EBRD

Baltic Ports Development Project (Kaliningrad Component)

Environmental Impact Assessment

Draft

June 2003

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0 Executive summary

The comprehensive Executive Summary is published as the separate document "Baltic Ports Development Project, Kaliningrad Component, Environmental Impact Assessment, Draft Executive Summary", prepared in June 2003 by COWI A/S for the EBRD.

1 Operational context

1.1 Purpose and need

In March 2001 the Russian Federation Government drafted a federal target programme with a view to ensuring the comprehensive economic and social development in the Kaliningrad region until 2010. (Daily news bulletin, 2001)

The chief objectives of the programme are the creation of conditions for sustainable economic and social development on basis of expanding the export-oriented industries and the attainment of living standards for the population comparable to the standards of living of contiguous states.

Above all, the programme takes into account the provision that federal policy towards the Kaliningrad Region is oriented to ensuring the status of the Kaliningrad Region as an integral part of the Russian Federation, developing integration ties with other regions of Russia, using the advantages of its enclave position in the Europe-wide economic space and converting the region into a zone of export production.

Among the measures listed in the programme the development of the transport sector will improve the investment climate in the region. To accomplish this it is planned to develop a modern multi-purpose port facility at Baltiysk. Its main purpose is to avoid the need for ships to make the 43 kilometres journey up the Kaliningrad Sea Canal to the existing port, to provide Kaliningrad with modern facilities for container and Ro-Ro traffic, and to strengthen Kaliningrad's linkages with mainland Russia.

1.2 Legal and institutional framework

Environmental protection as well as general planning system of the Russian Federation is currently under reform. The main consideration behind it is to reduce number of bureaucratic obstacles blocking economic development, while at the same time securing environmental safety. It also applies to the legal systems, which shall be more public-oriented and transparent, providing reliable civil services for civil society.

1.2.1 The legal framework

The system of Russian environmental legal framework is formed by:

- The Constitution
- federative agreements
- international agreements of the RF and generally accepted international legal norms and principles
- constitutional and federal laws
- normative decrees and regulations of the RF President
- normative decisions and regulations of the RF Government
- constitutions, laws and other normative acts of RF federative subjects
- normative legal acts of ministries and state agencies
- normative legal acts of local self- governments
- local normative legal acts
- judicial decisions
- some common law cases.

The main legal framework relevant to the environmental appraisal of the project is set in the following statutory documents:

- Federal Law 'On Environmental Protection' No. 7-FZ of 10.01.2002;
- Federal Law 'On the State Environmental Expertise' No. 174-FZ of 23.11.1995; and
- Regulation 'On Impact Assessment of Proposed Operation on the Environment in the Russian Federation' adopted by the Order of the Russian Federation State Committee for Environmental Protection No. 372 of 16.05.2000.

According to these regulations, any project to be implemented within the Russian Federation shall undergo special procedure set by the state environmental authorities. This procedure consists of 2 stages:

- OVOS, the purpose of which is to evaluate the significance of environmental impacts of the project, consider alternative options, incorporate mitigation measures into the project design and address public concerns regarding the project impact; and

- State Environmental Expertise (SEE), the purpose of which is to analyse OVOS materials together with other project documentation and to make a decision on environmental soundness of the proposed activity. The conclusion of the SEE is legally binding for the project.

According to the Article 11 of the Federal Law on the State Environmental Expertise the construction of the Cargo Road-Railway Ferry Facilities in Baltiysk is subject to a State Environmental Expertise (SEE) at the federal level. This implies that the results of the Environmental Impact Assessment will be part of the documentation to be submitted for the SEE.

Further procedural steps as per the Russian environmental, health and safety requirements will be defined and undertaken by the Ministry of Transport and its Implementation Unit – the Kaliningrad Port Authorities, together with the Directorate for State Procurement of Maritime Transport Development Programmes to ensure the project is in line with the relevant national environmental, health and safety regulation.

Further details on the Russian EIA legislation and procedure are given in Annex A.

The use of coastal zones is regulated by some statutory regulations from the Soviet time that are still in force:

- Rules of the Protection of the Coastal Waters of the Sea, 1984. This is the basic legal document for the protection of the coastal zone. The document defines a coastal zone of 2 km from the highest water level ever observed. In this zone, all uses that could have harmful effects on the marine habitats are only allowed with special authorisation of the ministries concerned; and

- Statement of the Council of Ministers of the Russian Federation on development of recreational and SPA networks, 1982. Some coastal areas belong to a resort zone. This Statement and the Federal Law regulate land use in these areas. In these resort zones, building, extraction of soil and many other activities are not allowed within a 100-m wide zone measured from the shoreline.

Other legislation relevant to coastal zone management includes:

- Land Code, 1991. The Act subdivides the land with regard to its use, thereby distinguishing, for example, areas for nature conservation, general protection areas and areas for health purposes, such as recreation;

- Law on Specially Protected Natural Areas, 1995. This law regulates the protection of territories and objects and focuses on regulations concerning different types of protected areas. These include state nature reserves, including biosphere reserves, national parks, federal or regional state nature reserves, nature parks and natural monuments. As mentioned above, the Law on Specially Protected Natural Areas forbids almost all economic activities in a 100-m wide zone along the coast;

- Water Code, 1995. The act includes regulations for the use and protection of waters. It also regulates the use of waters for recreational purposes including tourism and recreational fishery. Local governments are responsible for specific regulations and permits, that also requireg the agreement of water- and environmental authorities; and

- Urban Development Code, 1998. This code forms the legal basis for territorial planning. It states the goals for urban development, describes the basic public rights, defines essential actors, lists essential planning and development documents, and states that design documentation shall meet urban development requirements, as laid down in an Urban Development Ordinance.

