Analysis and Assessment of Transport Potential of E70 Waterway

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E70 waterway connecting Rotterdam with Kaliningrad is one of the longest navigation routes between east and west covered by the AGN agreement. Unfortunately, its Polish segment is virtually innavigable. The article presents characteristics and assesses transport availability of E70 waterway as well as attempts to estimate its transport potential.

Keywords: E70 Waterway, transport availability, transport potential

1. CHARACTERISTICS OF E70 WATERWAY

An agreement named "European Agreement on Main Inland Waterways of International Importance (AGN)" was adopted in Geneva in 1996. Within this agreement, three international waterways have been led through the territory of Poland:

- E-30 – linking the Baltic sea with the Danube
- E-40 – connection of the Baltic Sea to the Dnieper River, through the Vistula River from Gdańsk to Warsaw and the Bug River to Brest
- E-70 – linking the Netherlands with Russia and Latvia through the Oder River from the Oder- Havel Canal to the mouth of the Warta River, waterway Oder- Vistula and the Vistula and Nogat or Szkarpawa Rivers to Elbląg.

E70 Waterway Rotterdam–Berlin–Kostrzyn–Bydgoszcz–Vistula Lagoon–Kaliningrad connects Western Europe through the Berlin junction or inland waterways and through northern Poland to the area of Kaliningrad and further to the Neman waterway system. In Poland, it runs from the Oder–Havel Canal to the Hohensaaten lock through the lower section of the Oder river through Kostrzyn (E-30), then through the Warta river and the Noteć river waterway to the Bydgoszcz Canal, the Brda river and the section of the lower Vistula river (E-40) through the Nogat to the Vistula Lagoon and to Kaliningrad, further through the Pregolya and the Deyma Rivers to Klaipeda (Table 1).

Because of its parameters, the Polish section of E70 waterway can be included in the 2nd class, except for the section of the Noteć river from the mouth of the river Drawa to the connection with the Bydgoszcz Canal where only parameters of class Ib are met. E 70 is canalized using 22 barrages, one of which – the Czersko Polskie lock in Bydgoszcz – is a new barrage commissioned in 1999. Other 21 locks are mostly unelectrified locks constructed at the turn of the 19th and the 20th century. The width of the water route ranges from 16 to 25 m and the minimum arc radiuses are from 200 to 250 m, and the minimum clearances under bridges range from 3.5 to 4 m. The guaranteed depth of this route is 1.2 up to 1.5 m, and the border permitted speed of ships is 8 km/h.[1]

[1] U. Kowalczyk, Inland waterway links of Elblag to be used for inland cruises , IM Gdańsk, Elbląg 2006

Table 1. Navigational Characteristics of E 70 Inland Waterway.

AGN Inland waterway	Section	Lenght	Class
E 70	NIEUWE WATERWEG; Europoort - Botlek	19,7	VIb
	LEK; Krimpen - Wijk Bij Duurstede	60,7	VIb
	NEDER RIJN; Wijk Bij Duurstede - Ijsselkop	52,7	VIb
	IJSSELI; Jsselkop - Zutphen	43,6	Va
	TWENTEKANAAL; Zutphen - Enschede	49,8	Va/IV
	TWENTE – MITTELLANDKANAL; Enschede - Bergeshövede	55,0	Vb
	MITTELLANDKANAL; including the Rothenseer - Verbindungskanal	326,0	IV
E 70-04	MITTELLANDKANAL; branch to Hannover - Linden	10,0	IV
E 70-06	MITTELLANDKANAL; branch to Hildesheim	15,0	IV
	ELBE – HAVEL - KANAL	56,0	IV
	UNTERE HAVEL – Wasserstraße Plaue - Spree	68,0	
	HAVEL - ODER Wasserstraße	92,0	IV
	ODRA; Havela – Kostrzyn	49,4	III
	WARTA - NOTEĆ –BYDGOSKI CANAL; Kostrzyn - Bydgoszcz	294	II
	WISLA; Bydgoszcz - Biała Góra	116,2	II
	WISLA; Biała Góra - Gdańska Głowa	44,4	Vb
	SZKARPAWA; Gdańska Głowa – Elbląg	25,4	III
	NOGAT; Biała Góra – Elbląg	62,0	II
	ZALEW WIŚLANY; Elbląg – Kaliningrad	96,0	Vb
	Kaliningrad – Kłajpeda	-	-
E 70-01	HOLLANDSCHE IJSSEL; Krimpen - Gouda	19,7	Va
E 70-03	ZIJKANAAL; Twentekanal - Almelo	17,6	IV
E 70-02	MITTELLANDKANAL; branch to Osnabrück	13,0	IV
E 70-04	MITTELLANDKANAL; branch to Hannover-Linden	10,0	IV
E 70-06	MITTELLANDKANAL; branch to Hildesheim	15,0	IV
E 70-08	MITTELLANDKANAL; branch to Salzgitter	18,0	Vb
E 70-05	HAVELA CANAL	35,0	IV
E 70-10	SZPREWA; Westhafenkanal - Westhafenkanal	9,0	Va/Vb
	SZPREWA; Westhafen Berlin - Britzer Verbindungskanal	14,0	IV
E 70-12	BERLIN-SPANDAUER SCHIFFAHRTSKANAL; od Km 0.0 Do Westhafen Berlin	8,0	III

