Preliminary Assessment of the Proposed East-West Waterway Scheme in Poland

Prepared for WWF's European Freshwater Programme by

Wieslaw Dembek · Adam Jacewicz · Tomasz Okruszko

Warsaw, June 2000

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Cover photographs J Madgwick, WWF European Freshwater Programme
Top – Middle Vistula River
Bottom – River Bug

Preface

This report was prepared by three independent Polish experts in the fields of ecology, hydro-engineering and hydrology on behalf of WWF Internationals' European Freshwater Programme. It was commissioned due to the growing concerns by WWF, IUCN and Polish environmental NGO's regarding plans for the development of the Vistula, Odra, Warta, Notec and Bug rivers in the context of an East-West waterway scheme. This waterway scheme is currently under consideration by the Transport Infrastructure Needs Assessment group for the European Commission, (TINA) that assesses transport needs for EU Accession countries.

It is considered by many that the engineering works necessary for the East-West waterway development could be devastating for rivers and wetlands in central and eastern Europe. In recognition of this threat, Resolution VII.12 of the Conference of Contracting Parties of the Ramsar Convention on Wetlands COP7 (1999) called on the States concerned "*to undertake a full review and assessment of these impacts, in accordance with international transboundary impact assessment procedures*".

This report attempts a preliminary assessment of the case for developing a waterway to meet expected transport needs. It also outlines the associated costs and benefits, including those for the environment. It is hoped that the report will be influential for decision-makers who need to decide on the best options for developing transport infrastructure to benefit Poland's economic development, taking into account its strategic position between western developed countries and eastern Europe.

In the context of such decisions, WWF wishes to emphasise the opportunities that exist for sustainable development within Poland based on its high natural values – which are best represented by its major river valleys. Those authorities should also take into account that the development of major waterways elsewhere in Europe and globally, have resulted in major environmental changes that have translated into significant economic consequences - for example the investments needed to counteract increased flooding and poor water quality that results from river regulation.

We offer this report as a contribution to the debate on the future of Poland's rivers.

Jane Madgwick
Head of WWF's European Freshwater Programme

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Executive summary

According to UN Commercial Committee European Agreement on main inland international waterways from 19 January 1999, the route from Gdansk to Kherson, on the Vistula River from Gdansk to Warsaw, along the Bug River to Briest, along the Pina and Dniepr Rivers via Kiev to Kherson - is considered as one of main European waterways to be developed and used in the future.

This almost 11,000,000,000 Euro (in 1999 prices; for the Polish part of the waterway) project would dramatically affect the Vistula river, the largest river in Poland, as well as other Polish rivers including the Odra, Warta, Notec and Bug. The main question raised in this study concerns the other costs of transforming these rivers to the waterway.

Water transport currently plays no significant role in the overall transport system of Poland. In practice only the Odra river at the western border of country is used as a waterway. The rest of the rivers and canals, including those analysed for the East – West waterway, are at present not usable for regular navigation. There is only some local navigation activity by small boats and ships. All cargo and passenger transport needs, as well internal as international, are covered by use of roads and railway. The extensively developed railroads are suffering now severe economical crises due to the decline in cargo.

The *potential* cargo for the waterway at year 2025 was estimated to be 22,550,000 tons. To the authors knowledge, there has been no study on the potential of Polish railroads to take over part of these load or assessment of its impact on the situation of the bankrupting state railway company (with almost 200,000 employees).

This study reveals that there are high *existing* natural values of the river valleys, which will be significantly affected by the waterway project. In this study, natural habitats occurring along the river systems were considered. Most depend on the surface and groundwater level. Lowering the water level, diminishing the natural fluctuation or decreasing the water velocities are the main threats for the functioning of these ecosystems.

In order to assess the natural value of the areas along the planned East-West waterway, the list of areas protected for nature conservation purposes by law as well as list of places with high ecological values have been identified. In the river valleys that form the route of the planned East-West waterway there are:

- 42 nature reserves,
- 1 national park,
- 10 landscape parks,
- 28 protected landscape areas.

The different categories of legally protected areas are found in the river valleys for around 90% of the length of the planned waterway.

Considering the ECONET – areas, which are important for animal migration and/or non-disturbed connection of the different local populations, a hundred percent of the route of the planned waterway is found within the boundaries of the ECONET network. There are:

- 5 core areas of international importance,
- 2 core areas of national importance,
- 6 ecological corridors of international importance.

In the river valleys forming the waterway route there are 17 bird species which strongly threatened by extinction, (national population has less than 100 breeding pairs) and 49 threatened species (national population has 1,000 - 10,000 breeding pairs). Regarding habitats for birds, there are also 9 areas of European importance and one area of national importance (defined in international survey by Birdlife International).

Regarding the ichthyofauna (fish) in the considered rivers, the most valuable segments of the planned waterway are:

- The Bug River - for species diversity,
- The Vistula River below the Włocławek Dam - for the migration of threatened species: sea trout (*Salmo trutta)* and vimba (*Vimba vimba*),
- The Noteć River from the mouth of the Drawa River to the Odra River - for the migration of brown trout and potentially salmon (*Salmo salar)*.

The most valuable natural plant habitats in the considered valleys, which occur in the almost undisturbed state are:

- Willow-poplar riverside carrs *(Salici-populetum)*
- Ash-elm riverside carrs *(Ficario-Ulmetum campestris)*
- Alder carrs *(Carici elongatae-Alnetum)*

Changing the natural river system to a waterway would have a dramatic impact on the riverine habitats and the surrounding valley. This would occur as a result of changing the natural regime of river flow (lack of floods, constant flow velocities, almost stable water level) and decreasing the groundwater level but also by migration obstacles (weirs and barrages) as well as by changing the physical structure of the river (lack of meanders, oxbows, river islands).

To date, national and foreign experiments have concluded that it is impossible to satisfactorily compensate for the natural values lost as a result of river regulations. An example for this in Poland is the upper Narew River Valley where all proposals regarding the maintenance of the natural environment enclave, on the regulated segment, failed.

Taking into account the *existing* values and the *potential* uncertain benefits of river transport, the development of low-key tourism and recreation is worthy of investigation. However, the management needs could be complex. Diverse forms of water tourism and their accompanying infrastructure should be investigated. To meet anticipated transport needs, alternative ways of achieving this via inland ports in Kostrzyn and Brzesc and existing railroads should be seriously considered.

1. General

1.1 Introduction

According to UN Commercial Committee European Agreement on main inland international waterways from 19 January 1999 at the attached list, under symbol E – 40, the route from Gdańsk to Kherson, on the Vistula River from Gdańsk to Warsaw, the Bug River to Briest, the Pina and Dniepr Rivers through Kiev to Kherson is considered as one of main European waterways to be developed and used in the future (see Fig 1). Three inland harbours in Poland are also placed at the list:

- P- 40-01 Gdańsk at Vistula estuary
- P- 40-02 Bydgoszcz at km 772,3 of Vistula River
- P- 40-03 Warszawa at km 520,0 of Vistula River with entrance to Żerań Canal.

According to studies done in Poland (see list of works and studies) the possible routes of the waterways connecting east with west are:

- *Main route:* *Briest-Bydgoszcz-Kostrzyń*
  The most reliable, possible route of waterway, connecting eastern countries with western system, through the Polish territory, is from Briest at Bielorussian border by Bug and Żerań Canal to Warsaw, then by the middle Vistula to Bydgoszcz. From Bydgoszcz to Kostrzyń on Odra River at German border the existing waterway Vistula-Odra can be used, leading by Brda, Bydgoski Canal, Noteć and Warta.
- *Branch route:* *Bydgoszcz-Kaliningrad*
  Use of the branch waterway connecting Kaliningrad in Russia with Bydgoszcz by Vistula Lake, Nogat and Lower Vistula is also possible (Fig.2).

1.2 Historical data

The Vistula, Odra and Bug are the biggest Polish rivers and they were in past intensively used for navigation purposes in their natural state. In XVIII century, construction of navigation canals and other comprehensive works have commenced improvement of navigation conditions in the rivers. At the route considered as potential East-West waterway, the Bydgoski Canal connecting Brda and Noteć was constructed in 1772 – 1774 and the Królewski Canal connecting Muchawiec river – tributary of Bug with Pina river – tributary of Prypeć – was implemented in the years 1775 – 1783. The Upper and Lower Noteć Canal with a system of navigation locks and weirs for water level stabilisation was accomplished in 1870 – 1878. Furthermore, the Nogat, Vistula in Gdańsk region, and Szkarpawa were canalised, and river channels of the Odra, Warta and Lower Vistula were regulated. Completion of these works enabled navigation connections between the Vistula and Odra catchment areas. It was sufficient for use of small cargo vessels and the floating of timber.

In the XX century only minor improvements of the existing waterways took place. The Żerań Canal connecting Vistula river in Warsaw with Zegrzyński Lake at Bug river was accomplished and implementation of Lower Vistula and Bug Cascade planned for navigation and power production has started by construction of Włocławek and Dębe barrages.

The idea of East – West waterway Project from Dniepr through Prypeć, Bug, Vistula to Odra first time was presented in 1909 by the Inter-ministerial Commission in Petersburg when programme of waterways development in Russia was evaluated. In the period of 1914 – 1916 the feasibility study of this Project was worked out and in 1919 the East – West waterway was included into the development programme of waterways presented to the Polish Parliament. In 1926 the Committee of Experts from League of Nations arrived to Poland and supported construction of East – West waterway programme elaboration.

In the plan of the economical development of Poland, worked out in 1950, the East – West waterway project was presented as the most important investment. The cascade of theBug river from Briest to Modlin was considered as integral part of this great waterway. The feasibility study of Dniepr – Prypeć – Bug – Vistula class IV waterway was commenced in 1962. In 1975 Hydroprojekt Warszawa elaborated basic design documents for " Regulation of Bug river from Dębe reservoir tail water to Niemirów ", following the above mentioned study.

There has been a long history to the proposals for the Vistula River cascade. Many studies and proposals have been prepared. As aresult it has been proved that economically the cascade of Middle Vistula, upstream of the Narew River makes no sense. The works on lower Vistula and Bug are still an open question. However, recently the Polish Government declared that it would consider only one further dam (Nieszawa). Due in part to the expression of international environmental concerns, there is a government Commission of experts examining the options for the protection of Wloclawek dam, including the building of Nieszawa dam. A decision is expected still in the first half of 2000.

2. Present state characteristics

A large part of the proposed East-West waterway main route would use the Vistula and Bug Rivers which presently are two of most near-natural rivers in Europe. They are shallow for long periods of low and mean discharge, often changing the main course, producing deposits, islands and branches. This state does not allow use for navigation by big ships. Large scale works with use of radical technical measures would be necessary to alter this situation.

A slightly better situation for navigation actually exists in the Vistula-Odra waterway and the branch to Kaliningrad. They are for a large part artificial navigation canals and canalised parts of rivers with several barrages and locks. The only disadvantage is that they form a low class waterway allowing the use of small barges with load capacity up to 300 t.

The whole proposed waterway route is described in more detailed way below.

2.1 Main route

2.1.1 Section I - Bug river from Briest to Zegrze Lake

From Briest to Zegrze lake, the Bug is one of most natural of Polish major rivers, with side-branches, islands and unique mosaics of vegetation. In this part (286 km) the river depths during the navigation season is in the limits of 0.8 – 1.1 m, and during lower water flows this

drops in many parts to the depth of 0.5 m. The bends of main stream are with radius less than 250 m and minimum clearance under the bridge in Brok town is 5.00 m.