There is a number of international conventions signed and ratified by the Russian Federation. The list of international conventions which are relevant in the regional context of Kaliningrad Oblast and which are related to the project is as follows (OECD, 1998):

- Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention, first introduced in 1974, and newly adopted in 1992);

- Convention on the Protection and Use of Trans-boundary Water Courses and International Lakes (Helsinki, 1992);

- Convention on Environmental Impact Assessment in a Trans-boundary Context (Espoo, 1991), signed but not ratified by the Russian Federation;

- Protocol on the Prevention of the Pollution from Ships - MARPOL (London, 1978);

- Convention on Prevention of Marine Pollution by Disposal of Wastes and Other Matter (London, Mexico, Moscow, Washington, 1972, amended in 1978 and 1980);

- Convention for the Prevention of the Marine Pollution by Wastes and Other Materials (London, 1992);

- Convention on Biological Diversity (Rio de Janeiro, 1992);

- Convention on Wetlands of International Importance as Waterfowl Habitat (Ramsar,1971) and Protocol (Paris, 1982);

- Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts (Gdansk, 1973, amended in 1982);

- Convention on the protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (ILO 148) (Geneva, 1977);

- Convention on prevention of pollution of the sea by oil (London, 1971) and the Protocol on the International Fund for the Compensation for Oil Pollution Damage (1992);

- Convention on intervention on the high seas in cases of oil pollution casualties Œ INTERVENTION (Brussels, 1969) and the Protocol on the pollution by substances other than oil (London, 1973); and

- Convention on Civil Liability for Oil Pollution Damage - CLC (Brussels, 1969) and Protocols (London, 1976 and 1992).

Of the above, the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area and the Recommendations of the Helsinki Commission (HELCOM) are of primary importance.

The Russian Federation has also signed the Espoo Convention on the Environmental Impact Assessment in a Trans-boundary Context (25 February, 1991), but it has not yet ratified it. According to the convention any proposed activity that is likely to cause a significant adverse trans-boundary impact, the country responsible for that activity, has to notify potentially affected countries and has to provide an opportunity to the public in the areas likely to be affected to participate in relevant environmental impact assessment procedures. It is important to note that the first assessment carried out as part of the scoping procedure indicated that the present project will not cause trans-boundary impacts and that the conditions of the Espoo Convention do not have to be adhered to.

The other international conventions mentioned above provide guidelines and regulations, aiming at the protection of air and water quality, public health and safety, biotic resources, etc.

1.2.2 The institutional framework

The institutional framework relevant to the environmental appraisal of the project is comprised of five levels. At the top level there are the following ministries and authorities:

- Ministry for Natural Resources of the Russian Federation;

- State Committee for Fishery of the Russian Federation;

- Ministry of Health of the Russian Federation;

- Federal Service of Meteorology and Environmental Monitoring of the Russian Federation; and

- Federal Service of the Land Code of the Russian Federation.

- Ministry of Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters (EMERCOM of Russia).

These institutions set the strategy for management, use, protection and renewal of natural resources including land, water, soil, air, energy, mineral and biological resources. They also set federal environmental norms and standards and define the charging system for resource exploitation and pollution control. They are responsible for the development of national policies, regulations and procedures in the field of environment and human health. They set guidelines and national programmes for environmental monitoring and carry out state control functions that include, amongst others, appraisal of proposed operations and environmental supervision of ongoing economic activities.

Environmental authorisation for the Construction of the Cargo Road-Railway Ferry Facilities in Baltyisk is to be obtained from the State Environmental Expertise, which will be carried out at the federal level by the State Environmental Expertise Division of the Ministry for Natural Resources.

At the second level are the federal authorities that act within the area of Kaliningrad Region (Leningrad Oblast). These authorities are responsible for the following issues related to the Construction of the Cargo Road-Railway Ferry Facilities in Baltyisk (See Annex B for details):

- Environmental norms and standards applicable at the local/regional level (Board for Natural Resources and Environmental Protection of the Kaliningrad Region, State Centre of Sanitary and Epidemiological Control for the Kaliningrad Region, State Committee for Fisheries of the Russian Federation);

- Licensing of proposed operations (Board for Natural Resources and Environmental Protection of the Kaliningrad Region);

- Control of operations (Board for Natural Resources and Environmental Protection of the Kaliningrad Region, Kaliningrad Specialised Marine Inspectorate, State Centre of Sanitary and Epidemiological Control for the Kaliningrad Region, State Committee for Fisheries of the Russian Federation); and

- State environmental monitoring (State Centre of Sanitary and Epidemiological Control for the Kaliningrad Region, Kaliningrad Specialised Marine Inspectorate, Kaliningrad Center for Hydrometeorology and Environmental Monitoring).

Local authorities such as Administration of the Baltiysk Municipality and its Committees and Departments represent the third level of the institutional framework. The divisions of the Municipal Administration which are assigned responsibilities in relation to environmental protection, use of natural resources and environmental safety.

At the fourth level a role is played by research centres, universities, and NGOs. In Kaliningrad the NGOs do not form a driving force for environmental movement, but are formed by scientists who have a profound knowledge of the local environmental issues. Many research and design institutes were previously involved in different studies in relation to the Project and its impacts, amongst others Lenmorniiproject, AtlantNIRO (Atlantic Scientific Research Institute for Fisheries and Oceanography), and P.P. Shirshov Institute for Oceanology of the Russian Academy of Sciences.

1.2.3 Environmental norms and standards

Whenever possible, national Russian environmental standards have been applied. An overview of relevant Russian and International norms and standards is given in Annex C. Standards for water quality are set in a number of documents, amongst others 'The List of Maximum Admissible Concentrations and Non-Dangerous Levels of Harmful Substances in Water of Watercourses of Fishery Value' adopted by the Fishery Committee of the Russian Federation in 1995 (new edition in 2000) and 'Sanitary Rules and Norms, 2.1.5.980-00' adopted by Ministry of Health of the Russian Federation in 2000. A comparison of Russian water quality standards with European Union and World Health Organisation (WHO) standards is given in Annex C.

Air quality standards and allowable noise levels are defined in many documents. The most relevant are the following: SanPiN 2.1.6.1032-01: 'Hygienic requirements of ambient air in residential areas', 'List of Guide non-dangerous levels of Impacts from harmful substances in ambient air': [1]4414-87 of 28.07.87, GN 2.1.6.673-97: 'Non-dangerous levels of harmful substances in ambient air in residential areas', SNiP II-12-77: 'Protection from noise' and SN 2.2.4/2.1.8.562-96: 'Noise at working places, in premises of residential and public buildings and in residential areas'.

