CONTAINER CRUISES ON THE LOWER VISTULA RIVER

A NEW CONCEPT OF TRANSPORT IN THE LOGISTICS CHAIN

WISŁA CARGO 2021

Project EMMA EXTENSION (INTERREG Baltic Sea Region)

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More information on aims of the programme, funding possibilities and how to get involved: https://www.interreg-baltic.eu/home.html

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1 SCHEDULE


WISŁA CARGO 2021
KUJAWY POMORZE
CONTAINER TRANSPORTATION
ALONG THE LOWER VISTULA
6TH–9TH OF APRIL
Day 1. (06.04)
loading of the barge at the Port of Gdańsk
12:00 – start of the cruise
abt 3:00 – passage through the Przegalina lock
technical night break near Tczew
Day 2. (07.04)
continuation of the cruise
the barge reaching the quay of Chełmno
Day 3. (08.04)
10:00 – press release
start of transhipment – reloading import containers onto trucks and loading new export containers onto the barge
abt 6:00 – start of return transportation
Day 4 (09.04)
reaching the Port of Gdańsk
unloading and reallocation of containers to sea export erminals
facebook.com/KujawskoPomorskieForumWodne
wislacargo.kujawsko-pomorskie.pl
Port Gdańsk
Tczew
Świecie
Grudziądz
Chełmno
Bydgoszcz
Solec Kujawski
Toruń
Interreg Baltic Sea Region
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
Organizator:
Patronat:
Partnerzy:
KUJAWY POMORZE
Województwo Kujawsko-Pomorskie
Państwowe Gospodarstwo Wodne Wody Polskie
MINISTERSTWO INFRASTRUKTURY
BAC PL
PORT GDAŃSK

2 OBJECTIVES AND RELEVANCE OF THE CRUISE

On April 6, 2021, for the first time in history the commercial transport of containers with cargo for one of the factories located in the Kujawsko-Pomorskie Region set off from the Port of Gdańsk. A barge and a pusher, after crossing the lock in Przegalina, entered the lower Vistula River and after about 15 hours of cruise reached Chełmno. On the Vistula wharf in Chełmno, on April 8, cargo was transshipped. Import containers were placed on trucks, while goods intended for export were loaded onto a barge. After 10 hours, the barge with pusher returned to the Port of Gdańsk, from where the unloaded containers were transported to sea vessels. The entire operation, during which 12 containers (approx. 300 tons of goods) were transported, took 4 days.

The pilot cruise was possible thanks to the transnational project EMMA Extension (Program INTERREG Baltic Sea Region). Project partners from Germany, Sweden, Finland, Lithuania and Poland want to highlight the benefits and advantages of water transport and mobilize managing authorities to restore inland navigation to the group of key means of transport. This trend is in line with the policy of developing a competitive and sustainable transport system, set out in the "White Paper" of the European Commission. Therefore, the main goals of the project are:

- promotion of inland water transport in Poland as the most economical, safe and environmentally friendly,
- increasing awareness of the use of inland navigation services and infrastructure among cargo owners and shipping companies, and
- promotion of activities related to the planned construction of the Bydgoszcz Logistics Hub, using the potential of waterways.

Graph 1. Benefits of the inland waterways' revitalisation

The location of the pilot project was not insignificant. The issue of revitalization of waterways and the economic use of the rivers potential is one of the important elements of the territorial policy of the Kujawsko-Pomorskie Region. Two international waterways E40 and E70 intersect in the region. Moreover there is the only one water barrage on the lower Vistula, which is located in Włocławek. The special geographic location gives great opportunities for development and the investments. That is way we, as a voivodeship, are particularly interested in any activities aimed at revitalizing the lower Vistula and activating its economic potential while respecting the natural environment.

Apart from the promotion of inland navigation, cruises had one more important goal, namely the practical verification of water transport possibilities and reloading goods that go from seaports into the interior of the country, as an alternative to road or rail transport. In this case, water transport can be included in the supply chain, which in the future could run through the logistics center in the heart of the Kujawsko-Pomorskie Region - the Bydgoszcz Logistics Hub. Thanks to studies prepared by the voivodeship self-government, such as: *A location study for the multimodal platform Bydgoszcz-Solec Kujawski* and *The Last Mile Concept for the Bydgoszcz Logistics Hub*, the parameters of the future port were determined and the needs of economic entities from the region were identified in terms of optimization of logistics operations and the use of inland navigation.

The organization of cruises fits perfectly into the national transport policy and the activities carried out by the Ministry of Infrastructure to promote the use of alternative modes of transport and the transfer of some cargo from road to rail and water transport. As well as building modern inter- and multimodal terminals that will improve the existing supply chains. This issue is also important in the context of the planned revision of the TEN-T Network and the possibility of including international waterways and the Bydgoszcz Logistics Hub. In addition, the promotion of water transport will also indirectly justify the necessity and legitimacy of developing strategic programs for the Vistula and the Oder River.

3 LOCATION AND COURSE OF CRUISES

Container transport on the lower Vistula has been divided into two stages:

1. Import cruise Gdańsk – Chełmno - with goods intended for production (TZMO - Toruńskie Zakłady Materiałów Opatrunkowych),
2. Export cruise Chełmno-Gdańsk - with goods and components from the medical, furniture and food industries of companies located in Kujawsko-Pomorskie region, intended for European and world markets .

The "import" cruise began on April 6, at the Szczecińskie Quay in the Port of Gdańsk (Gdańsk Container Terminal). The containers were brought overland from the Port of Gdynia, where they arrived by sea transport.

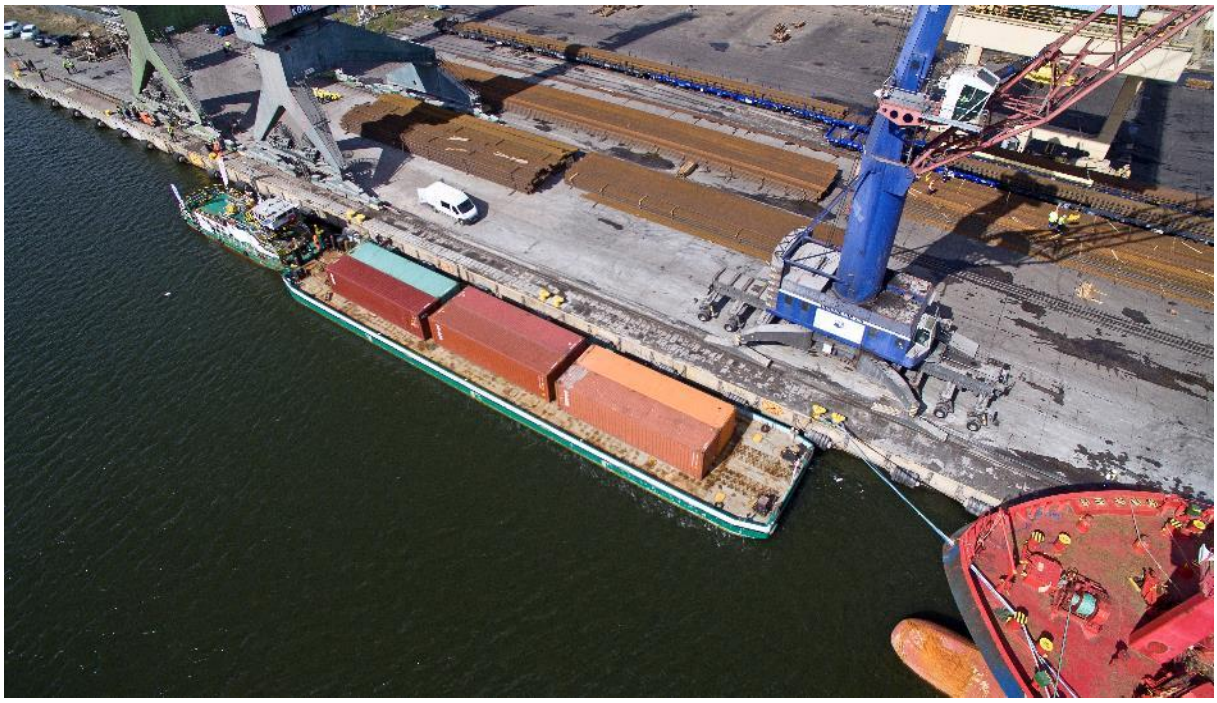


Photo no 1: River barge at the Szczecińskie Quay in the Port of Gdańsk.