Source: Inventory of Main Standards and Parameters of the E Waterway Network "Blue Book", United Nations New York and Geneva, 1998

According to the AGN agreement, the waterways regarded as international routes should have parameters corresponding at least to the 4th class (minimum ship dimensions: length: 80 m and width: 9.5 m). The newly built sections should correspond to at least class Vb, and the modernized sections – class Va. Unfortunately, E70 waterway does not meet the parameters of the AGN agreement on any section on the territory of Poland. Outside Poland, on the course of E70 route, there are still several sections requiring regulation. In the area of Germany there is no waterway between Mittellandkanal and the Elbe-Havel Canal. On the other hand, the following sections require modernization:

- Mittellandkanal (reconstruction to meet the requirements of class Vb)
- Elbe – Havel Canal (reconstruction to meet the requirements of class Vb)
- Untere–Havel waterway from Plaue to the Spree river (raising parameters to meet the requirements of class Vb)
- waterways of Berlin (raising parameters to meet the requirements class IV and higher)
- Oder-Havel Canal (raising parameters to meet the requirements of class Va).

In the area of the Netherlands the section from Zuid-Willemsvaart to Veghel, which requires improvement of its parameters to meet the requirements class IV, is a bottleneck.

Other strategic bottlenecks of E70 waterway in the area of the Netherlands include:

- IJssel from Arnhem to Zutphen – improvement in the parameters to meet the requirements of class Va is planned
- Twente Canal – raising parameters to meet the requirements of class Va and improvement in the parameters of locks on the Eefde canal is planned.

Modernization of the majority of missing sections of E70 waterway within the countries of Western Europe has been started, the date of their commencement has been defined precisely for the other. The project of modernization of this waterway in Poland is at the stage of preparation of the program concept. In Poland E 70 waterway will connect the regions located in the catchment area with the most industrialized regions of Europe, including: Germany, Belgium, the Netherlands, northern France as well as countries located along the Danube – the Czech Republic, Slovakia, Austria, Hungary, Romania (Fig.1).

Figure. 1. Areas covered by the European Inland Waterway network.

Source: Water Transport Fact and Figures, Inland Navigation Europe, /www.inlandnavigation.org

2. TRANSPORT CONNECTIONS SYSTEM

2.1. INLAND WATERWAYS

In Poland E70 waterway is connected to waterway of the Oder river included in international E70 route. The main route of E30 runs from Świnoujście through Szczecin, further through the Oder river to Wrocław and Kędzierzyn-Koźle. The route of E30-01 includes the Gliwice Canal.

E30 Waterway has the best parameters in the lower section of the Odra River from Ognica to the Dąbie Lake and to the border with sea waters. This is significant in the case of improvement in the technical parameters of E70 waterway, since as a result, direct access of inland ship transport to the ports in Szczecin and Świnoujście will be possible. The middle section of the Oder river has parameters of the 2nd class, while the section from Brzeg Dolny to the mouth of Nysa Łużycka (Lusatian Neisse) has the smallest transit depths. On the section immediately under barrage in Brzeg Dolny (90% of the navigation period) the depths drop below 1.3 m through a substantial part of the waterway traffic season, which makes it impossible to navigate on this section. It connects the basins of the Western Europe to the basins of the Eastern Europe through the Oder-Spree and Oder-Havel canals. [2]

More than 11 million people (ca. 30%) of the whole population of Poland live within the lane of the natural corridor of the Oder Waterway (E30). Approximately 30% of national production is generated in this region. There you can find important centres i.e. the Katowice district (0.5 million inhabitants), cities such as: Poznań (0.6 million inhabitants)), Wrocław (0,6 million inhabitants)) and Szczecin (0.4 million inhabitants)).[3] The most important ports, where barges transshipments are currently made, are: inland port of Gliwice and sea ports Szczecin and Świnoujście.