At the entrance from Bielorussian territory to "frontier Bug" on the Polish border, the existing weir in Kozłowice, downstream of Briest, without a navigation lock, constitutes the main obstacle at the waterway. The weir maintain water level in Bug and its tributary Muchawiec river to facilitate navigation at Muchawiec and in Briest river port.

2.1.2 Section II – from Zegrze Reservoir to Warsaw

The section is an artificial waterway consisting of Zegrze Reservoir developed by Dębe Barrage construction and Żerań – Zegrze navigation canal, 25 km long and 2.5 m deep, with navigation lock in Warsaw. The lock of class III measuring L = 85 m (length) by B = 12 m (width), with a capacity of 8500 lock operations annually.

2.1.3 Section III - Vistula river from Warsaw to Bydgoszcz

Considering the differences in technical parameters and hydraulic conditions, Section III should be divided into three Sectors:

Sector III.1 Warsaw to Płock

The Vistula river has a natural sector from Żerań Canal in Warsaw to Włocławek reservoir tailwater (Płock town). The navigation route of 103 km does not even meet the requirements of a Polish class I waterway because of shallowness. Rock and sand-bars and a lack of a clear main river channel characterises this section. It has been ascertained that in existing conditions the transit depth of 0.8 m prevail during the 215 days navigation period from April to the end of November.

Sector III.2. Włocławek reservoir

The navigation route of 52 km from Płock to Włocławek with a navigation lock at Włocławek Barrage meet the requirements of class IV waterway. The lock having a length of 115m and width of 12 m facilitates a maximum of 8500 lock operations annually at 10 hours for one working day shift. The length of lock allows for locking several barges at the same time, which results in much higher efficiency than in the Odra – Vistula section. The only problem is the effect downstream to the lock, as described below.

Sector III.3. Włocławek – Bydgoszcz

Conditions for navigation of the 97 km long section depend considerably on operating system of Włocławek hydropower station which has to satisfy demands for peak energy requirements. Therefore, for the most part of the time water is retained in Włocławek reservoir. Discharges in the downstream section of the river are small and water levels are low. In 1990, from April through to November, 110 days with depths in the river of less than 80 cm were found and 103 days in the year of 1991. This seriously limits navigation potential. According to statistics, before construction of Włocławek barrage, 5 hours were needed to sail from 718 km to 675 km upstream. Now, when Włocławek hydropower station operates, 3

days are needed to overcome the same section sailing on peak discharges with minimum 2 days "waiting – for – discharge". Furthermore there are sand and rock bars in this section.

2.1.4 Section IV - Vistula – Odra Waterway

The total length of this route consisting of Brda River, Bydgoski Canal, Noteć River and Warta River is 294 km. The Vistula – Odra waterway fulfils, with certain departures, requirements of class I and partly some requirements of class II navigation, according to the Polish local classification.

It could be ascertained that Vistula – Odra waterway still can be used by barges of 300 t capacity at low water levels and 400 ton at average and high water levels. Some years ago barges of 500 t used this waterway but with cargo limited to 50 – 60 % of load capacity. Departures from Polish class I waterway, resulting in navigation difficulties appear in following parameters:

- depths at the downstream sill of navigation locks 1.30 to 1.60 m instead of 1.50 m
- width of canalised Noteć navigation route at the bottom of fully loaded barge 16–25 m instead of 30 m
- minimum radius of curve of navigation route 200 – 250 m instead of 250 m required
- minimum clearance under bridges 3.5 – 4.0 m instead of 4.5 m.

Section IV can be divided for five sectors with different parameters as follows:

Sector IV.1

The canalised Brda river with two navigation locks including Brdyujście lock with a length of 60 m and width of 18.2 m. Presently the new lock in Czersk with a length of 190 m and width of 12 m, and a transit depth of 4.00 m is under construction.

Sector IV.2

The Bydgoski Canal represents 25 km of canal with six navigation locks which dimensions are: length 57 m, width 9.6 m, minimum depth at the downstream sill g = 1.30 m (at low water level) Lower Noteć. The transit depth t = 1.1 – 1.3 m and minimum clearance under existing bridge m = 3.78m.

Sector IV.3

The canalised Lower Noteć – 137 km of the river in which water level is maintained with 14 locks and barrages. Lock dimensions are of the similar size as at Bydgoski Canal. The transit depth of navigation route t = 1.1 – 1.3 m, minimum clearance under the bridge m = 3.55 m. 26 % of curves of navigation route have the radius R = 400 m, 61 % of curves have the radius R = 250 – 300 m and 13 % have the radius R = 200 m and less.

Sector IV.4

Lower Noteć – 50 km of natural river channel with depth of navigation route t = 1.1 – 1.3 m.

Sector IV.5

Lower Warta – 68 km of natural river channel with depth of navigation route at low water levels t = 1.5 – 2.0 m. Minimum clearance under the bridge m = 3.55 m.

2.2 Branch route

The other transport route which can be considered independently to the Briest - Odra way is branch from Kaliningrad to Bydgoszcz. Taking into consideration conditions of navigation three sectors can be distinguished in Section.

2.2.1 Sector IB - Zalew Wiślany Bay

Zalew Wiślany – part of route ca. 90 km long on a closed natural sea bay. For many years this has been closed for navigation because of the border between Poland and Russia crossing the bay. The possibility of utilising this waterway increased considerably with the political changes going on.

The navigation conditions are not well recognised. There is some local navigation activity on Polish and Russian parts of Zalew Wiślany and it is used for fishery but more investigation of the situation between Nogat mouth and Kaliningrad should be carried out.

2.2.3 Sector IIB - Nogat River

This an artificial navigation canal, 62 km long, with flow regulated by gates on inlet from Vistula River in Biała Góra. The water level in the canal is maintained by 4 navigation locks with dimensions: Length 57-62m, width 9.6m, minimum depth at the downstream sill 2,40m. The transit depth of navigation route t=2.40 – 3.10 m, width at the bottom of barge B=16-20m. Minimum radius of curve R=250m. There are four old bridges. Each of them has movable navigation span, so clearance is unlimited.

2.2.4 Sector IIIB - Vistula River fom Nogat to Bydgoszcz

The Vistula River from Nogat inlet at Biała Góra to Bydgoszcz including 94 km of natural river channel with a navigation depth t=1.20m. It meets requirements of Polish class I and in some parts class II waterway.

3. Transport needs

3.1 Actual use for navigation

Water transport currently plays no significant role in whole transport system of Poland. In practice only the Odra river at the western border of country is used as a waterway. The rest

of rivers and canals, including the East – West waterway route, are in present not usable for regular navigation. All cargo and passenger transport needs, as well internal as international, are covered by other means: roads and railway. There is only some local navigation activity by small boats, mainly for recreational and tourist purposes and for technical services.

3.2 Future water transport needs prognosis

The general transport needs for the Polish territory are rather large and growing fast. Taking into consideration the geographical position in Europe, one of its main directions is the east – west transit connection. According to some analysis from available studies, most of the needs could be covered by another kinds of transport means, but there are also some potential possibilities to use water transport too, on the condition that it will be reasonable from technical and economical point of view. In the "Feasibility Study of East – West Inland Waterway Restoring and Development Prospects" [1] was estimated that the potential cargo transport needs for East – West waterway in the year 2025 can amount to:

	Main route	Branch route
- Internal routes	7 350 000 tons	-
- Polish import and export	7 100 000 tons	200 000 tons
- Transit	8 100 000 tons	600 000 tons
Total	22,550,000 tons	800,000 tons

Due of long routes, passenger transport is only meaningful locally, in the vicinity of larger towns. Tourist and recreational use of the very attractive natural parts of Vistula and Bug rivers with their landscape and wild nature values, may be more realistic to develop.

4. Possible technical solutions

4.1 Minimum programme: existing waterways improvement

The most realistic programme, using existing waterways with some necessary improvements can be considered as a first step. It could be implemented in a short time and at rather small costs. Such action is possible only at the part of above described routes where the waterway just exists:

Section IV - Vistula – Odra Waterway
Branch route – Kaliningrad - Bydgoszcz

Taking into consideration parameters of these waterways they could be used for cargo transport by barges with maximum capacity up to 300 tons.

The other parts of waterway considered as a link between east and west (the Bug and Vistula rivers) do not allow cargo navigation in their present state even with small barges. Taking into consideration the natural conditions, there is no possibility to get better results by simple technical measures, for example by river complex regulation.

4.2 Basic programme: international waterway Class IV construction.

According to an analysis made of available studies, the most reasonable parameters assumed for the East – West future waterway are as for European Class IV for barges with capacity of 1500 tons. However, achieving such a waterway is possible only by huge investment program. A complex system of low-head barrages in a cascade construction for the whole waterway is required. Each barrage should consist at least of dam, weir and navigation lock and if a multipurpose cascade is proposed the hydropower plant should be also constructed. Upstream and downstream of each barrage, remodeling of river channel and river valley, together with a flood protecting dam system would be necessary. To complete the 875 km long East-West inland waterway for the Polish territory, the following works would need to be carried out (Fig.3):

- Bug river cascade with 13 barrages and lateral navigation canals
- Vistula river cascade with 6 barrages (including existing one in Włocławek) at the part between Warsaw and Bydgoszcz
- Modernization of Vistula – Odra Waterway by construction of 14 new barrages and 17 navigation locks

It is estimated that at least 30 years of intensive works would be necessary for implementation of such a huge programme.

5. Financial and economical analysis

5.1 Proposed phases of implementation

Taking into consideration the range of above described programmes in plans considered up to now, it is proposed to implement it in phases:

- First phase - existing water ways improvement (described in par.4.1),
- Second phase - the international water way Class IV construction (described in par.4.2).

5.2 Cost and profit estimation results

According to cost estimations made in basic studies for East-West waterway, the funds needed for programme implementation, calculated at the level of 1999 year prices are:

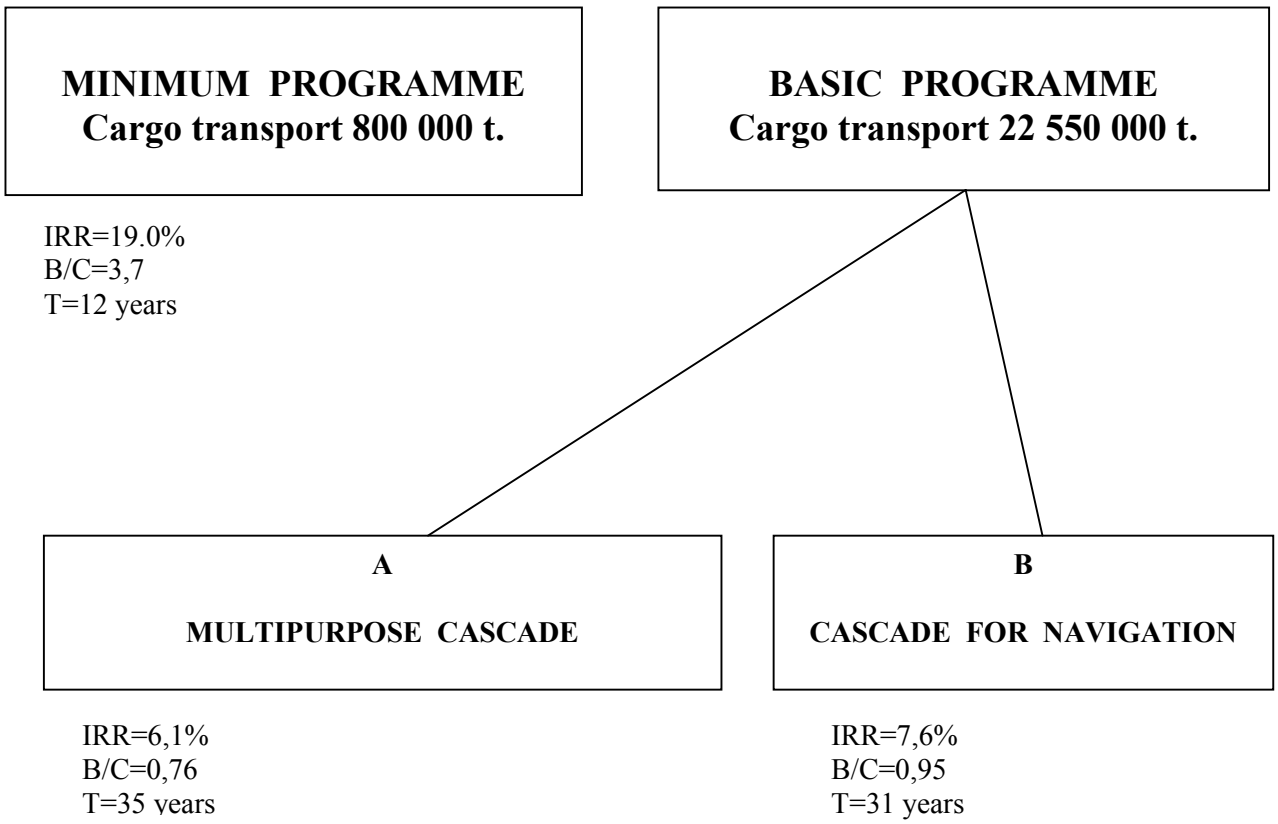
Phase I

- Vistula – Odra Waterway improvement		876 mln zł equal to 219 mln Euro
- Branch route from Kaliningrad to Bydgoszcz		4 mln zł equal to 1 mln Euro
	Total	880 mln zł equal to 220 mln Euro

Phase II

- Bug river cascade		11 180 mln zł equal to 2 795 mln Euro
- Vistula river cascade		5 530 mln zł equal to 1 385 mln Euro
- Vistula – Odra Waterway remodeling		27 000 mln zł equal to 6 750 mln Euro
	Total	**43 710 mln zł equal to 10 930 mln Euro**

According to analysis done in these studies, on the basis of classical cost/benefit calculations (excluding the environmental costs), construction of cascades at Bug and Vistula rivers and remodeling of Vistula – Odra Waterway for navigation purposes can not be economically proved. The results of these analyses are presented below:



Where:
IRR – Internal Return Rate
B/C – Benefits/Costs ratio
T – Return Time

The cost-benefit calculation was made by the team of economists from Gdańsk University at the beginning of 1993, at the start of fresh capitalism conditions in Poland and connected with that level of knowledge. The calculations seem to have been conducted in complicated way with use of many risky assumptions and circumstantial evidence to prove that the construction of waterway is profitable. It has many weak points and can be easily criticised.

In general the transport direct effect value was calculated separately for domestic, import, export and transit fares, comparing profits from water transport with those from railway transport. Transport profits make up 94% of the total profit made by the waterway construction. Other direct and indirect profits from energy production, agriculture, flood protection, environment improvement and unemployment reduction were also taken into consideration.

The only cost-effective result is that for the minimum programme. However, the more detailed economic assessment suggests very small profits and only for some fragments of the

analysed waterway route. In this situation it may be very difficult to find the investor for such complex, complicated and time consuming investments.

6. The natural value of river valleys along the planned East-West waterway

In order to assess the natural value of the areas along the planned east-west waterway the list of areas protected by law as well as list of places with high ecological values has been identified.

6.1 Areas protected by law for nature conservation purposes

Areas protected by law are grouped as follow:
- reserves,
- national parks,
- landscape parks,
- protected landscape areas,

All of these are territorially connected with the river valleys along the planned waterway. In this chapter, areas are shown (Fig. 4) whose specific habitat depends on the water level in the river and the river valley.

6.1.1 Reserves

Below are listed the names of reserves followed by their national identification number. Their localisation can be found on Figure 5.

The Bug River Valley from the mouth of the Muchawiec River including the Żerański Canal.
0955 “Czapli Stóg” breeding site of the grey heron
1188 “Szwajcaria Podlaska” old tree stands on the scarp of the Bug River Valley
0617 “Łęg Dębowy koło Janowa Podlaskiego” an oak riverside carr near Janów Podlaski
0855 “Zabuże” oak timber forest
0471 “Przekop” elm-ash riverside forest
0736 “Dębniak” lime-oak forest on the scarp of the Bug River Valley
0773 “Kaliniak” dry-ground forest and riverside forest
0958 “Wydma Mołożewska” with bird breeding sites
0982 “Skarpa Mołożewska” a river scarp with xerothermic plants
1064 “Biele” site of the globe flower Trollius europaeus
0795 “Czaplowizna” coniferous forests and marshy coniferous forests
0806 “Jegiel” spruce-swamp forest

The Vistula River Valley from the mouth of the Żerański Canal to the mouth of the Brda River
1344 "Ławice Kępińskie" islands and sandbars
1023 “Jezioro Kiełpińskie” old riverbed of the Vistula River
1345 "Kępy Kazuńskie"

0812 “Ruska Kępa” willow-poplar riverside carr
1346 "Zakole Zakroczymskie" sandy islands
1347 "Wikliny Wiślane" a breeding refuge
0990 “Rzepki” pine timber forest in the Vistula River Valley
1171 “Kępa Rakowska” Vistula island - breeding refuge for valuable river-bird species
1172 “Kępa Antonińska” as above
1173 “Wyspy Zakrzewskie” as above
1174 “Wyspy Białobrzeskie” as above
1175 “Kępa Wykowska” as above
0978 “Kępa Bazarowa” willow-poplar riverside forest

The Vistula River Valley from the mouth of the Brda River to the town of the Ujście
0023 “Wielka Kępa” riverside forests along the Vistula River
0222 "Park Mariański in Bydgoszcz"
0620 “Wiosło Duże” a forest with xerothermic plants
0486 “Wiosło Małe” a forest with xerothermic plants and forest-steppe plants
0528 “Biała Góra” steppe plants
0582 “Mątawy” an ash-elm riverside forest
1124 “Mewia Łacha” breeding colonies of water birds and waders
0505 ”Jezioro Drużno” breeding sites of water birds and waders

The Nogat River
0530 “Las Łęgowy nad Nogatem” an old ash-elm riverside forest
1125 “Zatoka Elbląska” the breeding site of water birds and waders in the bay

The Brda River Valley - The Bydgoski Canal - The Noteć River Valley -The Warta River Valley

0670	“Łąki Ślesińskie”	site of shrubby birch *(Betula humilis)*
0538	“Zielona Góra”	dry-ground broad-leafed forests
0531	“Wilcze Błoto”	a peatland in the Noteć Primeval Forest
1355	"Santockie Zakole"	riverside forests
0565	“Lemierzyce”	a mixed-forest in the Warta River Valley
1033	“Czapliniec Lemierzycki”	a colony of grey herons (*Ardea cinerea*)
0720	“Słońsk”	breeding ground and a refuge for migrating birds

6.1.2 National Parks
- Kampinoski National Park in the Vistula River marginal valley

6.1.3 Landscape Parks

The Bug River Valley from the mouth of the Muchawiec River including the Żerański Canal
- Podlaski Przełom Bugu (The Podlaski Gorge of the Bug River)
- Nadbużanski Landscape Park

The Vistula River Valley from the mouth of Żerański Canal to the mouth of the Brda River
- Gostynińsko-Włocławski Landscape Park
- Brudzeński Landscape Park

The Vistula River Valley from the mouth of the Brda River to the town of the Ujście
- Chełmiński Landscape Park
- Nadwiślański Landscape Park

The Nogat River
- Mierzeja Wiślana Landscape Park

The Brda River Valley - Bydgoski Canal - The Noteć River Valley - The Warta River Valley
- Ujście Warty Landscape Park

The Odra River Valley
- Cedyński Landscape Park

6.1.4 Protected landscape areas

The Bug River Valley from the mouth of the Muchawiec River including the Żerański Canal
- Nadbużański
- Dolina Bugu [The Bug River Valley]
- Dolina Bugu i Nurca [The Bug and Nurzec River Valley]
- Województwa Warszawskiego [The Warsaw Voivodship]

The Vistula River Valley from the mouth of the Żerański Canal to the mouth of the Brda River
- Nadwiślański
- Nizina Ciechocińska [The Ciechocińska Plain]
- Doliny Drwęcy [The Drwęca River Valley]
- Wydm Kotliny Toruńsko-Bydgoskiej [A dune area south of Toruń]
- Wydm Kotliny Toruńsko-Bydgoskiej [Dunes of the Toruńsko-Bydgoska Basin]
- Obszar Strefy Krawędziowej Kotliny Toruńskiej [The edge-zone of the Toruńska Basin]
- Ostromęcki

The Vistula River Valley from the mouth of the Brda River – to the town of Ujście
- Ostromęcki
- Strefy Krawędziowej Doliny Wisły [The edge-zone of the Vistula River Valley]
- Nadwiślański
- Doliny Kwidzyńskiej [The Kwidzyńska Valley]
- Gniewski
- Środkowożuławski
- Żuław Gdańskich [The Gdańsk Marshland]
- Wyspy Sobieszewskiej [The Sobieszewska Island]

The Nogat River
- Białej Góry
- Rzeki Nogat [The Nogat River]
- Ujścia Nogatu [The mouth of the Nogat River]

The Brda River Valley - The Bydgoski Canal - The Noteć River Valley - The Warta River Valley

- Wydm Kotliny Toruńsko-Bydgoskiej [Dunes of the Toruńsko-Bydgoska Basin]
- Nadnotecki
- Dolina Noteci [The Noteć River Valley]
- Puszczy Noteckiej [The Noteć Primeval Forest]
- Puszcza nad Drawą [The Primeval Forest along the Drawa River]
- Puszcza Drawska [The Drawa Primeval Forest]
- Pojezierze Międzyrzecko-Międzychodzkie [Międzyrzecko-Międzychodzkie Lakeland]
- Krawędź doliny Warty [The edge of the Warta River Valley]

In the river valleys that form the route of the planned east-west waterway there are:
- 42 nature reserves,
- 1 national park,
- 10 landscape parks,
- 28 protected landscape areas

About 90% of the length of the planned waterway affects areas legally protected for nature conservation.

6.2 The areas of ECONET-PL

Below are listed all segments of ECONET-PL that the planned waterway crosses as well as their national identification number and level of importance. The scheme of the sites can be found on Figure 6. In the ECONET system, core areas are designed for species protection and ecological corridors should allow for undisturbed migration.

1.	Core Area of the Lower Bug River Valley	24M	international importance
2.	Corridor of the Lower Narew River	22m	international importance
3.	The Warsaw Corridor of the Vistula River	20m	international importance
4.	Core Area of the Kampinoska Primeval Forest	20M	international importance
5.	Core Area of the Gostynin Lakeland	7K	national importance
6.	The Toruń Corridor of the Lower Vistula River	15m	international importance
7.	Corridor of the Noteć River Marginal Valley	13m	international importance
8.	Core Area of the Lower Noteć River	8M	international importance
9.	Core Area of the Noteć Primeval Forest	3K	national importance
10.	The Gorzów Corridor of the Warta River	11m	international importance
11.	Core Area of the Lower Warta River	4M	international importance
12.	The Kostrzyń Corridor of the Odra River	10m	international importance
13.	Core Area of the mouth of the Odra River	1M	international importance

Along the route of the planned waterway there are:
- **5 core areas of international importance (M)**
- **2 core areas of national importance (k)**
- **6 ecological corridors of international importance (m)**

A hundred percent of the route of the planned waterway is found within the boundaries of the ECONET network.

