

Current state and prognoses of the structure of cargo transport on Polish and European inland water transport area

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ABSTRACT

The present report was prepared within the framework of research activities carried out in the Maritime Institute in Gdansk, when taking part in the international research project EUREKA E! 3065 INCOWATRANS, the goal of which was working out preliminary designs of new-generation ships for inland and coastal navigation, and preparing technical and economic structure for the revitalisation of inland waterways in Poland, with their further incorporation to the European transportation system. The article aims at analysing the present state and assessing the future potential of cargo routes observed in inland East-West water transport, i.e. between Poland and Western Europe countries.

Keywords : inland water transport, Europe, State, flow of cargo, potential for development.

INTRODUCTION

The use of inland transport in European countries was analysed. Moreover a detailed analysis was performed of the scale and structure, with respect to both directions and types, of the cargo carried by inland transport between Poland and Western European countries. According to the assumptions of the EU transport policy, oriented on shifting some volumes of cargo from road and railway transport to water transport, as well as on sustainable development of the entire transport structure, this is the area in which potential cargo for water transport can be looked for. An attempt was made to assess potential volumes of cargo which could be carried by inland water transport. The scope of the analysis includes cargo transport between voivodeships situated along the E-70 waterway, which links the Western European countries with Russia and Lithuania. On Polish territory this waterway goes from the Oder-Havel Canal to the Hohensaaten lock, then along the lower part of the Oder river through Kostrzyn, along the Warta and Notec Rivers to the Bydgoszcz Canal, and finally along the Brda and lower Vistula Rivers through the Nogat River distributary to the Vistula lagoon.

USE OF INLAND NAVIGATION FOR CARGO TRANSPORT IN EUROPEAN COUNTRIES

In 2004, the inland water navigation in EU countries transported about 408 million tonnes of cargo (65 760 million

tonne-kilometres), 48% of which was the domestic transport and 52% was the international transport (percentages calculated with respect to volumes of the shipped cargo). The international transport included transit. To the highest degree the water transport is used in Germany and the Netherlands, contributing to 86% of total cargo carried by domestic and international transport in this sector in all EU member countries in 2004. The share of France and Belgium altogether was equal to 12%, while the combined share of Luxemburg and Austria equalled 1%, and that of all new member countries was also equal to as little as 1%. The highest dynamics in water transport development in that time was observed in Hungary and Luxemburg, increase by 20% and 15% in 2004 compared to 2003, respectively. Average transport increase in EU equalled 13.9% in 2004, when excluding Belgium and Poland. The domestic transport dominates in Poland and Czech, while in the remaining EU countries, except Luxemburg, it is the international transport which dominates.

In the domestic transport almost half of the transported volume is mineral raw materials and semiproducts, and construction materials. Self-propelled barges transported 81% products of this group. Among the non-EU countries and new EU member countries, inland waterways are most intensively used for international transports in Romania and Bulgaria, while remarkable decrease of the use of inland navigation for carrying goods has been observed in Czech in recent years.

General tendencies in the development of EU inland waterway transport in years 2001-2004 are given in Tab. 1.

Tab. 1. EU inland waterway transport in years 2001-2004.

Country	2001	2002	2003	2004	2001	2002	2003	2004
	transport in thousand tonnes				transport in million tonne-kilometres			
Total EU	395 465	382 651	357 894	407 533	58 337	58 505	54 655	65 760
Belgium	127 870	134 463	137 145	...	7 655	8 073	8 230	...
Czech	1 747	1 569	1 184	1 176	78	80	58	48
Denmark	236 101	231 746	219 999	235 861	64 818	64 166	58 154	63 667
France	68 408	67 092	63 670	67 312	8 294	8 269	8 024	8 420
Luxemburg	11 061	8 568	9 704	11 180	371	281	316	370

Country	2001	2002	2003	2004	2001	2002	2003	2004
	transport in thousand tonnes				transport in million tonne-kilometres			
Hungary	5 897	7 093	6 137	7 356	2 346	3 076	1 517	1 904
Netherlands	328 913	311 507	293 390	319 219	41 793	40 804	39 031	43 092
Austria	11 634	12 316	10 737	9 072	2 557	2 846	2 276	1 747
Poland	7 296	370
Scandinavia	3 234	3 293	2 624	2 725	...	98	94	91

Source: EUROSTAT.