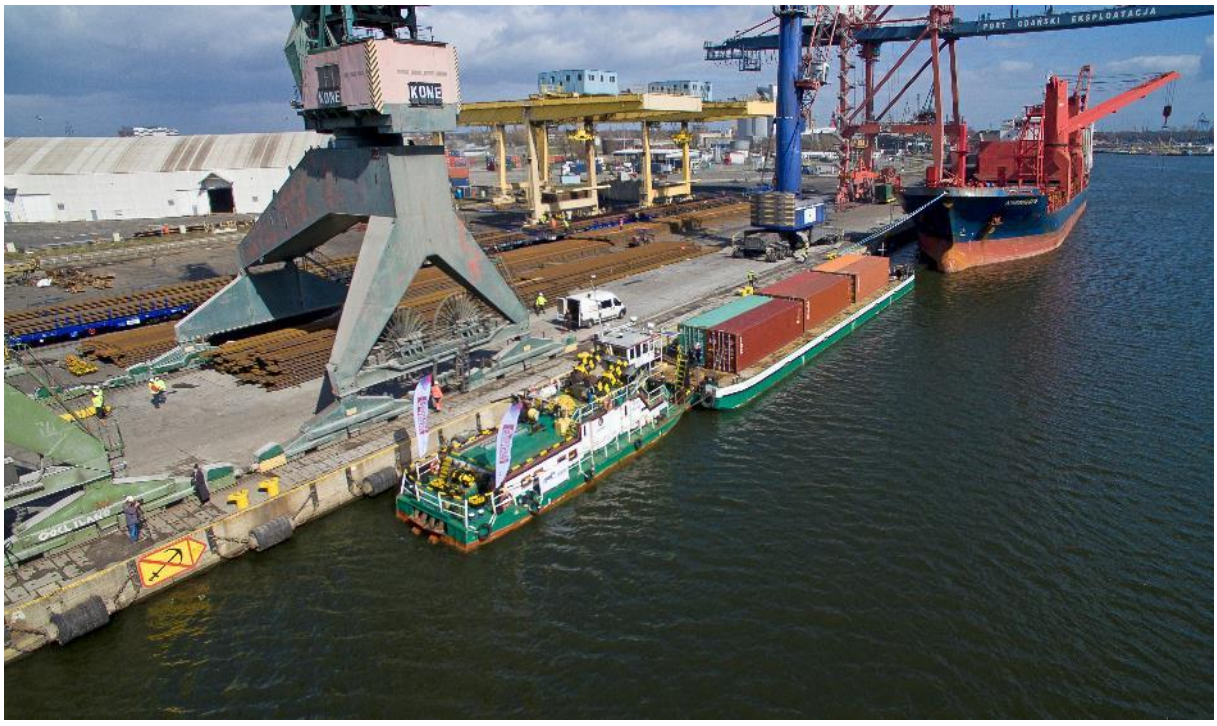


Photo no 2: River barge at the Szczecińskie Quay in the Port of Gdańsk.

After a distance of 22 km and a 2-hour cruise on the Martwa Wisła, the set reached the only lock on the route, in Przegalina. The recently renovated the South Lock is 188 m long and 11.9 m wide.

Photo no 3: River set in Przegalina lock chamber.

After an overnight stop in Tczew, the barge continued its cruise towards Chełmno. Around 9:00 a.m. the barge was on km 886 of the Vistula, at the height of the entrance to the Nogat - the Biała Góra Lock. An hour later the barge reached Korzeniewo.

Photo no 4: River set on the Vistula in Tczew.

The first stage of transporting containers up the Vistula ended around 5:00 pm in Chełmno. The entire 150 km way from the Port of Gdańsk to Chełmno was realized in 17 hours. Stable hydrological conditions, appropriate depth for this type of vessel and a well-marked waterway were conducive to the cruise.

Photo no 5: River set on the Vistula in Chełmno.

The reloading of twelve 40-foot containers (approx. 300 tons) at the Vistula wharf in Chełmno began on April 8, at 10:00 am.

Containers containing components for TZMO company production were reloaded onto trucks, and then the goods were delivered to the company's warehouses in factories in Brodnica and Kowalewo Pomorskie. At the same time, six export containers, with materials produced by kujawsko-pomorskie companies (medical, furniture and food industries), were loaded into the barge, which at 1:00 pm set off back towards Gdańsk.

A mobile crane, in the 250-ton class, took part in the operation.

Photo no 6: Unloading of a barge at the Vistula wharf in Chełmno.

The next day, April 9, the containers with the goods reached the Port of Gdańsk and were diverted to sea vessels bound to Israel and the United States.

Photo no 7: River set on the Vistula in Grudziądz.

4 WATER TRANSPORT IN THE SUPPLY CHAIN

On behalf of the Marshal's Office of the Kujawsko-Pomorskie Region, VAN cargo S.A. was selected as the operator of the cruise. The operator's task was to organize two pilot cargo cruises on the International Waterway E40 and E70, from the seaports of Gdynia/Gdańsk to Chełmno and back. The cruises were to be carried out with the use of inland transport within a real port-consignee (receiver)/shipper-port chain. The company was responsible for:

- identification of wharves for loading and unloading (seaports, the Vistula River) and access roads,
- securing a river set (pusher + barge) with a crew, organization of reloading (seaport, Chełmno wharf),
- obtaining and accepting forwarding orders for cargo container,
- water transport of total volume of 24 TEU (6x40'HC + 6x40'HC),
- organization of last and first mile road deliveries Chełmno-consignee(receiver)/shipper-Chełmno
- organization and securing of the formal side of the undertaking (Gdańsk Harbour Master's Office, Polish Waters).

The main objective of the project was to analyze the possibility of commercial use of inland waterway transport for container cargo handling and to identify the necessary boundary conditions.

Photo no 8: Infrastructure of Szczecińskie Quay in the Port of Gdańsk.