Fulfillment of the requirements of the AGN agreement requires raising the class of the freely flowing Oder river and the canalized Oder river from degree II and III to V. In addition, an important element of E30 waterway is the so far non-existing Oder – Danube Canal, passing through the areas of the Czech Republic, Poland and Slovakia. Construction of this canal would enable direct access to the inland waterways of

[2] J.Pyś, Odrzańska Droga Wodna – europejskie dziedzictwo, Wstęp, Prosto z pokładu, Wrocław 2004, nr 10, s.8.

[3] K. Woś, Kierunki aktywizacji żeglugi śródlądowej w rejonie ujścia Odry w warunkach integracji Polski z Unią Europejską, OW Sadyba,Warszawa 2005

Southern Europe and would connect the ports in Szczecin and Świnoujście as well as the areas immediately adjacent to the Oder- Vistula waterway to the ports of the Black Sea.

Within the works over the project, a concept of an optimum connection of waterway traffic on the Koźle- Ostrava section has been prepared, setting out the route of the future waterway on the Polish territory and the basic technical solutions: location of barrages, height of fall, necessary accompanying facilities.[4] Within the modernization projects assumed by the Ministry, adjustment of hydrotechnical facilities only to the 3rd class, is planned not to the 5th class, as envisaged by the AGN agreement. In spite of that, implementation of the intended investment projects would contribute to recovery of commercial turnover in this region of Europe and development of particular regions related to the river.[5]

The second route connected to E70 waterway located in Poland is E40 waterway. This waterway has an international character and connects several significant economic centres located within the Central and the Eastern Europe. It runs from Gdansk through the Vistula river to Warsaw, goes further through the Bug river to Brest, through the Pripyat river to Kiev to the Dnieper river and further to the Black Sea. The branches of E 40 include the Desna river (of E 40-01) and the Pivdenny Buh river (E40-02).

The Bug river waterway is off-class and virtually innavigable. At the low level of waters, there are shallowings up to 40 cm. The conducted inventory-taking of waterways in Poland has shown that the parameters defined for waterways of international importance in the AGN agreement, on E40 route, are met only by the Vistula river on the section from Włocławek to Płock and the section of Martwa Wisła. As a result currently freight transport takes place only in these sections. In 2008, 22000 tons were transported on the first of the mentioned sections in the Mazovian province, while 106 000 tons in the Pomeranian province.[6] These are minute quantities as compared to the transports performed on the Oder Waterway.

2.2. RAILWAY LINES SYSTEM

Railway line no. 203, which connects Kostrzyn to Gorzów Wielkopolski, Krzyż and Piła and railway line no. 18 Piła-Bydgoszcz is located along E70 waterway.

Railway line no. 203 -connects the Tczew station with the Küstrin Kietz station. The acceptable speed of trains is 100 km/h almost on the whole length, except for the neighbourhood of Stobn and from Kostrzyn to the state border, there are speed limits up to 50 km/h. This is a single-track unelectrified line. Railway line no. 18 Piła – Bydgoszcz – Toruń – Kutno, total length: 247 km, is an electrified line. The acceptable speed is 100 km/h. On the section Toruń Main – Bydgoszcz, there are speed limits up to 70 km/h. Lines 203 and 18 are connected to the network of railway lines covered by the AGC agreement- on major international railway lines and the AGTC agreement- on major combined transportation lines. Line 203 is connected to line E59 in Krzyż and line C-E59 in Kostrzyn, while line 18 crosses line C-E65 in Bydgoszcz.

2.3.ROAD SYSTEM

Two national roads are located along E70 waterway:

- national road no. 22 – road with approximate length of 460 km, running from the Polish- Russian border crossing in Grzechotki to the border crossing to Germany in Kostrzyn, the section along E70 waterway runs from Kostrzyn through Wałdowice - Gorzów Wielkopolski to Wałcz
- national road no. 10 - road connecting the following agglomerations: Szczecin,

[4] The replay of the Secretary of the State in the Ministry of Transport – on behalf of the Minister – to the interpellation no 8330 referring to taking action aiming at revitalizing waterways in Poland and at development of inland waterway transport, dated on 16th August 2007.

[5] J. Pyś, What argues for building of the Island waterway connection of AGN – E30, a so called Central European Transport Corridor (CETC), www.zegluga.wroclaw.pl

[6] Transport. The Results 2008, Central Statistical Office of Poland, s. 198.

Bydgoszcz, Toruń and Warsaw, passes through the following provinces: Western Pomeranian, Greater Poland, Kuyavian-Pomeranian and Mazovian, on the section of southern and eastern Toruń beltway the road has the status of expressway S10, the section along E70 waterway runs from Wałcz through Piła, Pawłówek to Bydgoszcz.