Relevant health and safety regulations and norms are provided in the following documents: GOST 12.1.007-76: 'Hazardous substances, classification and general safety rules', GN 2.2.5.686-98: 'Maximum allowable concentrations of hazardous substances in the ambient air at workplaces, RD 03-418-01: 'Methodological regulations for risk analysis', GOST 12.1.004-91: 'Fire protection, general requirements', GOST 12.1.010-76: 'Explosion-proof operation, general requirements', POT RM-004-97: 'Inter-branch labor safety rules for handling chemicals', NPB 102-95: 'Norms of the state fire protection authority of the Russian Ministry of Internal Affaires, container type filling stations. fire protection regulations', SNiP 2.04.09-84: 'Automatic fire protection systems for buildings and structures', GOST 12.3.008-75 SSBT: 'Application of metallic and non-metallic inorganic coatings, general safety requirements' and POT RO 14000-005-98: 'Regulation for dangerous works.

Regulations and norms regarding construction and construction materials are covered by the following documents: SNiP 2.06.01-86: 'Construction norms and regulations, hydro-technical facilities, main regulations for design', GOST 19433-88: 'Dangerous cargo, classification and marking', GOST 22237-85: 'Cements, packaging, marking, shipment and storage', GOST 25880-83: 'Construction materials and items for heat insulation, packaging, marking, shipment and storage', GOST 1510-84: 'Oil and oil products, packaging, marking, shipment and storage' and SNiP 32-04-97: 'Construction norms and regulations, road and railway tunnels'.

1.3 The project and the alternatives considered

1.3.1 The history

The overall target programme setting the frames of the present port development was drafted in March 2001. The Substantiation of Investments (SI) regarding the construction of combined multiple-purpose cargo and automotive-railway ferry sailing between Ust-Luga, Baltiysk and a harbour in central Europe (possibly Germany) was performed by ZAO "GT Morstroji" in 2002 according to the Terms of Reference authorised by the First Deputy of the Minister of Transport of the Russian Federation. This work was performed within the framework of a number of decisions of the Government of the Russian Federation.

1.3.2 Alternatives

The issue of alternatives has not been dealt with in the OVOS to the same extent as required in EBRD or World Bank EIAs. The reason is evident, since such considerations of alternative are not required by Russian environmental legislation.

Zero solution

The issue of "Zero" solution or "do-nothing" alternative is not dealt with in the existing documents since the port construction is considered a necessary step to achieve the overall objectives of the governmental target programme.

The environmental consequences of not establishing the new port with its spin-off on employment and local and regional development will probably mean increased deterioration of the infrastructure and increased emission from inadequate facilities and machineries. It is the general experience that such decrease can give rise to increased pollution.

Alternative port location

Alternative locations where investigated in TACIS (2002). Here three alternatives were studied, see Figure 1.1. The main environmental concerns identified are the dredging activities during construction and operation.

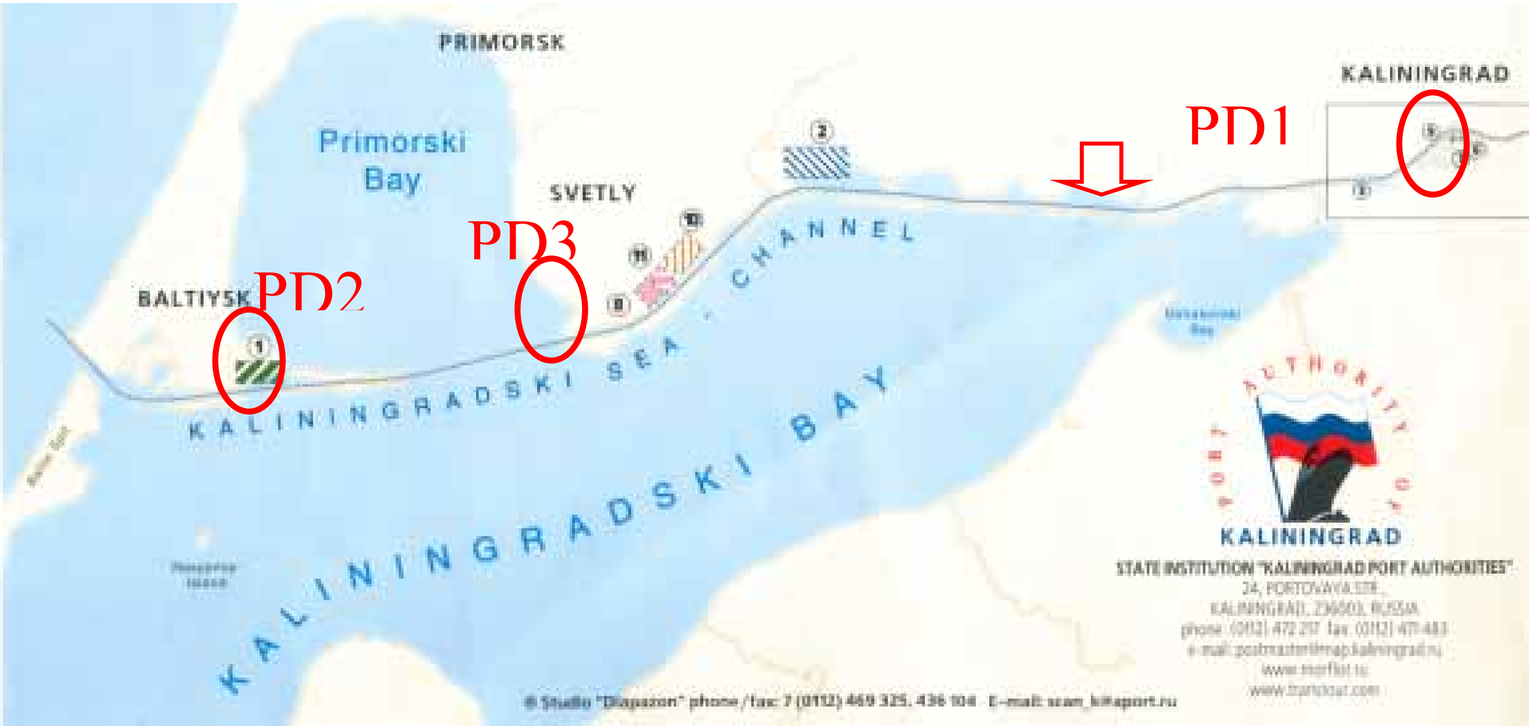


Figure 1.1 *Kaliningrad Port Development Project - Overview on Port Development Options (Tacis, 2002)*

PD01, Kaliningrad

The strategic position of Kaliningrad and the potential increased growth in traffic forecast warrants improvements in its port facilities. The investigation of the option of improving the facilities at the existing City Ports shows that it can serve the projected traffic.