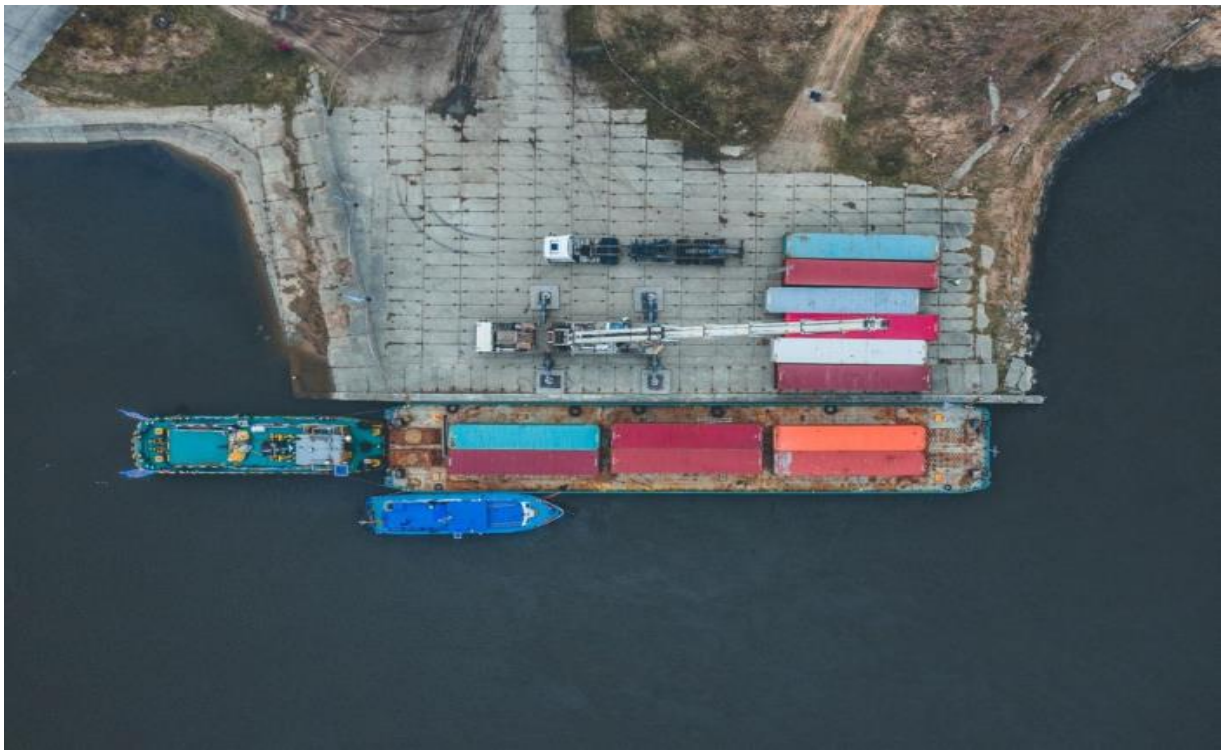


Photo no 9: Infrastructure of the Vistula riverfront in Chełmno.

Detailed schedule of the cruise:

02.04.2021	
	Cargo relocation Gdynia GCT-Gdańsk Szczecińskie Quay
06.04.2021	
11:00 AM	Start of loading the 6x40'HC on barge
12:45 PM	completion of loading and securing of containers
1:00 PM	start of the cruise to Chełmno
3:30 PM	passing the Przegalina Lock
7:00 PM	overnight stop in Tczew
07.04.2021	
6:00 AM	resumption of the cruise
5:00 PM	docking in Chełmno wharf
	Loading of export containers 6x40'HC and access to Chełmno
08.04.2021	
7:00 AM	commencement of works at the wharf in Chełmno - setting up the crane
8:30-9:15 AM	unloading of containers from truck to yard
10:00 AM	commencement of unloading and loading of the barge in relation barge - truck and yard - barge
11:45 AM	completion of the barge loading
1:00 PM	completion of works at the wharf - crane departure
1:15 PM	start of the cruise to Gdańsk
9:00 PM	overnight stop in Przegalina

1:00 PM-4:00 AM	unloading of import containers
09.04.2021	
7:00 AM	passing the Przegalina Lock
9:00 AM	arrival at the Szczecińskie Quay in the Port of Gdańsk and starting the unloading
9:30 AM	completion of landing
	relocation of containers to relevant terminals

Time:

- cruise time**:** upstream 15 hours, downstream 9 hours
- barge service time (including stevedoring work): about 2 hours

Volume:

- transported volume: 150 tons / 12 TEU + 70 tons / 12 TEU
- barge load capacity: 320 tons / 36 TEU,
- possible set: pusher + 4 barges (1280 tons / 144TEU) - according to current water conditions.

Interest of customers and partners:

- great interest in the potential of the solution among shipowners,
- interest among clients operating in the Kujawsko-Pomorskie Region,
- numerous requests to the operator for a meeting to summarize the project and the possibility of cooperation (container, conventional, bulk cargo),
- very good feedback from the TSL and maritime industry on national and international level.

At this point it is worth mentioning that there was no need to convince companies to participate in the cruise. The key argument was the eco-friendliness of this solution and an innovative method of transportation in the local market.

The companies indicated that they want to use various modes of transport, thanks to which they will be able to optimize both economic aspects and have a positive impact on the environment. What is more, they also pointed out to the fact that more and more often companies include in their business strategies constant search for solutions, which will allow for even greater cost optimization and reduction of negative impact on the environment.

The TZMO company also noted a positive aspect of reducing congestion. Their factories monthly consume 200 containers of all products, raw materials, materials and goods that arrive monthly at their branches. Therefore, the use of inland water transport will relieve the roads of such a number of trucks, which can certainly affect the use not only on the environment but also on other road users. They also indicated that if water transportation was occurring regularly they would certainly use this method of transportation on a permanent basis.

Problems and difficulties:

- the need to mobilize the crane - the time of preparation and disassembly is twice longer than the time of reloading,
- necessity to relocate road container transport means,
- lack of shipping capacity at night,
- opposition of environmental organizations to the development of waterways on the Vistula (picketing of environmentalists in Chełmno concerning plans of building a new barrage in Siarzewo).

Overcoming the problems:

The above problems and difficulties did not constitute a major obstacle to the implementation of the task. They only indicate what should be ensured and how the tasks should be carried out in order to avoid such problems in the future. The most important thing to take care of is the development of reloading and port infrastructure, apart from the obvious matter which is also restoring the proper technical condition of the river and ensuring its proper depth.

Regarding night sailing, we can inform that it is not a significant problem. It only lengthens the entire operation, what was taken into account. According to the latest news, Polish Waterways are planning to launch night navigation on some sections of the Vistula River, among others in the vicinity of Toruń. This gives hope for a possible improvement of inland water transport on the Vistula.

The issue concerning the picketing of ecologists did not pose any problem in the implementation of the task. A dialogue was undertaken with them and various issues were discussed. It is worth mentioning that the ecologists were not against transport, they picketed against the construction of the water barrage in Siarzewo.

Operator recommendations

Infrastructure and access:

- Seaports: loading and unloading should take place directly at the main container terminals of the Tri-City ports, i.e. DCT Gdańsk, BCT and GCT Gdynia. There is a need to build a permanent, regular schedule of arrivals to port to obtain a guarantee of timely service at the quay, the GCT terminal at the Szczecińskie Quay in Gdańsk should be secured as an emergency terminal if the barge cannot pass through the Bay of Gdańsk (weather conditions).
- Vistula wharf in Chełmno: the length of the wharf should be adjusted to the maximum dimensions of the possible inland set. As well as the height of the wharf should be secured, because it is flooded in high water levels and it does not guarantee the safe mooring of the river set. The area for reloading goods should be fenced, lighted, protected and monitored. In addition, the distance from residential buildings should be kept - the noise during night reloading. Also direct access to the railway infrastructure is recommended.

Transshipment equipment:

A permanent self-propelled port crane should be provided - which will eliminate the need to mobilize and set up the crane every time as well as it will enable the versatility of transshipment (containers, bulk cargo, conventional cargo). A reachstacker should be provided as a supplement.

Waterway:

In the long-term policy, the navigability of the Vistula should be upgraded to class IV (international waterways). In the short-term policy, consultations with the vessel operators and Regional Water Management Board (RWMB) should be carried out on the effectiveness of deepening and regular maintenance of the waterway to ensure the minimum required parameters for the sustainability of inland navigation.

Inland transport vessels:

The barges should be adapted to the transport of container - for this purpose, it would be necessary to install on-board "twist locks" and equip with "twist locks" for stacking and connecting containers - minimizing the scope of stevedoring work. In addition, the modernization of drive systems should be analyzed in terms of reducing the combustion / emissivity of vessels, as well as investment support for inland shipping owners (volume, bank guarantees, co-financing).

Terminal cargo handling:

It is necessary to improve the organization of the local base of container transporters without the need to mobilize and travel to the transshipment terminal, and to create an effective storage and warehouse base with the possibility of consolidating and completing cargo (containers, bulk cargo, conventional cargo). The described terminal should enable the use of simplified customs procedures and be available 24 hours a day, 7 days a week.

