74.	INBUD Sp. z o.o.	Bydgoszcz	production of containers
75.	JK	Bysław	production of containers
76.	OPAK-MET Sp. z o.o.	Inowrocław	production of containers
77.	POL-KONT	Bydgoszcz	production of containers
78.	HANPLAST	Bydgoszcz	production of PVC boxes
79.	GRAFORM	Bydgoszcz	manufacturing of special tools
		Bydgoszcz	plastic processing
80.	OKT	Bydgoszcz	plastic processing
81.	KLK	Bydgoszcz	plastic processing
82.	LIFOCOLOR FARBPLAST	Bydgoszcz	plastic processing
83.	AKSON	Bydgoszcz	plastic processing
84.	VICIM Poland	Toruń	plastic processing
85.	DR Dispersions Resins Sp. z o.o.	Włocławek	manufacturing of enamel paints
86.	INDORAMA VENTURES	Włocławek	plastic processing
87.	DrM Polska Sp. z o.o.	Włocławek	steel products
88.	Thyssenkrupp Materials Poland S.A.	Włocławek	steel products
89.	HYDRAPRESS	Solec Kujawski	Automotive
90.	KLIMAT SOLEC	Solec Kujawski	sanitary equipment
91.	BOGNER EDELSTAHL	Solec Kujawski	stainless steel products

92.	KMW ENGINEERING	Solec Kujawski	sanitary equipment
93.	Solair Instalacje	Solec Kujawski	sanitary equipment
94.	DROZAPOL PROFIL S.A.	Bydgoszcz	steel products
95.	ECS CABLE PROTECTION	Inowrocław	protectors for cables and hoses
96.	JURMET	Lubicz Dolny	machines and equipment for packaging
97.	TAGMET	Lubicz Dolny	systems of furniture mechanisms
98.	WASIAK S.A.	Brodnica	production of tanks
99.	SITS S.A.	Brodnica	production of furniture
100.	MAKRUM	Bydgoszcz	steel structures

Source: Own elaboration

Many of the companies listed above used inland waterway transport services on an ad hoc basis. The list includes the companies in which transport is based on containers, usually 20" and 40" (twenty and forty feet), with export deliveries, that is deliveries to the ports (terminals), usually packed in 40" containers. The attitude of potential customers towards the inland waterway transport is "moderately positive", and this means that a competitive price will possibly be a turning point, and it can be achieved for transport of several containers.

2.2 Shipping services (initial and final stage)

Until the 1980s, the last shipowners offering regular transport services between Warsaw and the Tricity ports were state owned companies: Żegluga Bydgoska and Żegluga Warszawska, which ceased to exist as independent organisations many years ago. The name Żegluga Bydgoska was taken over by the shipowner OT LOGISTICS S.A. Currently, a company Birkefeld Sand Sp. Z o.o. is located at its former registered office. The name Żegluga Warszawska is used for passenger transport in the Warsaw agglomeration, which are increasingly popular amongst inhabitants (ferries in Warsaw and "ship to Młociny").

Currently, no regular transport services of any cargo are conducted over the Lower Vistula, similarly, no regular passenger services are offered. However, an increase in passenger cruises of tourist nature is visible. They are organised regularly: on weekends and holidays (when navigational conditions are favourable), along a waterway from Toruń to Ciechocinek and Ciechocinek to Bydgoszcz, as well as cruises within the Bydgoszcz area on a ship partly powered by solar energy, on the Brda and the Bydgoszcz Canal (cruises limited to one or two locks on the Bydgoszcz Canal). This innovative service of tourist transport enjoys a significant interest. The "Water Tram" promotes Bydgoszcz as a city integrally connected with water, directing attention to the water transport, its possibilities and perspectives. Furthermore, a ferry across the Vistula operates between Nieszawa and Bobrowniki, and in 2019 a ferry connection across Vistula is to be launched between Solec Kujawski and Czarnowo.

The planned shipping service would be of a regular nature. It is to be provided throughout the year, with an option for suspending services and changes in the schedule during the summer (July–



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August) and the winter (December-January-February). The service can be provided twice a month, at fixed dates and hours for barge arrival and departure, between: Warsaw (Port Żerań), Płock (river shipyard basin in Płock Radziwie), with optional loading and unloading in Toruń (Winter Port), with loading and unloading in Solec Kujawski (at the SOLBET Quay), from where the barges would sail to Gdańsk and/or Gdynia or to the general cargo port.

Eventually, the transshipment services at the SOLBET Quay will be moved to the Multimodal Platform in Solec Kujawski, which will take over loading and unloading, and voyages will be performed in double cycles (two sets of pushers with barges would sail, with an option for an additional barge in each set, and this will allow taking of up to 80 containers on each set).

2.3 Characteristics of the transshipment ports

The Warsaw – Tricity waterway provides for mooring, or even transshipment, at 11 places (apart from Tricity), that is in Warsaw (Port Żerań), Płock (Radziwie), Nowy Duninów, Włocławek, Toruń (Winter Port), Solec Kujawski (SOLBET Quay), Chełmno, Grudziądz, Korzeniewo, and in Tczew. Their brief characteristics are provided in the table below.

The ports in Nowy Duninów and in Korzeniewo will not be of a regular nature, and transshipments there may be of an incidental nature. The Port in Toruń has the required infrastructure, but it is very concentrated and there are limited conditions for traffic in there. The Port in Chełmno has a very difficult access for land traffic, and this may disqualify it for access by a truck with a container. The Port in Grudziądz was revitalised recently, and has recreational and tourist functions, although barges and pushers can still be moored there. Taking into account the traffic access (access for a truck with a container, possibilities of transshipment, options for temporary storage, and parking places), two locations were selected as intermediate ports between Warsaw and Tricity for a regular shipment line, that is, Płock and Solec Kujawski.

None of the inland ports offers ideal conditions, or even conditions appropriate for services of this type, and this selection is a compromise, as there are no alternatives in a given location.

