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Summary report on establishment of "the Daugava - Dnieper waterway link and, as an option, its connection to the White Sea

Nowadays there's sustainable tendency in the world economy to share the labour and to be specialised in certain fields of production. Under such circumstances special attention is paid to the transport. Its basic mission is to fill geographic gap between the sources of mineral resources, industries and their consumers, for the supplier and the customer could exchange goods and services to mutual benefit.

Economic growth after the WW II has facilitated development of transport and in particular of the rail and road ones. It resulted in overloading of European countries with means of transport which negatively affect ecology. Due to this growth the development of alternative to the road and rail transport is getting urgent. At recent European forums it was stressed that priority should be given to inland shipping because of its ecological and economic advantages over other types of transport and due to overloading of European transport infrastructure.

The tasks which have been set forth by them could be solved in two ways that is by increasing traffic capacity of existing European infrastructure and by creating new transit waterways.

Based on the study of cargo flows the priority should be given to transit waterways which would link the Baltic and the Black Seas. There are various options of the link. In the file attached to this report there are comparison data on the Pripyat-the Nieman and the Dnieper - the Dvina options of the waterway. Optimal is the Dnieper - the Dvina option. Realisation of this project would positively influence the economy in general and transport sector of European and Asian regions in particular. Time required for the vessels to go from the Baltic Sea to the Black Sea would be 50% less. The quantity of vessels passing the Straight of Gibraltar would be reduced and as a result the sea traffic safety in this region would be improved. A number of ecological problems would be solved. It would be economically sound to extract mineral resources along the waterway route.

The peculiar feature of this option is that the route would be transit. It has high potential of further development and could be linked to the waterways of Europe and Russian Federation.

The extension for the waterway is the Volga basin. It is necessary to build 20 km. long connection canal at Valdai highland and a number of hydrostructures at the upper Western Dvina and Volga. It would provide for safe water traffic to Moscow and then to the Volga and the White Sea. The cost of the Daugava (the Western Dvina) - the Dnieper transit waterway with extension to the Volga and the White Sea is estimated to be 10 Bl. EURO.

It should be stressed that the idea to establish such waterway came to existence in the XIX century. They developed the project named “Riga-Kherson canal” with the price of 300 mln. tsar roubles. The WW I prevented from execution of the project.

They came back to the idea of building the Daugava-the Dnieper waterway in the mid of the XX century. Having technical assignment of the Ministry for water resources of the USSR “Belgiprovodhoz” institute (Belarus) developed “ Programme for complex exploitation and control of water and land resources in the basin of the Western Dvina (the Daugava) river” while the “Rosgiprovodhoz” institute (Russia) worked out a similar “Programme” for the basin of the Dnieper river. “Hydroproject” institute developed waterway link between the Daugava (the Western Dvina) and the Volga.

In the fundamental studies mentioned above they deal with nature conditions, physical and geographic characteristics, hydrological, engineering - geological and hydrogeological conditions, resources of sweet water, underground water, plants in the basin of the rivers. They worked out measures to control natural resources, small rivers and water reservoirs, exploitation of land and water resources. Special attention is given to establishing of deep waterways, watercraft, hydropower generation, development prospects of water resources and capital investments. This statement can be proved by the file attached to this report.

In the study made by “Belgiprovodkhoz” they suggest deep waterway along the following route: the Dnieper - the canal (cross the water shed)- the Western Dvina to the Gulf of Riga in the Baltic Sea. The route of canal connecting the Dnieper and the Western Dvina is traced to the north of Dubrovno and would be 82 km. long. It would partially canalise the Lutchesa river with its right tributaries. “Hydroproject” institute named after S.Y. Zhuk (Russia) suggested connection of the Western Dvina to the Volga, which could be performed by 15-20 km. long canal at Valdai highland. In this option it is necessary to build six hydrostructures at the upper Volga, 15-20 km long canal at the water shed, four

hydrostructures at the upper Western Dvina, Vitebsk dam type and river valley reservoirs, Surazh reservoir which would ensure water run off in the Western Dvina.

Complex approach to the above options would provide for:

1. link of the Black, the Baltic, the Caspian and the White seas and establishing joint waterway system of Europe and Asia.
2. establishing new 2110 km long waterway connecting the Black and the Baltic seas via the Dnieper - the water shed canal - the Western Dvina (the Daugava), extension of the route to Moscow, reduction of distances to Moscow, the White Sea and the Black Sea. Water supply of Moscow in amount of 1 km^3. would be improved alongside with this.

So, being based on research and survey study of the Western Dvina and the Dnieper it could be stated that preliminary stage of “The Daugava - the Dnieper Transit waterway” project has been finished:

- working teams of involved parties are formed and are functioning
- technical feasibility and economic soundness of the project have been proved by research and survey studies
- the project is based on analytical and graphic works done by a number of research institutes of the parties
- main parameters of the waterway are defined and feasibility study is prepared (business offer)

Looking attentively at the map of Europe one could state availability of wide network of inland waterways at the territory of Western Europe and fair network of inland waterways in Eastern Europe mainly in the basin of the Volga river.

In between them there’s huge potential of waterways which are not used now. One of them is the Daugava (the Western Dvina) - the Dnieper with the extension to the Volga. The distance from the Baltic Sea to the Black Sea could be twice shorter, the distance from Moscow to the White Sea and to the Black Sea could be 1500 - 1700 km. less. For the companies from Western Europe there could be easier access to the vast resources of Belarus, the north-western and central areas of Russia. Additional contracts could be reached by the ship building yards to commission new fleet.

Establishing of the Daugava (the Western Dvina) - the Dnieper waterway would provide for upgrading of the Dnieper - the Pripyat - the canal - the Vistula - the Oder link., for

restoration of Polesie marshes which are “ the lungs of Europe” and the same for the northern Belarus.

By its decision 95/308/EC the EC included the Daugava (Western Dvina) and the Dnieper into the list of 10 largest transborder rivers of Europe. It is necessary to prepare, to sign and to ratify an Agreement between the governments of Russia, Belarus, Latvia and the Ukraine on co-operation in exploitation and control of water resources of the Daugava (the Western Dvina) and the Dnieper. The need for such an Agreement is defined by the UNEEC Convention on the Protection and Use of Transboundary Watercourses and International Lakes of 1992.

In order to regulate the joint use of this transborder waterway, an International Treaty on the North - South water link (similar to the Convention on the Navigation of the Rhine of 1868 and to the Convention on the Regime of Navigation on the Danube of 1948) should be reached. It would be necessary to establish intergovernmental body (commission) with the purpose to operate the waterway.

One cannot consider establishing the Daugava - Dnieper transit waterway from merely economic point of view aimed at getting profit. This project is aimed at getting peoples closer and at making Europe ecologically clean. We need your positive conclusion on this project.

Additional information on the establishment of the Daugava-Dnieper transit waterway and, as an option, the link of the Daugava to the White Sea

The idea of establishing straight waterway connecting the Baltic and the Black seas or likely the Baltic, the Black and the White seas is not a new one. Referring to the entries in the chronicles about the waterway “from Variagy to Greky” (from the Scandinavian countries to Greece) a full scale study of the Western Dvina (the Daugava) and the Dnieper with the purpose of complex exploitation of water resources have been carried out. About twenty large research institutes and scientific institutions of Belarus, Russia, the Ukraine, Lithuania and Latvia participated in this investigation.

In the XXI century the idea to establish deep waterway is getting urgent in order to oppose large scale acts of terrorist organisations.

Having technical assignment of Ministry for water resources of the USSR “Belgiprovodhoz” institute (Belarus) developed “ Programme of complex exploitation and control of water and land resources in the basin of the Western Dvina (the Daugava) river” while “Rosgiprovodhoz” institute (Russia) worked out similar “ Programme of complex exploitation and control of water and land resources in the basin of the Dnieper river”. Both programmes deal with:

1. Underground water resources
2. Evaporation, precipitation and water run off combinations required to meet deficiency of soil moisture by means of water resources from the Western Dvina and the Dnieper
3. Water supply of agriculture
4. Antierosion control of land
5. Control of flora and fauna resources
6. Drainage of forests and antierosion measures
7. Power generation
8. Fishing
9. Drainage of agriculture fields, organisation of territories and processing industries.
10 Antiflooding measures
11. Modern conditions and development prospects of industries, towns, settlements, their power supply and waste water systems
12. Water control of small rivers
13 Development of transport network

14. Recreation evaluation of the territories
15. Water protection against pollution and flooding
16. Landscape
17. Designation and economic efficiency of watercraft

During research works for the Western Dvina river “Hydroproject” institute named after S.Y. Zhuk discussed the feasibility of straight deep waterway from the Dnieper via the Western Dvina to the Volga.

They have studied:

1. Climate, hydrography and hydrology
2. Engineering, geological and hydrological conditions
3. Resources of underground water
4. Natural resources of underground water
5. Exploitation reserves of underground water
6. Land surface and plants
7. Industry development in towns
8. Towns
9. Agriculture
10. Drainage and development of agriculture and forest areas
11. Water supply and waste water
12 Fishing
13 Balances of underground and surface water
14. Water reservoirs
15 Hydropower generation
16. Watercraft

Measures worked out by this research to regulate water flow by water reservoirs provide for complex solution of the following tasks:

- To fully meet growing requirements of various industries in water
- To study water table of reservoirs for fishing purposes
- To reduce water run off
- To make water reserves for production purposes
- To guarantee minimum water run off at the Western Dvina
- To create conditions for the straight traffic along the Daugava - the Dnieper waterway

It is planned to build 775 water reservoirs at the Western Dvina with total water table of 142,6 thousand hectares and useful capacity of 2940,8 mln. m^3 (water reservoirs for power generation are not included).