5 TECHNICAL PARAMETERS AND POTENTIAL OF TRANSPORT

River set:

- shipowner - Żegluga Wiślana Rafał Błocki - crew consisting of the captain of inland navigation - Rafał Błocki (an experienced captain with several years of experience in inland navigation, repeatedly sailing the Vistula from the estuary to Zawichost), and a helmsman with several years of experience in inland navigation
- equipment:
  - pusher TUR-W-01:
    - dimensions: length - 20.86 m, width - 5.96 m, maximum draft - 0.90 m, engine power - 294 kW. Fuel consumption 40-70 l / h depending on the speed on which it is sailing, fuel consumption in neutral 40 l / h.
  - the crew with the set used and at the indicated working time:
    - 2 people Galar II barge - dimensions: length - 49.90 m, width - 9.03 m, load capacity - 370 t, maximum draft 115 cm, maximum number of containers - 42 TEU (18 40 'containers and 6 20' containers).

During the cruise at the distance of 308 km (route Gdańsk-Chełmno-Gdańsk - 296 km, route base-Szczecinskie Quay-base - 12 km) a total of 1,120 l of fuel was used, including 850 l upstream with use of generator and 270 l downstream with use of generator (the combustion of the aggregate during the entire cruise was 320 l).

Assuming that each container weighs 24 tons, we can take 15.5 of them per one barge. With two Galar type barges, it is already 30 containers with a total weight of 720 tons and with the same fuel input.

Wharf infrastructure:

Port of Gdańsk - Szczecin Quay, ul. Wiślna, Gdańsk.

The terminal is located in the close vicinity of the tunnel under the Martwa Wisła, 4 km from DCT Gdańsk. Its location allows for a collision-free departure, thus increasing the operational capabilities of the terminal. The quay is adapted to handle ships with a load capacity of up to 35,000 DWT and container units up to 3,000 TEU. It is possible to service ships in lo-lo and ro-ro systems. The services are provided by Port Gdański Eksploatacja SA.

Technical data:

- ship length - up to 225 m,
- quay operational length - 365 m,
- maximum draft - 10.20 m,
- storage yards - 79,570 m², up to 4,000 TEU
- quayside crane (STS) - 40 tons,
- self-propelled quay crane - 100 tons,
- quay cranes - 40 tons,
- yard gantries - 32/40 tons,
- straddle carriers - 40 tons,
- reach-stackers - 10 tons,
- 95 stands for refrigerated containers,
- two railway tracks, 330 meters each,
- transshipment capacity - 100,000 TEU per year,
- truck scale,
- radiometric gates.

Chełmno - wharf on 806 km of the Vistula, 63 m long, at the disposal of State Water Management Company Polish Waters, Regional Water Management Board Gdańsk, the Management of the river basin area in Toruń. The wharf is in a good technical condition, with a short loading front, with the necessity to mobilize lifting devices (250 tons crane, access from Toruń). Good access to DK91, close proximity to S5 and A1, no access to the railway line. The necessity to direct traffic at the exit from the quay at the intersection of Powiśle and Nad Groblą streets in Chełmno. Unprotected, unlit area, no monitoring, no possibility of safe storage of containers.

Transport possibilities (barge):

According to the registration document of the Tur-W pusher, it can push barges with a total capacity of 2,000 tons, the amount of fuel consumed on the Gdańsk-Chełmno section would be approx. 800 l (40 l / h). In the opposite direction, for the same load, fuel consumption would be about 200 l. The given river set requires 2-3 crew members to handle the transport in both directions. The time of cargo transportation: upstream 14-15 hours, downstream 8 hours. Water transport, like rail transport, requires additional reloading in order to direct it to the end recipient.

Similarly, a load of 2000 t would have to be transported from Gdańsk to Chełmno by about 72 full-load trucks, which gives almost 3000 l of fuel (average fuel consumption of a truck 35 l per 100 km). Additionally, it should be taken into account that in the opposite direction it would be necessary to consume another 3000 l of fuel. To transport the above-mentioned cargo, it is necessary to employ over 140 drivers. The time of cargo transport is much faster, targeted directly to the end recipient and does not require additional reloading operations.

Fuel consumption on the Gdańsk-Chełmno-Gdańsk route for 2,000 tons cargo:
- ship/barge - 800-1.000 l
- trucks - over 5.000 – 6.000 l

Combustion with a load of e.g. 500, 1000 or 2000 tons will remain practically the same. The time for locking 4 barges may only be slightly longer.

However, with the 4th class of the waterway, there can be use a larger pusher and larger barges, which would increase transport possibilities, especially since the infrastructure is supposed to be at least a class higher.

Parameters of vessels that can operate on individual waterways:

Waterways	Individual vessels		Towed convoy			Pushed convoy	
	length in meters	width in meters	lenght in meters	width in meters	Convoy in meters	lenght in meters	width in meters
The Vistula River from km 813.5 to the mouth of the Zatoka Gdańska, downstream	without limitations	without limitations	300	25	towed barge to 3 in convoy	125	25
The Vistula River from km 813.5 to the mouth the Zatoka Gdańska, upstream	without limitations	without limitations	600	20	towed barge to 2 in convoy	150	25
The Martwa Wisła River	110	11,40	200	11,40		150	11,40
The Szkarpawa River Barges loaded Barges empty	61	11,40	 200 200	 11,40 11,40		 118 118	 11,40 11,40
The Nogat River	56,60	9,50	200	9,50		118	9,50
The Jagielloński Canal	61	9,50	86	9,50		86	9,50
The Elbląg Canal (ramps - transport carts)	27						

According to the shipowner, after the construction of the water barrages, it would be possible to use sets with the following parameters: setting up a barge (you should add a pusher length of about 25 m):

L	B	T	[1]	Payload	
80	11,4	2,8	0,75	1915,2	tons
				7660,8	tons with 4 barges
				24	container weight
				319,2	number of containers
80	11,4	2,5	0,75	1710	tons
				6840	tons with 4 barges
				24	container weight
				285	number of containers

Advantages for the customer to use inland waterway transport:

- for some regions it is innovative way of transportation;
- ecological benefits:
  - lower CO2 emissions;
  - lower noise costs - practically zero;
- more economical:
  - a standard river set transports as much goods as 84 trucks;
  - with the same energy input we transport 100 km by truck and 370 km by barge;
  - one barge a day from the port of Gdansk means 15 thousand less trucks on the road each year;
  - one PLN invested in inland waterways means PLN 4-6 profit;
- road safety
  - accident costs in inland waterway transport are the lowest.

6 ECONOMIC ASPECTS OF INLAND WATERWAY TRANSPORT SERVICES

As it has already been mentioned. During the upstream cruise up the river, on the Gdańsk-Chełmno section, the river set consisting of the Tur pusher and the Galar 2 barge, with a load of 6 40-foot containers (150 tons of cargo), used 850 liters of fuel (including generator operation). On the way back, with a similar load, the consumption was 270 liters of fuel. It should be noted that the transport time was extended by several hours due to promotional activities. The real time of arrival of the barge from the Port of Gdansk to Chełmno is 15 hours, while the return cruise is only 8 hours.

According to the registration document, the Tur W-01 pusher can push barges with a total capacity of up to 2,000 tons. The amount of fuel used with a larger load and the number of barges pushed does not

[1] Block coefficient of the hull (each ship has a different one, but for preliminary calculation 0.75 is used) at GALAR is L-50 x B-9 x Tmax 1.15 x 0.72 = 372.6 tons rounded

change significantly. The amount of fuel consumed on the Gdańsk-Chełmno section would be approx. 800 l (40 l / h). In the opposite direction, for the same load, fuel consumption would be about 200 l.

In turn, when transporting the same load on the same section with 72 trucks, 3000 l of fuel would be used one way (average fuel consumption of a truck 35 l per 100 km). In the opposite direction, another 3,000 liters of fuel would be required. To transport the above-mentioned cargo, it is necessary to employ over 140 drivers. The time of cargo transport is much faster, directed directly to the final recipient and does not require additional reloading operations.