The improvement measures are related to both, c
channel infrastructure and include mainly:

- Rehabilitation / completion of the existin
  Sea Commercial Port
- deepening of the sea Canal up to a level
- bend smoothing
- introduction of a siding at the Canal.

Existing Port Facilities

1- Baltic Oil Handling Company JSC
2- Lukoil-Kaliningradmorneft Ltd
3- Kaliningrad Port Oilbase (State Enterprise)
4- Port Elevator PSC
5- Terminal GMB CSC
6- Sea Commercial Port of Kaliningrad Co. Ltd
7- Sea Fishing Port of Kaliningrad (State Enterprise)
8- River Port of Kaliningrad CSC

Deepening of the sea Canal is required to operate larger vessels carrying bulk and break bulk cargo, the siding is essential to decrease waiting time at sea entrance and thus to reduce vessel's costs.

During a first phase (2001 to 2015) only limited measures should be performed along the Canal. The material (1.8 mill. m³ *in-situ* wet material) should be brought to the dumpsites at mark No. 42 and at mark No. 224 (Phase I).

Depending on the further sea traffic development (after 2015), a deepening and widening of the Canal could be carried out in a later Phase II. The material, about 8.5 mill m³ mud and sand, should preferably be taken to the dumpsites at marks No. 42, 130, 224 and 340 (peninsula Rybachy). Another about 1.2 mill. m³ of dredged material from the Kaliningrad port area has to be added (sum: 9.6 mill. m³).

For environmental reasons (sustainability) it would be worthwhile to take into consideration the construction of a separation field for dredge spoil, too. Such a facility may be needed to support further capital dredging for the reconstruction of the KSC, for the continuously required maintenance dredging and/or for construction work related to the creation of new ports within that area. It would be possible to use major parts of the former dredge material later for the construction or reconstruction of roads, for landfills and other purposes.

PD02, Vostochny
The improvement measures are related to both, cargo handling facilities and related sea Canal infrastructure and include principally:

- a new port for container/Ro-Ro traffic
- a rail ferry terminal at Baltiysk/Vostochny
- providing sea access and turning areas from the existing Canal.
- land access links by road and rail
- bend smoothing at the entrance and VTS improvements

The capacity of the Canal has been examined in PDO1. This concluded that the growth in liquid and dry bulk cargo would accompanied by an increase in numbers of larger vessels and this trend would be further promoted by deepening the sea Canal. The numbers of ships calling would increase slightly and the Canal capacity would be sufficient. The additional opportunities for vessels to enter and leave the new port will reduce the access time for these vessels.

For environmental reasons (sustainability) it would be worthwhile taking into consideration the construction of a separation field for dredge spoil, too. Such a facility may be needed to support further capital dredging for the reconstruction of the KSC, for the continuously required maintenance dredging and/or for construction work related to the creation of new ports within that area. It would be possible to use major parts of the former dredge material later for the construction or reconstruction of roads, for landfills and other purposes. It is necessary to find an agreement with the fishing industry for this measure

The main features where human health and environmental assets can be gained are:

- Increased living standard for the local population
- More healthy and safe working conditions due to new technology
- Enhanced sewage treatment
- Better harbour reception facilities (Oil, Bilge)
- Removal of fuel depot
- Enhanced waste treatment

PD03, Svetly
The improvement measures are related to both, cargo handling facilities and related sea Canal infrastructure and include principally:

- a new port for Ro-Ro vessels
- a Rail ferry Terminal at Svetly/Komomloskiy
- providing sea access and turning areas from the existing Canal
- land access links by road and rail
- bend smoothing at the entrance and VTS improvements
- interaction with a military site in the vicinity to be cleared.

The capacity of the Canal has been examined in PDO1. This concluded that the growth in liquid and dry bulk cargo would accompanied by an increase in numbers of larger vessels and this trend would be further promoted by deepening the sea Canal. The numbers of ships calling would increase slightly and the Canal capacity would be sufficient. The additional opportunities for container and ferry vessels to enter and leave the new port will reduce the access time for these vessels.

One major aspect is the environmentally proper handling of the dredged material. The material (4.5 mill. m^3 *in-situ* wet material) of this KSC reconstruction phase and the building of the new port should be brought to the dump sites at mark No. 42, mark No. 130 and at mark No. 224. It is necessary to find an agreement with the fishing industry for this measure.

For environmental reasons (sustainability) it would be worthwhile to take into consideration the construction of a separation field for dredge spoil, too. Such a facility may be needed to support further capital dredging for the reconstruction of the Canal, for the continuously required maintenance dredging and/or for construction work related to the creation of new ports within that area. It would be possible to use major parts of the former dredge material later for the construction or reconstruction of roads, for landfills and other purposes.

Comparison
In the TACIS study extension of the existing port in Kaliningrad is described as the solution that solves the traffic growth and that can be extended with less cost than for the Baltiysk and the Svetly option.

The Baltiysk option has the following advantages

- Short approach time
- Reduced traffic intensity in the Kaliningrad Canal
- A new infrastructure can be established without interfering with major master plans / town planning.