The positive factor in regulating water run off at plain landscape is availability of a great number of lakes which provide for accumulation of flooding within their natural water beds without impounding of vast territories.

It is planned to create 359 water reservoirs at the place of lakes with total area of water table of 83,8 thousand hectares, useful capacity of 455,4 mln. m^3 which make over 15.5% of useful area of all projected water reservoirs.

Basic parameters of projected water reservoirs are listed in table #1

Table #1

№	Item	Quantity of water reservoirs	Area, thousand ha.	Useful capacity, mln. m3	Specific share of water reservoir, %	Useful capacity to the area ratio
1	Russia - total	148	18.98	88.3	3.0	0.45
	including small	131	4.53	72.3	2.45	1.6
	medium	-	-	-	-	-
	in the lake bed	17	14.45	16.0	0.55	0.11
2	Belarus - total	286	79.71	2650.0	90.1	3.32
	including small	115	4.33	84.8	2.9	1.96
	medium	31	5.10	130.0	4.4	2.55
	big	14	33.68	2101.0	71.5	6.24
	in the lake bed	126	36.65	334.2	11.3	0.91
3	Latvia - total	301	33.17	165.08	5.6	0.50
	including small	105	1.98	35.01	1.2	1.76
	medium	5	0.50	14.94	0.5	3.00
	big	1	8.07	41.0	1.4	0.51
	in the lake bed	190	22.62	74.13	2.5	0.33
4	Lithuania - total	38	10.49	36.80	1.2	0.35
	including small	14	0.68	6.40	0.2	0.94
	in the lake bed	24	9.80	30.40	1.0	0.31
5	Estonia - total	2	0.24	0.60	-	0.25
	including in the lake bed	2	0.24	0.60	-	0.25
	Totally	775	142.6	2940.8	100	2.06
	including small	365	11.5	198.5	6.6	1.72
	medium	36	5.6	144.9	4.9	2.59
	big	15	41.7	2142.0	73.0	5.14
	in the lake bed	359	83.8	455.4	15.5	0.54

They have discussed exploitation of hydropower resources and options for construction of Hydraulic Stations located in series.

Particular attention was given to the construction of water reservoir at Vitebsk and to the choice of water reservoir type.

The calculations show that water consumption in the basin of the Western Dvina at the territory of Belarus in 2000 was one km 3. Outlined measures to regulate water run off at the tributaries will not meet entire requirement for water and the deficiency of 250 mln. m^3 would remain.

“Hydroproject” studied the possibility of making water reservoirs for power generation at the Western Dvina near Vitebsk. They suggested two options of water reservoirs: the first option envisaged construction of one dam while the second of two dams. One dam option provides for construction of the main structure at the Western Dvina close to Lushtchykha settlement. The area of water reservoir would make 49,5 thousand hectares with full capacity of 2,0 km^3 provided water level is 153,00.

In this case the backwater on the Western Dvina will reach the town of Velizh while the town of Surazh, the Kasplya river, the town of Demidov, the Usviatcha river and the settlement of Usviaty will be submerged. The Luzhesianka river is outlined to be included into this reservoir as well. It is planned to build power station at the mouth of the Luzhesianka river close to Vitebsk. This one dam option suggests alternative place to build main structure with the same water level i.e. up the river from the town of Surazh. In such case the town of Surazh and the Western Dvina down from it would not be submerged. The water to the power station would be supplied via the Usviatcha river, the Ovsianka river, the derivation canal and then the Luzhesianka river.

In two dam option two reservoirs of river valley type are supposed to be built that is at Vitebsk and at Surazh. Vitebsk water reservoir would be damed up at the Western Dvina up the mouth of the Luzhesianka river. Its water level would be 143.0, water table of 30 km^2 and full capacity of 140 mln. m^3.

Surazh water reservoir would be damed up at the Western Dvina up the mouth of the Kasplya and the Usviatcha rivers. Storage water level would be 153.0, water table of 77 km^2 and full capacity of 305 mln. m^3.

One dam option was rejected since vast agricultural lands (25 thousand hectares, 10,5 thousand hectares out of them are plough lands) were supposed to be impounded. So, they gave priority to two dam option with total water storage capacity of 445 mln. m^3 and 330 mln. m^3 of useful capacity. However, due to the fact that water run off deficiency is over 700 mln. m^3 these reservoirs are not enough to compensate it.

“Belgiprovodkhoz” institute studied the possibility of making water reservoir of required capacity. Its bed is similar to that developed by “Hydroproject” and it was taken as the basis of the study. The towns of Usviaty and Surazh are not supposed to be impounded.

The bed of water reservoir is formed by natural slopes of the Osvianka and the Luzhesianka rivers as well as by construction of three fencing dikes of total length 49,5 km and total volume of 16,6 mln. m^3. (Layout of Vitebsk reservoir, Vitebsk and Surazh river valley reservoirs is enclosed).

There are 380 houses which are to be moved off within the flowage zone. The flowage area makes 24 thousand hectares and 6.3 thousand hectares out of them are cultivated lands, 15.1 thousand hectares are forests, 3 thousand hectares are lakes and 0.3 thousand hectares are used for various purposes.

This water reservoir will be impounded via derivation canal from Velizh water storage which is projected by “Giprovodkhoz” (Moscow) to divert part of the Western Dvina run off to the Volga.

The canal length is 43 km. It is formed by fencing dikes (see drawings). Provided its dimensions are as per the drawings the passing capacity will be about 500 m^3/sec. When more details are available this figure will be specified.

Full capacity of the water reservoir is 2.3 km^3 and useful capacity is 1,75 km^3. The cost of works to build the bed of water reservoir makes 105,17 mln. roubles. Construction of the water reservoir will provide for the solution of the following tasks:

1. To provide the customers located in the Western Dvina basin with 303 mln. m^3 of water and to compensate for the loss of 158.0 mln. m^3 of underground water which is bound up with surface water.
2. To generate 50 kWt of electric power at HEPS built at the Luzhesianka.
3. To boost up the output of electric power at existing Riga cascade of HEPS because of construction of this water reservoir.
4. To use water table of the reservoir for fishing.
5. To irrigate 855 thousand hectares of land in the future.

Projects of Vitebsk and Surazh reservoirs of river valley type developed by “Hydroproject” institute have been adopted without changes. They are designed for watercraft traffic and partially for boosting up of power generation at Vitebsk HEPS by pumping water from Vitebsk reservoir of river valley type to Vitebsk dam type reservoir.

Water control at small rivers have been discussed with respect to the instructions of leading scientific, research and design institutes of participating countries. Water control measures have been worked out for each small river separately (totally 124 rivers). For very small rivers (107 rivers) they worked out instructions which will be specified at design stage.

Outlined measures are divided into two categories: main and secondary.

Main measures are:

- construction of water reservoirs to regulate water run off, clearing and reinforcement of river beds, anti erosion measures. The main measure to control small rivers is establishing of water reservoirs since they are characterised by seasonal variation of the capacity.
- maintaining of required water level in the river, water run off to the lower pool and clearing of the river bed in case of necessity.
- obvious cleaning of waste water at the places of concentration (sewerage systems of towns and settlements, industrial and agricultural enterprises).
- establishment of waste water accumulation lakes to control their discharge or to abandon their discharge during low water periods.
- construction of refuse collectors and disposing of garbage.
- establishment of water control zones along the rivers which are to prevent erosion of land, hollow out of banks, to change surface water run off for underground one
- construction of support structures to maintain required ground levels along the river
- preservation of marshes in their natural state

The secondary measures are:

- special measures to stimulate and ensure self clearing ability of water
- aeration of water streams
- auxiliary structures at water reservoirs (filtering dams at the tributaries, extraction of peat, cleaning of river banks)
- measures to protect natural landscape (limitations on river bed regulations, drainage of marshes)

In the “Programme” they made an attempt to demonstrate the influence of suggested measures on the quality of water, maintaining of natural flow of the rivers.

The scope of works and the cost of control measures for the small rivers are listed in the table 2

Table 2

#	River	Works, measures and structures									Total amount of capital
		Capital investments in mln. roubles (prices of 1969)									
		Forest zones, km	Accumulating lakes	Sediment lakes for the surface water	Collective purification lakes	Refuse collectors	Regulating water storage	Seasonal regulating water storage	Pump station of the first level, mln. roubles	Water ducts and canals, mln. roubles	investments in mln. roubles.
I	the Western Dvina (from Surazh)	55/0.22	-	4/0.20	4/0.30	3/0.06	-	-	-	-	0.78
II	the Mezha	90/0.36	-	2/0.10	2/0.15	6/0.15	-	-	-	-	0.76
III	the Usviatcha	15/0.06	-	-	-	-	-	-	-	-	0.06
IY	the Kasplya	150/0.60	2/0.10	3/0.15	3/0.25	4/0.10	-	-	-	-	1.20
Y	the Western Dvina (from Surazh to Verkhnedvinsk)	130/0.42	2/0.10	7/0.35	7/0.55	2/0.05	-	-	-	-	1.47
YI	the Lutchesa	95/0.30	1/0.05	2/0.30	2/0.18	2/0.05	-	1/1.0	2.0	1.0	4.88
YII	the Obol	75/0.30	-	3/0.15	3/0.35	-	-	-	-	-	0.80
YIII	the Ulla	75/0.30	1/0.05		3/0.35	-	-	-	-	-	0.85
IX	the Disna	225/0.90	-	6/0.30	6/0.45	3/0.07	1/2.5	1/1.0	2.0	1.0	8.22
X	the Disna	225/0.90	-	6/0.30	6/0.45	3/0.07	1/2.5	1/1.0	2.0	1.0	4.49
XI	the Western Dvina (from Verkhnedvinsk to the Riga gulf)	170/0.68	-	13/0.65	13/1.21	7/0.20	-	2/1.5	1.0	0.5	5.74
XII	the Dubna	75/0.30	-	2/0.10	2/0.15	-	-	-	-	-	0.55
XIII	the Aiviekste	175/0.70	5/0.25	8/0.40	8/0.60	3/0.08	-	1/1.1	1.0	0.5	4.63
XIY	the Yougla	15/1.06	-	-	-	1/0.02	-	-	-	-	0.08
	Totally	1375/5.32	11/0.55	55/2.95	55/4.76	33/0.83	1/2.5	6/5.6	8.0	4.0	34.51

They have studied land and landscape control aspects. Total area of erosion lands in the basin is about 438,5 thousand hectares as per table #3

Table #3

№	State	Erosion lands totally	Including		
			Plough lands	Grass fields	Cultivated lands
1	Russia	37.9	29.6	8.3	-
2	Belarus	159.6	151.8	6.1	1.7
3	Latvia	210.9	210.9	-	-
4	Lithuania	29.6	29.6	-	-
5	Estonia	0.5	0.5	-	-
	Total	438.5	422.4	14.4	1.7

To protect lands from erosion the “Programme” provides for organisational, agricultural and forest control measures

Organisational measures are:

- transformation of the lands with the view of antierosion control
- complex of agricultural and forest drainage measures

Agricultural measures are: ploughing, fertilisation ect.