Summing up the fuel consumption on the Gdańsk-Chełmno-Gdańsk route for a cargo of 2,000 tons:

- ship - 800-1000 l
- trucks - over 6,000 l

What is more as part of the elaborated document “The Concept of the Last Mile for the Bydgoszcz logistics hub“ implemented under the COMBINE project, among others, analyses of the costs of cargo transport by modes of transport were prepared. According to these analyses, the lowest unit costs of combined transport between the seaports of Gdansk and Gdynia and the Bydgoszcz-Solec Kujawski Multimodal Platform, and further to the end-customers is shown in the configuration using inland waterway transport. With respect to the other configurations (i.e. rail-road, road-road) the unit costs using inland transport are on average lower by 15-20 PLN per ton. Certainly, the significant capacity of means of water transport, low costs and ecological advantages of this mode of transport make inland navigation competitive in relation to other modes of transport.

In addition, apart from lower transport costs, we can point to other economic benefits resulting from the use of water transport and river management:

- positive impact on seaports
- development of water tourism
- regional development
- reduction of flood losses
- energy effects
- an increase in agricultural yields as a result of regulating water relations

It is also worth noting that economic aspects are one of the elements of sustainable river management.

7 SHIPPING LANE AND NAVIGATION

The competitiveness of inland waterway transport and the legitimacy of its full use depends on the technical conditions of the waterways. In order to launch regular navigation on the Vistula River between seaports and the Bydgoszcz Logistics Hub (also during periods of low water levels), first of all it is necessary to maintain the parameters of the waterway specified in the Regulation of the Council of Ministers of May 7, 2002 on the classification of inland waterways. In addition, the regulatory facilities on the lower section of the Vistula River (groynes) should be rebuilt and "bottlenecks", i.e. places problematic for navigation (rapids, shoals), should be removed. It should also be remembered to provide full marking of the trail by setting up shore and floating signs, placing radar navigation and signs informing about clearances under bridges (inverted patch), as well as adaptation of the waterway for

night navigation. Creating appropriate conditions for navigation will allow for full use and adaptation of the inland waterway fleet to the class of the waterway, which will directly translate into the size and tonnage of vessels. In parallel to the technical works, a wide promotional and educational campaign should be launched. The promotion should target the general public and aim at disseminating knowledge about inland waterway transport and inland navigation.

In order to restore transport navigation on the lower Vistula in the shortest possible time, the first priority is to:

1. Rebuild - reconstruct the coastal infrastructure on the river sections influencing the maintenance of the transit depth.
2. Remove narrow, difficult and cumbersome passages for ships/barrages.
3. Mark the navigable route with shore and floating signs and with the use of radar.
4. Adapt the waterway to navigation at night.
5. Indicate clearances under bridges.
6. Use such river formations to obtain the best economic results and to maintain the safety of navigation.
7. Start educating the public on water management, geography of waterways, the benefits of inland navigation and water tourism, as well as the cascading of the Vistula River.

Ad.1. Increasing the depth of the riverbed is achieved by adjusting it, i.e. creating a cross-section appropriate for a given class of waterway, thus obtaining depths and widths sufficient for navigation. The fairway on the lower Vistula should be min. 30 m wide and 1.8 m deep in transit, guaranteed for 270 days a year. In order to obtain these navigation parameters, in the first place, it is necessary to rebuild the coastal infrastructure, i.e. longitudinal dams and transverse dams (groynes) in these places of the river, the shoreline, which have an impact on the concentration and direction of the flow. Obviously, in a situation of a hydrological low, it will be impossible to obtain these parameters anyway. The only solution is the cascading of the Vistula.

Ad.2. Due to the continuous interaction of water on the shoreline and its blurring, lateral erosion occurs, which results in the accumulation of moving material (sand, gravel) on the fairway - the navigable route. As a result, shoals are created. These navigational hard spots occur at each shore-to-shore transition, i.e. every 900 meters on average, the navigable route goes from one bank to the other. During the cruise, troublesome places and shoals and rapids occurred on the following kilometer of the Vistula River:

- 851 km - above the town of Nowe - grinding, depth - 1 m;
- 844.1 km – Góry Łosiowe - depth - 1.63 m;
- 839 km - Parski - depth - 1.72 m;
- 832 km - Grudziądz - depth - 1.73 m;
- 820 km - Wąskie Piaski - depth - 1.72 m;
- 815 km - Wiąg pod Górami - depth - 1.76 m;
- 811 km - Świecie - depth - 1.64 m.

It is proposed, while supporting the activities of companies extracting aggregate from the Vistula riverbed, to direct the mining works in such a way as to improve and maintain the transit depths at the above-mentioned places and other newly created ones. Of course, there is also a requirement that the regulatory infrastructure be fulfilling its purpose.

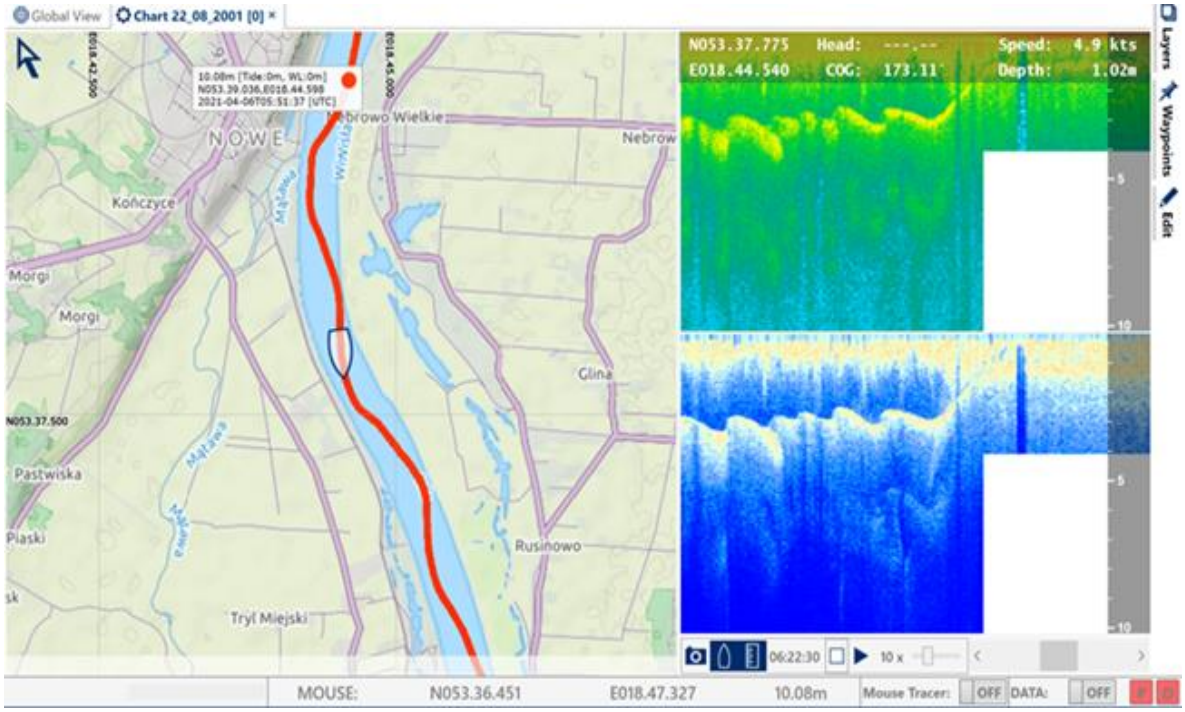


Figure no 1: Grinding at 851 km of the Vistula River - depth of 1.02 m.