Table 3 List of transshipment ports

Mileage ↑ (to the estuary)	Description	Mileage ↓ (from the estuary)	Comments	Transshipment facilities	Mooring facilities	Other
	<i>GDYNIA (port harbour, BTC)</i>			<i>General cargo port or container terminal</i>	-	<i>easily access for the traffic</i>
	<i>GDAŃSK (Gdańsk port harbour)</i>			<i>container port</i>	-	<i>easily access for the traffic</i>
	<i>GDAŃSK (DCT)</i>			<i>container terminal</i>	-	<i>easily access for the traffic</i>
908.	TCZEW (basin of the former river shipyard in Tczew)	33.	reinforced quay for transshipment, the basin allows for limited manoeuvring, space for storage areas, including roofed	easily transshipment	mooring facilities	easily access for the traffic, parking spaces
876.	Korzeniewo (Korzeniewo port)	74.	reinforced quay for transshipment, no place for manoeuvring, limited open storage area	limited transshipment	mooring facilities	access for the traffic
835.	GRUDZIĄDZ (River port in Grudziądz)	106.	reinforced quay for transshipment, no place for manoeuvring, limited open storage area	limited transshipment possibilities due to the changed function of the harbour for recreation purposes	mooring facilities	easily access for the traffic, parking spaces
806.	CHEŁMNO (River port in Chełmno)	135.	reinforced quay for transshipment, the basin allows for limited manoeuvring, space for storage areas, including roofed	limited transshipment	mooring facilities	access for the traffic
768.	<i>A location for the future Multimodal Platform - Bydgoszcz/Otorowo/Solec Kujawski</i>	174.	<i>reinforced quay for transshipment, the basin is to allow for easy manoeuvring and turning of push trains, storage areas, including roofed</i>	<i>Easily and efficient transshipment</i>	-	<i>access for the traffic (railway, express roads, dry port in Emilianowo)</i>
764.	Solec Kujawski (SOLBET quay)	177.	reinforced quay for transshipment, the basin allows for limited manoeuvring, space for storage areas, including roofed	limited transshipment	mooring facilities	access for the traffic
734.	TORUŃ (Winter Port)	205.	reinforced quay for transshipment, the basin allows for limited manoeuvring and turning of barges, limited space for storage areas, including roofed	limited transshipment	limited mooring facilities (crowded)	access for the traffic



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674.	WŁOCŁAWEK (basin at the Włocławek Dam Lock)	268.	reinforced quay for transshipment, limited space for manoeuvring, limited storage area	limited transshipment	-	access for the traffic
649.	Nowy Duninów (port basin in Nowy Duninów)	292.	reinforced quay for transshipment, space for manoeuvring, limited storage area	limited transshipment	mooring facilities	access for the traffic
633.	PŁOCK (basin of the Radziwie river shipyard and port)	308.	reinforced quay for transshipment, the basin allows for limited manoeuvring, space for storage areas, including roofed	transshipment facilities	mooring facilities	access for the traffic
521.	WARSAW (Port Żerań)	421.	reinforced quay for transshipment, the basin allows for limited manoeuvring, space for storage areas, including roofed	transshipment facilities	mooring facilities	access for the traffic

Source: Own elaboration

The level at which individual ports are adapted for mooring, loading and unloading varies depending on a location, in terms of mooring facilities, unloading and loading capacities (equipment), manoeuvring space, and storage areas. Also an access for the traffic to each of these locations, concerning transport of containers, both with cargo and empty returned containers, and their temporary storage, varies. The size of former port basins also varies. Some of them were adapted to recreational and tourist functions (as in Włocławek and Grudziądz - with possibilities for port services reduced or liquidated), and only mooring is possible there.

Warsaw



Map 3. Żerań Port in Warsaw (scale 1: 10,000)

The Żerań Port in Warsaw has an inland port infrastructure required for small transshipment, although it is very old and reduced, thus requiring appropriate investments in equipment. It has quays, yards and fencing allowing to start performance of the service. It has appropriate connections to the traffic routes.

Płock



Map 4. River port and a river shipyard at Płock Radziwie (scale 1 : 10,000)

The Port in Płock has an inland port infrastructure required for small transshipment, which is old and reduced, thus requiring appropriate investments in equipment. It has quays, yards and fencing allowing to start performance of the service. It has appropriate connections to the traffic routes.

Nowy Duninów



Map 5. Fishing port in Nowy Duninów (scale 1 : 10,000)

The port in Nowy Duninów is of a reserve nature for the service (it operates as a fishing port). It enables easy manoeuvring, required for large-size cargo. It does not have transshipment equipment for containers. It has quays and is appropriately connections to the traffic routes (at the DK 62 route, at its Płock–Włocławek section).

Włocławek

A stop in Włocławek is of an emergency character, important when a stop at the lock of the Barrage is necessary. The location is of an emergency nature.



Map 6. Włocławek stop at the Barrage (scale 1: 10,000)