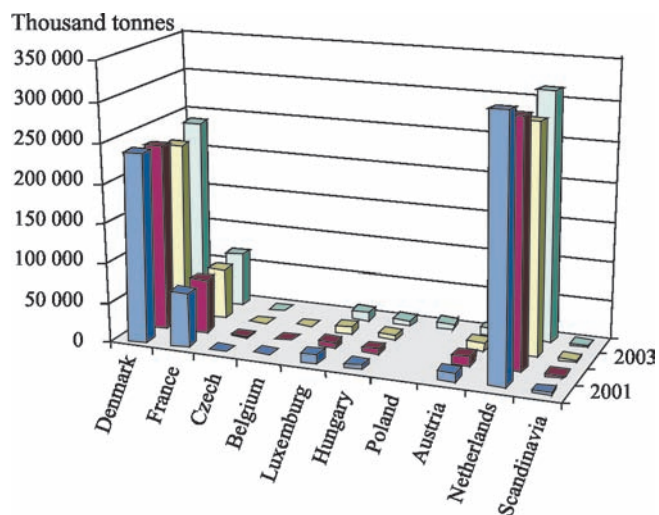


Fig. 1. Inland waterway transport in EU countries.
Source: Tab. 1.

The directional structure of the inland waterway transport between particular EU countries in 2004 is given in Tab. 2.

Out of the total volume of EU international waterway transports, about 75% takes place between three countries: the Netherlands, Germany and Belgium, and as much as 49% of total international transports in EU takes place between Germany

Tab. 2. Inland waterway transport between EU countries in 2004 (in thousand tonnes).

Country of loading	Country of unloading										
	Total	Belgium	Czech	Germany	France	Luxemburg	Hungary	Netherlands	Austria	Poland	Scandinavia
Total	211 003	54 893	436	94 712	12 644	1 269	1 333	40 960	4 223	316	217
Belgium	22 454	x	2	11 851	5 175	282	50	5 041	52	1	0
Czech	255	16	x	222	-	-	.	17	-	.	-
Germany	48 284	14 700	357	x	1 798	387	381	29 324	998	311	28
France	15 253	3 854	.	5 231	x	208	27	5 933	.	.	.
Luxemburg	281	19	-	181	6	x	-	76	-	.	.
Hungary	1 676	69	-	659	6	23	x	333	585	.	2
Netherlands	117 413	36 110	78	73 947	5 634	370	314	x	957	4	.
Austria	1 411	95	-	440	24	-	526	140	x	.	186
Poland	1 832	24	.	1 773	.	.	.	35	.	x	.
Scandinavia	2 144	7	-	407	1	-	35	62	1 632	-	x

Source: EUROSTAT.

and the Netherlands, while 17% between the Netherlands and Belgium. Using inland waterways, the Netherlands exported 117 million tonnes of cargo in 2004, out of which 110 million tonnes covered their exchange with Germany and Belgium, equalling to 94% of the total volume of the international transports. In inland waterway export, Germany is the main target of almost all transports from EU countries. Out of 95 million tonnes of total export to Germany, 80% is represented by the Netherlands, 14% by Belgium, and 6% by France. Germany is also the biggest cargo exporter using inland water transport.

In the type structure of domestic transports in 2004, nearly half were mineral raw materials, and construction materials and semiproducts, out of which 19% were oil products. At the same time the biggest proportion in the international transports were metals and scrap, contributing in 19% in total volume of the transported cargo. The volumes of transit transports in EU inland water transport in 2004 are given in Tab. 3.

With respect to cargo groups, transit transports are highly diversified in particular countries. In France, it was the cargo falling into group 0 in the NST/R classification, i.e. agricultural products and living animals, which was the biggest proportion (18%). In Luxemburg the dominating cargo was that belonging to the group 6, i.e. mineral raw materials and semiproducts, and construction materials, and that belonging to group 3, i.e. oil products. Altogether, they amounted to 2/3 of total transport. The oil products were also relatively high proportions in transits in France, Germany, and the Netherlands: 35%, 17% and 15%, respectively.

Tab. 3. Inland waterway transit transports in EU countries, year 2004 (in thousand tonnes).