A difficult and cumbersome place for navigation, especially for pushed sets, is also the passage between the pillar of the bridge that no longer exists and the shoreline in Opalenie at km 863.75. The navigational situation is a problem for long pushed and towed sets going downstream and upstream. The navigable route passes once on the left bank and once on the right bank of the Vistula (photo no 10), now on the left bank. Pillars are not marked. The ship should be directed to the bank marks in advance to safely enter this passage. There are dangers on both sides of the ship, sand deposited on the starboard side and regulatory structures on the port side. It is proposed to dismantle these external pillars of the bridge to the bottom level, which will contribute to the widening of the navigable route and increasing the safety of navigation.

Photo no 10: Remains of bridge pillars in Opaleniu at 863.75 km of the Vistula River.

Ad. 3. With reference to European waterway marking standards, in order to increase the safety of barges, it is proposed to introduce marking of the floating navigable route and marking of dangerous places and navigation obstacles on the left and right banks of the Vistula river and to introduce additional marking for navigation by means of radar.

Ad.4. In order to develop inland navigation and water tourism, it is proposed to gradually adapt the navigational markings to night navigation. Marking on the section of the Vistula that is part of the Żuławy loop, i.e. from Biała Góra to the Przegalina Lock, would be particularly important. The users of this section of the waterway, depending on the season, are both transport ships that can operate in the A1 (14H) or A2 (18H) system, as well as water tourists.

Ad. 5. A good practice on waterways where there are large differences in water levels, e.g. in the Netherlands and Belgium, is to mark the clearances under bridges with inverted water level gauges. With this solution, the zero of the water level gauge is at the height of the lowest span of the bridge structure, while the water surface indicates the size of the clearance. Due to frequent drops in the water level on the Vistula River, it is proposed to introduce this solution.

Ad. 6. In the present shipping conditions on the lower Vistula, the best economically and safe solution for the transport system is the configuration of a pushed-towed set. Such a set consists of a tugboat with barges towing behind it and a pusher following behind. It is also possible to have a tugboat configuration with barges joined by their sides and a pusher behind them. The towed sets are more maneuverable and perform better in difficult, tricky spots because the tug "pumps water" under the pushed barges. The pushed and towed convoy also provides and enables safe navigation in strong crosswinds (a barge loaded with e.g.: two layers of containers provides a large wind field and acts as a sail, which pushes the vessel off the track). It is good shipping practice that upstream in a tug-barge-pusher formation vessels follow each other in single formation. Downstream, on the other hand, they follow each other in a side-by-side formation, i.e. tugboat-barge-barge-pusher. On the other hand, self-propelled barges, motor barges with a bow thruster system, may have problems on the Vistula due to the small draft at low water and ineffective rudder stream.

Ad.7. The society should be educated in the field of broadly understood water management and the benefits of using inland waterways. Elements of water management and the geography of Polish and European waterways should be introduced into school curricula. At the same time, a promotional campaign should be conducted to disseminate knowledge in water management and inland waterway transport.

8 PROMOTIONAL CAMPAIGN AND PUBLIC AWARENESS

Promotional campaign

The promotional slogan of the container cruise, which perfectly captured the essence of the entire event, was Wisła Cargo 2021. For the purposes of the campaign, a logo was also developed, which was consistent with the slogan and was published in the media and on all promotional materials.

Figure no 2: Logo of cruise Wisła Cargo 2021.

The container cruise promotional campaign was mainly based on the banner campaign and the campaign on social media. The main media used for the promotion was the website of the Kujawsko-Pomorskie Forum Wodne on Facebook and the website wislacargo.kujawsko-pomorskie.pl. Both pages were used to post all information and news from the course of the cruise. After the event, the website will also be used to promote inland navigation and to present the benefits and advantages of managing waterways.

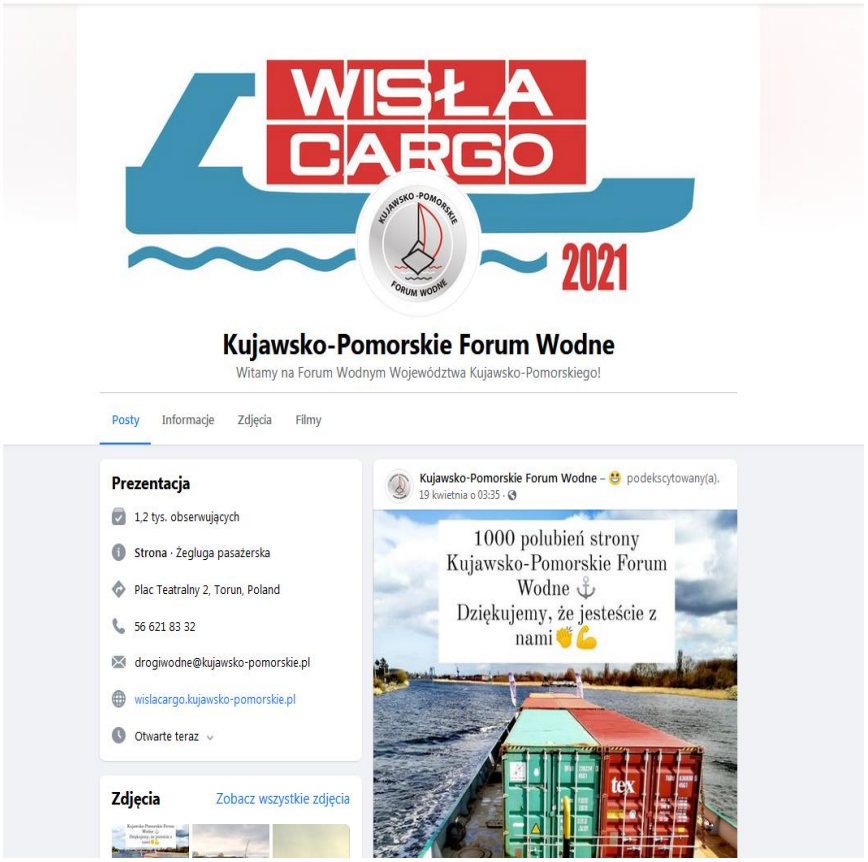


Figure no 3: Profile of Kujawsko-Pomorskiego Forum Wodne on the Facebook.

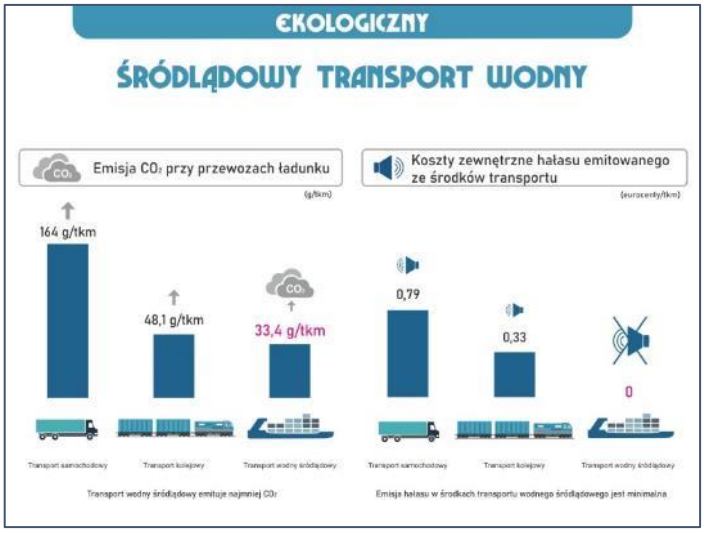
Figure no 4: Website: wislacargo.kujawsko-pomorskie.pl.