6.3 The ornithological values

6.3.1 The state of threatened species

- The number of strongly threatened species - 17
- The number of threatened species - 49
- The number of threatened and strongly threatened species for which the east-west valleys are main breeding sites for more than 10% of the national population - 16
- The number of threatened and strongly threatened species, for which the valleys of the planned east-west waterway are breeding sites for about 50% of the national population of the stone curlew (*Burhinus oedicnemus*), common gull (*Larus canus*) and western curlew (*Numenius arquata*) - 3

Where the following criteria are used

- strongly threatened by extinction: national population has less than 100 breeding pairs
- threatened by extinction: national population 1,000 - 10,000 breeding pairs

In the river valleys forming the route of the planned East-West waterway, there are 66 bird species threatened by extinction.

6.3.2 Bird Areas

Below are listed the bird areas which are found along the route of the planned waterway with their specified level of importance and the number of the bird area as given in the chapter "Poland" of the book by Grimmett and Jones entitled "Important bird areas in Europe".

The Bug River Valley

The Lower Bug River Valley	European importance	no. 095
The Zegrzyński Reservoir	National importance	no. 120

The Vistula River Valley

The Kampinoska Primeval Forest	European importance	no. 122
The mouth of the Vistula River	European importance	no. 023

The Nogat River

Lake Drużno	European importance	no. 025
Vistula Lagoon	European importance	no. 024

The Noteć River Valley

The Ślesin Ponds	European importance	no. 130
The Ostrówek and Smogulec Ponds	European importance	no. 129
The Upper Noteć riverside carrs	European importance	no. 035

The Warta River Valley

The Warta River flood waters
Słońsk **(Ramsar site)** European importance no. 039

In the river valleys along the route of the planned East-West waterway there are (Figure 7):
- **9 bird areas of European importance, including 1 Ramsar site**
- **1 bird area of national importance**

6.3.3 Valleys of the planned waterway as a route for the migration of birds

The main route:	Siberia and Scandinavia ↔ Africa
The most important habitats:	shallow waters and islands of the Bug and Vistula Rivers flood waters of the Noteć and Warta Rivers
The most valuable migration areas:	the mouth of the Warta River close to the town of Słońsk - up to 90,000 migrating geese

The planned waterway includes a vital north-south bird migration corridor

6.4 The ichthyological values

The Bug River to the Zegrzyński Reservoir

On the basis of fish catches, 29 fish species were found with a total biomass slightly less than that found in the neighbouring Zegrzyński Reservoir. This is more than 70% of the number of species living in Polish lowland rivers (40 species). In comparison to all other segments, fish composition is clearly the most diverse here. In previous years, as a result of periodical autumn sewage discharge from a sugar plant, widespread fish kills were noted.

The Zegrzyński Reservoir and the Żerański Canal

Here, an abundance (in biomass) of fishes, three times larger than in the Włocławski Reservoir was recorded. The size of the fish was much greater, which is most likely connected with the cleaner water in the Zegrzyński Reservoir. In this segment 29 fish species were found.

The Vistula River from the mouth of the Żerański Canal to the dam in Włocławek

Fourteen (14) fish species, occurring abundantly, were found in the area of the dam backwater in Włocławek These fish do not reach large sizes, which we can assume is a result of water pollution. There is a shortage of data about the state of the fish in the segment from the mouth of Żerański Reservoir to the dam backwater in Włocławek.

The Vistula River from the dam in Włocławek to the mouth
Two species use this segment during their spawning time migration: sea trout (*Salmo trutta*) and vimba (*Vimba vimba*). Despite the existence of a fish ladder, the dam in Włocławek interferes with these migrations. The list of results of fishing using nets is proof of this condition:

Species	Fishing ton/year	
	below dam	above dam
Sea trout	9.2	0.0
Vimba	19.2	0.2

The Nogat River
The damming of river water causes the Nogat River to be a habitat for fish suited to standing waters. In 1964, 26 fish species were found here. Fish harvesting was at the level of 45 tons annually.

The Brda River - The Bydgoski Canal - The Noteć River to the mouth of the Drawa River
There is a shortage of data for these areas. It is only known that in this segment anglers have caught at least 19 fish species.

The Noteć River from the mouth of the Drawa River to the Odra River
Until the late 70s - early 80s, this was a route of salmon (*Salmo salar)* migration from the Baltic Sea to the Drawa River, where their natural spawning grounds were located. Unfortunately, it was the last population of salmon in Poland. This route is now used by vimba migrating up the river during their spawning time, but now the vimba have almost disappeared. Sometimes eels also appear, partly originating from fish stocking.

The planned waterway will affect valuable riverine segments for fish:
- **The Bug River - for species diversity**
- **The Vistula River below the Włocławek Dam - for the migration of threatened species: sea trout and vimba**
- **The Noteć River from the mouth of the Drawa River to the Odra River - for the migration of sea trout and potentially salmon**

6.5 The value of plant cover

6.5.1 Natural habitats and plant types in river valleys along the route of the planned East-West waterway

Willow-poplar riverside carrs *(Salici-populetum)*
These are sites with course-grained sandy alluvial soil located in the yearly flood zone of the river. There are three main types of these riverside carrs, characteristic of:
- large rivers, occurring in the shallow zone close to the river in the valleys: of the middle-Bug River, of the Vistula River to the mouth, of the Lower Warta and Odra Rivers;

- medium rivers, sometimes occurring across the entire width of the valley - characteristic of the Lower Bug River;
- medium and smaller rivers with a low gradient, flowing in meliorated valleys; occurs in the Noteć Valley.

Willow-poplar riverside carrs, in their natural form, rarely occur in these valleys. They are most often found in the form of fragmented tree plantings in a mosaic with meadow-pasture areas. Their fragmentation is also a result of intensive fluvial processes and movement of the river channel. They play an important role in assuring the valleys' function as an ecological corridor.

Ash-Elm riverside carrs *(Ficario-Ulmetum campestris)*
They are naturally found under flooded conditions in species-rich forests dominated by: ash, elm and oak and rich undergrowth and ground cover. This type of forest was preserved in only a few fragments because the high soil fertility resulted in strong pressure from agriculture. The habitats of ash-elm riverside carrs mostly occur in the Lower Warta River Valley and the middle-Bug River.

Ash-alder riverside carrs *(Circeao-Alnetum)*
They are alder forests with the addition of ash with rich undergrowth and under cover. These sites generally occur on the discussed area, especially in the Upper Noteć River Valley. However, they are most often used for agriculture as moist meadows.

Alder Carrs *(Carici elongatae-Alnetum)*
An alder carr is a type of forest where broad-leaved forest vegetation occurs together with herbaceous marsh and shallow water plants. Alder carrs mostly occur on peatlands close to the edge of river valleys, often within the boundaries of shallow-old riverbeds. Due to difficult accessibility, alder carr sites are refuges for many plant and animal species.

Dry-ground forests
Dry-ground forest communities are naturally found in non-flooded, broad-leaved forests with high species diversity dominated by oak, hornbeam and lime trees. Dry-ground forests occur on the abundant mineral soils of high valley terraces, their slopes and local elevations. In the discussed valleys the majority of the dry-ground forests were cut and the land used for cultivation.

Mixed-coniferous forests *(Pino-Quercetum)*
In nature they appear as oak-pine forests. At the present time they are most often strongly transformed by forest management. On the discussed areas, they mostly occur on higher terraces in marginal valleys having only a small connection with valley waters.

Pine-coniferous forests on mineral soils
Pine-coniferous forests occur numerously in the discussed valleys, growing on the very poor, sandy soils of the higher terraces, often diversified by dunes. As a rule they are strongly transformed by man, occurring in pine monocultures.

6.5.2 The current diversity of plants and habitats

The planned waterway would use and change the main valley system of Polish lowlands, which cross the country (Fig 8). They host the natural habitats of great ecological values.

The Bug River Valley along the border segments
- Meadows, willow brushwoods and many fragments of forests located on willow-poplar riverside carr sites in the zone close to the river.
- Fields, meadows and settlements on ash-elm riverside carr sites in the zone far from the river.

The Bug River Valley from the national border to the town of Drohiczyn
- Meadows and pastures on willow-poplar riverside carr sites.
- Pine-coniferous forests on small diluvial terraces.
- Valuable xerothermic communities located on the valley slopes - especially in the vicinity of the towns of Drohiczyn and Mielnik.

The Bug River Valley from the town of Drohiczyn to the town of Brok
- Meadows on willow-poplar riverside carr sites in the zone close to the river.
- Mosaic of ploughed fields located on sandy elevations in the valley.
- Moist meadows on peatlands located on the valley's margins.

The Bug River Valley from the town of Brok to the town of Wyszków
- Meadows strongly dominated by willow brushwoods, with a small concentration of willows and rushes on willow-poplar riverside carr sites - in the vicinity of a strongly meandering channel.
- Pine-coniferous forests and mixed-coniferous forests as well as ash-alder riverside carrs of the Biała Primeval Forest on the southern alluvial terrace.
- Diverse meadows, alder carrs, coniferous forests and coniferous-swamp forests on the northern alluvial terrace.

The Bug River Valley from the town of Wyszków to the Zegrzyński Reservoir
- Grasslands located on willow-poplar riverside carr sites in the zone close to the river.
- Pine-coniferous forests located on the eastern side of the alluvial terrace.
- Meadows and ploughed fields located in different habitat patterns on alluvial terraces.

The Żerański Canal
- Ploughed land and meadows located on dry-ground forest sites and ash-alder riverside carrs close to the Canal.
- Pine-coniferous forests and mixed-coniferous forests located far from the Canal on the alluvial terrace.

The Vistula River Valley from Warsaw to the town of Wyszogród
- Extensive willow brushwoods with a few forest fragments located on willow-poplar riverside carr sites in the zone close to the river.
- Diverse forests and fens located on alluvial terraces especially in Kampinoski National Park on the left part of the valley.

The Vistula River Valley from the town of Wyszogród to the town of Płock
- Diverse willow-poplar riverside carrs located in the zone close to the river.
- Intensively used cropland and rural buildings located on ash-elm riverside carr sites.
- Meadows located on alder carr and ash-alder riverside carr sites on the valley margins.
- Coniferous forests located on alluvial terraces.

The Vistula River Valley from the town of Płock to the town of Włocławek
- Naturally valuable forests, meadows, and fens located in mixed-coniferous forests and riverside carr sites on the wide alluvial terrace of the left side of the valley.
- The remaining part of the valley is located in the area of the Włocławski Reservoir.

The Vistula River Valley from the town of Włocławek to the mouth of the Brda River
- Meadows, pastures, brushwoods and plantings located on willow-poplar riverside carr sites in the zone close to the river.
- Meadows and pastures in a mosaic with ploughed fields located on ash-alder riverside carrs far from the river.
- Pine- and mixed-coniferous forests located on wide alluvial terraces.