Country	Group of loading											
	Total	%	Agricultural products and live animals	Food and feed	Solid fuels	Oil products	Ore and scrap	Metal products	Mineral raw materials and semiproducts, construction materials	Fertilizers	Chemicals	Machines, transport equipment, industrial goods
Total	93 454	x	7 874	5 866	12 637	13 953	6 932	9 659	11 294	4 063	6 461	14 715
%	x	100	8.4	6.3	13.5	14.9	7.4	10.3	12.1	4.3	6.9	15.7
Belgium	4 325	4.6	1 425	295	200	41	301	444	436	727	396	61
Czech	0	0.0	0	0	0	0	0	0	0	0	0	0
Germany	24 175	25.9	2 610	2 150	4 283	4 174	2 008	1 765	3 178	624	538	2 845
France	9 344	10.0	314	375	235	3 285	186	784	1 982	171	710	1 302
Luxemburg	9 650	10.3	1 852	882	3 965	35	1 219	739	666	234	50	8
Hungary	3 146	3.4	83	191	142	65	1 286	598	124	279	86	293
Netherlands	41 454	44.4	1 514	1 558	3 794	6 267	1 892	4 868	4 872	1 921	4 651	10 117
Austria	1 174	1.3	67	4 04	11	87	7	353	29	100	29	86
Poland	68	0.1	1	2	0	0	18	41	4	0	1	1
Scandinavia	119	0.1	8	11	6	0	15	66	3	7	0	3

Source: EUROSTAT.

VOLUMES OF INLAND WATERWAY CARGO TRANSPORT IN POLAND

For many years, Polish inland water navigation has played negligible role in the domestic transport system. In recent years the proportion of inland transport in meeting total transport needs, measured in tonnes, was kept within 0.6–0.8%. As well as that, this type of transport contributes to a negligible degree

in cargo shipped by Polish foreign trade. Since the early eighties the process of increasing degradation of the role of inland water navigation in cargo transport has been observed. The number of craft belonging to Polish carriers has systematically decreased, and the transport activities have been reduced (Tab. 4). In recent years some fluctuations of the volume of the transported cargo are observed, at the background of a general tendency of keeping them on a low level.

Tab. 4. Numbers of watercraft and inland waterway cargo transport in Poland, years 1980–2005.

Items	1980	1990	1995	2000	2001	2002	2003	2004	2005
Inland water transport craft (in numbers)									
– tugs and pushers	425	411	339	245	278	259	259	257	253
– barges	1 570	1 337	737	492	598	582	590	587	574
Transported cargo ¹⁾									
– thousand tonnes	22 247	9 795	9 306	10 433	10 255	7 729	7 968	8 747	9 607
– millions tkm	2 325	1 034	876	1 173	1 264	1 126	872	1 066	1 277
– average distance of transport (km)	104.5	105.5	94.1	112.4	123.2	145.7	109.4	121.9	132.9

Source: Transport – results of activity in 2005.

¹⁾ Data refer to the transport performed by the craft operated by Polish inland navigation companies (including that being at the disposal of foreign companies during the break in navigation on Polish waterways) and, since 2001, also the transport performed by companies whose basic activity is different than those services.

The main reason for the present situation is continuously worsening quality of Polish inland waterways.



Fig. 2. Polish inland waterways
Source: www.zegluga-bydgoska.com.pl

Over 54% of waterways in Poland are of class I. The waterways of international significance which, according to the European standards should have parameters of class IV, the least, to provide opportunities for operating ships of net deadweight of over 1500 tonnes, are as short as 5.5%. In a total of over 3638 km of navigable waterways, this amounts to about 200 km, represented by three small Vistula river

fragments without links, a fragment of the upper Vistula River opened in 2003, and lower fragments of the Odra River. Too small a volume of storage reservoirs and insufficient waterway management are the reasons why even those parameters are not kept. In dry years the river depths drop down considerably below levels required by particular classes, thus making the navigation impossible or extremely difficult. In total volume of cargo carried by Polish inland water transport the majority is done on domestic waterways. Transport of cargo shipped by Polish foreign trade in relations with Western Europe amounts only to 25 – 28% of the total volume (Tab. 5, Fig. 3).

A tendency towards strengthening the position of Polish inland water navigation on the European navigation market has been observed since the ninetieths, when Polish shipping companies started looking for employment on the European market as a result of unfavourable infrastructural conditions of Polish waterways and decreased demand for domestic transport. In two recent years Polish inland navigation has recorded strong increase of coastal transport, which is undoubtedly connected with the accession of Poland to the European Union and opening of transport markets for Polish ship owners, as well as with good quality of services offered by them. In 2005, the volume of outside cargo transported between foreign ports amounted to 2.44 million tonnes, and was nearly 5 times as big as in 2003. The majority of these transports was done between German inland ports (Tab. 6).