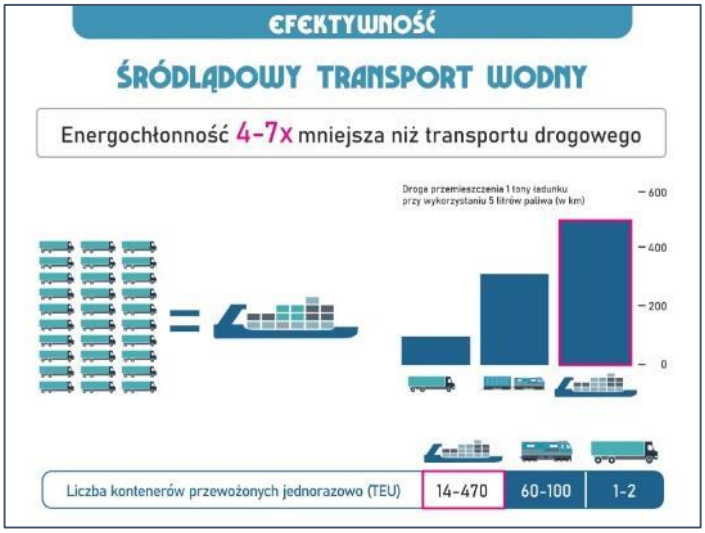
Along with the promotion of the cruise, there were also published posts showing the benefits of developing inland waterways and the advantages of water transport. To make the published messages more attractive, infographics have been developed, thanks to which the shared content was transparent and understandable to the general public. Information graphics presented, such data as:

• environmental friendliness, efficiency and safety of inland water transport;

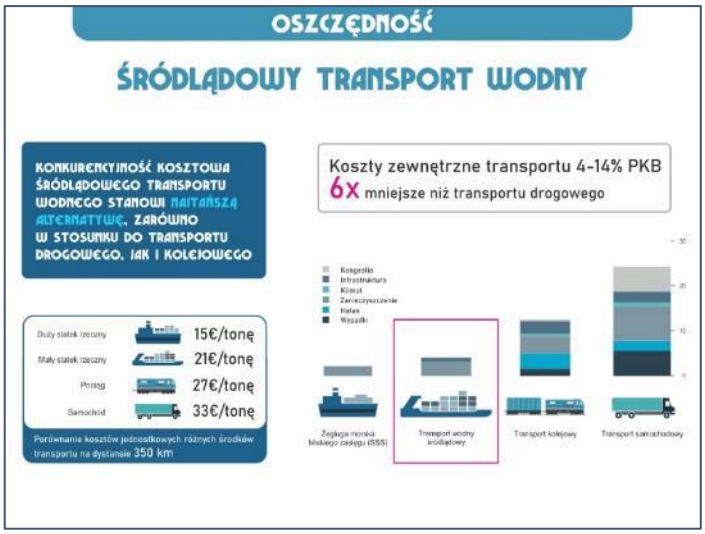
• socio-economic benefits of developing inland waterways.

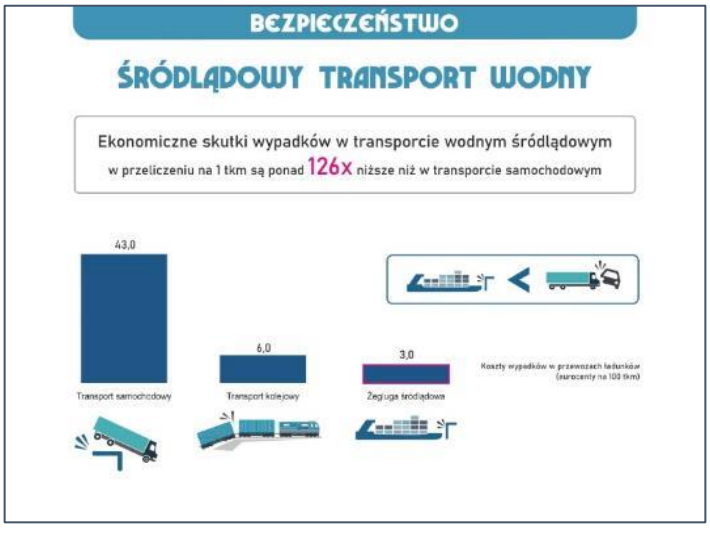
The problem of road congestion, the solution of which would be the use of inland water transport, was also outlined.


EKOLOGICZNY
ŚRÓDLĄDOWY TRANSPORT WODNY
Emisja CO₂ przy przewozach ładunku
(g/tkm)
Koszty zewnętrzne hałasu emitowanego ze środków transportu
(eurocenty/tkm)
164 g/tkm
48,1 g/tkm
33,4 g/tkm
0,79
0,33
0
Transport samochodowy
Transport kolejowy
Transport wodny śródlądowy
Transport wodny śródlądowy emituje najmniej CO₂
Emisja hałasu w środkach transportu wodnego śródlądowego jest minimalna


EFEKTYWNOŚĆ
ŚRÓDLĄDOWY TRANSPORT WODNY
Energochłonność 4-7x mniejsza niż transportu drogowego
Droga przemieszczenia 1 tony ładunku przy wykorzystaniu 5 litrów paliwa (w km)
600
400
200
0
Liczba kontenerów przewożonych jednorazowo (TEU)
14-470
60-100
1-2


KONGESTIA
ŚRÓDLĄDOWY TRANSPORT WODNY
INNE ŚRODKI TRANSPORTU
TRANSPORT WODNY W PORÓWNANIU DO INNYCH ŚRODKÓW TRANSPORTU NIE JEST ZAGROŻONY KONGESTIĄ, A DROGI WODNE MAJĄ DUŻĄ PRZEPUSTOWOŚĆ
- Załtoczone drogi
- Wypadki
- Wysokie koszty
- Hałas
- Duża emisja CO₂
- Duża przepustowość
- Minimalna emisja CO₂
- Brak hałasu


OSZCZĘDNOŚĆ
ŚRÓDLĄDOWY TRANSPORT WODNY
KONKURENCYJNOŚĆ KOSZTOWA ŚRÓDLĄDOWEGO TRANSPORTU WODNEGO STANOWI NAJTAŃSZĄ ALTERNATYWĘ, ZARÓWNO W STOSUNKU DO TRANSPORTU DROGOWEGO, JAK I KOLEJOWEGO
Koszty zewnętrzne transportu 4-14% PKB
6x mniejsze niż transportu drogowego
Duży statek rzeczny 15€/tonę
Mały statek rzeczny 21€/tonę
Pociąg 27€/tonę
Samochód 33€/tonę
Porównanie kosztów jednostkowych różnych środków transportu na dystansie 350 km
Transport wodny śródlądowy
Transport kolejowy
Transport samochodowy


BEZPIECZEŃSTWO
ŚRÓDLĄDOWY TRANSPORT WODNY
Ekonomiczne skutki wypadków w transporcie wodnym śródlądowym w przeliczeniu na 1 tkm są ponad 126x niższe niż w transporcie samochodowym
43,0
6,0
3,0
Transport samochodowy
Transport kolejowy
Żegluga śródlądowa
Koszty wypadków w przewozach ładunków (eurocenty na 100 tkm)

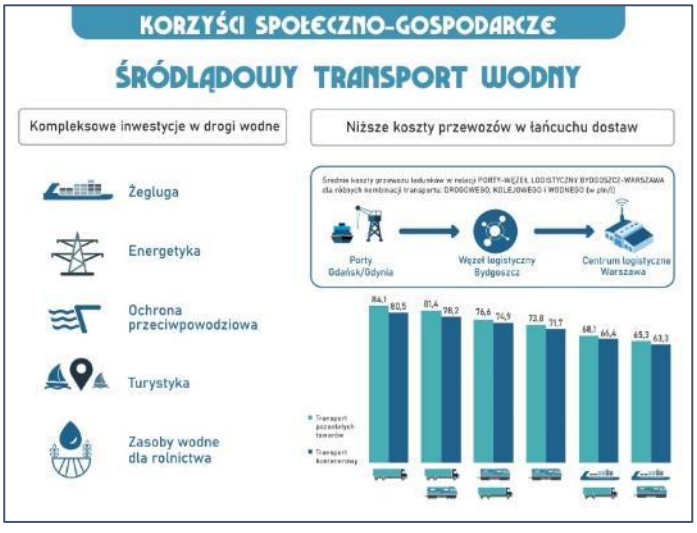

KORZYŚCI SPOŁECZNO-GOSPODARCZE
ŚRÓDLĄDOWY TRANSPORT WODNY
Kompleksowe inwestycje w drogi wodne
Niższe koszty przewozów w łańcuchu dostaw
Żegluga
Energetyka
Ochrona przeciwpowodziowa
Turystyka
Zasoby wodne dla rolnictwa
Porty Gdańsk/Gdynia
Węzeł logistyczny Bydgoszcz
Centrum logistyczne Warszawa
84,1
80,5
81,4
78,2
76,6
74,9
73,8
71,7
68,1
65,4
65,3
63,3

Figure no 5: Infographics outlining the benefits of inland waterway transportation.