Compared to the alternative locations the Baltiysk option has the following environmental advantages

- Increased living standard for the local population
- Less risk for accidental pollution at sea
- High dilution rates in the marine environment providing a high environmental stability
- Minimised reconstruction of existing infrastructure and settlements.
- Possibility for enhanced sewage treatment for residential areas
- Better harbour reception facilities (Oil, Bilge)
- Removal of a potentially hazardous military site
- Enhanced waste treatment

2 Description of the project

The Baltiysk terminal is to be developed close to an existing naval base. The terminal will comprise a Ro-Ro berth to handle approximately 10,000 trailers per annum (a rail ferry facility could be constructed at this berth at a later stage), and a container berth to handle approximately 125,000 TEU per annum. The territory for the Ro-Ro terminal will cover an area of approximately 32.5 ha, and the area of the container and general cargo terminals will be about 12 ha.

2.1 Physical Construction

The terminal would be composed of a Ro-Ro vessel link for road vehicles services and rail services.

The terminal construction will consist of the construction elements shown in Table 2.1.

Table 2.1 Design parameters for different elements of Baltiysk terminal, (OVOS)

Element (unit)	Amount
1. Capacity (million t/y) - Railway transport (million t/y) - Roadway transport (million t/y)	up to 1.57 up to 1.23 up to 0.34
2. Design types of ships	Ro-Ro ships, ferries
4. Length of berth (m)	215
5. Marine earthworks - Total area dredged to 9.5 m depth (10^3 m^2) - Dredging volume (10^3 m^3)	 288 2,100
6. General Plan Parameters - Construction area (ha) - Total area of the site including boundaries (ha) - Area within boundaries (ha) - Volume for earth fill (10^3 m^3)	 64 33.6 32.5 162

- Volume for excavation (10^3 m^3)	94
7. Utilities demand - Electricity (MW) - Water supply (m^3/day) - Household Sewage (m^3/day) - Industrial Sewage (m^3/day)	 1.3 110 30 80
8. Total man power - Administration - Port and auxiliary personnel - State controlling personnel - Security	344 37 117 141 49

The quantities given in the table above will be needed to be reassessed based on a detailed survey of the topography (on land) and a survey of the bathymetry (at sea).

Based on the existing design information the size of the necessary land area for the terminal facility and its design seem to be appropriate, taken into account that extension of the port area is possible towards north and south.

Figure 2.1 Illustration of the planned port development in the Baltiysk region.

Figure 2.2 Sketch port design on the Vostochny peninsula

2.2 Construction Phase

The construction phase as currently foreseen will have a duration of 22 months, including detailed design and tendering. The foreseen period is from March 2004 till December 2005.

Future development is planned for a extension for container handling. Future expansion plans should not be restrained due to actions within the early phases. The future plan is given below in Figure 2.3.

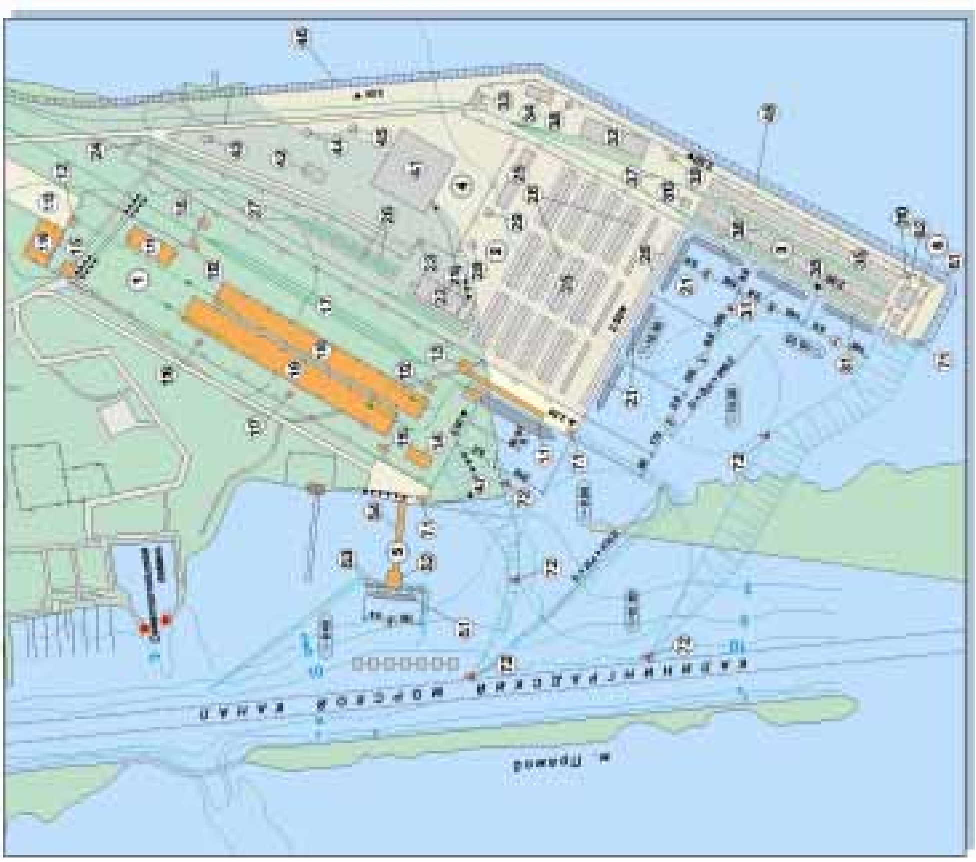


Figure 2.3 Future development plans for a container terminal at Vostochny (not included in the present EIA)

2.3 Operation

The operation of the terminal will include loading/offloading of cargo, vehicles and railway wagons on ferries, short-term storage of road vehicles, control and clearance of sea-going vessels, cargoes, vehicles and persons, crossing the border of Russia. The following types of cargo are expected to be handled: general, pallets/packages, containers, vehicles, heavy and large equipment. Cargo turnover is expected to be 1.3 million tons with 330 calls per year.

3 Description of the existing environment

Figure 3.1 Aerial photo from the project site (May 2003)

3.1 Climatic conditions

The climate of the Kaliningrad coast is actively influenced by the Baltic Sea and is characterised as maritime-continent transitional.

Solar radiation

The annual input of aggregated solar radiation totals 88 kkal/cm^2, duration of solar glowing is 1850-1900 hours. The radiation balance averages 38.9 kkal/cm^2 per year. The seaside location causes an increase of sunny weather in comparison with the regions far from the coast.