Due to a bad state of Polish waterways, which limits transporting distances, domestic transports are mainly of a local nature (Tab. 7). The majority of transports is concentrated on waterways of individual voivodeships, mainly situated along the Oder River. Most cargo is transported on the Lower Oder River, in the Zachodniopomorskie voivodeships.

Tab. 5. Polish inland waterway cargo transport in domestic and international communication, years 2000–2005 (in thousand tonnes).

Item	2000	2001	2002	2003	2004	2005
TOTAL – in thousand tonnes	10 433	10 255	7 729	7 968	8 747	9 607
- in thousand tkm	1 172 772	1 263 596	1 125 784	871 935	1 066 377	1 276 766
domestic communication	5 025	5 816	4 536	4 959	5 010	4 466
international communication	5 408	4 439	3 193	3 009	3 737	5 141
- export	3 946	3 076	1 936	1 859	1 832	2 086
- import	551	673	444	307	386	588
- transit	421	373	562	353	68	26
- transport of outside cargo between foreign ports	490	317	251	490	1 451	2 441

Source: *Transport – results of activity in 2000–2005*, Central Bureau of Statistics, Warsaw 2000, 2001, 2002, 2003, 2004, 2005.

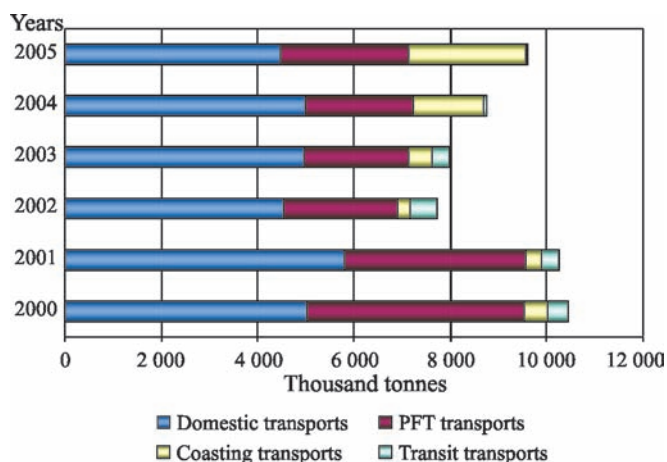


Fig. 3. Polish inland waterway cargo transport in years 2000–2005. Source: Tab. 5.

Tab. 6. Inland waterway transports of outside cargo between foreign ports.

Voivodeship or country	Cargo (thousand tonnes)		Transporting work (thousand tkm)		
	2004	2005	2004	2005	
Total	1 451	2 441	221 965	418 461	
Germany	Germany	1 341	2 318	155 722	338 770
Germany	Netherlands	16	19	10 418	12 895
Germany	Belgium	5	12	3 971	9 413
Netherlands	Germany	58	48	32 156	30 052
Netherlands	Netherlands	1	1	242	243
Netherlands	Belgium	2	1	398	257
Belgium	Germany	28	38	19 058	26 285
Belgium	Netherlands	-	3	-	446
Belgium	Belgium	-	1	-	100

Source: Customs Administration Analytical Centre, Warsaw.

Tab. 7. Domestic inland waterway transports between voivodeships, years 2004–2005 (in thousand tonnes)^{a)}.

Voivodeship		Cargo (thousand tonnes)		Transporting work (thousand tonne-kilometres)	
From	To	2004	2005	2004	2005
Total		5 010	4 466	242 758	185 410
Dolnoslaskie	Dolnoslaskie	1 025	1 276	3 939	4 878
Dolnoslaskie	Zachodniopomorskie	30	-	15 682	-
Kujawsko-pomorskie	Kujawsko-pomorskie	-	72	-	255
Lubuskie	Lubuskie	4	4	63	86
Małopolskie	Małopolskie	262	357	6 272	5 089
Mazowieckie	Mazowieckie	4	-	49	-
Mazowieckie	Pomorskie	-	8	-	2 380
Opolskie	Opolskie	827	840	1 788	2 004
Podkarpackie	Podkarpackie	9	-	9	-
Pomorskie	Pomorskie	291	257	6 526	4 638
Pomorskie	Warminsko-mazurskie	19	-	1 035	-
Slaskie	Dolnoslaskie	567	631	109 115	120 457
Slaskie	Slaskie	460	54	460	54
Swietokrzyskie	Swietokrzyskie	53	51	413	367
Warminsko-mazurskie	Pomorskie	-	9	-	596
Warminsko-mazurskie	Warminsko-mazurskie	-	4	-	231
Zachodniopomorskie	Dolnoslaskie	32	-	17 053	-
Zachodniopomorskie	Slaskie	21	-	14 879	-
Zachodniopomorskie	Zachodniopomorskie	1 085	889	55 747	39 534