National road no. 2, being a part of international E30 waterway, is located parallel to E70 waterway. On the section between Nowy Tomyśl and Stryków it has parameters of a motorway. Since it first of all serves as a transit road, it is very heavily loaded with traffic. Average traffic per day on the route between Świecko and Warsaw is approx.13 500 vehicles.

E70 waterway is crossed by two national roads in meridian system:

- national road no. 3 from Świnoujście through Szczecin – Gorzów Wielkopolski – Zielona Góra – Lubin –- Legnica – Bolków – Jelenia Góra – Jakuszyce to the state border with Czech Republic
- national road no. 1 from Gdansk through Świecie – Toruń – Łódź – Piotrków Trybunalski – Częstochowa – Wojkowice Kościelne – Dąbrowa Górnicza – Tychy – Bielsko Biała – Cieszyn to the state border with the Czech Republic.

By 2012 it is planned to develop the basic network of throughways. The priority tasks are first of all connections between the largest municipal centres in Poland, generating the largest transport demand, included within the catchment area of E70 waterway. The following road investment projects will have substantial meaning for inland transports on route E70:

- motorway A1 - construction on the whole length (Gdańsk – Toruń – Łódź – Piotrków Trybunalski – Częstochowa – Gliwice – Gorzyczki)
- motorway A2 - completion of construction on section Świecko – Poznań – Łodź – Warsaw; section Warsaw –Siedlce will be built until 2014
- motorway A4 – completion of construction on section state border - Jędrzychowice - Krzymowa – Legnica – Wrocław – Opole – Gliwice – Katowice – Kraków – Tarnów – Rzeszów – Korczowa – state border
- expressway S3 – construction of section Szczecin – Parnica – Gorzów Wielkopolski – Zielona Góra – Legnica – Lubawka; section Nowa Sól – Legnica will be constructed until 2013
- expressway S5 - construction of section Nowe Marzy – Gniezno – Poznań (interchange "Kleszczewo") and Poznań (A2, interchange "Głuchowo") – Wrocław (A8, interchange "Widawa").[7]

It is worth to point out that until 2012 it is not planned to modernize national road S6 from Szczecin to the Gdynia and Gdansk ports in the road construction plans.

3. PERSPECTIVES OF TRANSPORT USAGE OF E70 WATERWAY

The volume of inland transports in such countries as Belgium, Germany the Netherlands or France may prove the benefits of making E70 waterway navigable and connecting it to the inland waterways of Western Europe. Almost 800 million tons of loads were transported in 2006 in total in the aforementioned countries. (Tab. 2).

Table 2. Cargo transported by inland waterway in relations with EU countries (including cabotage) in selected European Union countries in 2006 (thousand tonnes)

Country	Carriages of cargo
Belgium	165 855
Germany	243 495
France	71 448
Netherlands	317 853

Source: Panorama of Transport, Eurostat 2009, s.86

Bearing in mind the system of roads in Poland, the improvement in the technical parameters of E70 waterway to the level of 3rd class would enable takeover of a part of loads from the roads used in the following routes:

[7] The program for national Road building In 2008-2012, an Annex to the cabinet's resolution no 163/2007 dated 25th Sept 2007.

- Germany (Western Europe) – Kaliningrad Oblast – transported through national road no. 6 from Kołbaskowo to Braniewo
- Germany (Western Europe) – Warsaw – Terespol – national road no. 2
- ports of Szczecin and Świnoujście – Gorzów Wielkopolski, Piła, Bydgoszcz, and in the case of improvement in the technical parameters of E40 waterway also Warsaw – transported through national road no. 10
- ports of Gdynia and Gdansk – Bydgoszcz, Piła, Gorzów Wielkopolski – transported through national no. 1, 10, 22.

The estimated stream of traffic on the mentioned roads has been presented in Table 3, it includes both international traffic and the domestic traffic conducted on short sections. The calculations have been based on the traffic stream study conducted in 2005 by the General Administration of National Roads and Motorways, according to which 21.7% of vehicles moving on international roads and 14.4% on other national roads are trucks with and without trailers. In the forecast it has been assumed that the average mass of the cargo in the vehicle at the level of 20 tons and 30% increase in the traffic stream in the period between 2005 and 2020.