The Vistula River Valley from the mouth of the Brda River to the Nogat
- A mosaic of brushwood communities, meadow-pastures and water-rushes located on willow-poplar riverside carr sites contained by embankments.
- Ploughed fields and settlements located on ash-elm riverside carr sites outside of the embankments.
- Meadows located on ash-alder riverside carr sites along the margins of the valley.
- Pine-coniferous forests, mixed-coniferous forests and ploughed fields located on small areas of alluvial terraces.
- Xerothermic communities located on the valley's slopes in the vicinity of the towns of Chełm, Świeć, Kwidzyn and Gniew.

The Nogat River
- A very valuable ash-alder riverside carr forest located in the fork of the Nogat and Vistula Rivers.
- Alder carr fens surrounding Lake Drużno.

The Bydgoski Canal from the Vistula River to the town of Nakło Noteckie
- Meadows located on ash-alder riverside carr sites - in the eastern part.
- Urbanised areas of the town of Bydgoszcz - in the western part.

The Noteć River Valley from the town of Nakła Noteckie to the town of Ujście
- Meadows located on ash-alder riverside carr sites.
- Pine-coniferous forests and ploughed fields located on alluvial terraces on the southern side of the valley.

The Noteć River Valley from the town of Ujście to the town of Drezdenko
- Fen-rushes in old riverbeds.
- Grasslands on shallow organogenic soils located on ash-alder riverside carr sites across the entire width of the valley.
- Coniferous forests - on alluvial terraces.

– Dry-ground forests, oak forests, mixed-coniferous forests - on the valley margins in the vicinity of the town of Czarnków.

The Noteć River Valley from the town of Drezdenko to the town of Santok
– Meadows on diverse riverside carr sites.
– Ploughed fields on the higher terraces in the form of islands.
– Pine-coniferous forests located on the southern terrace of the marginal valley (The Notecka Primeval Forest).

The Warta River Valley from the town of Kostrzyn to the town of Santok
– Fields and grasslands on alluvial soils - located on willow-poplar riverside carr sites close to the river channel and on ash-elm riverside carr sites far from the channel.
– Meadows on alluvial soils and shallow organogenic soils - located in the segment close to the mouth on ash-alder riverside carr sites.
– Meadows on peatlands - located in the eastern part of the segment.
– Coniferous forests on mineral soils - located on alluvial terraces far from the river.
– Oak forests, dry-ground forests and xerothermic plants on mineral soils - located on the northern slopes of the valley.

The most valuable natural plant habitats in the valleys along the route of the planned East-West waterway are:
- **Willow-poplar riverside carrs *(Salici-populetum)***
- **Ash-elm riverside carrs *(Ficario-Ulmetum campestris)***
- **Alder carrs *(Carici elongatae-Alnetum)***

The most valuable plants, with regards to nature, occupy the following segments of the planned East-West waterway:
- **The Bug River Valley on the border segment**
- **The Bug River Valley from the town of Brok to the town of Wyszków**
- **The Vistula River Valley from Warsaw to the town of Wyszogród**
- **The Vistula River Valley from the town of Płock to the Nogat River**
- **The Noteć River Valley from the town of Ujście to the town of Drezdenko**

7. The environmental impact of the planned East-West waterway

7.1. The impact of the planned waterway on protected areas

Through analysing the habitat conditions of areas protected by law, it can be estimated that any changes of water conditions in the river channels along the route of the planned East-West waterway will lead to changes in the water conditions of:
– 23 nature reserves
– 5 landscape parks
– 10 protected landscape areas
This estimation was made with expert knowledge on the subject of essential water conditions for many kinds of valley ecosystems.

7.2 The impact of the planned waterway on ornithofauna

7.2.1 The impact of the planned waterway on bird habitats

Sandy islands in a channel and sandbars along the banks
In Poland, islands in the river channel are found only in the Vistula River and the Bug River. The destruction of sandy islands in the river channel means a drastic reduction in valuable bird species.

Birds living on islands in the river current occupy only newly formed islands, those not yet occupied by bushes and trees. The narrowing of river channels as a result of river regulation prevents natural processes from forming new sandy islands. Therefore leaving part of islands during channel regulation - proposed in the project's assumptions - doesn't give any possibility for the survival of their ornithofauna.

Flooded open areas in valleys, which are a mosaic of meadows, extensively used pastures, old riverbeds and permanently swamped depressions
In order to maintain the ornithofauna of these habitats, it is necessary to assure spring flooding and the extensive use of meadows. Increasing the discharge along the segments of the Noteć River, the Warta River and the Bug River will cause old riverbeds and water-logged places in the valleys to be drained, as well as preventing flooding.

Riverside forests
The changes of water level in the rivers can change the water balance in riverside forests. This will cause changes in the vegetation cover and in the associated fauna.

7.2.2 The impact of the planned waterway on the state of ornithofauna

- For 6 threatened species: the stone curlew (*Burhinus oedicnemus)*, Mediterranean gull (*Larus melanocephalus)*, ringed plover (*Charadrius hiaticula)*, little tern (*Sterna albifrons)*, common tern (*Sterna hirundo)* and common gull (*Larus canus),* the islands in the east-west valleys are their main site of occurrence in Poland (over 10% of the national population). The islands are also essential breeding areas for 3 other species threatened on the country scale; white-winged black tern (*Chlidonias leucopterus),* little ringed plover (*Charadrius dubius)* and the common sand-piper (*Actitis hypoleucos)*
- Cutting off old riverbeds and tributaries of the river from the channel will mean the extermination of other species connected with these habitats including the bluethroat (*Luscinia svecica)*, black tern (*Chlidonias niger)* and shoveler (*Anas clypeata).*
- Building works, which would require moving huge quantities of earth and building materials, the movement of heavy equipment and the work of a large amount of people would cause birds to be flushed from the littoral habitats. The return of these birds will be unsure and a long-lasting process. It will lead to the break down of the population of the great stone curlew, which is strongly threatened by extinction, and whose 4 pairs (among 10 found in Poland) are nesting along the Bug River (1992).
- The drying of forests and riverside carrs will cause their degradation, which will in turn threaten the existence of species nationally threatened, including the crane (*Grus grus)*, middle spotted woodpecker (*Dendropocus medius)*, green woodpecker (*Picus viridus)*,

bluethroat (*Luscinia svecica)*, and the Red Kite (*Milvus milvus)* (also threatened on the European scale).

- It can be said that drying open areas will cause the destruction of feeding and breeding sites for 10 threatened species, including the corncrake (*Crex crex*), which is globally threatened by extinction. In particular, about 40% of the national population of curlews will be threatened.

The Bug River Valley
Foreseen in the Basic Program**,** the cascade of dammed reservoirs will lead to the extermination of all key biotopes and their ornithofauna.

The Vistula River Valley to the mouth of the Brda River
The system of cascades will lead to the destruction of all of the most valuable habitats and threatened bird species.

The Vistula River Valley below the mouth of the Brda River
The cascade of three dammed reservoirs will destroy littoral riverside carr habitats. Ornithofauna, already reduced by the construction of the Włocławek dam, will not be altered significantly in the area of the reservoirs and its backwaters.

The valleys between the Vistula and the Odra Rivers
The reduction of floods will cause serious changes in habitat characteristics and their ornithofauna. It is feared that the water conditions of the Słońsk Reserve will change.

7.3 The impact of the planned waterway on ichthyofauna

The building of a cascade of dams along the Vistula River will result in catastrophic impoverishment of ichthyofauna. An example of this situation is the Włocławski Basin, in which the population of vimba and sea trout has disappeared. Further river regulation would threaten the sea trout and zahrte in the Vistula river by further obstructing migration routes and the spatial continuity of the corridor. It is considered critical that the last migration routes for spawning migrations from the Baltic to the Drweca are maintained. In order to conserve the fish diversity it is also considered essential to secure water quality improvements. Out of more than 30 other fish species existing earlier in this segment of the Vistula River, only a few are left in the basin. 9 species are threatened (including 4 species of lamprey, the sea trout, the zahrte and two species of gudgeon). Fish ladders will not prevent the reduction of the fish stock. It can be foreseen that only a few species will be left here. The measures directed to maintain ichthyofauna diversity in the river channel will fail.

The International Baltic Sea Fisheries Commission (IBSFC) was established in 1974 to regulate fishery management - and a Salmon Action Plan exists for 1997 -2010. Poland has a responsibility under the Helsinki Convention to take measures to restore wild salmon populations to potential salmon rivers, according to a "Salmon Action Plan" (1997-2010).
The Vistula cascade of dams would definitely prevent the widely discussed programme for recovery of salmon populations (*Salmo salar)* in Poland.

7.4 The impact of the planned waterway on plants

The Bug River Valley

In the variant with a navigation cascade, the elimination of river overflow as a result of the influence of a side dam and the disappearance of fluvial processes can be foreseen.
In the variant with an energetic-navigation cascade, very serious and definitely harmful changes in plants will be caused. Willow-poplar tree stands, willow bushes and flooded meadows and pastures will be replaced by the arrangement of reservoirs. This will mean the destruction of willow-poplar riverside carr sites and the elimination of floods. Harmful changes in plant communities will also occur in the remaining part of the valley.

The Vistula River Valley from the mouth of the Żerański Canal to the mouth of the Brda River
Along the regulated segments, willow-poplar riverside carr sites will completely disappear. On the still unregulated segments, the submersion of all islands and other elements of fluvial relief, the elimination of willow-poplar riverside carr sites, and the destruction of the natural values of near river areas will occur. Less significant changes will occur along the Płock-Włocławek segment.

The Vistula River Valley from the mouth of the Brda River to the town of Ujścia
The complete destruction of willow-poplar riverside carr sites will occur.

The Nogat River
More significant changes are not foreseen.

The Bydgoski Canal
More significant changes are not foreseen.

The Noteć River Valley from the town of Nakło to the town of Ujście
The proportion of water-rush plants will increase as a result of cutting segments of the existing channel. If the average water level in a channel decreases it will directly influence the lowering of the valley's moisture content.

The Noteć River Valley from the town of Ujście
The willow-poplar riverside carr sites will disappear. Wet meadows may appear if their use is maintained.

The Warta River Valley
On the segments where the river will exist in its present state, the changes in plants will be less significant if the present flooding is maintained. However, this condition is very difficult to achieve. On the channelled segments, in the near river zone, the willow-poplar riverside carr sites will disappear. Other changes will depend on the water level in the channel.

The Odra River Valley
The arrangement of vegetation communities will be virtually undisturbed because the Odra River has been an active sailing route for a long time.

7.5 The impact of the planned waterway on water quality

In Poland there is a shortage of data that would allow us to precisely foresee the impact of the realisation of the waterway on the change in water purity. Apart from that it can be stated that:

- the realisation of the cascades of dams and reservoirs will seriously effect the waters of the Bug and Vistula Rivers. Based on the knowledge of events that occurred in the area of

the Włocławski Reservoir (and other dammed reservoirs in Poland as well) it can be foreseen that in the reservoirs:

- the BOD-5 value will decrease,
- the concentration of suspended solids will decrease,
- the sedimentation of pollutants will occur,
- the content of nitrogen and phosphorus will increase,
- the content of dissolved oxygen will decrease.

Taking into account the toxicity of the accumulated sediments and the initiation of environmentally harmful biochemical processes in connection with the reduction of oxygen content in the water, the realisation of the cascade would need to be followed by significant water purification in the rivers. Severe eutrophication and increased sedimentation (resulting from the dominance of phytoplankton over macrophytes) would be likely, due to reduced flows and the accumulation of nutrients (N and P) in the water and sediment of the reservoirs. Oubreaks of toxic blue-green algae (cyanobacteria) in the summer are likely to be frequent. Bio-accumulation of certain substances e.g. mercury and cadmium, through the food chain is also anticipated.