^{a)} Only those voivodeships were taken into account in which transports equalled or exceeded 4 thousand tonnes

Source: Customs Administration Analytical Centre, Warsaw.

This cargo is mainly carried between Szczecin/Swinoujscie and Police seaports. Relatively large volumes of cargo is also carried on the Upper Oder River, between Glogow and Kedzierzyn-Kozle, and on the Gliwice canal.

Smaller volumes of cargo are transported on the Upper Vistula River in the Malopolskie voivodeships - on a river part opened for operation in 2003, and on the waterways of the Pomorskie voivodeship in the region of Gdansk and Elblag - on the Vistula River delta fragment. This confirms the above statement about the use of only limited fragments of Polish waterways for transport.

Due to geographic position of Poland, transport links with Western European inland waterways, and the directional structure of the Polish foreign trade, the international transport is, as a tradition, mainly performed with Germany, to which about 98% of cargo is carried (Tab. 8). Cargo transported to the Netherlands, Belgium, and France are of negligible volumes.

The data recorded during two recent years reveal that about 2.0 – 2.5 million tonnes of cargo is carried between Szczecin/Swinoujscie seaports (Zachodniopomorskie voivodeship) and Germany per year. This transport is facilitated by a good system of links between Polish ports situated on the western coast of Poland and the German waterways, and good state of those waterways. At the same time only very limited volumes of cargo are carried to Germany from other voivodeships (on upper and Middle Oder River waterways).

Tab. 8. Inland waterway cargo export to and import from countries in East-West direction, years 2000–2005 (in thousand tonnes).

Country/year	2000	2001	2002	2003	2004	2005
Total	4 497	3 749	2 380	2 166	2 218	2 674
- export	3 946	3 076	1 936	1 859	1 832	2 086
- import	551	673	444	307	386	588
Germany	4 422	3 692	2 282	2 129	2 153	2 619
- export	3 889	3 039	1 859	1 827	1 773	2 053
- import	533	653	423	302	380	586
Netherlands	64	41	61	24	39	40
- export	49	30	43	19	35	40
- import	15	11	18	5	4	-
Belgium	9	14	26	13	26	14
- export	6	5	23	13	24	13
- import	3	9	3	-	2	1
France	2	1	11	-	-	-
- export	2	1	11	-	-	-
- import	-	-	-	-	-	-

Source: Customs Administration Analytical Centre, Warsaw.

Tab. 9. Inland waterway transport in East – West direction, broken into voivodeships and countries situated along E-70 waterway, years 2004–2005.

Voivodeship or country		Cargo (thousand tonnes)		Transporting work (thousand tkm)	
		2004	2005	2004	2005
Exports - Total		1 816	2 085	464 866	510 203
Dolnoslaskie	Germany	30	-	8 588	-
Dolnoslaskie	Netherlands	0	-	572	-
Lubuskie	Germany	37	43	9 634	14 191
Lubuskie	Netherlands	8	1	7 840	694
Lubuskie	Belgium	8	3	7 981	3 113
Opolskie	Germany	2	0	2 568	162
Opolskie	Netherlands	1	2	838	3 205
Opolskie	Belgium	1	-	834	-
Slaskie	Germany	-	0	-	299
Warminsko-mazurskie	Germany	-	0	-	93
Zachodniopomorskie	Germany	1 704	1 989	386 326	442 762
Zachodniopomorskie	Netherlands	25	37	23 376	34 923
Zachodniopomorskie	Belgium	16	10	16 309	10 761
Imports - Total		386	588	121 122	154 910
Germany	Dolnoslaskie	1	-	433	-
Germany	Lubuskie	7	6	1 776	3 287
Germany	Opolskie	-	0	-	411
Germany	Zachodniopomorskie	373	580	113 436	149 395
Netherlands	Dolnoslaskie	-	0	-	6
Netherlands	Zachodniopomorskie	4	1	3 982	716
Belgium	Mazowieckie	-	0	-	3
Belgium	Zachodniopomorskie	1	1	1 495	1 092

Source: Customs Administration Analytical Centre, Warsaw.