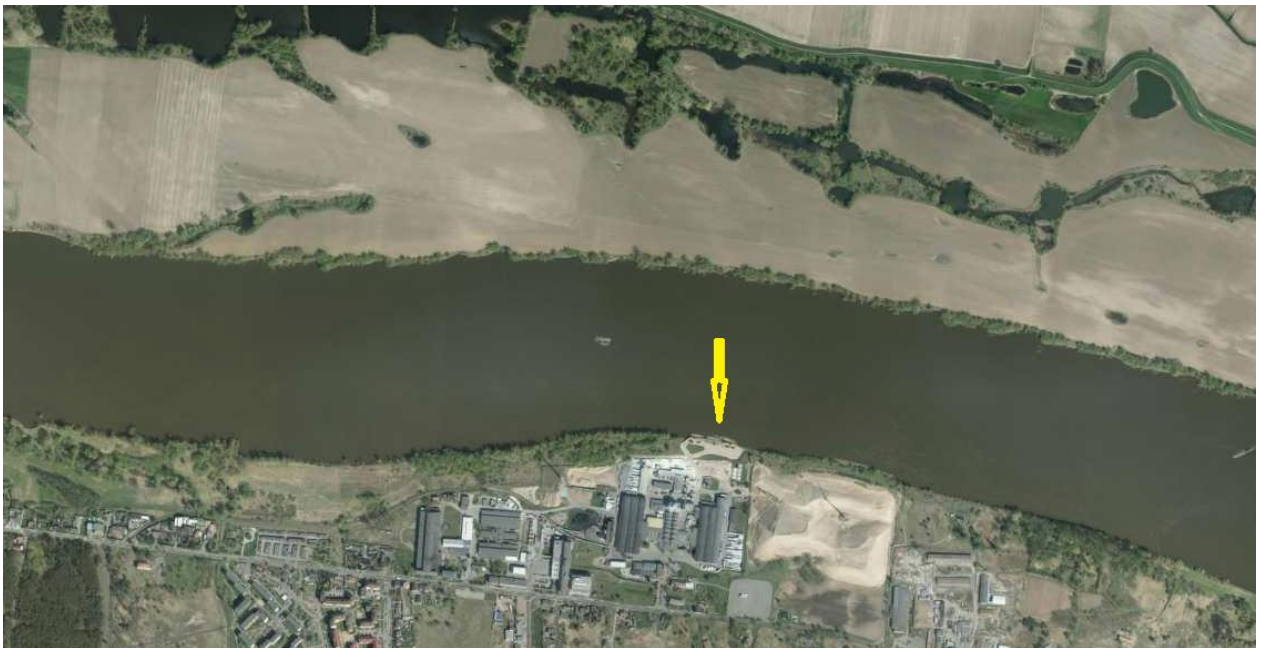
Toruń

The Winter port in Toruń has an inland port infrastructure required for small transshipment, although it is very old and reduced, thus requiring appropriate investments in equipment. It has quays, yards and fences, however, the port basin is filled with many vessels, so navigation and stops will be very difficult.



Map 7. Winter port in Toruń (scale 1: 10,000)

Solec Kujawski



Map 8. SOLBET Quay in Solec Kujawski (scale 1: 10,000)

The quay owned by SOLBET Sp. z o.o. in Solec Kujawski has an infrastructure adequate for small transshipment, but requiring appropriate investments in equipment to service containers. It has appropriate connections to the traffic routes.

Chełmno (Świecie)

The port in Chełmno (Świecie) is too small, its access to traffic routes is too poor, and manoeuvres there will be very difficult. The location is of an emergency nature.



Map 9. Port in Chełmno (scale 1: 10,000)

Grudziądz

The former basin of the river port in Grudziądz is currently used for recreational purposes and is not suitable for servicing cargo shipments.



Map 10. Port in Grudziądz (scale 1: 10,000)

Korzeniewo

The port in Korzeniewo is not suitably equipped, and its quay is too short. The location is of an emergency nature.



Map 11. Port in Korzeniewo (scale 1: 10,000)

Tczew

The quay of the former river shipyard in Tczew enables transshipment of cargo. It requires investments in appropriate equipment adapted to servicing of containers. It has appropriate connections to the traffic routes. However, only an emergency function is foreseen for it, as it is located too close to the Tricity.



Map 12. The basin of the former river shipyard in Tczew (scale 1: 10,000)

2.4 Organisation of the last mile transport

A way in which the last mile transport is organised depends on equipment and facilities at the loading/unloading locations, and on adapting quays to possibilities of manoeuvring and further storage of containers. This level is high and sufficient at container terminals in Gdańsk and Gdynia (although, even there, assigning of special transshipment quays for barges in the direct vicinity of the terminals should be considered). To simplify, it can be said that this problem should not be of a fundamental importance in ports. Access to them by vehicles and railway is easy, therefore, they are characterised by a high traffic accessibility. The areas near the terminals should be provided with warehouse and storage areas, and manoeuvring yards should ensure easy manoeuvring for transshipment equipment. In the inland ports, a serious obstacle is providing required loading and unloading equipment (cranes, conveyors). The quality of quays, and the lack of manoeuvring space, storage and warehouse areas, and parking places with warehouse and storage areas are a problem.

To launch the service, the best solution is to engage the external equipment companies for loading and unloading operations on the port quays. The access for the traffic will also be of importance, to ensure deliveries of containers on truck trailers.

Such options are available at the following locations: Warsaw (Port Żerań), Płock (shipyard and port basins in Płock-Radziwie), Toruń (Winter Port), Solec Kujawski (SOLBET Quay would have to be equipped with cranes for loading and unloading containers), and the basin of the former river shipyard in Tczew. It will also be necessary to employ road carriers for deliveries to/from ports of loading/unloading. Remuneration for loading and unloading will be paid to these companies according to the number of containers, their standard and weight, and the transshipment time.

2.5 Competition in the possible new market

The competition in the potential new market for the transport shipping services at the initial period will not exist, as the project may be considered economically risky or bringing too low profit. There is a threat of the competition from the vehicle transport, which in some part will have to be involved in the service, concerning last mile deliveries and collections. Therefore, the project requires taking a significant business risk, however, it is a profitable undertaking, and its main advantage is a price per 1 km of the container transport, competitive for the vehicle transport. A stimulator for the interest and a catalyst for competitive activities in the waterway transport will be fuel prices and environmental fees, as well as rising costs of labour.



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2.6 Conclusions: potential for new shipping services

It was demonstrated that there is a potential for launching a new service in the inland transport. There is a potential and interest amongst companies from the widely understood metal sector, manufacturing of devices from metal sheets and steel, production of materials from acid proof steel and PVC, and ready construction prefabricates, as well as transport of large-size and oversize cargo. Due to their fast development, these areas of economy, a size of transported cargo, and road congestion, and in particular, lower transport prices, will be interested in using inland waterway transport services.

Increasingly often, especially during the summer, road and railway carriers are forced to transport cargo at times not interfering with the passenger transport. This mainly concerns railway routes on which the cargo transport during the day is difficult due to an intense traffic of passenger trains. At the same time, the Tricity ports foresee further development of port areas, leading to the increase in a volume of goods arriving to them in the nearest future. In the coming years, large investments are planned in the Tricity ports aiming, amongst the others, at development of infrastructure ensuring access to the ports, to increase their transshipment capacities. The investments will mainly concern modernisation of the fairway (dredging) and expansion of the port quays.