8. Conclusions

Taking into account existing situation, technical and economical study as well as ecological considerations on the proposed East-West waterway, the following conclusions can be drawn:

- Water transport currently plays no significant role in whole transport system of Poland. In practice only the Odra River is used as a waterway. There are only some local navigation activity by small boats and ships, mainly for tourism purposes and technical services.

- The main obstacles for the water transport on existing rivers system is due to their natural variability in water stages, meandering, presence of the river sand islands and non-modernised weirs.

- The 10 billion Euro investment is planned assuming the 22,5 million tons of cargo in 2025. With this huge forecasted but uncertain loads, the return of the investment would not be expected for more than 30 years, without counting the long-term ecological costs. The verification of the decision could only be made at the end of the century. The risk of wrong decision is therefore very high.

- Parallel to the planned waterway, there is a railroad system, which connects Frankfurt with Terespol. The transit of cargo, after modernisation/construction of inland ports might be an important chance for saving the Polish State Railroads, which currently faces bankruptcy. To the authors' knowledge, there has been no study addressing this.

- The majority of the planned East-West waterway runs through riverside carr valleys dominated by marshy (flooded) habitats, whose water conditions and their connected natural values are formed by river overflows and by groundwater running along the valleys through sandy deposits. In this clearly defined valley, it is certain that any water level change in the channel will cause changes in the groundwater levels in the larger part of the valley. It is also certain that the natural vegetation in the valleys will be affected by these changes.

- Without the detailed study it is impossible to make a precise forecast for the future of particular national reserves. However already it can be stated that all reserves which have in names (see point 6.1.1) "Kepa", "Wyspa", "Zakole" "Lacha" will disappear if any engineering activity will take place in the rivers. These reserves are located either in the river or at the riverside.

- The main natural values of the valleys along the route of the planned waterway are the very well preserved, near-natural river systems of the Bug and Vistula Rivers, where a complete range of fluvial relief forms occurs - islands, shallow waters, beaches, steep banks, etc. These forms create ideal natural bird habitats so that significant parts of the national population of species that are threatened by extinction survive there.

- The highest natural values are represented by:
  - the Bug river valley because it is impacted by an unregulated, flooding river,
  - the Vistula river valley, which is almost unregulated between embankments.

- National experimentation has shown that river regulation in the riverside carr valleys, resulting in the destruction of overflows and geomorphologic river activities, has caused the biggest losses in the natural environment.

- The East-West waterway is planned along the route of the main national ecological corridor in the east-west direction, running through the main and marginal valleys of Poland. It is a corridor of international character because in the east it joins with the biggest peatland in Europe (the peatland of Polesie in the Ukraine), and in the west it runs through the Toruńska-Eberswaldzka on the marginal valley to Germany.

- The legally protected areas of different categories are found in the river valleys along about 90% of the length of the planned waterway.

- Independent of the present status of naturally valuable areas, it is clear that the Bug and middle-Vistula River valleys deserve very high status i.e. all-encompassing protection, including that of national park. In light of the global recognition of the need to conserve the remaining near-natural rivers (and the requirements for action by the Polish government under the Ramsar Convention on Wetlands, the Bern Convention and the EU Habitats and Birds Directives), this protection status is likely to be achieved in the next few years. The bird refuge at the mouth of the Warta River is a current example of an international designation (Ramsar site).

- To date, a number of national and foreign experiments have concluded that it is impossible to satisfactorily compensate for the natural values lost as a result of river regulations. An example for this is the upper Narew River Valley where all proposals regarding the maintenance of the natural environment enclave, on the regulated segment, failed.

- The building of a cascade of dams in the Vistula and Bug Rivers would contradict the general guidelines of avoiding the constructing reservoirs in heavily polluted rivers. It can be emphasised that purifying the water of these rivers will provide work for a few generations of Poles.

- Taking into account the highly attractive character of the valleys under consideration, the development of low-key tourism and recreation is worthy of investigation, although the management needs may be complex. Preferably, diverse forms of water tourism and their accompanying infrastructure should be considered, each based on the natural values of the area. An essential element of that management must be the gradual improvement of the river water quality, for human health reasons. Thorough, professional studies on tourist and recreation management is necessary. This should take full account of their nature and landscape values.

- From the above points, it follows that the idea of building the East-West waterway is in direct conflict with national priorities for nature protection because it will completely alter valleys that have strategic meaning for the natural environment of Poland and form very important ecological resources for the continent. The waterway idea, having its roots in the 1960s, is a relict that is in contradiction with global tendencies managing river valleys to conserve their natural resources and ecological functions.

- The development of the East-West waterway scheme would involve constructions that would bring the Polish government into conflict with its international commitments under the Ramsar Convention on Wetlands, the Bern Convention and the Helsinki Convention.

- A decision to pursue the waterway scheme would lead to an investment strategy involving a chain of major infrastructure developments that are on an unsustainable course. This would also be counter to the "integration" commitment for sustainable development and environmental protection which is binding under the Amsterdam Treaty.

- There are potential conflicts of interest for the use of EU and EIB funds due to the environmental impacts. EU funds for infrastructure development can, in principle, only be allocated to projects that are in line with and shall contribute to achieving the principles of the Treaty including EU environmental legislation and environmental protection. (for example Article 12 of EC Council Regulation 1260/99 and Article 5 of EC Council regulation 1267/99).

- Further major constructions in the Vistula River would raise strong conflicts with regard to EU environmental legislation such as the future implementation of the Habitats and Birds Directives, environmental impact assessment procedures and the forthcoming EU Water Framework Directive.

- Any failure to carry out any public consultation process in the decision-making process so far, would create a severe discord with civil society and NGOs across Poland. This in turn conflicts with all international standards relating to major infrastructure project approval.