The cargo which traditionally dominates in the domestic inland waterway transport is bulk cargo (tables 10-11). For instance, in 2005 transports of coal (52%), fertilizers (13%) and minerals (13%) were the biggest proportions in export, while the imported cargo mainly included metal products (71%). Goods transported in smaller volumes include food and feed, construction materials, iron ore and scrap, and non-ferrous ores. Transports of containers, replaceable bodywork and semitrailers (within the framework of intermodal transport) are not used in Polish waterway transport.

POTENTIAL FOR INCREASING VOLUMES OF CARGO FOR INLAND TRANSPORT TO WESTERN EUROPEAN COUNTRIES

It is believed that the inland waterway transport between Poland and Western European countries has not been used so far to the extent which would cover all transport needs. Development and modernisation of Polish waterways, in particular the Oder-Vistula waterway being a component of the E-70 international waterway, would undoubtedly provide opportunities for higher competitiveness of inland navigation.

In the light of EU transport policy, the potential for increasing cargo volumes for East-West river transport should be mainly looked for in road transport. To do this :

- ➔ the area of gravitation to the E-70 waterway in Poland is to be defined

- ➔ Western European countries gravitating to the E-70 waterway are to be identified
- ➔ type of cargo which has been transported by land to selected European countries but which can be transported using inland waterways is to be defined
- ➔ the scales of general streams of cargo carried by road transport between Poland and Western European countries are to be analysed
- ➔ directional and type structure of cargo streams from the gravitation area to Western European countries are to be analysed
- ➔ cargo volumes which can be potentially shipped by Polish foreign trade for inland transport are to be assessed.

It can be assumed that those cargos will gravitate to East-West inland waterway transport which were carried by road transport and directed to or from voivodeships situated along the E-70 waterway part on the territory of Poland, i.e. from the Havel-Oder canal to the Hohensaaten lock, then along the lower part of the Oder River via Kostrzyn, along the Warta and Notec rivers to the Bydgoszcz canal, an finally along the Brda and Lower Vistula Rivers to the Vistula River distributary (Fig. 4). The area gravitating to this transport includes the warminsko-mazurskie, pomorskie, kujawsko-pomorskie, wielkopolskie, lubuskie and zachodnio-pomorskie voivodeships.

The foreign partners include such countries as Germany, the Netherlands, Belgium, France and Russia.

Tab. 10. Type and directional structure of East-West inland waterway transport, year 2004 (in thousand tonnes).

Groups of cargo	Export				Import			
	Total	including:			Total	including:		
		Germany	Netherlands	Belgium		Germany	Netherlands	Belgium
Total	1 832	1 773	35	24	386	380	4	2
Cereals	8	8	–	–	8	8	–	–
Food and feed	3	3	–	–	64	63	1	–
Oil seeds and fruit, fats	47	43	4	–	2	2	–	–
Mineral solid fuels	838	835	2	1	5	5	–	–
including: hard coal and briquettes	827	826	–	1	5	5	–	–
Iron ore, iron and steel scrap, blast-furnace dust	258	257	1	–	5	5	0	–
Non-ferrous ore and scrap	28	14	–	14	15	13	2	–
Metal products	108	77	23	8	217	217	–	–
Cement, lime, other finished construction materials	12	12	–	–	18	17	1	–
Raw and processed minerals	181	181	–	–	32	32	–	–
Natural and artificial fertilisers	286	286	–	–	4	2	–	2
Paper pulp and waste paper	52	52	–	–	0	0	–	–
Finished metal products	9	4	4	1	3	3	–	–
Glass, glassware and ceramics	–	–	–	–	12	12	–	–
Others	2	1	1	0	1	1	–	–

Source: Customs Administration Analytical Centre, Warsaw.

Tab. 11. Type and directional structure of East-West inland waterway transport, year 2005 (in thousand tonnes).