Forest drainage measures are:

- planting of forests along ditches
- planting of water regulating forests
- planting of field fencing forests
- planting trees around lakes, water reservoirs, along rivers, canals and roads.

Particular attention is paid to antiflooding measures. Flooded areas in the basin of the Western Dvina are listed in table #4

Table #4

№	Floods	Flooded lands	Total area, thousand ha.	Including		
				Russia	Belarus	Baltic states
1	Spring flood P=1%	plaugh land	23.9	3.7	10.1	10.1
		grass fields	101.9	15.7	25.5	60.7
		Forests and other	158.4	76.4	8.1	73.9
		Total:	284.2	95.8	43.7	144.7
2	Spring flood P=10%	plaugh land	10.1	3.1	3.0	4.0
		grass fields	61.9	13.1	13.4	35.4
		Forests and other	119.5	62.3	2.7	54.5
		Total:	191.5	78.5	19.1	93.5
3	Summer - autumn floods P=10%	plaugh land	2.5	2.4	-	0.1
		grass fields	18.3	10.9	1.6	5.8
		forests	57.6	52.3	0.3	5.1
		Total:	78.4	65.5	1.9	11.0

The villages which are not perspective according to “The regional planning chart” and which are to be moved off to the perspective settlements located out of flowage area will not be protected from floodings.

Only insignificant anti flooding measures are planned due to the fact that spring floodings in Belarus, Smolensk and Kalinin districts of Russia do not prevent from sowing and that is why do not cause damage to the crop.

In planning of anti flooding measures at the territory of Latvia the problem of the Lubansk is the most important. This “Programme” includes measures pointed out in “General plan of complex exploitation of lake Lubansk and northern part of lowlands”. Totally 61.6 thousand hectares of land including 20.5 thousand hectares of agricultural lands are to be protected at the territory of Latvia.

Summer-autumn floodings in the basin of the Western Dvina inundate 20.8 thousand hectares of cultivated lands. The “Programme” outlines construction of summer drainage ditches at the territory of 9.7 thousand hectares.

The objects to be protected are towns, industrial premises, roads, bridges and other structures.

The main antiflooding measures are:

- construction of dikes and moving off dwelling houses from flowage zone
- reconstruction of roads, bridges and other road structures

Protection of flora and fauna outlines establishment of reservations and controlled territories. Some additional provisions to save flora and fauna are planned. Antierosion measures are planned as well.

Protection of plants and animals is ensured by fulfilling of all conditions and instructions issued by fishing and hunting legal entities.

Special attention is paid to water plants.

Forests and parks at the banks of the lakes and rivers prevent them form erosion. That is why they would allocate and create protection zones along the rivers and at the banks of designed reservoirs.

It is planned to save in the basin wild berry fields and marshes in their natural state.

The main part in environmental control would be played by respective services of forest, fishing and agriculture spheres.

Under the circumstances when there’s no necessary data to evaluate possible changes of the nature due to economy activities the priority should be given to creation of wide hydrological observation network which would cover closed basins and separate regions.

There's high potential of resort areas in the basin of the Western Dvina though they are poorly studied. Boreholes proved availability of mineral waters (chloride, natrium, sulphur-chloride). Treatment mud was found and studied at Braslav lakes, Lepel lakes, Sloboda lakes.

Turning back to the idea of establishing the Daugava (the Western Dvina)- the Dnieper transit waterway it is necessary to point out its favourable geographic location which enables to cope with a number of tasks.

Water connections between the Black and the Baltic Seas via western areas of our country existed for more than two thousand years.

There's no true indication of the discovery of these ways. However, it is widely believed that they have been known in ancient times.

Gerodot (V B.C.) speaks about existence of the way along the Dnieper.

Later on before opening sea routes to India and before Tartar invasion trading routes from the north-west to the south - east went via Slavic lands.

From time to time they turned back to the idea of building waterway to the east of the Dnieper - the Bug canal. However, at that periods there was no possibilities to realise artificial waterway similar to that which connected the Neva to the Volga in the XIX century.

In the XIX century the government of Russia studied possibility of building water way from Riga to Kherson that is from Riga along the Daugava (the Western Dvina) up to the Valdai highlands then via artificial canal to the Dnieper and down to the Black sea. This project was discussed in 1910 at the congress of Russian hydrotechnicians. In 1912 State Duma adopted decision on design works of the Daugava (the Western Dvina) - the Dnieper water way. This project could be possibly carried out if it was not WW I which put away with it.

Because of development of productive forces in the European part of the USSR and intense cargo traffic within NIS from the south to the north and v/s traffic of mass consignment have been formed such as iron ore, coal, metal and wheat from the Ukraine to the west and north-west, wood and apatite ore from the north to the south and west, potash fertiliser to the south.

Annual turn over of such mass cargo by means of traditional water shipment is estimated to be 40 mln. t. (according to "Hydroproject" named after S.Y. Zhuk in 1980), without

haulage down the Dnieper to the south, in particular correspondence with the countries crossed by the Danube.

“Hydroproject” named after S.Y. Zhuk made feasibility report on the Black sea- the Baltic sea deep waterway along the Prypiat - Neman route.

According to their calculations pay back period of this project is 9.4 years. It speaks for sufficient efficiency of this project.

“Belgiprovodkhoz” institute suggests another option for this way that is from the Dnieper to the Western Dvina via canal with access to Riga gulf in the Baltic sea. The route of the canal is planned to the north of Dubrovno and it is 82 km long. Part of the Lutchesa river and its right tributaries will be canalised.

Right now at the Western Dvina there are 4 dams: at Riga, Kegum, Pilau, Daugavpils. They ensure required depth for the vessels from the moth of the Western Dvina (the Riga gulf) to Polotsk, if Verhnedvinsk HEPS would be built, and to Vitebsk if Beshenkovitchy HEPS would be built.

Having in mind construction of HEPS mentioned above and water locks at the Western Dvina straight watercraft traffic from Vitebsk to the White sea would be possible.

The Black Sea - the Baltic Sea deep transit waterway along the Dnieper - the Western Dvina is divided into three stages:

1. the Dnieper river from Kiev reservoir to Rossasna settlement
2. water shed from the Dnieper (Rossasna settlement) to the Western Dnieper (Vitebsk)
3. the Western Dvina from Vitebsk to the mouth of the river (the Riga gulf)

Estimated cost of construction of the Dnieper -the Western Dvina option makes 830 mln. roubles in prices of 1969.

Capital investment for the Pripyat - the Nieman option of the Baltic sea - the Black sea waterway calculated by “Hydroproject” named after S.Y. Zhuk is estimated to be 804.6 mln. roubles (up to Kiev water reservoir).

Having in mind all mentioned above “Belgiprovodkhoz” provides lump costs, feasibility and efficiency evaluations of suggested construction options to connect the Black and the

Baltic seas via the Dnieper and the Western Dvina in comparison with previously suggested options.

The cost is defined in the price scale of 1961.

With reference to modern conditions and calculations in the prices of 1969 the capital investments to establish the waterway would make approximately 1046.0 mln. roubles.

The calculations show that suggested by “Belgiprovodkhoz” option to establish the Black sea- the Baltic sea deep waterway along the Dnieper - canal - the Western Dvina route costs approximately 21% or 176.2 mln. roubles less then previously developed the Black sea- the Baltic sea waterway along the Dnieper - the Pripyat- the Nieman route. Due to better topography the flowage area is less by 2.5 times or approximately 50 thousand hectares.

The table of scope of works and costs compares the options to connect the Black and the Baltic Seas (Table 5)

Table 5

№	Item	Unit	The Pripyat- the Nieman option				The Dnieper -the Western Dvina option			
			sections				sections			
			the Pripyat	water shed	the Nieman	Totally:	the Dnieper	water shed	the Western Dvina	Total:
1	2	3	4	5	6	7	8	9	10	11
1	Route length	km	360	205	600	1165	479	81	610	1170
	including:									
	via artificial canal	-"-	360	205	-	565	235	70	-	305
2	Water level at the water shed	m	-	146.5	-	146.5	-	165.5	-	165.5
3	Total number of designed water locks(including locks at HEPS)	pcs	7	7	7	21	11	1	6	18
4	Quantity of HEPS:									
	а) operating (without locks)	-"-	-	-	1	1	-	-	3	3
	б) designed (without locks)	-"-	-	-	-	-	-	-	2	2
	в) outlined in the future(with locks)	-"-	-	-	4	4	1	-	1	2
	Scope of excavating works	mln. m^3	246	169	-	415	84	38	-	122
	Ditto in the prices of 1969	mln. roubles	350.3	223.1	472.6	1046.0	440	120	309.8	869.8

The payback period of suggested option is estimated to be 7.5 - 8 years and it proves to be economically sound.