3. CONCEPT FOR A MODEL FOR LAUNCHING NEW SHIPPING SERVICES

The proposal resulting from this Study concerns launching a new shipping transport services of a regular basis, i.e., a regular shipping line for transport of containers, to be of an all-year round basis, with an option for suspending or limiting courses in the winter (December–February) and in the summer (July–August), between Warsaw and Tricity. The service would be executed by a set (a pusher and a barge) which would stop at mooring (loading and unloading) ports on the route, in Płock and in Solec Kujawski. Under additional orders and fee, the cargo can also be delivered to Gdynia (BCT) and to the general cargo port in Gdańsk.

The line can be launched already in April 2020 in the optimistic variant, in June 2020 in the realistic variant, and in April 2021 in the pessimistic variant. The main advantage of the new service is an option to offer prices at a level competitive to the vehicle transport. This model, based on performance of regular transport, is to win the companies that would like to perform deliveries in the planned way and at completeive prices.

3.1 Characteristics of the new service

The inland waterway transport services for cargo containers will be of a regular character, performed all-year-round, with an option for suspending or limiting courses in the winter (December–February) and the summer (July–August) due to hydrological conditions on the Vistula, related to navigational difficulties during courses between Warsaw and Tricity. This service is of the innovative nature in the Polish internal market of transport services, as currently the transport services by inland watercourses are limited to the transport of large-size and heavy cargo. Currently, the container transport services over inland waterways are not performed on an incidental basis.

The new service would concern transport of 40” containers (so-called sea containers) and, additionally, also of 20” containers.

The standard and dimensions of containers with cargo (as well as empty containers transported on a return route from Tricity) are provided in the Table below.

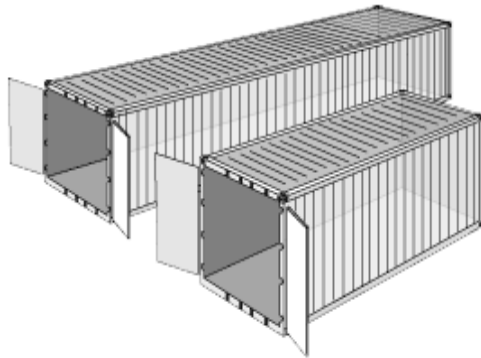
STANDARD 40 FT CONTAINER

CONTAINER WEIGHT	LOAD CAPACITY	VOLUME	INTERNAL LENGTH	INTERNAL WIDTH	INTERNAL HEIGHT	DOOR DIMENSIONS
3,750 kg	26,700 kg	67.7 m ³	12.03 m	2.35 m	2.39 m	2.34 m X 2.28 m
8,268.8 lbs	2,389 cu ft	2,389 cu ft	39.5 ft	7.7 ft	7.9 ft	

STANDARD 20 FT CONTAINER

CONTAINER WEIGHT	LOAD CAPACITY	VOLUME	INTERNAL LENGTH	INTERNAL WIDTH	INTERNAL HEIGHT	DOOR DIMENSIONS
2,300 kg	28,180 kg	33.2 m ³	5.9 m	2.35 m	2.39 m	2.34 m X 2.28 m
5,071.5 lbs	62,136.9 lbs	1,172 cu ft	19.4 ft	7.7 ft	7.9 ft	

Drawing 1. Container parameters



It is assumed that a set (a pusher and one barge) can take up to 42 containers (40") on board. At the further stage, a transport on two barges is possible, which would take up to 82 containers (40"). In the Port Żerań, 30 containers can be loaded for one journey, in the port in Płock further 10 containers can be loaded. The next stop would be in Solec Kujawski, where 10 containers would be unloaded designated for the last mile region (150 km radius from Solec Kujawski), and 10 containers for Gdańsk can be loaded, to fill the empty space on the barge. This way 50 (40") containers would be transported during each journey. In a period from March to June, two journeys a month would be made, and in a season of hydrological dangers (winter: December–February, summer: July–August) one journey to Gdańsk and back, with an option for cancelling a journey.



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3.2 Market and customer requirements

Customer requirements have not been specified so far, as a service of this type has not yet been provided. A carrier should secure and insure the cargo (and this is a standard procedure in the transport sector). The containers should be delivered to the transshipment port over a distance not exceeding 30 km. The service is of a regular nature, so it should ensure for customers a regular rhythm of transport and deliveries to their clients, and from their suppliers.

3.3 Technical requirements for barges

The technical requirements for inland waterway vessels, including barges and pushers, are specified in the Regulation of the Minister of Infrastructure of 5 November 2010 (Journal of Laws of 2010, No. 216, item 1423), which specifies methods and requirements for technical maintenance operations. The technical requirements for inland vessels covered by the Community certificate for inland waterway vessels are specified in the Regulation of the Minister of Infrastructure of 13 May 2010 (Journal of Laws of 2010, No. 94, item 604). This Regulation refers to the Directive 2006/87/EC of the European Parliament and of the Council of 12 December 2006 laying down technical requirements for inland waterway vessels and repealing Council Directive 82/714/EEC, hereinafter “the Directive”, i.e., to II Chapter 3 of Annex II to the Directive. According to that Directive, application of which in Poland is suspended until the end of 2019, significant limitations were implemented, concerning safety and environmental protection. A framework was specified, under which ships (including pushers) to be registered will need to have 2 motors and double lanterns, starting with January 1, 2020. Furthermore, a higher emission standard will apply to newly constructed ships. The river fleet adapted to the needs of cargo transport (pushers, barges), presented in Table 03 (appendix), demonstrates a pool of river fleet available for transport of cargo, therefore, a relevant set should possibly be purchased in Germany or The Netherlands, refurbished and adapted to local Polish requirements at some smaller river shipyard. The total net cost of the set from 1980–1985 that can be purchased in The Netherlands or Germany, together with its overhaul in Poland would be ca. PLN 1,400,000. The set must be approved by the Inland Waterways Authority and be registered in the Register of Inland Waterways Vessels of the Polish Register of Shipping by 31 December 2019, to be able to sail freely.