Atmospheric circulation
The general processes are characterised by active cyclone with fast moving Atlantic air masses. The cyclone is active about 200 days a year. Prevailing latitude winds are accompanied by air masses of moderate latitudes - 80 %, by arctic air masses – 6-17 % and by tropical air masses only 1%. Almost all air masses passing above the basin are poorly transformed. Intensity of atmospheric circulation is emphasised by a great number of intense atmospheric fronts, over 160 in average are registered per year. Frontal sections determine the weather in the oblast 50-60 % of the year on average.

Air temperature
The average annual air temperature on the coast is +7.5ºC. The summer is long and fairly warm and the winter is mild with modest snowfall. The temperature in January is -2.7C, temperature in June is +16.7ºC. Absolute fluctuations largely vary from +35ºC in July-August, up to -33ºC in January-February. Very low and very high temperatures are not continuous.

Humidity
The humidity is high all year round, fog is common. The area is excessively humid. The average annual amount of precipitation amounts to 700-800 mm. Maximum falls during the warm season of the year (maximum is in August - 90 mm), minimum - in autumn-winter. 63-65 % on average of an annual amount of precipitation falls during warm periods in April-November.

Wind
The area in question is affected by winds from south-west and up to east. Western winds are the most recurrent (20.4 %), southern winds (19.9 %) and northwestern winds (15.3 %). Wind velocity of 2-5 m/s (76.2 %) is often observed. 5-10 % of the winds have velocity less than 1m/s. Gales (> 15 m\s) recurrent up to 6 % are mostly western. The autumn-winter period is stormy. Storms are mostly recurrent in February - January. Storms peak up to 30 m/s and more. Outstanding storms (higher than 7-8 points) in the Baltic are recurrent once per 5-7 years, they, however, became two-fold frequent within the two recent decades.

3.2 Geomorphology and geology

3.2.1 Lower sediments

The general profile of the Kaliningrad seacoast is predetermined by tectonic development of the terrain. The Vistula Lagoon occupies the inherited depressions of the earth crust, and the ledge (prominence, projection) of the Sambian peninsula is a relatively elevated part of the earth crust. The peninsula is shaped by orthogonal faults of the earth crust, which caused displacement of crystalline basement blocks.

The formation of a modern coastal zone is dated 9-8 thousand years BP, i.e. one of the last phases of transgression (rise) of the World Ocean level. At approximately that time (Ancilus lake stage), the coastal zone of the south-eastern Baltic started to form at a sea level of 35-40 m below the current level. The subsequent rise of the level accompanied by relatively short-term regressions resulted in flooding of the ancient profile of the Sambian peninsula. These transgressions and regressions formed terrace fragments and abrasion berms at the coastal bed.

3.2.2 Upper sediments

The Vostochny peninsula has been created during the last 100 years as a result of the dredging spoil accumulation, see Figure 3.2

Figure 3.2 Illustration of the fact that the Vostochny peninsula (arrow) is younger than 1902. The coastline from a survey in 1902 (red line) is drawn on top of an Admiralty sea chart.

During one of the last transgression phases, the shallow Vistula Lagoon was formed. It appeared hedged from the sea by the Vistula spit (0.5-2.0 km wide) formed by sand, which was and is currently supplied by the Sambian coast being destroyed by waves. The lagoon drops into the sea through the narrow (up to 500 m) Baltiysk Strait. As for dynamic features of the Vistula spit, it is worth pointing out the intensive erosion of the lagoon coast of the peninsula (approximately 14 out of 30 km of the Russian coast is being washed away).

The north-eastern coast of the lagoon is formed by a low terrace, i.e. external edge of outwash plain. There are big marshes inshore.

During the 19th and 20th century the coast line along the lagoon was protected against waves by artificial dams.

The lower lagoon coast consists of coastal-marine deposits representing sea terraces formed during a peak of Litorina transgression.

Active destruction of the coast is caused by natural factors as well as anthropogenic activities (construction of hydraulic engineering facilities, recreation, etc.). In a number of cases, anthropogenic activities result in degradation of natural and artificial coastal woods, over-moistening of soil, rise of ground water level, etc.

In terms of lithological structure, the investigated area has a complex of quaternary deposits up to 40 m deep.

Glacial deposits lay in the basis of the investigated geological section at significant depths of 30 m and more and are inclined towards the sea. They are represented by loamy sands and loams containing coarse material and sand layers. Stripped thickness of the layer is 25 m and more.

Late Pleistocene lacustrine-glacial deposit consisting of sand and varved clays lay over glacial deposits. The sand layer thickness is 20 m. The varved clay layer thickness is 2-5 m.

Younger post Pleistocene lagoon-marine deposits are located everywhere and compose a main part of the lithological section. They lie under technogen deposits on the land and reach seabed in the marine area. They consist of layers of sands, loams, mud and partly peat. The layer thickness is 24 m and more. Thickness increases towards the sea. Loam, partly loamy sand, clay lay only on the land. The layer is 18 m thick. Layer of mud located only in marine areas may be 7 m thick. Peat is located as lenses in the top part of post-Pleistocene deposits. Peat layer is up to 2.5 m thick.

The uppermost layer is composed of modern technogen deposits. They consist of sand of different size mixed with building materials, disturbed loams, coarse clastic rocks. Sands are medium dense, moisturised. The layer is 1.0-2.0 m thick.

The Vistula Lagoon is a natural sedimentation for alluvial loads of Vistula, Pregel and smaller rivers. The maximum depth of the lagoon is about 5.5 m. The part of mud is taken out during floods and high waters into the sea through the Baltiysk Strait. Thus it naturally removes mud out of the Vistula Lagoon.

Grounds of the Kaliningrad Canal bed are composed of clayed sand containing a lot of much clay particles. Grounds are slightly contaminated. Bottom sediments contain 8 % of organic matter in average, which is gradually increased as approaching the Primorsk Bay.

Sedimentation conditions in the Vistula Lagoon are characterised by two trends:

- a general deepening of the lagoon through an active removal of sedimentary matter into the sea (during storms) and
- a process of sedimentary matter redistribution in the lagoon.