"Soyouzgyprovodkhoz" was to develop several options to divert the Western Dvina run off to the Volga in order to improve water supply of Moscow in the volume of 1.2 km^3.

It was suggested to build cascade of river valley reservoirs at the Western Dvina provided the lower pool would be near the town of Velizh.

Nowadays waterway along the Volga from Kalinin to Astrakhan is minimum 3.25 m. deep.

The program of complex exploitation of the upper Volga developed by "Hydroproject" in 1974 outlines construction of hydrostructures at:

1. Kalinin #2
2. Storitsa
3. Rzhev #2
4. Rzhev #1
5. Verkhny Volochek
6. Plotichensk

Due to this there would be an option to connect the Volga and the Western Dvina and respectively the Black and the Baltic seas. The Volga and the Western Dvina can be connected by 15 -20 km long canal at the Valdai highlands.

Estimated cost of deep waterway from the Volga to the Western Dvina is 660 mln. roubles in prices of 1969.

The cost of similar structures which have been already built or designed are taken as specific cost.

Complex approach to this project will provide for the solution of the following tasks:

1. to connect the Black, the Baltic, the Caspian and the White seas and to establish joint waterway system for the European part of NIS.
2. to establish new 2155 km long waterway connecting the Black and the Baltic seas via the Dnieper - the canal - the Western Dvina, which will enable to:

- reduce cargo traffic intensity at the Volga waterway
- make 2400 km. shorter haulage along waterways from the Black to the Baltic sea
- make 1500 km. shorter the way from Moscow to the Black sea.
- make 1200 km shorter the way from the Black to the White sea.
- to make 2700-2800 km. shorter haulage from the south to the American continent.

All studies of the project performed during previous years proved its technical feasibility and reality to establish straight waterway along the Daugava-the Dnieper route with the access to the Baltic, the Black and in case of necessity to the White seas. Its basic technical and economic data in prices of 1969 are listed in table #6.

Table #6

№	Item	Price unit of 1969	Totally
1	2	3	4
1	Area of the basin	thousand km^2	86.3
2	Drainage fund	thousand ha	4620.91
3	Drainage area	-"-	2497.40
4	Drainage and irrigation area	-"-	978.47
5	Drainage by run off waters	-"-	34.90
6	Water requirement for irrigation purposes	mln m^3 a year	1195.39
7	Capital investments in irrigation of cultivated lands	mln/ roubl	4150.77
8	Drainage of forests	-"-	79.82
9	Antierosion measures	-"-	5.20
10	Water supply	mln m^3 a year	-
11	Wastewater	-"-	-
12	Investments	mln. roubl	837.74
13	Fishing	thousand	-
14	Investments	mln. roubl	45.79
15	Road construction	-"-	307.38
16	Water reservoirs (useful capacity)	mln m^3	3345.2
17	Full capacity	-"-	5667.81
18	Water table area at required water level	thousand ha	183.28
19	Capital investments	mln. roubl.	498.98
20	Water reservoirs - full capacity	pcs mln. roubl	6 2120
	- useful capacity	-"-	821
21	Expansion of agriculture production basis	mln rouble	1891.19
22	Anti flooding measures	mln rouble	59.75
23	Watercraft	-"-	36.94
24	Protection of small rivers	-"-	34.51
25	Power generation	-"-	411.50
26	Diverting water to Minsk and to lake Naroch.	-"-	43.3
27	Recreation (infrastructure)	-"-	426.92
28	Creation of the Black sea - the Baltic sea waterway	-"-	1600.0
29	Total investments	-"-	10702.27
30	Annual income	mln. roubles a year	756.27
31	Payback period	years	9.5

The costs for transit waterway and corresponding works are given in prices of 1969. It is not by chance but to substantiate the results of the study. The results of the study were reported to State Planning and Soviet of Ministers of the USSR.

Approximate conversion of the calculated cost in price scale of 1969 without drainage works is

{ (10.702 - (4.150 + 0.080)} x 1.23 + 2.17 + 0.771 = 13.3 Bl. US Dollars

The working team for establishment of transit waterway is composed of the representatives of Belarus, Latvia and the Ukraine. It prepared and submitted the leadership of the Republic of Belarus the business plan. According to our calculations the cost of creating of the waterway is 10.6 Bl. US Dollars, including 2.4 Bl. US Dollars for Latvia, 2.5 Bl. US Dollars for the Ukraine, 5.7 Bl. US Dollars for Belarus.

Be positive decision made to connect the Baltic, the Black and the White seas the cost of the project would be 1 Bl. US Dollars higher. Totally the amount of 10 Bl. EURO will ensure execution of all works stipulated by this Project.

Construction period according to the standards is estimated to be 10 years. In reality the works could be finished within 5-6 years provided design and construction works are carried out in parallel and proper financing is ensured.

Basic parameters and costs of main structures of the Daugava - the Dnieper waterway at the territories of Latvia, Belarus and the Ukraine which have been listed in the business offer are enclosed.

BASIC PARAMETERS

OF HYDROSTRUCTURES AT THE TERRITORY OF LATVIA

No	Description	Specification	Approximate costs, million LVL	Notes
1	Riga barrage H = 18 m	Riga HES 400 MW Riga two-lane locks L = 150 m, B = 18 m, H = 18 m, with access canals	---- 150.00	Existing To be built
2	Kegums barrage H = 1.5 m	Kegums HES 260 MW Kegums two-lane locks 150 x 18 x 15 m with access canals	---- 140.00	Existing To be built
3	Plavinas barrage H = 40 m	Plavinas HES 840 MW Aizkraukle two-lane locks (lift trunk) 150 x 18 x 40 m	---- 240.00	Existing To be built
4	Krustpils barrage H = 6 m	Dam with HES 30 MW Krustpils two-lane locks	30.00	To be built

		150 x 18 x 6 m with access canals water storage basin formation	 80.00 2.00	 To be built To be built
5	Jekabpils barrage H = 8 m	Dam with HES 50 MW Jekabpils two-lane locks 150 x 18 x 8 m with access canals water storage basin formation 15 sq. km, with 327 ha flooded, 14 individual farms to be moved	50.00 100.00 10.00	To be built To be built To be built
6	Daugavpils barrage H = 15 m	Dam with HES 100 MW Daugavpils two-lane locks 150 x 18 x 15 m with access canals water storage basin formation 21 sq. km, with 470 ha flooded, 37 individual farms to be moved	100.00 130.00 20.00	To be built To be built To be built
7	Reconstruction of existing Daugava bridges	9 bridges	15.00	Existing `1
8	Arrangement of wharves in inhabited areas	15 wharves	5.00	To be built
9	Waterway 360 km arrangement	Placement of navigation signs along the entire shipping waterway required bed width 50 m and depth at least 5 m	2.00 10.00	To be placed To be provided
10	Preliminary research		5.42	To be performed
11	Project design/ research jobs		75.88	To be performed
	TOTAL:		**1,165.30 million LVL**	

Exchange rate of LVL was 1.8259 US Dollars (20.05.04) that is 2 127.70 mln. US Dollars

TECHNICAL PARAMETERS OF THE WATERWAY AT THE TERRITORY OF THE UKRAINE

Establishment of the waterway from the Baltic Sea to the Black Sea at the territory of the Ukraine means recovery and reconditioning of the waterway with the purpose of its integration to Trans European Network.

There are 6 water reservoirs on the Dnieper at the territory of the Ukraine: at Kakhovka, Dnieper, Dneprodzerzhinsk, Krementchug, Kanev, Kiev. They ensure waterway depth of 5 m. at 842 km out of 1031 km. To ensure watercraft traffic it is planned to build an additional water reservoir of Slavoutitch HEPS, six water locks and seven quays as well as to make deeper 189 km. of the Dnieper. The list of existing and required structures with their parameters is enclosed.

№	Hydrostructure	Technical parameters	Note
1	2	3	4
1	The Black sea - Kahovka section	Waterway (0-93 km) safe width - 80 м safe depth - 5 м	Exists
2	Kahovka hydrostructure	2.1. Kahovka HEPS	Exists
		2.2. Kahovka water lock length - 270 м; width - 18 м4 depth - 3,65* м access canals	Exists
		2.3. Kahovka water lock with access canals length - 150 м; width - 18 м; depth - 5,5* м	To be built
		2.4. Waterway (93-306 km) safe width - 80 м safe depth - 3,65 м there are: 8 distances with total length of 30 km less then 5 м deep.	Exists **Making the waterway 5 m deep is required.** The bed is rocky.
		2.5. Quays Depth - 3,65 м	Exist
		2.6. Quays Depth - 5,5 м	To be built
3	Dnieper hydrostructure	3.1. Dnieper HEPS	Exists
		3.2. Zaporozhje three chamber water lock length - 120 м width - 18 м depth - 4,4 м	Exists
		3.3. Zaporozhje one chamber water lock length - 290 м width - 18 м depth - 5,5 м	Exists
		3.4. Waterway (306-434 km) safe width - 80 м safe depth - 3,65 м there are: 3 distances with total length of 15 km less then 5 м deep.	Exists **Making the waterway 5 m deep is required**. The bed is rocky.
		3.5.Quays depth - 3,65м	Exist
		3.6. Quays depth - 5,5м	To be built
4	Dneprodzerzhynsk hydrostructure	4.1. Dneprodzerzhynsk HEPS	Exists
		4.2. Dneprodzerzhynsk water lock length - 270 м width - 18 м depth - 3,65 м	Exists

		***4.4.* Dneprodzerzhynsk water lock** length - 150 м width - 18 м depth - 5,5 м with access canals	To be built
		4.3. Waterway (434-556) safe width -80 м safe depth - 3,65 м there are: 8 distances with total length of 9 km less then 5 м deep.	Exists **Making the waterway 5 m deep is required**. The bed is rocky.
		4.4. Quays depth - 3,65 м	exist
		4.5. Quays depth - 5,5 м	To be built
5	Krementchug hydrostructure	5.1. Krementchug HEPS	Exists
		5.2. Krementchug water lock length - 270 м width - 18 м depth - 3,85 м	Exists
		5.4. Krementchug water lock length - 150 м width - 18 м depth - 5,5 м	To be built

		5.3. Waterway (556-721) safe width - 80 м safe depth - 3,65 м there are: 5 distances with total length of 19.5 km less then 5 м deep.	Exists **Making the waterway 5 m deep is required**. The bed is rocky.
		5.4. Quays depth - 3,65 м	Exist
		5.5. Quays depth - 5,5м	To be built
6	Kanev hydrostructure	6.1. Kanev HEPS	Exists
		6.2. Kanev water lock length - 270 м width - 18 м depth - 4,25 м	Exists
		6.2. Kanev water lock length - 150 м width - 18 м depth - 5,5 м	To be built
		6.3. Waterway (721-872 km) safe width - 80 м safe depth - 3,65 м there are: distances with total length of (about) 9 km less then 5 м deep	Exists **Making the waterway 5 m deep is required**.