3.4 Indications of potential manufacturers of barges, their equipment and costs of purchase

The manufacturers of the vessel fleet - barges and pushers, as well as tankers (oil tanker barges), tugboats, and self-propelled barges, include: Shipyard Group Odra Sp. z o.o. in Szczecin, CENTROMOST S.A (river shipyard in Płock), Shipyard CRIST Sp. z o.o. with its registered office in Gdańsk, Shipyard WISŁA Sp. z o.o. in Gdańsk, Gdańska Stocznia Remontowa S.A. in Gdańsk, Shipyard CONRAD S.A. in Gdańsk, Marine Projects Sp. z o.o. in Gdańsk. Overhauls of barges and pushers are conducted in the river shipyard in Płock (CENTROMOST) shipyard workshops in Tczew and in Chełmno, as well as in Czarnowo (opposite to Solec Kujawski). The barge overhauls can also be conducted by numerous workshops in Płock, Włocławek, Toruń, Bydgoszcz, Grudziądz and Tczew.

3.5 Description of the organisation during launching of the new service

For an entrepreneur, the real period of the service preparation covers three years. The project must be divided into three stages: preparation, start-up and development.

The preparation stage takes about 1 year (in the optimistic variant, in the pessimistic variant it is 2 years), during which the following activities should be performed:

- specifying and selecting financing;
- selecting and purchasing vessels (a pusher and a barge);
- arrange and monitor details of the overhaul;
- obtain a permit for performance of the services from the Inland Waterways Authority, obtain the approval of the fleet by the Inland Waterways Authority and register the overhauled fleet in the Register of Inland Waterways Vessels of the Polish Register of Shipping;
- find the crew (skipper and mechanic) for the pusher & barge set;
- launch the shipping services on a basis of the previous marketing operations;
- intensify marketing operations, secure marketing activities, popularise the idea of inland waterway transport (e.g., amongst the companies from the pilot list of 100 companies).

The start-up stage covers coordination of the initiated shipping services.

The development stage is a stage of business monitoring and intense marketing operations to find customers to fill the second barge.

3.6 Legal and legislative background

The main legal acts governing the inland waterway transport are:

- The Act of 21 December 2000 on inland waterway transport (Journal Laws, 2000, item 1458). This Act specifies:
 - 1) administrative bodies for inland waterway transport and their competences;
 - 2) conditions for waterway transport;
 - 3) rules for maintaining an administrative register and conducting vessel measurements;
 - 4) requirements for inland waterway transport safety;
 - 5) rules for classification and maintenance of inland waterways;
 - 5a) rules for maintaining a harmonised system of river information services;
 - 6) rules for pilot services;
 - 7) procedures in the event of an accident in the inland waterway transport;
 - 8) penalty regulations.
- Regulation of the Minister of Infrastructure of 23 January 2003 (Journal of Laws 26/2013, item 227) on the registration form for registration of transported cargo used in the inland waterway transport, specifying:
 - 1) a template of a registration form;
 - 2) a body to which it should be provided;
 - 3) a detailed procedure for handling of received forms.
- Regulation of the Minister of Infrastructure of 28 April 2003 concerning navigation regulations applying to inland waterways (Journal of Laws of 2003, No. 212, item 2072) specifying
 - 1) navigation regulations governing a detailed marking of vessels;
 - 2) vessel movement and stopping on navigation routes and in ports;
 - 3) visual and audio signalling;
 - 4) radiocommunication on inland waterways;
 - 5) rules for marking navigation routes, hydrotechnical structures and devices, navigation obstacles, and transmission structures and lines;
 - 6) templates of navigation marks and signals, their meaning, and scope of application.
- Regulation of the Minister of Infrastructure concerning specification of a template and rules for maintaining a logbook on inland waterway vessels, of 11 January 2002 (Journal of Laws of 2002, No. 8, item 69).

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- Regulation of the Minister of Infrastructure concerning an administrative register of Polish inland waterway vessels, of 23 January 2003 (Journal of Laws of 2003, No. 39, item 340).
 - Regulation of the Minister of Infrastructure concerning technical requirements and equipment for inland waterway vessels and entitling entities to perform technical maintenance of vessels, of 5 November 2010 (Journal of Laws of 2010, No. 216, item 1423).
 - Regulation of the Minister of Infrastructure concerning technical requirements for inland waterway vessels covered by the Community certificate for inland waterway vessels, of 13 May 2010 (consolidated text) (Journal of Laws of 2014, item 1607).
 - Regulation of the Minister of Infrastructure concerning the Community certificate for inland waterway vessels, of 02 June 2010 (Journal of Laws of 2010, No. 110, item 731).
 - Regulation of the Minister of Infrastructure concerning the certificate for inland waterway vessels, of 5 November 2010. (Journal of Laws, 2010, No. 216, item 1424).
 - Regulation of the Minister of Transport, Construction and Maritime Affairs concerning the ADN vessel certificate, of 14 August 2012, (Journal of Laws, 2012, item 974).
 - Regulation of the Cabinet on inland waterways of 10 December 2002 (Journal of Laws of 2010, No. 201, item 1786).
 - Regulation of the Minister of Transport and Maritime Affairs of 10 July 2001 (Journal of Laws of 2001, item 831) concerning specifying venues and territorial areas of operations for directors of inland waterways authorities, in which cities and towns of: Bydgoszcz, Gdańsk, Giżycko, Kędzierzyn-Koźle, Kraków, Szczecin, Warsaw and Wrocław are specified as venues of inland waterways authorities.

All the above legal acts, and other acts of an announcement rank can be found at the website of the Inland Waterways Authority (<http://www.bydg.uzs.gov.pl>). Another important regulation governing activities of Polski Rejestr Statków S.A. (the Polish Register of Shipping) is the Act on Polski Rejestr Statków S.A. of 26 October 2000 available at the Polski Rejestr Statków S.A. website. (www.prs.pl).