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Annexes

Figure 1. EUROPEAN MAIN WATERWAYS SCHEME

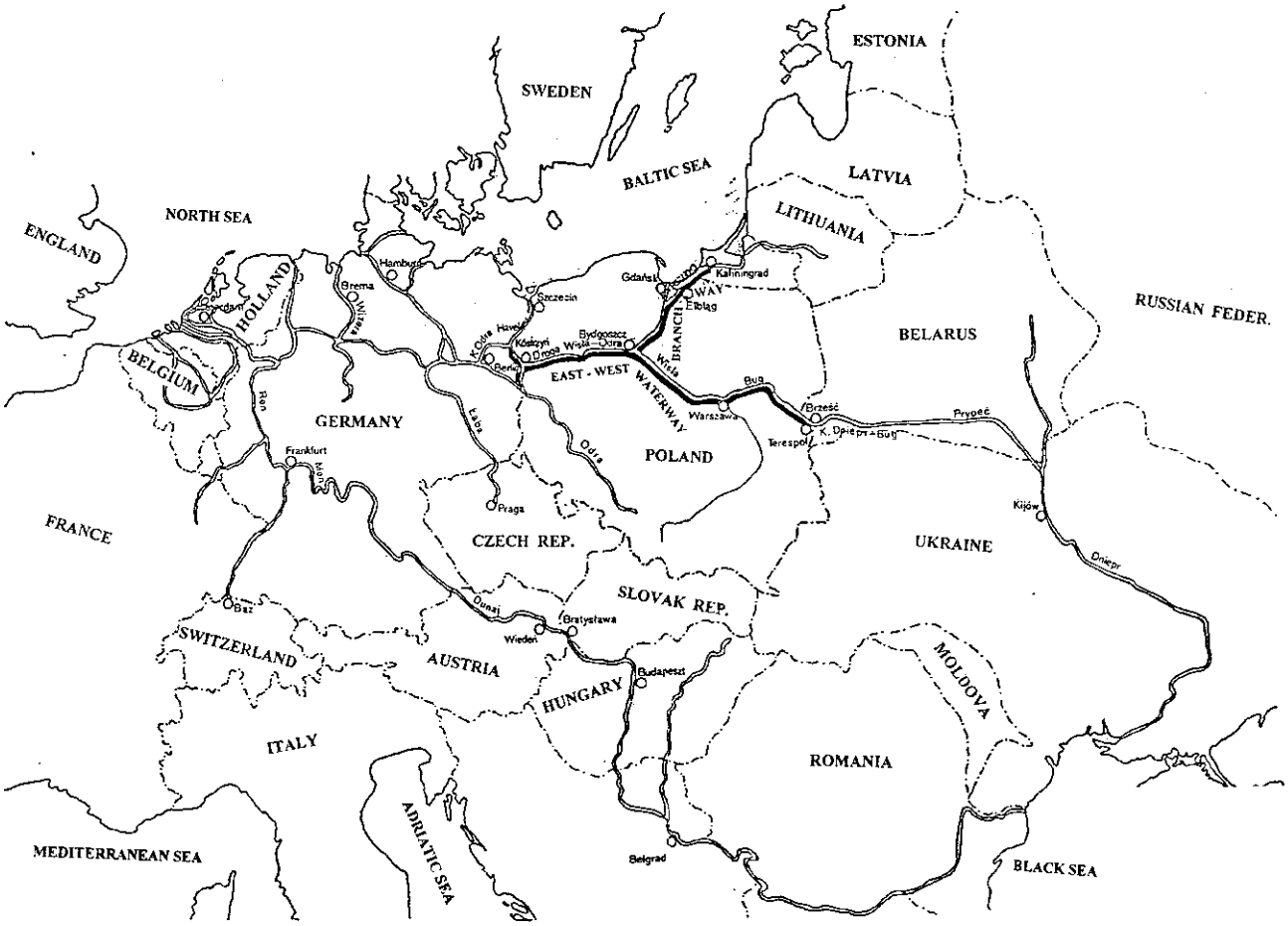


Figure 2. PLANOWANA DROGA WODNA WSCHÓD–ZACHÓD
THE PLANNED EAST–WEST WATERWAY

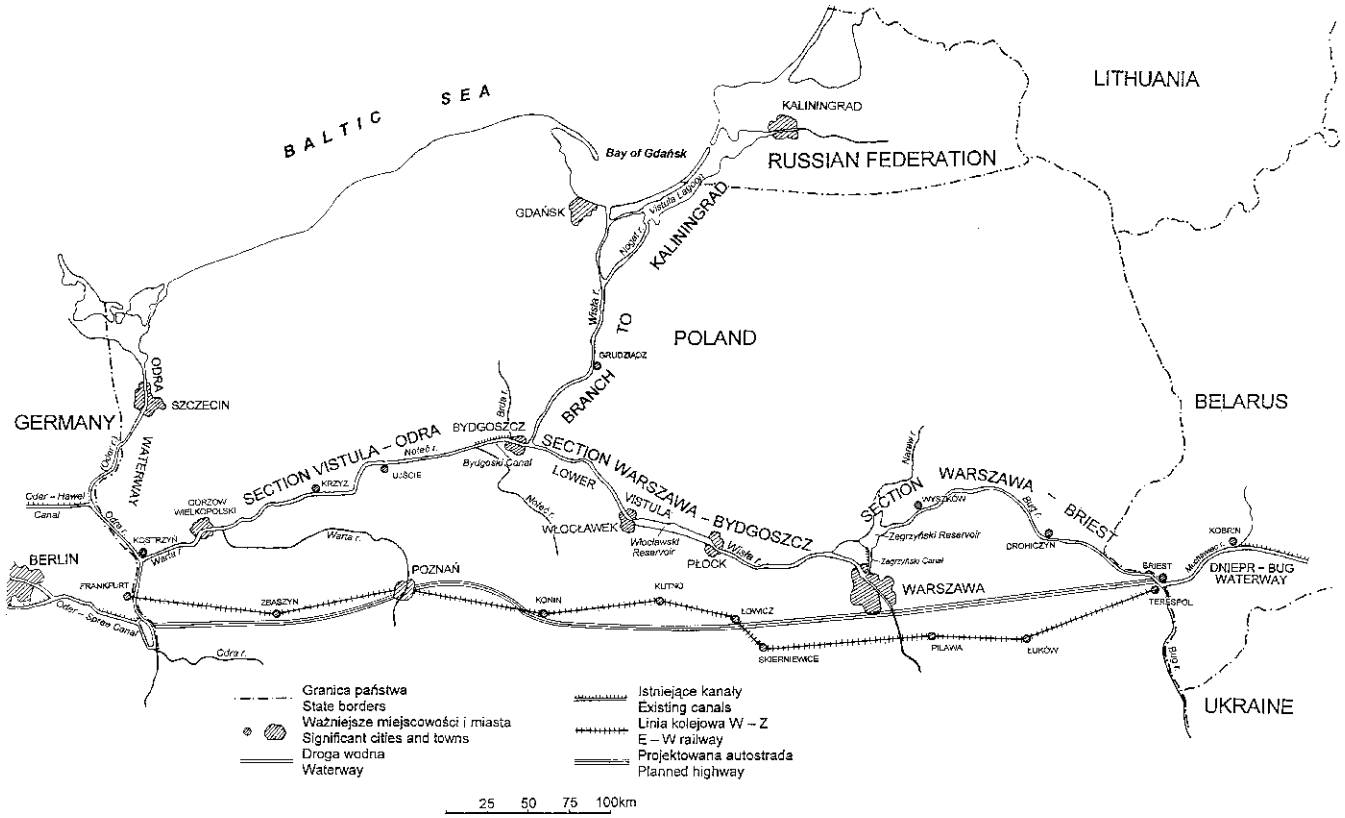


Figure 3. EAST-WEST WATERWAY PROFILE

ACCORDING TO BASIC PROGRAM - CLASS IV

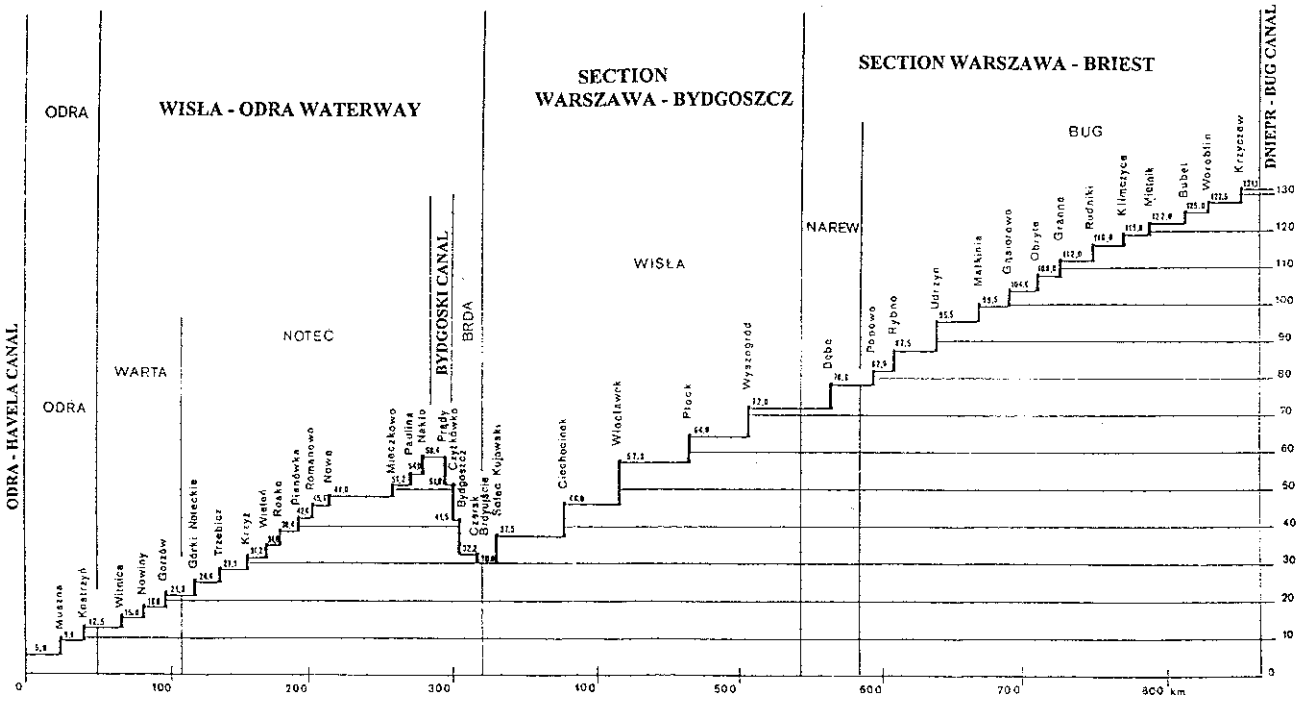


Figure 4. PLANOWANA DROGA WODNA WSCHÓD–ZACHÓD
THE PLANNED EAST–WEST WATER WAY

OBSZARY CHRONIONE
PROTECTED AREAS

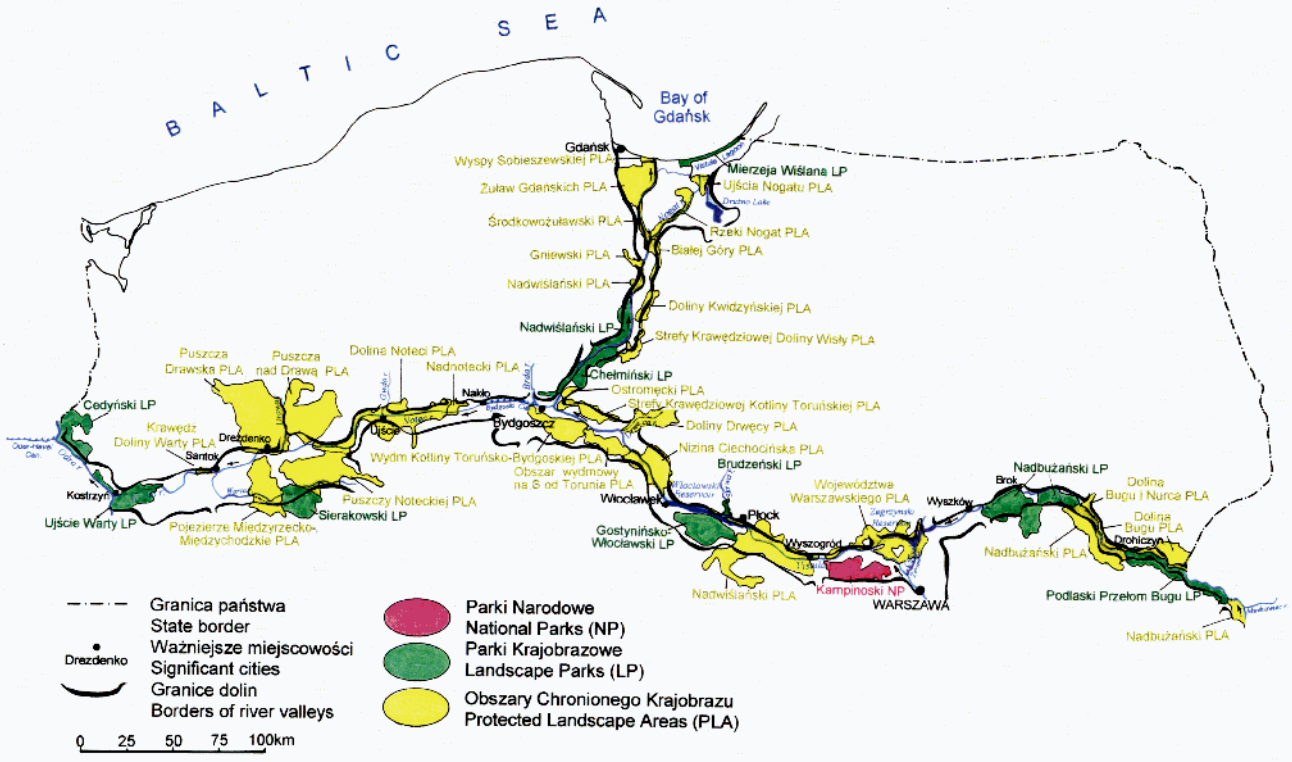


Figure 5. PLANOWANA DROGA WODNA WSCHÓD–ZACHÓD