		6.4. Quays depth - 3,65 м	Exist
		6.5. Quays depth - 5,5 м	To be built
7	Kiev hydrostructure	7.1. Kiev HEPS	Exists
		7.2. Kiev water lock length - 150 м width - 18 м depth - 4,0 м	Exists
		7.4. Kiev water lock length - 150 м width - 18 м depth - 8,0 м	To be built
		7.3. Waterway (872-967 km) safe width - 80 м safe depth - 2,65 м (967-1000 km) safe width - 50 м safe depth - 1,25 м there is: distance with total length of 75 km less then 5 м deep.	Exists Exists Exists **It is required to make the waterway deeper** due to the problem of Chernobyl
		7.4. Quays depth - 2,65м - 1,25 м	Exist

		7.5. Quays depth - 5,5 м	To be built
8	Slavoutitch hydrostructure at 1000 km of the waterway	***8.1. Slavoutitch HEPS***	To be built
		8.2. Slavoutitch water lock** length - 150 м width - 18 м depth - 5,5 м	To be built
		8.3. Waterway (1000-31 km) safe depth - 1,25 м there are: distances with total length of 31 km less then 5 м deep.	Exists **It is required to make the waterway deeper** due to the problem of Chernobyl
		8.4. Quays depth - 1.25 м	Exist
		8.5 Quays depth - 5.5 м	To be built
		8.6. Railroad bridge	Exists. **Rehauling is required** probably together with the construction of the hydrostructure

* Here and below: depth at sills.

** The title is conventional since it was derived from the name of Slavoutich town located close to the site. Safe and design depths in the table are given with reference to the design level.

LUMP COSTS OF BELARUSIAN SECTION OF THE DAUGAVA -THE DNIEPER TRANSIT WATERWAY

1.1. New structures to be built

1.1.1. Dams

№	Title of the structure	Technical parameters	Cost, mln. US Dollars	Note
1	Verkhnedvinsk dam H=15m	Verkhnedvinsk HEPS Verkhnedvinsk two-lane water locks L = 150 m, B = 18 m, H = 15 m, with access canals Water reservoir area -27 km^2 To be submerged - 1030 ha To be moved off - 14 houses	91 105 4.0	To be built To be built To be built
2	Polotsk dam H= 15м	Polotsk HEPS - 23 mWt Polotsk two-lane water locks L = 150 m, B = 18 m, H = 15 m, with access canals Water reservoir area -23.7 km^2 To be submerged - 750 ha To be moved off - 8 houses	91 91 3.0	To be built. To be built. To be built.
3	Beshenkovitchy dam H=15 м	Beshenkovitchy HEPS - 26 mWt Beshenkovitchy two-lane water locks L = 150 m, B = 18 m, H = 15 m, with access canals Water reservoir area -13 km^2 To be submerged - 360 ha To be moved off - 12 houses	105 91 2.0	To be built. To be built. To be built.
4	Vitebsk dam H= 14 м	Vitebsk HEPS - 9 mWt Water reservoir area -12.4 km^2 To be submerged - 420 ha To be moved off - 20 houses	147 3.0	To be built To be built.
5	Orsha dam H= 14 м	Orsha HEPS - 9 mWt Orsha two-lane water locks L = 150 m, B = 18 m, H = 14 m, with access canals Water reservoir area -8.9 km^2 To be submerged - 310 ha To be moved off - 25 houses	35 84 4.0	To be built To be built. To be built.
6	Mogiliov dam H= 11 м	Mogiliov HEPS - 12 mWt Mogiliov two-lane water locks L = 150 m, B = 18 m, H = 11 m,	49	To be built

		with access canals Water reservoir area -8.2 km^2 To be submerged - 250 ha To be moved off - 8 houses	77 2.0	To be built To be built.
7	Mogiliov water diverting dam H=10 м	Mogiliov water diverting dam (2 streams) Two-lane water locks L = 150 m, B = 18 m, H = 7 m, with access canals	56 63	To be built. To be built.
	TOTAL		**1103**	

1.1.2 Quays

№	Location	Cost, mln. US Dollars	Note
1	Verkhnedvinsk quay Design depth - 5.5 м	4.5	To be built.
2	Polotsk quay Design depth - 5.5 м	4.5	To be built.
3	Shklov quay Design depth - 5.5 м	4.5	To be built.
4	Bykhov quay Design depth - 5.5 м	4.5	To be built.
5	Rogatchev quay Design depth - 5.5 м	4.5	To be built.
6	Retchytsa quay Design depth - 5.5 м	4.5	To be built.
7	Loev quay Design depth - 5.5 м	4.5	To be built.
8	Druja port quay Design depth - 5.5 м	4.5	To be built.
9	Novopolotsk port quay Design depth - 5.5 м	4.5	To be built.
10	Novopolotsk port quay Design depth - 5.5 м	4.5	To be built.
11	Orsha port quay Design depth - 5.5 м	4.5	To be built.
12	Mogiliov port quay Design depth - 5.5 м	4.5	To be built.
13	Zhlobin port quay Design depth - 5.5 м	4.5	To be built.
14	Komarin port quay Design depth - 5.5 м	4.5	To be built.
	TOTAL	**63**	

1.1.3. Bridges

№	Location	Cost, mln. US Dollars
1	Road Vitebsk - Beshenkovitchy - Minsk road. Over canal across the water shed	3.5
2	Vitebsk - Orsha railroad Over canal across the water shed	4.5
3	Vitebsk - Orsha road Over canal across the water shed	6.0
4	Vitebsk - Orsha road Over canal across the water shed	6.0
5	Railroad to “Osintorf” Over canal across the water shed	3.5
6	Minsk - Moscow highway Over canal across the water shed	6.0
7	Minsk - Moscow railroad Over canal across the water shed	6.0
8	Connecting road from Bykhov to St. Petersbourg - Odessa highway Canal along the Dnieper	3.0
9	Gomel - Minsk railroad Canal along the Dnieper	4.5
10	Gomel - Brest railroad Canal along the Dnieper	4.5
	TOTAL	**47.5**

1.1.4. Canals, ports, water locks

№	Location	Cost, mln. US Dollars	Note
1	Canal across the water shed L=83 km, B=100 м, H=5м, W excavation - 18mln..м3, F flowage - 8.3 km^2	263	To be built.
	Pump station - 35 м^3/sec, H-25 м	7.0	To be built
	Vitebsk two-lane water locks L=150м, B=18м, H=32м with water supply canals	161	To be built
	Bogushevsk two-lane water locks L=150м, B=18м, H=32м with water supply canals	161	To be built
	Dubrovno two-lane water locks L=150м, B=18м, H=30м with water supply canals	154	To be built.
2	Canal along the Dnieper L=242km, B=100м, H=5м, W excavation-94 mln.м3, F flowage - 24.2 km^2	840	To be built.
	Rogatchev two-lane water locks L=150м, B=18м, H=19м with water supply canals	112	To be built.
	Zhlobin two-lane water locks L=150м, B=18м, H=14м with water supply canals	91	To be built.
	Retchitsa two-lane water locks L=150м, B=18м, H=14м with water supply canals	91	To be built.
	Loev two-lane water locks L=150м, B=18м, H=17м with water supply canals	98	To be built
3	Druja port at the Western Dvina (customs terminal)	49	To be built
4	Vitebsk port at the Western Dvina	56	To be built

5	Orsha port at the Dnieper	42	To be built
6	Mogiliov port at the Dnieper	42	To be built.
7	Zhlobin port at the Dnieper	42	To be built.
8	Komarin port at the Dnieper	49	To be built
	TOTAL	**2258**	

1.1.5	Construction of 719 km. long waterway (installation of navigation signs and signals, establishment of 5 m. deep and 50 m. wide waterway), mln. US Dollars	354.0	To be built.
	TOTAL:	**354.0**	