The deterioration of environment in the lagoon is opposed by the process of water self-treatment. The most effective one is inflow form the Baltic Sea, which ventilates lagoon water (80 % of water inflow to the Vistula Lagoon is provided by inflow through the Baltiysk Strait).

Climate conditions of the area are closely correlated with soil conditions:

- The relatively continuous rain results in a fast mineralization of vegetation remains and it washes out the unstable compounds in the soil;

- Small amplitudes of daily temperature fluctuation and mild winters do not support physical destruction of minerals. Biological factors dominate the weathering processes;

- High humidity and a moderate temperature regime as well as anaerobic conditions result in gleying process; the climate of west and east differs, which leads to differentiation of soil covers in these areas.

Origin of soil forming rocks in the area relates to glacier period and processing of moraine materials in post glacier period. Various genetic types of quaternary deposit and appropriate lithologic rock groups exist in the area. Three main groups of soil formation rocks are seen frequently than others: a) boulder loam transformed into binary layers, washed up from the surface; b) non-boulder clay, more often underlying loamy or clay sand in-wash; c) sandy deposit forming hills and ridges or composing flat surfaces of terraces.

3.2.3 Sediments in the Canal

The sediments in the Canal are regularly investigated in connecting with the maintenance dredging operations conducted through the KPA.

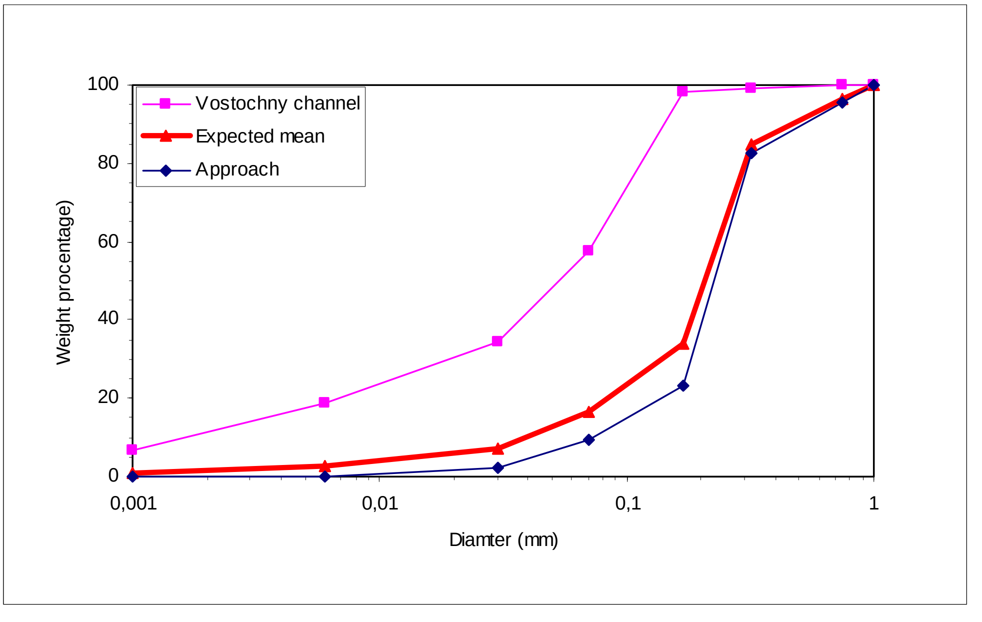


Figure 3.3 Grain size distribution from the outer part of the Kaliningrad Navigational Canal (Lenmorniproject, 2003). The red line indicates the material expected for the capital dredging.

The grain size distribution of sediments in the area close to the proposed development site is given above. The dredging positions in the Vostochny area comprise location with fine silt material from the deep parts of the inner canal and of locations with coarser sand material which is assumed to be representative for the seafloor outside the canal. The capital dredging volume will consist of a combination of these two sediment types. Volume considerations give an approximate ratio of 1/7. Application of this ratio gives the expected mean grain size distribution indicated in Figure 3.3.

3.3 Surface water

The lagoon area in the vicinity of the planned port is of primary environmental interest for the present impact assessment. Therefore, particular effort has been spent on the description of the marine environment.

3.3.1 Geographical description

The geographical description comprises a regional description of the hydro-geographical context and a local description of the Vistula Lagoon.

The region

The “Atlantic Ocean \ Baltic Sea \ Gdansk Bay \ Vistula Lagoon \ Baltiysk harbor” is a ‘planetary address’ of new Russian ferry terminal (Figure 3.4). This Ferry Terminal in port Vostochny is planning to be constructed on the north coast of Kaliningrad Canall, which passes along the northern coast of the Vistula Lagoon (Figure 3.5). The port development is to be located at the distance of a near 7 km from the Vistula Lagoon outlet (Baltiysk Strait) at the Vostochny peninsula, namely at a traverse of the 2nd dam and opposite the western end of Northern dam. These dams as well as other dams bound Kaliningrad Canall (8-10 m depth) from the South and the North. The Kaliningrad Canall (length is of 17.5 nm or 32.4 km) was constructed at 1901 to provide the Koenigsberg (now named Kaliningrad) port by deep fairway for marine vessels.

The ferry terminal will be located at the internal part of the Vostochny peninsula on the coast of Primorsk Bay, a semi-closed basin at the northern part of the Vistula Lagoon. The by pass for large ferries is to be constructed by deepening and widening of the existed small boats by pass (57 m) between Vostochny peninsula and the Northern dam.

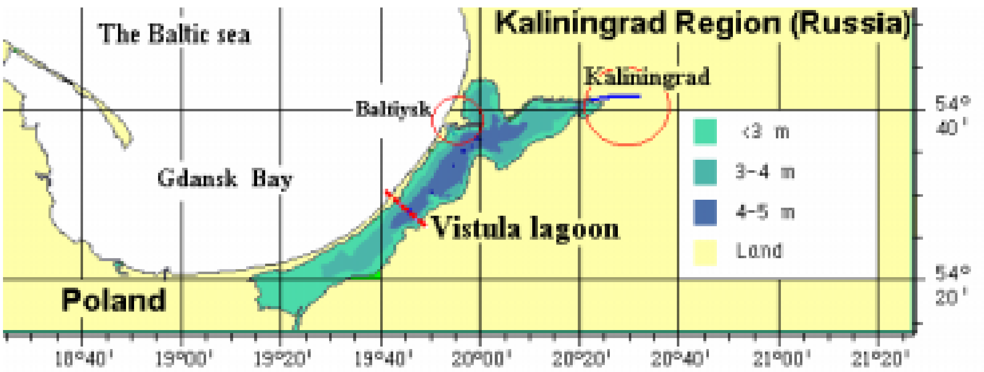


Figure 3.4 Location of new ferry terminal in South-eastern Baltic.