Table 3. The average daily traffic of trucks and buses on the national road network in 2005

Direction	International road	National road	The average daily traffic	Incluging heavy goods vehiles	Estimated weight of cargo (tonnes per day)	Estimated weight of cargo (tonnes per year)	Forecast 2020r. (thousand tonnes per year*
Germany (Western Europe) – Kaliningrad Oblast	E 28	DK nr 6	11 402	2 474	49 485	18 062	23 480
Germany (Western Europe) – Warszawa	E 30	DK nr 2	13 439	2 916	58 325	21 289	27 675
Szczecina and Świnoujście ports – Gorzów Wielkopolski, Piła, Bydgoszcz, Warszawa	--	DK nr 10	6 000	864	17 280	6 307	8 199
Gdynia and Gdańsk ports – Bydgoszcz	E 75	DK nr 1	18 365	3 985	79 704	29 092	37 820
	E 26 1	DK 5, S5	11 374	2 468	49 363	18 018	23 423
Gdynia and Gdańsk ports - Gorzów Wielkopolski	--	DK 22	4 500	648	12 960	4 730	6 150

* According to GDDKiA in 1995-2000 there was a 34% increase in international road transport, in 2000-2005, this increase was smaller and amounted to 18%, assuming that by 2020 traffic growth will continue to weaken, so in the forecast assumes growth at 30%.

Source: elaboration on self research based on: Zorganizowanie i wykonanie pomiaru ruchu na zamiejskiej sieci dróg krajowych w roku 2005, etap VI, zadanie 5.7. Synteza wyników GPR 2005, Transprojekt-Warszawa, na zlecenie GDDKiA, marzec 2006

As one can see, the estimated road traffic stream along E70 waterway in 2005 amounted almost to 70 million tons. A substantial part of this stream are local carriages whose handling with the use of inland ship transport would be unprofitable, due to a small transport distance. However, in the case of revitalisation of E70 waterway, takeover of only 5% of the forecast road traffic stream would result in transport on the level of 4.5 million tons per year. The great load potential, whose transport

could proceed on E70 waterway, is proven by commercial trade between Germany and the Baltic States: Lithuania, Latvia, Estonia and the Kaliningrad Oblast. According to the Eurostat's data, in 2008 trade between these countries amounted to 17.5 million tons. Most loads are transported by sea – 14.5 million tons in 2008, much less – 3 million tons – by road transportation, railway carriages are minute (Tab. 4).

Table 4. Carriages of cargo between Germany and the Baltic countries and Kaliningrad Oblast (thousand tonnes)

Mode of transport	Direction	2006	2007	2008
Sea	Kaliningrad Oblast	2 222	2 508	2 061
	Estonia	3 196	2 351	1 845
	Lithuania	2 838	3 128	3 358
	Latwia	4 597	5 873	7 399
	Total sea transport	12 853	13 860	14 663
Rail	Estonia	--.	1	1
	Lithuania	63	53	42
	Latwia	b.d.	b.d.	b.d.
	Total rail transport	63	54	43
Road	Estonia	317	368	370
	Lithuania	1 713	1 527	1 508
	Latwia	987	1 023	923
	Total road transport	3 017	2 918	2 801
TOTAL		15 933	16 832	17 507

Source: Eurostat, Statistics Database, ec.europa.eu/eurostat [20.07.2010]

Special attention should be paid to the fact that approximately 2-2.5 million tons of cargo per year is transported between Germany and the Kaliningrad Oblast. In most cases it is the cargo transported by sea through German ports. Improvement in the technical parameters of E 70 waterway on the territory of Poland would enable shifting a substantial portion of this cargo to inland waterways. It would significantly simplify the transport process, due to elimination of unnecessary transshipment points. Thanks to the well developed network of inland waterways in Germany, the cargo could be transported by one mode of transport directly to and from the seaport in Kaliningrad.

4. SUMMARY

Three waterways covered by the AGN agreement pass through the territory of Poland: E30, E40 and E70. None of these waterways meets the parameters required by the agreement. E30 waterway has the best parameters, thanks to which the largest carriages in Poland are performed on it.

Making E70 waterway navigable will connect the regions located in the catchment area of the road to the ports in Szczecin, Świnoujście, Gdańsk and Gdynia, the Wrocław and the Katowice agglomerations as well as to the most industrialized regions of Western Europe: Germany, Belgium, the Netherlands and northern France.

Inland ports along E 70 waterway are well connected with the railway network base covered by the AGC and the AGTC agreements and the planned network of motorways and expressways in Poland, which substantially affects their competitive position.

E70 waterway may take over the part of cargo so far handled by road transportation on international routes between the Western Europe and the Kaliningrad Oblast, the Western Europe and Ukraine, also some cargo handled on routes between the following seaports: Szczecin, Świnoujście, Gdynia and Gdańsk and the following economic centres located along E70 waterway: Piła, Gorzów Wielkopolski and Bydgoszcz and between the German ports and the Baltic States. Takeover of only several percent of the potential cargo stream would allow to achieve transport at the level of several million tons.

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