THE PLANNED EAST–WEST WATER WAY

REZERWATY
RESERVES

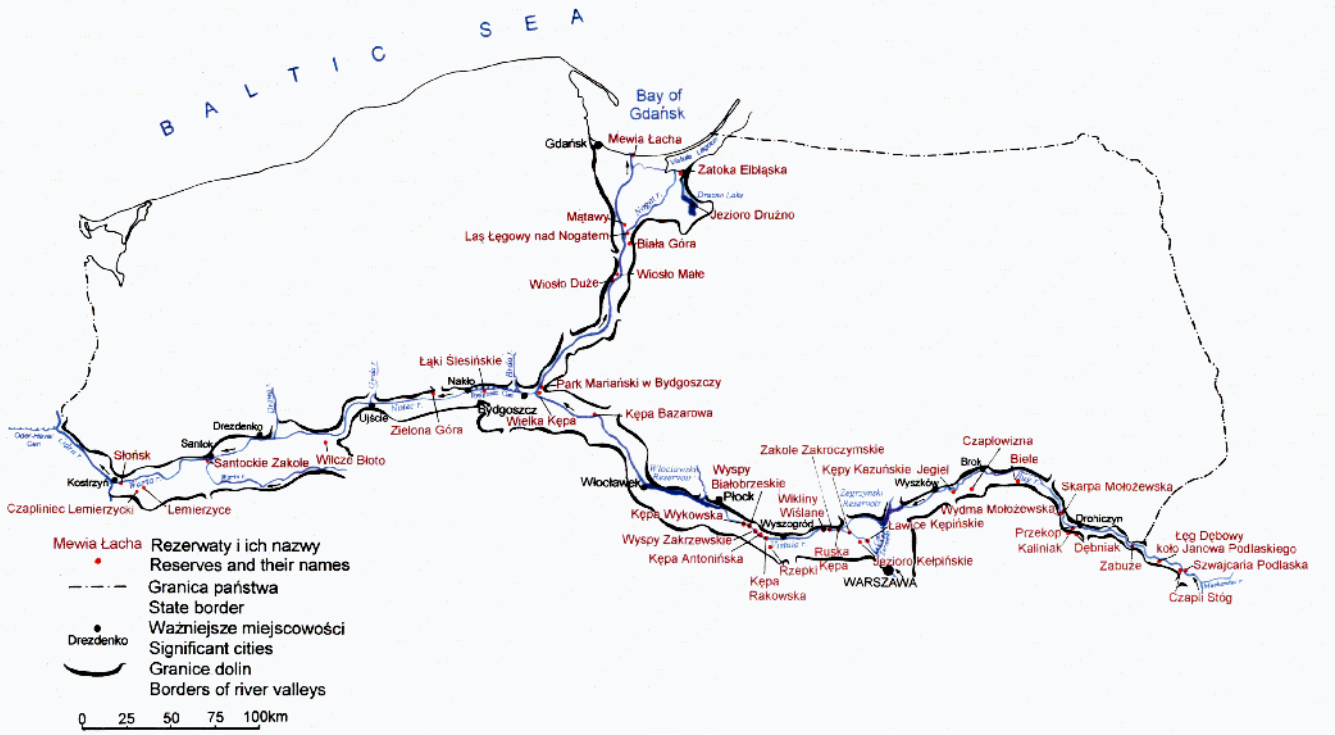


Figure 6. PLANOWANA DROGA WODNA WSCHÓD – ZACHÓD
THE PLANNED EAST – WEST WATER WAY

E C O N E T – P O L A N D

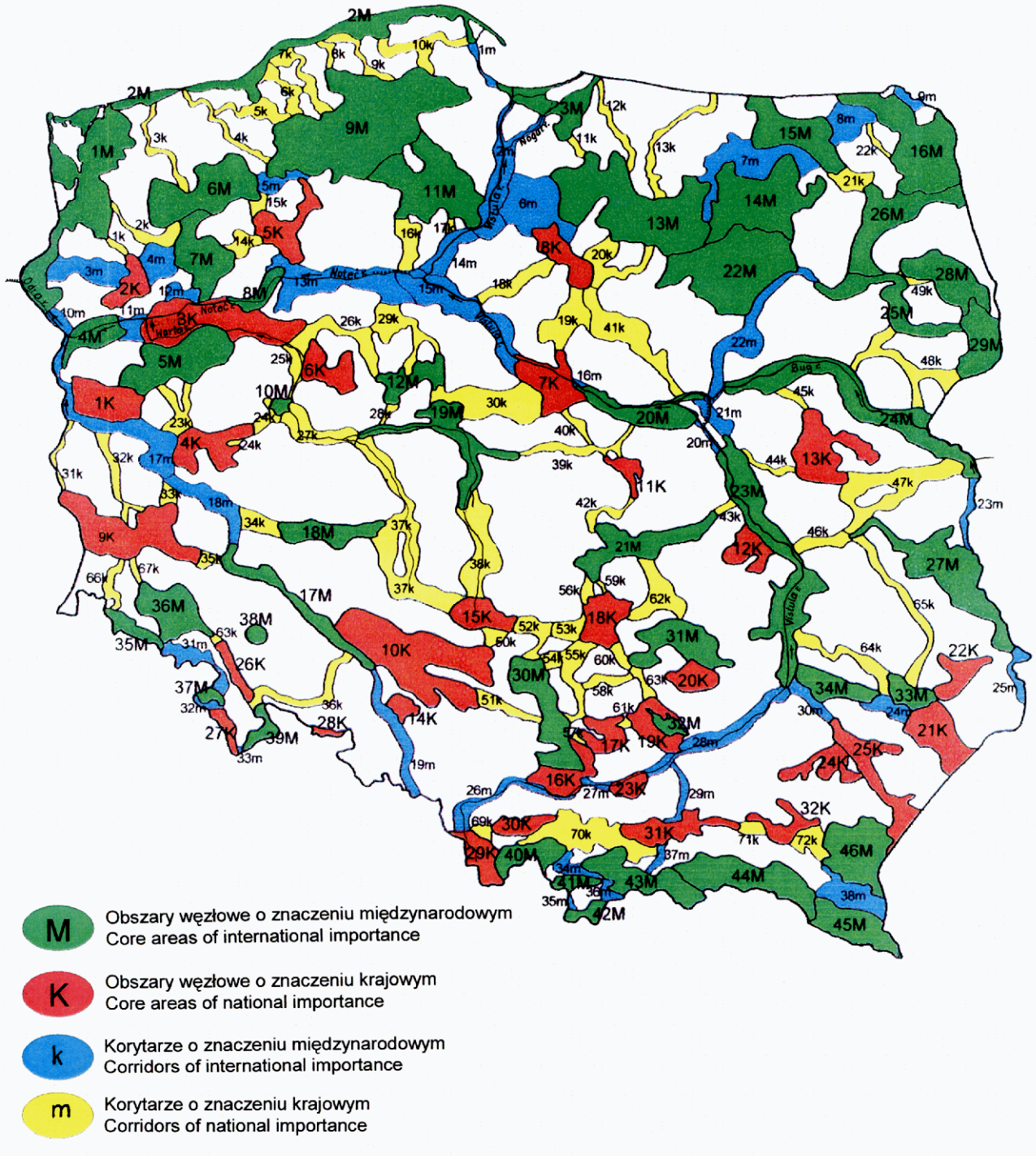


Figure 7. PLANOWANA DROGA WODNA WSCHÓD–ZACHÓD
THE PLANNED EAST–WEST WATER WAY

OSTOJE PTAKÓW
BIRD AREAS

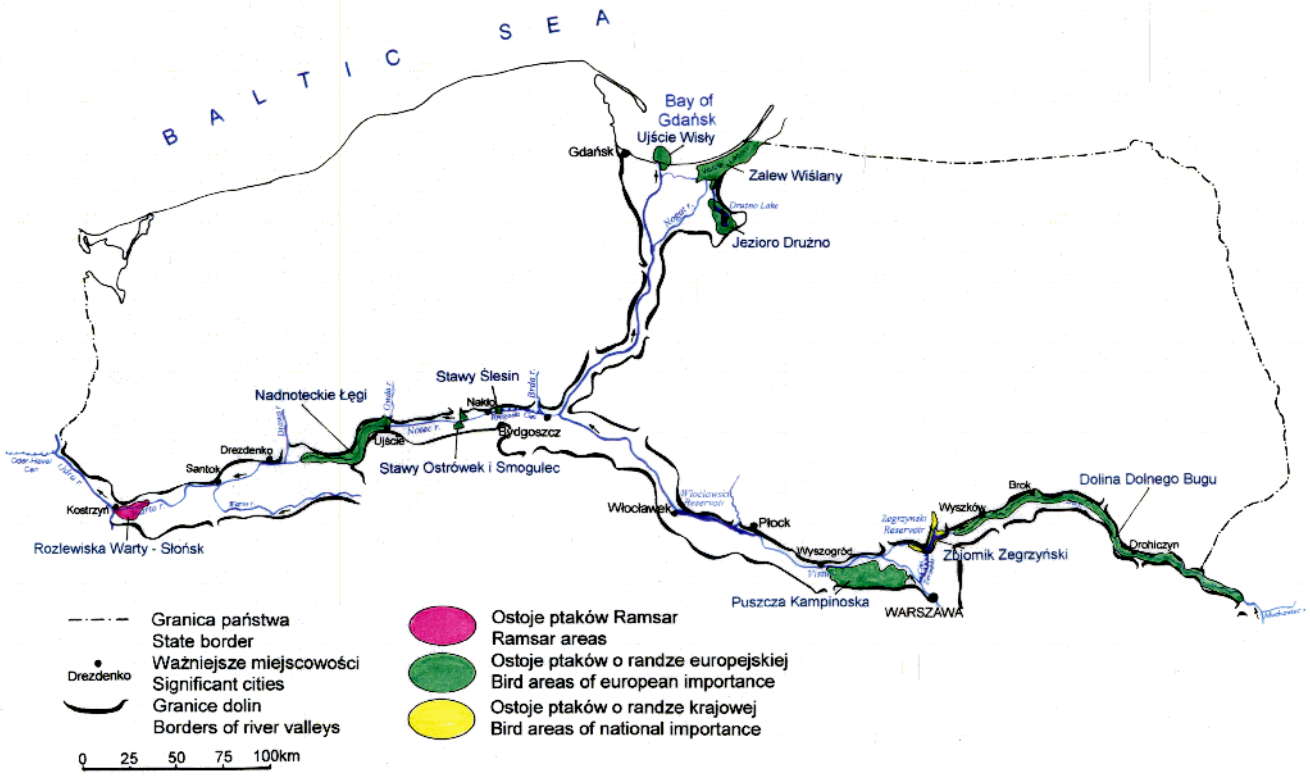
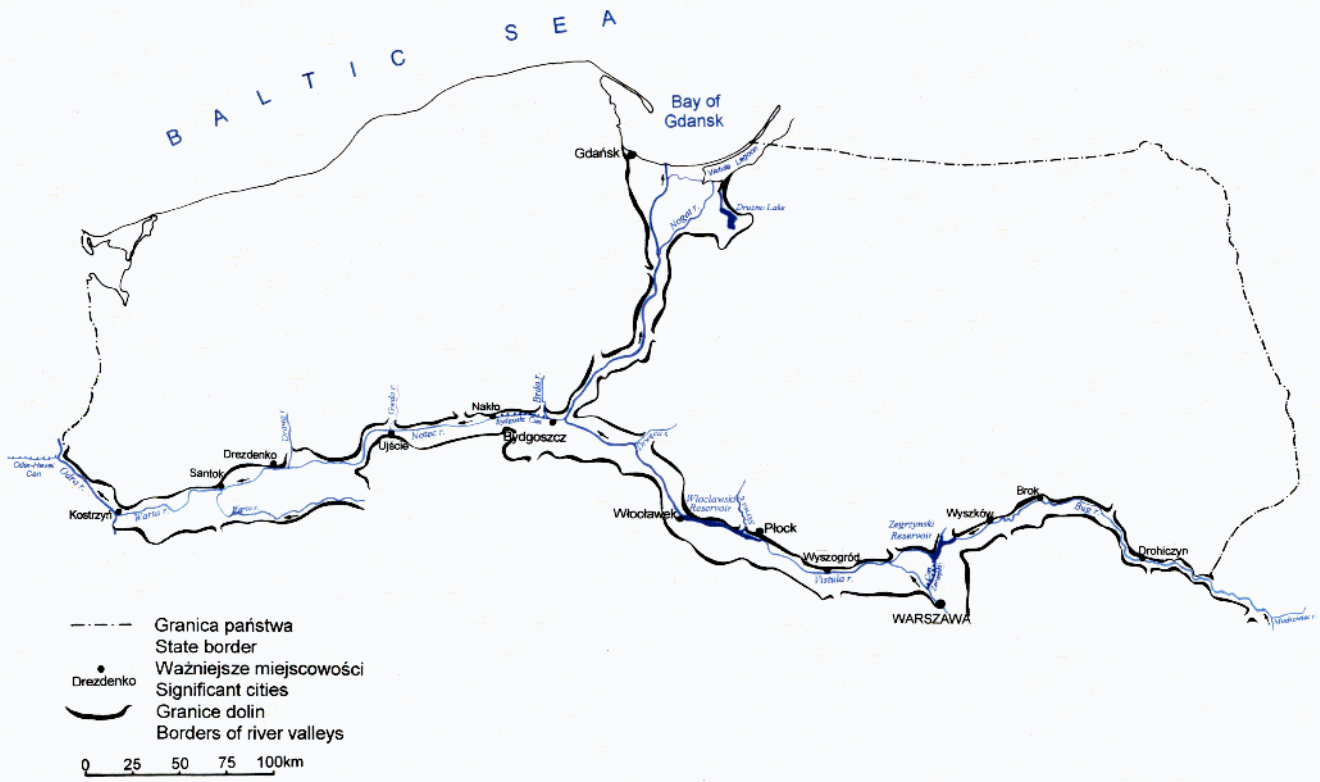


Figure 8. PLANOWANA DROGA WODNA WSCHÓD–ZACHÓD
THE PLANNED EAST–WEST WATER WAY

DOLINY RZECZNE
RIVER VALLEYS



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