Groups of cargo	Export				Import			
	Total	including:			Total	including:		
		Germany	Netherlands	Belgium		Germany	Netherlands	Belgium
Total	2 086	2 033	40	13	588	586	–	2
Cereals	34	34	–	–	0	–	–	–
Food and feed	15	14	1	–	46	46	–	–
Oil seeds and fruit, fats	57	50	7	–	4	4	–	–
Mineral solid fuels	1 093	1 073	17	3	–	–	–	–
including: hard coal and briquettes	1 086	1 067	16	3	–	–	–	–
Iron ore, iron and steel scrap, blast-furnace dust	195	192	3	–	12	11	–	1
Non-ferrous ore and scrap	28	20	–	8	24	24	–	–
Metal products	72	62	9	1	420	419	–	1
Cement, lime, other finished construction materials	6	6	–	–	39	39	–	–
Raw and processed minerals	269	269	–	–	15	15	–	–
Natural and artificial fertilisers	274	274	–	–	15	15	–	–
Other chemicals	–	–	–	–	2	2	–	–
Paper pulp and waste paper	38	38	–	–	6	6	–	–
Finished metal products	4	1	2	1	2	2	–	–
Glass, glassware and ceramics	–	–	–	–	–	–	–	–
Others	1	–	1	–	3	3	–	–

Source: Customs Administration Analytical Centre, Warsaw.



Fig. 4. Area of gravitation to E-70 inland waterway. Source: in-home analysis.

Cargo streams in the road transport are enormous. In recent years the road transport carried 7.6 – 9.6 million tonnes of cargo per year in export and 7.8 – 9.4 million tonnes in import (Tab. 12). The main direction of transport is Germany. This country is the main trade partner for Poland. For instance in 2005, the road transport carried to Germany 42% of total cargo in w export and 46% in import. To France about 1.0 million tonnes of cargo is transported per year both in export and in import. Cargos transported on such long distances, in particular those which could be transported using inland waterways, are especially attractive for inland transport.

Analysing the volumes of cargo transported between the above defined gravity area on the territory of Poland and selected Western European countries reveals that the road transport in these relations carries 3.2 – 3.8 million tonnes in export and 3.2 – 3.4 million tonnes in import (Tab. 13).

For a detailed analysis of cargo streams such cargos were selected, which have been transported by road but can be carried by barges on inland waterways. Selecting those cargos was based on the data on international transports, including statistical information arranged making use of commodity type relations used in Polish customs nomenclature. For selected cargos, a preliminary analysis of cargos transported from or to voivodeships situated along the E-70 waterway in relation with selected Western European countries was done.

The analysis of road transport cargo routes, done using data for two recent years, reveals that 1.9 – 2.6 million tonnes of cargo is transported from the area identified as the inland waterway gravity area to those countries in export, and 1.9 – 2.2 million tonnes in import per year (Tab. 14).

Tab. 13. East-West road transports between voivodeships and countries situated along E-70 waterway and France, years 2004 – 2005 (in thousand tonnes).

Voivodeship	2004		2005	
	export	import	export	import
Total	3 821.7	3 459.9	3 192.0	3 212.8
Warminko-mazurskie	298.2	99.9	267.5	115.2
Pomorskie	390.3	350.7	373.7	370.3
Kujawsko-pomorskie	527.5	357.0	634.9	367.9
Wielkopolskie	1 082.6	1 214.9	1 013.1	1 510.3
Lubuskie	881.5	880.1	594.8	466.2
Zachodniopomorskie	641.6	557.3	308.0	380.2

Tab. 14. Type and directional structure of road transport of cargos attractive for inland waterway transport between voivodeships and countries situated along E-70 waterway and France, years 2004–2005 (in thousand tonnes).

Type of cargo	2004		2005	
	export	import	export	import
Total	3 822	3 460	3 192	3 213
Cereals	4	6	56	4
Food ¹⁾	125	65	46	48
Oil seeds and fruit, fats, feed	6	3	15	1
Salt, sulphur, soil, stones, gypsum materials, lime and cement	41	159	33	117
Metal ores, slag and ash	15	1	0	2
Mineral fuels, mineral oils, products of their distillation, bituminous substances	13	114	19	71
Organic and inorganic chemicals	60	161	40	126
Natural and artificial fertilisers	22	40	42	55
Plastics and their products	138	433	141	397

¹⁾ Vegetables and some edible roots and bulbs, products of milling industry, malt, starches, products made of cereals, flour, starch, or milk.

Tab. 12. Total road transports to countries situated along E-70 waterway and to France, years 2000 – 2005 (in thousand tonnes).