1.2. Existing structures which are to be rehauled or upgraded

1.2.1. Dams (No)

1.2.2. Bridges

№	Location	Cost, mln. US Dollars
1	Verkhnedvinsk HEPS at the Western Dvina Connection road from Novopolotsk to Vitebsk-Daugavpils highway	4.5
2	Verkhnedvinsk HEPS at the Western Dvina Bridge in Polotsk	7.5
3	Verkhnedvinsk HEPS at the Western Dvina Railroad bridge in Polotsk	9.0
4	Orsha HEPS at the Dnieper St. Petersbourg - Odessa highway	6.0
5	Orsha HEPS at the Dnieper Bridge in Orsha	6.0
6	Orsha HEPS at the Dnieper Mogiliov - Vitebsk railroad	9.0
7	Mogiliov HEPS at the Dnieper Connecting road from Shklov to St. Petersbourg - Odessa highway	7.0
8	Mogiliov water diverting dam at the Dnieper Connecting road from highway to Mogiliov-Minsk road	4.5
9	Mogiliov water diverting dam at the Dnieper Mogilev-Moscow railroad	9.0
10	Mogiliov water diverting dam at the Dnieper Bridge in Mogiliov	7.5
11	Mogiliov water diverting dam at the Dnieper Bridge in Mogiliov	7.5
12	Mogiliov water diverting dam at the Dnieper Bridge in Mogiliov	7.5
13	Polotsk HEPS at the Western Dvina Connecting road from Lepel to Polotsk-Vitebsk road	7.5
	TOTAL	**92.5**

1.2.3. Other structures, works, expenses

№	Location	Cost, mln. US Dollars
1	Research and survey works	368.0
2	Environment control costs	532.0
3	Other works and expenses	540.0
	TOTAL	**1440.0**
	TOTALLY	**5400.0**

ESTIMATION OF CAPITAL INVESTMENTS TO ESTABLISH THE WATERWAY

According to estimations of the specialists from Latvia, the Republic of Belarus and the Ukraine capital investments to establish the Daugava - the Dnieper Transit waterway would make 10.024 Bl. US Dollars, including 5.4 Bl. US Dollars for Belarus. Net profit would make 0.93 Bl. US Dollars. The payback period would be 11 years. The profitability is estimated to be 9.3 %. Capital investments at the territory of Belarus could go up to 5.758 US Dollars if projects to build TV broadcasting tower and international business center would be added.

The share of Belarus in net profit would make 50-55%, that is 0.45-0.5 Bl. US Dollars a year. Income would be received from home and international cargo traffic as well as from power generation at HEPS.

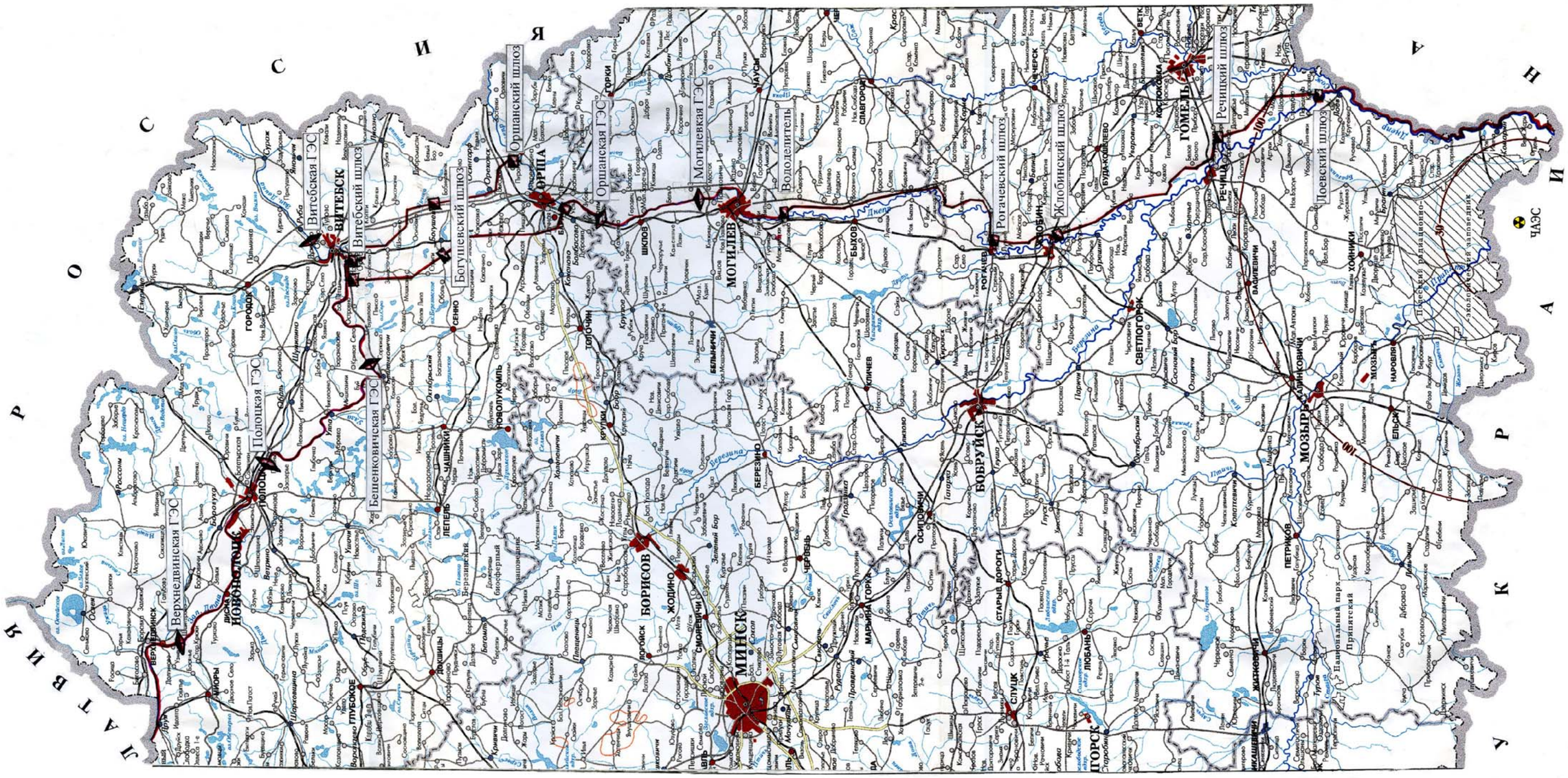
This estimation doesn't include income from recreation business, ecological cleaning of the territories, additional infrastructure of the towns and settlements, development of mineral resources to be extracted close to the waterway and particularly in Vitebsk region (clay, sand, gravel, ect.)

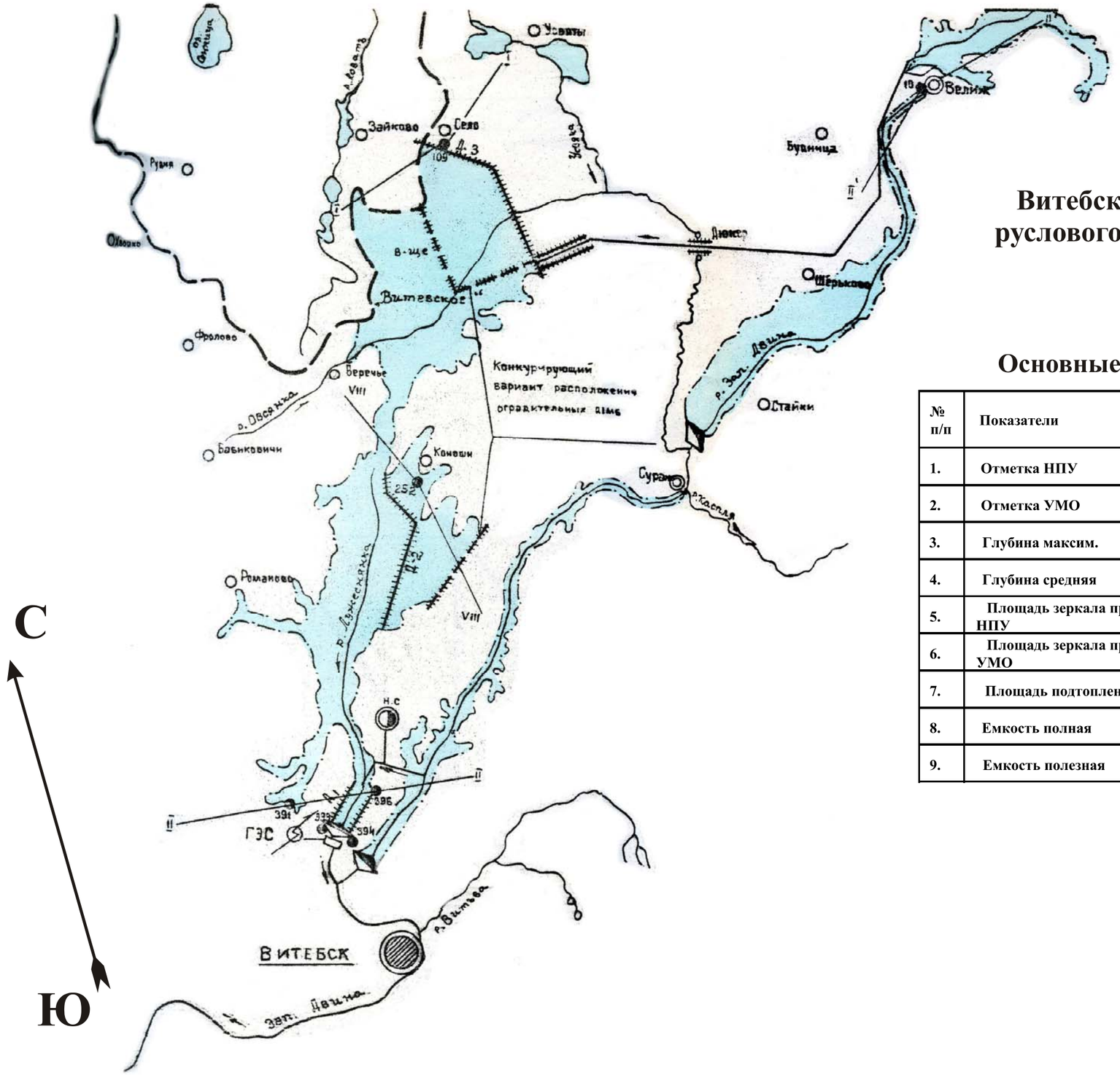
Main technical and economic data on "The Daugava (the Western Dvina) - the Dnieper Transit waterway" are as follows:

1. Location	the territories of Latvia, the Republic of Belarus, the Ukraine
2. Total length of the waterway	2110 km
including at the territory of:	
- Latvia	360 km
- the Republic of Belarus	719 km
- the Ukraine	1031 km
3. Displacement of watercraft	5000 t
4. Estimated cargo traffic	150 mln. t a year
5. Quantity of hydrostructures on the waterway	19 pcs.
including existing ones	9 pcs.
6. Rated power output of projected HEPS	up to 700 mWt.
7. Additional power generation	up to 2000 mln. kWt/hour a year
8. Capital investments to establish the waterway	10,024 + 0,25 + 0,108 + 0,200 = 10,582 Bl. US Dollars

including construction documentation and substantiation of investments	618 mln. US Dollars
9. Net profit	929 227 380 US Dollars a year
10. Payback period	11 years
11. Profitability	9,3 %
12. Construction period (according to standards)	10 years (Be constant financing available the construction period could be reduced to 5-6 years)

Трасса транзитного пути
Даугава (Западная Двина) - Днепр





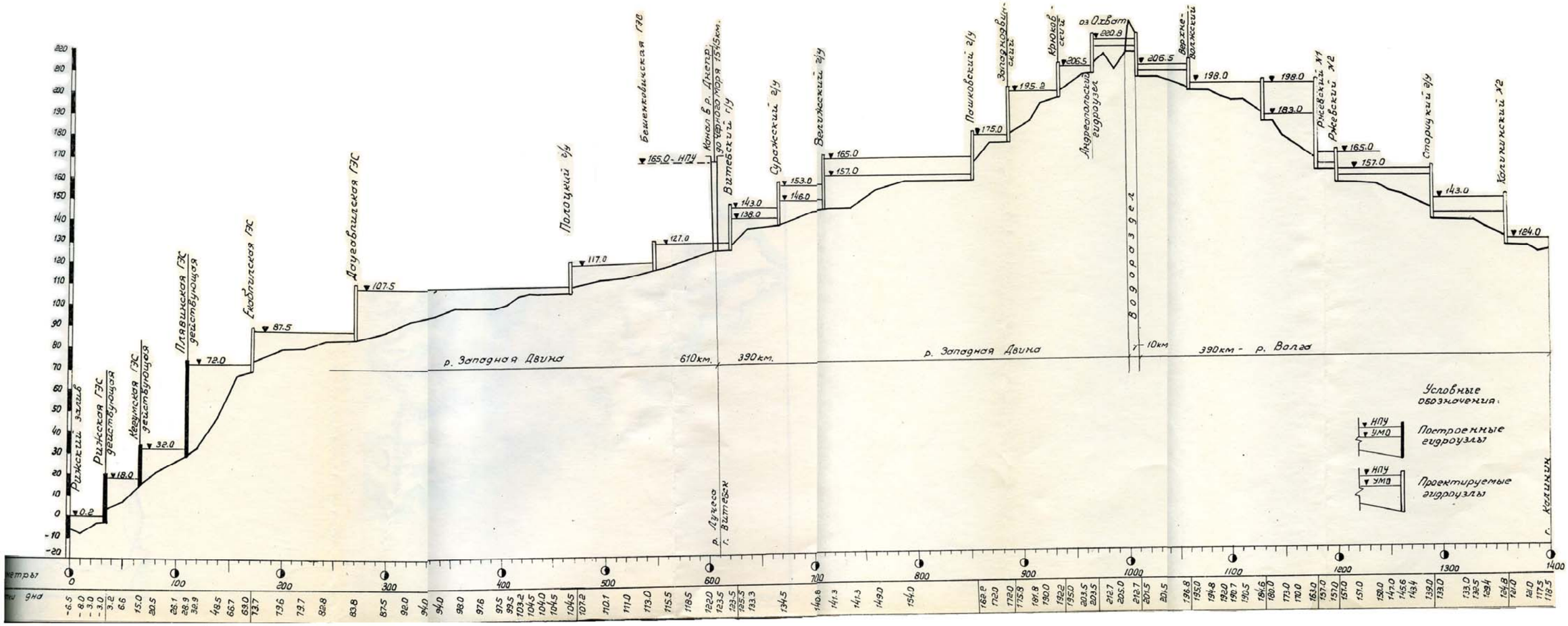
СХЕМА

Витебского пойменного, Витебского руслового и Суражского водохранилищ

Основные показатели водохранилищ

№ п/п	Показатели	Ед. измер.	Витебское пойменное		Витебское русловое	Суражское
			I вариант	II вариант		
1.	Отметка НПУ	м	165.0	165.0	143.0	153.0
2.	Отметка УМО	м	160.0	155.4	138.0	146.0
3.	Глубина максим.	м	20.0	20.0	16.0	15.0
4.	Глубина средняя	м	9.5	9.5	4.7	4.0
5.	Площадь зеркала при НПУ	$км^2$	240	240	30	77
6.	Площадь зеркала при УМО	$км^2$	180	125	10	20
7.	Площадь подтопления	$км^2$	12	12	8	15
8.	Емкость полная	$км^3$	2.30	2.30	0.14	0.30
9.	Емкость полезная	$км^3$	1.05	1.75	0.08	0.25

Продольные профиль водного пути
Балтийское море р. Даугава (Западная Двина)
р. Волга (г. Калинин)



ЧЕРНОМОРСКО-БАЛТИЙСКИЙ ГЛУБОКОВОДНЫЙ ТРАНСПОРТНЫЙ ПУТЬ В СИСТЕМЕ ВОДНЫХ ПУТЕЙ СССР

Условные обозначения

Действующие ГЭС

Намечаемые ГЭС

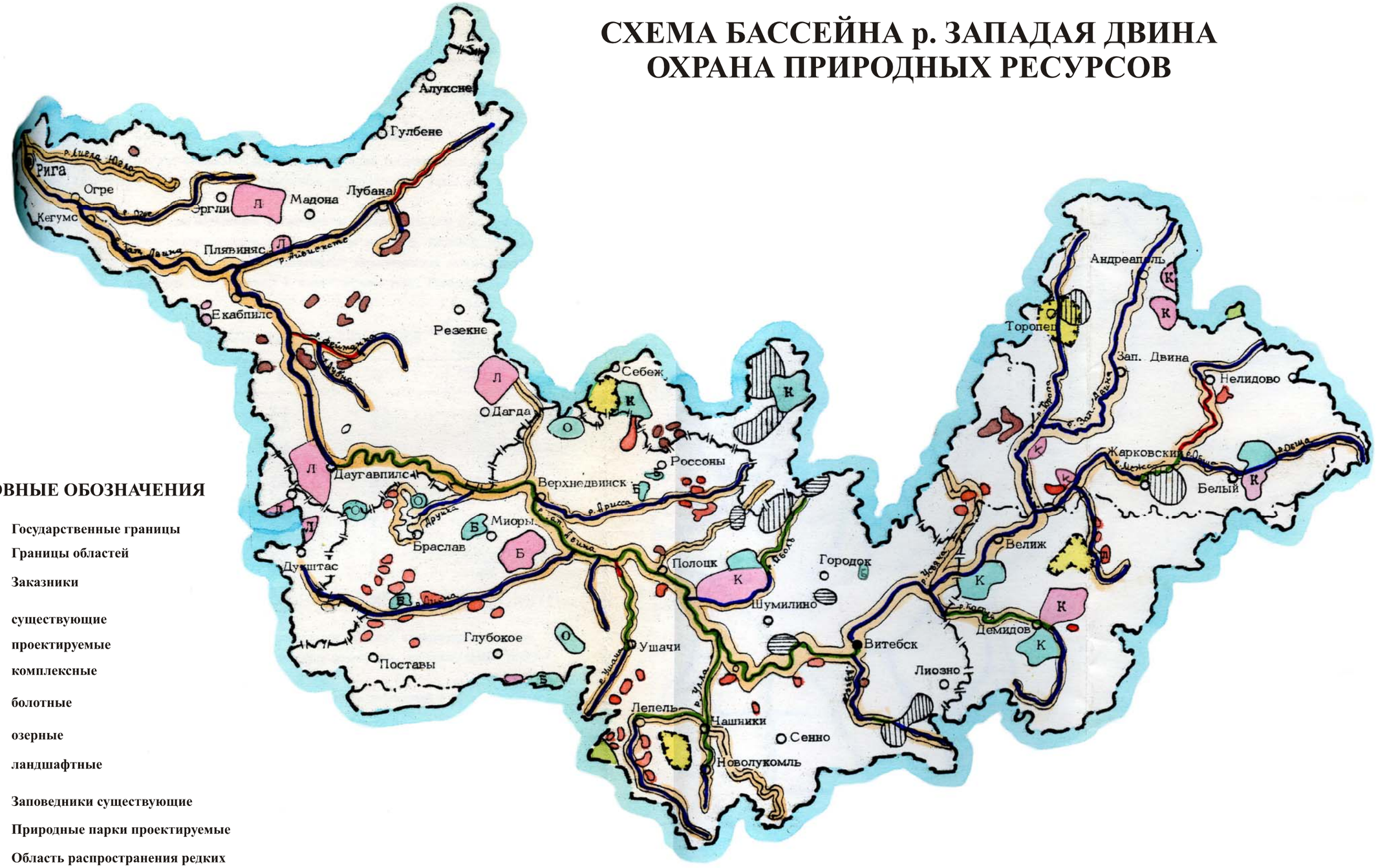
Транспортные гидроузлы (намечаемые)