3.7 An analysis of legal background for operation of the inland waterways transport market and quality control

All the Acts listed above do not govern the inland waterways transport market, which, currently does not have its own administrative and commercial regulations, possibly due to its relatively small size. A supervisory authority is the Inland Waterways Authority (hereinafter: UŻŚ) and its branches located in: Bydgoszcz, Gdańsk, Giżycko, Kędzierzyn-Koźle, Kraków, Szczecin, Warsaw and Wrocław. The commercial shipping services is supervised by them in terms of meeting technical and safety requirements. Cargo register documents are delivered to branches of the Chief Statistical Office (GUS), i.e., to relevant GUS centres at a given territory, and the register is maintained by a master of an inland waterway vessel.

It can therefore be said that currently that register is not extensive, and market conditions are governed by general terms and conditions of transport. At the moment there are no specific solutions available for inland waterway transport of cargo. All issues related to it are available at the Inland Waterways Authority website, which is cohesive, logical and concerns safety rules and proceedings in the navigation sector concerning rules of its operation, and sector and qualification requirements.

3.8 Conclusions - a plan for launching the new service

Taking into account information provided in Chapter 3, illustrating functioning of the inland waterway sector, there are no formal or legal threats to implementation of the new service which would prevent or significantly hinder implementation of regular inland waterway transport services for cargo (containers).

4. FINANCIAL EVALUATION: ECONOMIC FEASIBILITY OF THE PROJECT RELATED TO LAUNCHING OF A NEW SERVICE

The financial evaluation of the new service - start-up of regular container transport to be loaded in place of unused space of large-size cargo and big-bags transported between Warsaw and Tricity (and return), with a stop and transshipment in Płock and in Solec Kujawski, is a profitable and viable undertaking, ensuring a return on investment. However, it is burdened by a risk related to the fact that for many years the Vistula waters were not used or used only to a small extent for cargo transport, and thus, to distrust of customers who must be won.

4.1 An analysis of costs for starting-up the pilot project

In each presented variant: optimistic, realistic and pessimistic, the costs for launching the service amount to PLN 1,400,000 for purchase and overhaul of the barge of deadweight of up to 600 tonnes, and the pusher with a motor power of 600 kW (or two motors of 300 kW each). Tables of revenues and costs for each variant are as follows:

Table 4. Cost statement for the optimistic variant

Category/Period of prognosis	2019.	2020.	2021.	2022.
Year of the project- OPTIMISTIC VARIANT	0.	1.	2.	3.
Expenditures (including replacement costs); depreciation				
Capital expenditure	1,400,000.00.			
Capital expenditure, incremental:	0.00.	1,400,000.00.	1,400,000.00.	1,400,000.00.
Depreciation and amortisation rate (%) - pusher&barge set	10.0%;	10.0%;	10.0%;	10.0%;
Depreciation and amortisation rate (%) - other	10.0%;	10.0%;	10.0%;	10.0%;
Investment expenditures - pusher&barge	1,400,000.00.	0.00.	0.00.	0.00.
Capital expenditures - other				
Depreciation value:		105,000.00.	140,000.00.	140,000.00.
Amortisation (value), incremental:		105,000.00.	245,000.00.	385,000.00.
Net value at the end of the year	0.00.	1,295,000.00.	1,155,000.00.	1,015,000.00.
Initial value at the beginning of a given year	0.00.	0.00.	1,400,000.00.	1,400,000.00.
Initial value at the end of a given year	0.00.	1,400,000.00.	1,400,000.00.	1,400,000.00.
TOTAL PROJECT:				
OPERATING INCOME ON SALES OF CARGO (CONTAINER) SHIPMENT SERVICES		698,174.84.	884,354.79.	924,552.74.
Project operating costs				
Depreciation		105,000.00.	140,000.00.	140,000.00.

Materials and energy consumption (materials and accessories, greases, paints, minor operational maintenance)		40,000.00.	40,000.00.	40,000.00.
External services		125,000.00.	150,000.00.	156,000.00.
Taxes and fees		48,750.00.	58,500.00.	67,500.00.
Salaries		80,000.00.	102,000.00.	102,000.00.
Employee benefits		90,000.00.	114,000.00.	114,000.00.
TOTAL OPERATING COSTS (OV):		488,750.00.	604,500.00.	619,500.00.
INCOME:		209,424.84.	279,854.79.	305,052.74.
Income tax	19%;	39,790.72.	53,172.41.	57,960.02.
NET INCOME (after tax)		169,634.12.	226,682.38.	247,092.72.

Source: Own elaboration

Table 5. Cost statement for the realistic variant

Year of the project- REALISTIC VARIANT	0.	1.	2.
Expenditures (including replacement costs); depreciation			
Capital expenditure	1,400,000.00.		
Capital expenditure, incremental:	0.00.	1,400,000.00.	1,400,000.00.
Depreciation and amortisation rate (%) - pusher&barge set	10.0%;	10.0%;	10.0%;
Depreciation and amortisation rate (%) - other	10.0%;	10.0%;	10.0%;
Investment expenditures - pusher&barge	1,400,000.00.	0.00.	0.00.
Capital expenditures - other			
Depreciation value:		105,000.00.	140,000.00.
Amortisation (value), incremental:		105,000.00.	245,000.00.
Net value at the end of the year	0.00.	1,295,000.00.	1,155,000.00.
Opening value at the beginning of a given year	0.00.	0.00.	1,400,000.00.
Initial value at the end of a given year	0.00.	1,400,000.00.	1,400,000.00.
TOTAL PROJECT:			
OPERATING INCOME ON SALES OF CARGO (CONTAINER) SHIPMENT SERVICES		511,994.88.	884,354.79.

Project operating costs

Depreciation		105,000.00.	140,000.00.
Materials and energy consumption (materials and accessories, greases, paints, minor operational maintenance)		40,000.00.	40,000.00.
External services		125,000.00.	150,000.00.
Taxes and fees		48,750.00.	58,500.00.
Salaries		80,000.00.	102,000.00.
Employee benefits		90,000.00.	114,000.00.
TOTAL OPERATING COSTS (OV):	0.00.	488,750.00.	604,500.00.

INCOME:		23,244.88.	279,854.79.
Income tax	19%;	4,416.53.	53,172.41.
NET INCOME (after tax)		18,828.35.	226,682.38.