Country	2000		2001		2002		2003		2004		2005	
	export	import	export	import	export	import	export	import	export	import	export	import
Total	9 612	7 798	9 266	7 759	9 209	8 505	10 332	9 048	8 458	8 950	7 755	9 431
Germany	7 490	5 458	7 055	5 472	6 858	6 024	7 698	6 407	6 112	6 343	5 577	6 839
Netherlands	906	860	904	793	940	835	1 018	866	783	829	650	831
Belgium	429	567	474	585	507	660	598	698	567	689	540	679
France	787	918	833	909	904	986	1 018	1 077	996	1 089	988	1 082

Source: Customs Administration Analytical Centre, Warsaw.

Continuation Tab. 14				
Type of cargo	2004		2005	
	export	import	export	import
Wood and wooden products ²⁾ , wood coal	977	330	594	332
Wood pulp, cellulose, waste paper, paperboards	53	9	20	24
Cotton	0	12	0	11
Products made of stone, gypsum, cement, asbestos, and mica	54	67	34	35
Glass, glassware and ceramics	36	138	26	36
Iron, cast iron, steel and their products	293	414	213	422
Other metals and their products	80	86	68	73
Boilers, machines and installations, tools	101	117	85	84
Furniture, bedding, mattresses	492	21	412	13
Total	2 592	2 233	1 915	1 910
Others	1 230	1 227	1 277	1 303

²⁾ Except furniture

Source: Customs Administration Analytical Centre, Warsaw.

Assuming that out of the cargo volumes presented in Table 14 at least 20% of exports and 10% of imports will be shifted to inland waterway transport means that additional cargo potential for this transport in East-West relation amounts to 400-500 thousand tonnes in export (increase by about 20% with respect to the present level) and about 200 thousand tonnes in import (increase by nearly 50%). According to experts' opinions, present conditions of operation of Polish inland navigation do not create limits for servicing this additional mass of cargo, especially taking into account that the majority of cargo is directed from or to voivodeships situated close to the waterways linked with the European inland waterway system.

More intensive development of East-West inland navigation will undoubtedly be possible after the development and modernisation of the E-70 waterway along all its length from the Oder River to Bydgoszcz and further to Elblag, and adapting it to European standards. This goal was assumed in the AGN Agreement expressing pro-ecological transport policy of the European Union. However, the Agreement assumes that all waterways of international significance will be adapted to the technical state of class IV parameters, the least, which in Polish situation cannot be achieved in the nearest years to

come. Therefore a problem of utmost importance becomes adapting the inland fleet to the present navigational conditions, assuming that all bottlenecks existing now on this waterway will be removed.

CONCLUSIONS

- It was the accession of Poland to the European Union and opening EU transport markets for Polish carriers which affected most the improved results of Polish owners of inland watercraft in terms of transport activity.
- Traditionally, transports in international communication are mainly performed to or from Germany, amounting to about 98% of all international cargo carried on inland waterways. Due to bad condition of the Odra-Bydgoszcz-Elblag waterway, transport of cargo between the area situated along this waterway and Western Europe is not performed at all.
- According to AGN Agreement, part of the E-70 waterway on the territory of Poland from the Havel-Oder canal to the Hohensaaten lock, then along the lower part of the Oder River through Kostrzyn, along the Warta and Notec rivers to the Bydgoszcz canal, and finally along the Brda and Lower Vistula Rivers to the Vistula River distributary, was included to the European network of inland waterways of international significance and is a condition for the planned activation of East-West inland navigation between Western and Eastern Europe.
- The inland waterway transport is dominated by bulk cargo (coal, fertilisers, minerals in export and metal products in import). Food products and feed, construction materials, iron ore and scrap, and non-ferrous ores are transported in smaller volumes.
- Detailed analysis of the type structure of cargo routes has revealed that the volume of cargo, which is potentially attractive for inland waterway transport but now transported by road in the area of gravity to inland waterways, is on the level of 1.9 – 2.6 million tonnes in export and 1.9 – 2.2 million tonnes in import. The inland water transport will take over 400-500 thousand tonnes in export. According to experts' opinions, the existing conditions of operation of Polish inland navigation do not create limits for servicing this additional mass of cargo, in particular taking into account that the majority of this cargo comes from or is directed to voivodeships situated in the vicinity of the Oder River waterway having direct links with the European inland waterway system.
- Visible improvement of the situation and development of East-West transport via Polish inland waterways is only possible after the development and modernisation of the E-70 waterway along all its length.