Каналы

действующие

намечаемые

СХЕМА БАССЕЙНА р. ЗАПАДАЯ ДВИНА
ОХРАНА ПРИРОДНЫХ РЕСУРСОВ



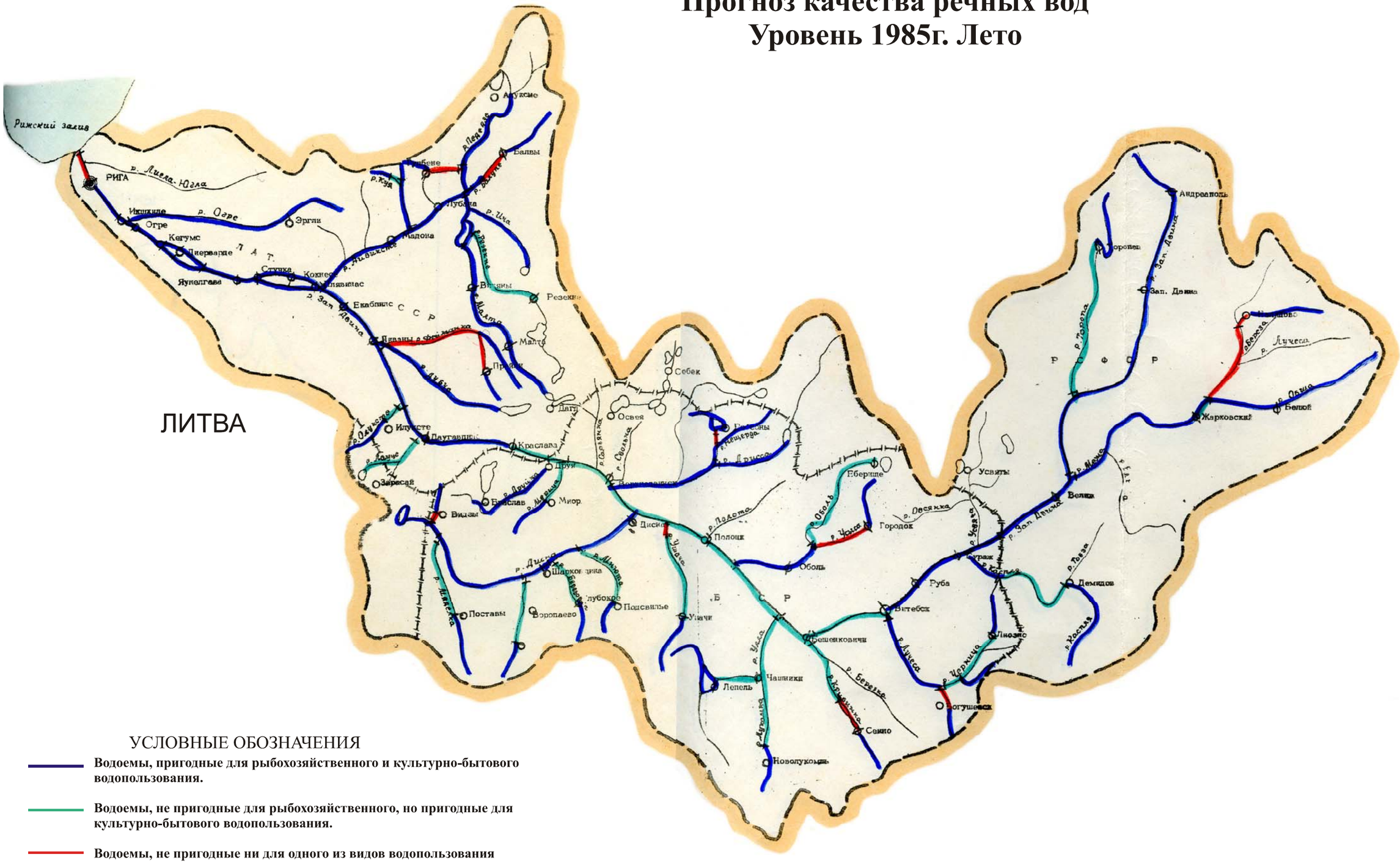
УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

- Государственные границы
- Границы областей
- Заказники
  - существующие
  - проектируемые
  - К — комплексные
  - Б — болотные
  - О — озерные
  - Л — ландшафтные
- Заповедники существующие
- Природные парки проектируемые
- Область распространения редких и исчезающих видов животных
- Область распространения редких и исчезающих видов растений
- Водоохранные зоны
- Клюквенные болота
- Клюквенные заказники

Качество воды на уровень 2000г., Лето

- Водоемы, пригодные для рыбохозяйственного и культурно-бытового водопользования.
- Водоемы, не пригодные для рыбохозяйственного, но пригодные для культурно-бытового водопользования.
- Водоемы, не пригодные ни для одного из видов водопользования

СХЕМА
ГИДРОГРАФИЧЕСКОЙ СЕТИ БАССЕЙНА р. ЗАПАДНОЙ ДВИНЫ
Прогноз качества речных вод
Уровень 1985г. Лето



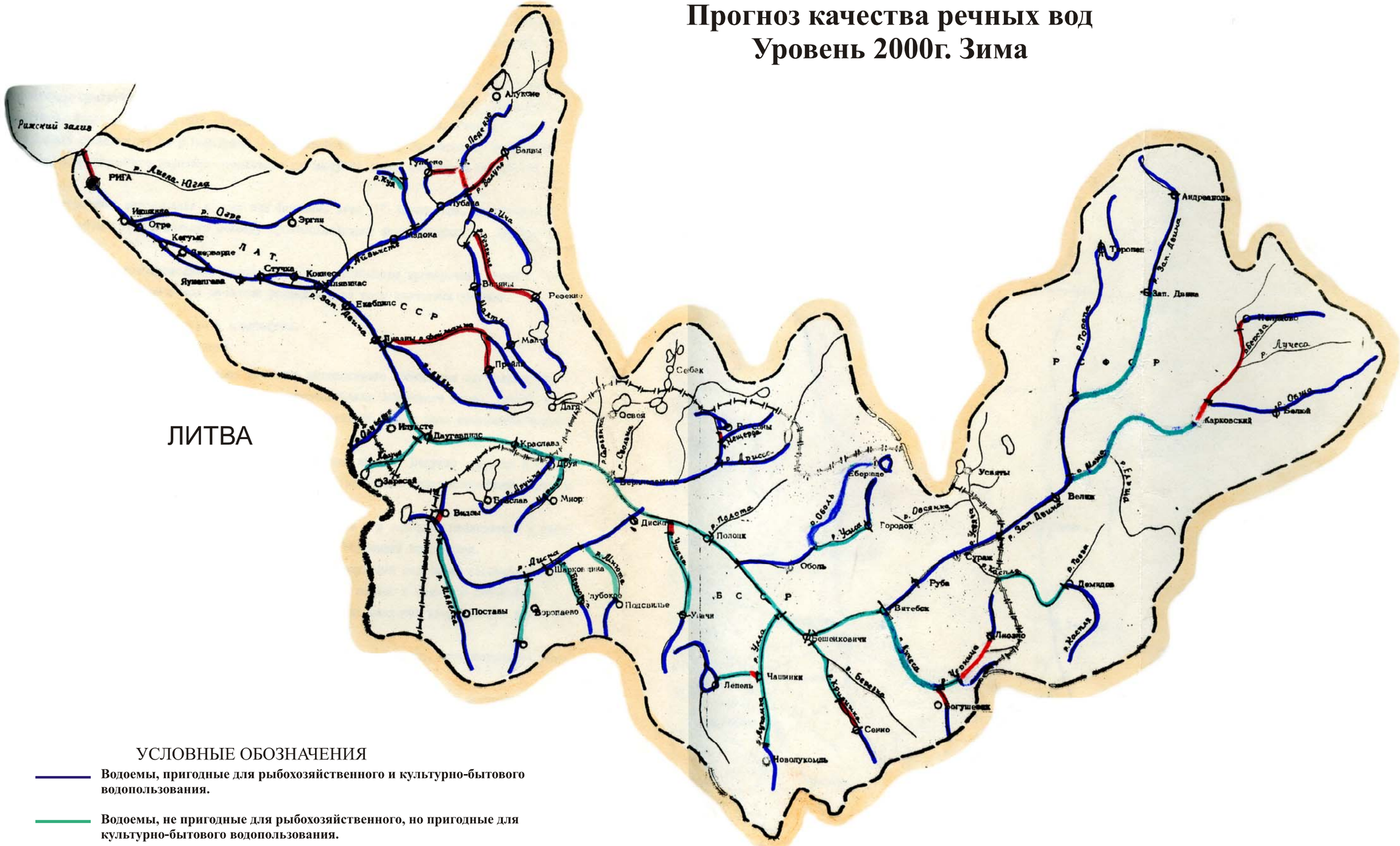
УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

Водоемы, пригодные для рыбохозяйственного и культурно-бытового водопользования.

Водоемы, не пригодные для рыбохозяйственного, но пригодные для культурно-бытового водопользования.

Водоемы, не пригодные ни для одного из видов водопользования

СХЕМА
ГИДРОГРАФИЧЕСКОЙ СЕТИ БАССЕЙНА р. ЗАПАДНОЙ ДВИНЫ
Прогноз качества речных вод
Уровень 2000г. Зима



УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

Водоемы, пригодные для рыбохозяйственного и культурно-бытового водопользования.

Водоемы, не пригодные для рыбохозяйственного, но пригодные для культурно-бытового водопользования.

Водоемы, не пригодные ни для одного из видов водопользования

СХЕМА
БАССЕЙНА р. ЗАПАДНОЙ ДВИНЫ
Инженерная защита территории от затопления