The conducted information and promotion campaign undoubtedly brought a positive result. The promotional activities carried out were definitely effective because the information about the organization of the container cruise was widely covered in the media. About 200 posts, articles and film materials about the cruise were published on the Internet. In turn, a number of articles appeared in the local and regional press.

The media interest in inland water transport turned out to be very high. An example of this are programs and interviews realized after the cruise. The subject of the Samorządni program of April 12, 2021 (TVP Bydgoszcz, https://bydgoszcz.tvp.pl/7084935/samorzadni) was a pilot container cruise on the lower Vistula, and the Eco-option program of April 17, 2021 (TVP Bydgoszcz, https://bydgoszcz.tvp.pl/1863247/ekoopcja) issues of inland shipping as the most environmentally friendly transport. In addition to preliminary conclusions and reports from the conducted cruise, the discussions focused on the economic potential of the Vistula River, plans to build a barrage in Siarzewo and the Bydgoszcz Logistics Hub (Bydgoszcz-Solec Kujawski Multimodal Platform and Bydgoszcz Emilianowo Intermodal Terminal).

In addition, information about the cruise is to be presented at the June meeting of the United Nations Economic Commission for Europe.

wprost

WPROST.pl

Trasa Gdańsk-Chełmno i z powrotem. Pilotażowy rejs Wisłą, barka już płynie

6 kwietnia z portu w Gdańsku wypłynęła barka, która ma dotrzeć Wisłą do Chełmna. To pilotażowy program, który ma promować śródlądowy transport wodny.

BUSINESS INSIDER

Pierwszy taki transport w historii. Kontenery płyną barką po Wiśle [ZOBACZ WIDEO]

Business Insider Polska

Sześć kontenerów płynie barką z gdańskiego portu w górę Wisły. 150 ton materiałów dla toruńskiego zakładu produkcyjnego trafi na miejsce po niespełna dwóch dniach. Następnie barka zostanie ponownie załadowana – tym razem gotowymi wyrobami – i wróci do Gdańska. Stamtąd towary popłyną w świat.

Sześć kontenerów z portu w Gdańsku trafi Wisłą do Chełmna.

Strefa Biznesu

Wiadomości Komunikaty Pieniądze Firma Więcej

Wisłą płyną kontenery. Tony towarów trafią do kujawsko-pomorskiej firmy [zdjęcia]

Ewelina Sikorska · 6 kwietnia

Ruszyły kontenery, które nie wrócą puste. 150 ton ładunku popłynie bowiem z Chełmna do Gdańska powrotnym rejsem. Będą to gotowe produkty wysyłane z Polski w świat. Andrzej Goinski/UMWKP

.PL NEWS POLSAT

Polska Świat Biznes Technologie Sport Kultura Wideo Tygodnik

Pierwszy komercyjny rejs z kontenerami na Wiśle. Sprawdzą opłacalność transportu rzecznego

06.04.2021, 12:54 Biznes

Barka miała zabrać z Gdańska sześć 40-stopowych kontenerów.

BIZNES NAJNOWSZE PIT 2021 WOJEWÓDZTWA Z KRAJU ZE ŚWIATA PIENIĄDZE TVN24 GO NIERUCHOMOŚCI RYNKI DLA FIRM

"150 ton ładunku 150 kilometrów w górę rzeki". Pierwszy taki rejs Wisłą

Woj. kujawsko-pomorskie organizuje pierwszy w historii transport komercyjny z wykorzystaniem drogi wodnej

FAKTY PO POŁUDNIU

WIĘCEJ: tvn24.pl E-MAIL: kontakt24@tvn.pl

Figure no 6: Headlines of articles posted online (selected).

Figure no 7. Shots from the program Samorządni (TVP Bydgoszcz)

9 COOPERATION AND EVENT PARTNERS

The container cruise was under the honorary patronage of the Ministry of Infrastructure and the patronage of the Polish Water Management Authority and the Senator of the Republic of Poland - Mr. Jerzy Wcisła. The partners of the event were the Association of Polish Regions of the Baltic-Adriatic Transport Corridor, the Inter-voivodeship Team of the International Waterway E70 and the Port of Gdansk Authority. Moreover, the entire project was also supported by the University of Gdańsk, Kazimierz Wielki University in Bydgoszcz and TZMO SA. It should also be mentioned that the cruise would not be possible without the owner of the river set, i.e. Captain Rafał Błocki and his crew (Żegluga Wiślana Rafał Błocki) and the operator - VAN Cargo SA based in Warsaw.

10 CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

- The launch of regular inland shipping on the lower Vistula River would be a real boost to the economic potential of the Kujawsko-Pomorskie Region - mainly in the context of the planned construction of the Bydgoszcz Logistics Hub.
- Inland water transport is the cheapest, most efficient and environmentally friendly branch of transport, which according to EU regulations and guidelines should be developed to complement the country's transport system.
- In the short-term policy, consultations should be held with vessel operators and the Regional Water Management Board regarding the effectiveness of dredging and regular maintenance of the waterway to maintain the minimum required parameters for the sustainability of inland navigation. The regulatory buildings on the lower section of the Vistula (groyes) should be rebuilt and "bottlenecks", i.e. places which are troublesome for navigation (rapids, shoals) should be removed.
- Once the technical conditions of the trail are ensured, it should be fully marked by setting up shore and floating signs, introducing radar navigation, introducing signs informing about clearances under bridges, as well as adapting the waterway for night navigation.
- Future loading and unloading should take place directly at the main container terminals of the Tricity Ports, i.e.: DCT Gdansk, BCT and GCT Gdynia.
- In order to ensure regular transshipment at the wharves in the Kujawsko-Pomorskie Region, adequate wharf length and height must be provided to guarantee the safety of mooring the river sets.
- In addition, a permanent self-propelled port crane should be provided - which will affect the lack of need to mobilize and set up a crane and the versatility of handling (containers, bulk cargo, conventional cargo). A reachstacker truck should be provided as a supplement.
- It is necessary to improve the organization of local facilities of container transporters without the need to mobilize and commute to the transshipment terminal and to create an effective storage and warehousing facility with the possibility of consolidation and picking of cargo (containers, bulk cargo, conventional cargo).
- Media interest in the topic of inland waterway transport has been very high. Promotion and information activities on the benefits of economic use of rivers should be continued with the involvement of competent institutions and authorities.

Next steps:

- Sending the report to the authorities responsible for transport infrastructure and water management, i.e., the Ministry of Infrastructure and the State Water Management Authority Polish Waters, in order to include the results in the Programme for the Vistula River.
- Disseminate the report to all parties interested in the economic use of the potential of Polish rivers and lobby for an increased share of inland shipping in the national transport system (companies from the region, logistics operators, forwarders, seaports in Gdansk and Gdynia, etc.).

- Lobbying for the construction in the Kujawsko-Pomorskie Region of a modern logistics center capable of handling inland shipping - the Bydgoszcz Logistics Hub.
- Establishing a Council of Stakeholders interested in the establishment of the Bydgoszcz Logistics Hub
- Establishing a Project Team responsible for the construction of the Bydgoszcz Logistics Hub - and ultimately a special purpose vehicle with a majority share of the Voivodeship, with the participation of other self-governments interested in the establishment of the hub.