Source: Own elaboration

Table 6. Cost statement for the pessimistic variant

Year of the project- PESSIMISTIC VARIANT	0.	1.	2.	3.
Expenditures (including replacement costs); depreciation				
Capital expenditure	1,400,000.00.			
Capital expenditure, incremental:	1,400,000.00.	1,400,000.00.	1,400,000.00.	1,400,000.00.
Depreciation and amortisation rate (%) - pusher&barge set	10.0%;	10.0%;	10.0%;	10.0%;
Depreciation and amortisation rate (%) - other	10.0%;	10.0%;	10.0%;	10.0%;
Investment expenditures - pusher&barge	1,400,000.00.	0.00.	0.00.	0.00.
Capital expenditures - other				
Depreciation value:		105,000.00.	140,000.00.	140,000.00.
Amortisation (value), incremental:		105,000.00.	245,000.00.	385,000.00.
Net value at the end of the year	0.00.	1,295,000.00.	1,155,000.00.	1,015,000.00.
Opening value at the beginning of a given year	0.00.	0.00.	1,400,000.00.	1,400,000.00.
Initial value at the end of a given year	0.00.	1,400,000.00.	1,400,000.00.	1,400,000.00.
TOTAL PROJECT:				
OPERATING INCOME ON SALES OF CARGO (CONTAINER) SHIPMENT SERVICES		0.00.	698,174.84.	924,552.74.

Project operating costs

Depreciation		105,000.00.	140,000.00.	140,000.00.
Materials and energy consumption (materials and accessories, greases, paints, minor operational maintenance)		40,000.00.	40,000.00.	40,000.00.
External services		125,000.00.	150,000.00.	156,000.00.
Taxes and fees		48,750.00.	58,500.00.	67,500.00.
Salaries		80,000.00.	102,000.00.	102,000.00.
Employee benefits		90,000.00.	114,000.00.	114,000.00.
TOTAL OPERATING COSTS (OV):	0.00.	488,750.00.	604,500.00.	619,500.00.



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INCOME:		-488,750.00.	93,674.84.	305,052.74.
Income tax	19%;	-92,862.50.	17,798.22.	57,960.02.
NET INCOME (after tax)		-395,887.50.	75,876.62.	247,092.72.

Source: Own elaboration

4.2 Operating costs of the new service

The operating costs of the new service are presented in the tables above. They are specified for real items that must be incurred. Information on the operating costs is provided in subchapter 4.3.

4.3 A comparative analysis of costs related to start-up of a new service and operating costs with costs of alternate modes of transport

Tables below present comparisons of unit costs by determining unit costs and adding a fixed margin, which should give an estimated unit price.

Table 7. Determination of unit cost and price for road transport and for planned inland water shipping line

Average monthly mileage for a vehicle (truck and trailer)	7,500 km	VEHICLE TRANSPORT	1,724 km	INLAND WATERS TRANSPORT
Average annual mileage for a vehicle (truck and trailer)	90,000 km		20,688 km	
Number of containers loaded	1. Pcs (40')		40. Pcs (40')	

Specification of a price per 1 km as of:	31/12/2018				31/12/2018			
	annual	monthly	per 1 km	additional description	annual	monthly	per 1 km	additional description
price of 1 L of diesel				PLN 4.95				PLN 4.95
Fuel			PLN 1.58	consumption 32 L/100				
barge of a deadweight of up to 600 tonnes							PLN 9.90	
<i>fuel (Warsaw–Tricity)</i>							PLN 4.95	100 L/ 100km
<i>fuel (Tricity–Warsaw)</i>							PLN 14.85	300 L/ 100km
road fees		PLN 3,500.00	PLN 0.47	average cost				
<i>lock (Włocławek, Przegalina) and mooring fees (accommodations nearby)</i>						PLN 3,500.00	PLN 2.03	average cost
Civil liability insurance of a carrier	PLN 1,000.00		PLN 0.01		PLN 2,500.00		PLN 0.12	
Collision, comprehensive and third party insurance	PLN 7,500.00		PLN 0.08		PLN 10,000.00		PLN 0.48	
taxes on transport vehicles	PLN 1,800.00		PLN 0.02	for a road set (truck and trailer)	PLN 4,000.00		PLN 2.32	for a set (pusher + barge)
driver /skipper and mate remuneration (including Social Insurance)		PLN 2,500.00	PLN 0.33			PLN 8,000.00	PLN 4.64	(skipper + mate)

allowances, business trips, flat rates		PLN 3,500.00	PLN 0.47			PLN 9,000.00	PLN 5.22	(skipper + mate)
depreciation and amortisation (truck&trailer vs pusher&barge)	PLN 40,000.00	PLN 3,333.33	PLN 0.44	PLN 400,000 (net) over 10 years	PLN 140,000.00	PLN 11,666.67	PLN 6.77	PLN 1,400,000 (net) over 10 years
consumables, maintenance	PLN 30,000.00	PLN 2,500.00	PLN 0.33		PLN 40,000.00	PLN 3,333.33	PLN 1.93	
tyres (summer and winter)			PLN 0.05	(2 sets of tyres for 2 years)				
<i>minimum remaining costs of shipping (fees for loading and unloading, use of equipment, administrative expenses, etc.)</i>					PLN 150,000.00	PLN 12,500.00	PLN 7.25	
empty courses			PLN 0.25	minimum 20% concerns empty courses				
Estimated costs of 1 km:			PLN 4.04				PLN 40.67	
Margin (minimum):			PLN 0.40	10%;			PLN 4.07	10%;
Estimated price:			PLN 4.45				PLN 44.73	

Specification of a price per 1 km	31/12/2021 (own forecast)				31/12/2021 (own forecast)			
	annual	monthly	per 1 km	additional description	annual	monthly	per 1 km	additional description
Cost type:								
price of 1 L of diesel				PLN 5.25				PLN 5.25
Fuel			PLN 1.68	consumption 32 L/100				
barge of a deadweight of up to 600 tonnes							PLN 10.50	
<i>fuel (Warsaw–Tricity)</i>							PLN 5.25	100 L/ 100km
<i>fuel (Tricity–Warsaw)</i>							PLN 15.75	300 L/ 100km
road fees		PLN 4,000.00	PLN 0.53	average cost				
<i>lock (Włocławek, Przegalina) and mooring fees (accommodations nearby)</i>						PLN 4,000.00	PLN 2.32	average cost
Civil liability insurance of a carrier	PLN 1,500.00		PLN 0.02		PLN 3,000.00		PLN 0.15	
Collision, comprehensive and third party insurance	PLN 8,000.00		PLN 0.09		PLN 12,000.00		PLN 0.58	
taxes on transport vehicles		PLN 2,000.00	PLN 0.02		PLN 4,500.00		PLN 2.61	



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driver /skipper and mate remuneration (including Social Insurance)		PLN 3,000.00	PLN 0.40			PLN 8,500.00	PLN 4.93	
allowances, business trips, flat rates		PLN 4,000.00	PLN 0.53			PLN 9,500.00	PLN 5.51	
depreciation and amortisation for truck&trailer	PLN 40,000.00	PLN 3,333.33	PLN 0.44	PLN 400,000 (net) over 10 years	PLN 140,000.00	PLN 11,666.67	PLN 6.77	PLN 1,400,000 (net) over 10 years
consumables, maintenance	PLN 30,000.00	PLN 2,500.00	PLN 0.33		PLN 40,000.00	PLN 3,333.33	PLN 1.93	
Tyres			PLN 0.07	(2 sets of tyres for 2 years)				
<i>minimum remaining costs of shipping (fees for loading and unloading, use of equipment, administrative expenses, etc.)</i>					PLN 156,000.00	PLN 13,000.00	PLN 7.54	
empty courses			PLN 0.30	minimum 20% concerns empty courses				
Estimated costs of 1 km			PLN 4.42				PLN 42.84	
Margin			PLN 0.44	10%;			PLN 4.28	10%;
Estimated price			PLN 4.86	109.38%;			PLN 47.12	105.34%;

Source: Own elaboration

4.4 Profitability analysis

A profitability analysis is limited to items resulting from the profit and loss account, and from investment expenditures. A balance sheet and a cash flow statement were not analysed, as they would have to be estimated in terms of capital projects and investor capabilities. This aims at considering also investors that do not maintain accounting records, but only simplified accounting (e.g., based on simplified single entry accounting) or entities initiating business activities based on simplified single entry accounting.

The analysis presented in individual calculation variants for 2021–2023.

Optimistic variant	2020.	2021.	2022.
ROS = net profit/revenues on sales	24.30%;	25.63%;	26.73%;
ROI = net profit/return on investment	12.12%;	16.19%;	17.65%;

Realistic variant	2020.	2021.	2022.
ROS = net profit/revenues on sales	3.68%;	25.63%;	26.73%;
ROI = net profit/return on investment	1.34%;	16.19%;	17.65%;

Pesimistic variant	2020.	2021.	2022.
ROS = net profit/revenues on sales	0.00%;	10.87%;	26.73%;
ROI = net profit/return on investment	0.00%;	5.42%;	17.65%;

Source: Own elaboration

The profitability of the above project was demonstrated for each variant.

4.5 Summing up of the economic feasibility for the new service

The above analysis proves that the project will be profitable for transport of 40 40-foot containers during one journey; the costs were estimated correctly on a basis of actual prices and rates as of 31/12/2018.

The filling of the barges will depend on intensification and intensity of all marketing activities.



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5. MARKETING AND DISTRIBUTION ACTIVITIES REQUIRED FOR LAUNCHING OF NEW SERVICES

Marketing activities focusing on finding customers should be foreseen for at least one year before starting the service (after co-financing is obtained and during purchases and overhaul of the set). The pilot list of entities attached can be used for potential involvement of companies into marketing activities. That list can be expanded with other entities from sectors of interest currently not considered. Majority of the companies from sectors of steel and metal trading, manufacturing of products from steel and non-ferrous metals, manufacturing of construction prefabricates, trading in construction materials and aggregates, transport of oversize products, and engineering constructions should be reached to create groups of permanent and of target customers. In these activities, we should focus on people willing to initiate cooperation in shipping and supporting innovations. In these activities, the competitive, nearly 4 times lower price should be strongly emphasised, versus the road transport.

An optimum solution for the project implementation would be to interest into this service a company that also provides vehicle transport services, and then this company could service the last mile transport, applying the synergy rules.

6. RISK MANAGEMENT ASSESSMENT FOR LAUNCHING OF A NEW SERVICE

Before starting works under successive stages of the project, it is necessary to establish assumptions for the risk management during implementation of the project. The risk management should concern the created catalogue of risks that may prevent implementation of the project.

Risk catalogue

- diesel oil price changes (increases) and implementation of new charges related to its sales;
- changes in environmental legislation;
- changes in regulations concerning vessels, its safety and maintenance;
- other unforeseen risks related to the project.

Monitoring of measures for risk control

Risk monitoring will be performed on a regular basis at specified intervals. A template for a report form should be developed, containing a requirement for risk assessment by identification and description of hazards, indication of an owner and a way of responding to the identified hazards.

7. SWOT ANALYSIS

Table 8. SWOT analysis

STRENGTHS	WEAKNESSES
possibility to offer to customers a lower and more attractive price of transport	a need for significant capital investments in the infrastructure (quays, loading and unloading equipment, and conveyors)
maintained feasibility and profitability of performed services	lack of required river fleet
implementation of pro-environmental services easy to promote	
implementation of innovative services with possible co-financing for entrepreneurs (from EU and Polish funds)	
OPPORTUNITIES	THREATS
increasing range and scale of transport (for example, waste from Tricity to PRONATURA incinerator in Bydgoszcz)	changes in legislation
easy options for promotion of services in media, combining it with tourist services	changes in diesel prices and possible special taxes on diesel
easy promotion on sailing vessels (wide and legible banners)	increase in costs of labour

Source: Own elaboration

REFERENCES AND SOURCES

Websites:

<http://www.bydgoszcz.gov.pl/>

<https://www.gov.pl/web/gospodarkamorska>

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