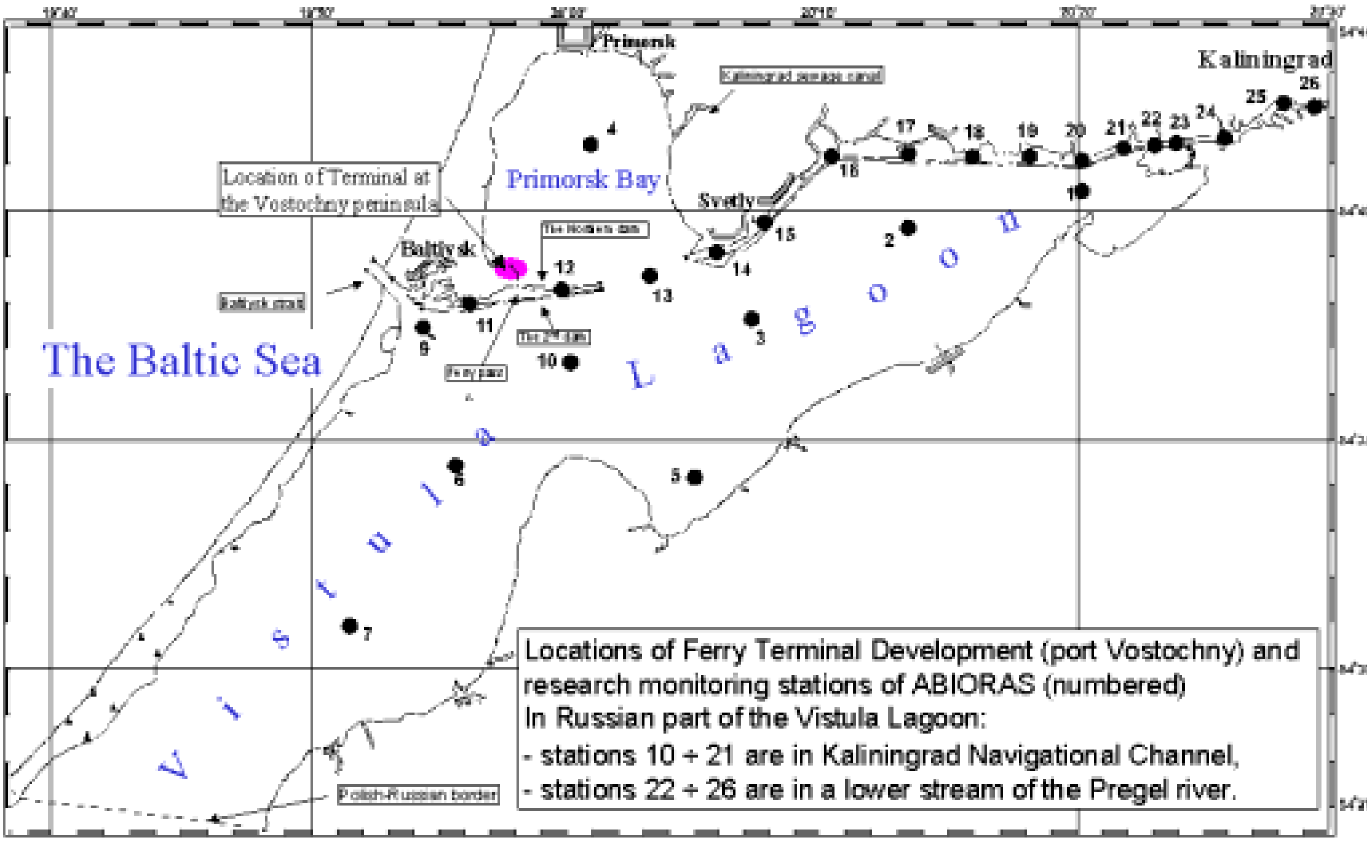


Figure 3.5 Russian part of the Vistula Lagoon with indications of important locations.

3.3.2 The Vistula Lagoon

The Vistula Lagoon is located in the south-eastern part of the Baltic Sea and belongs to the Gulf of Gdansk Basin. The lagoon [Lazarenko and Maevskiy, 1971] has an elongated shape, goes from the south-west to the north-east (91 km). The average width of the lagoon is c.a. 9 km and the widest point is 13 km. The length of coastline is c.a. of 270 km, and the volume of water in the lagoon is c.a. of 2.3 km^3. The average depth is 2.7 m, the maximum natural depth is in the central part of lagoon and equals to 5.2 m.

The Vistula Lagoon is trans-boundary basin, a state border between Russia (the Kaliningrad region) and Poland divides the Vistula Lagoon into two national parts. The surface area of the lagoon is of 838 km^2, 473 km^2 of which belongs to Russia and the remainder to Poland.

The bottom of the lagoon is basically muddy. During storm, re-suspension occurs mostly everywhere in the lagoon, and bottom material is carried by currents.

The catchment area of the lagoon is 23871 km^2. The main part of annual fresh water inflow (43 per cent) comes from the river Pregel. Other rivers supply: Pasleka (14 %), Prokhladnaya (7 %), Elblong (6 %), Bauda (2 %), Mamonovka (2 %). There are many others small rivers and streams around the lagoon.

Water budget

The main water inflow (80 per cent of total) coming through the Baltiysk Strait is a marine water (17 km^3 per year) terrestrial land surface freshwater income contains a 3.6 km^3 per year. Atmospheric precipitation (0.5 km^3 per year) and underground discharge (0.07 km^3 per year) make about 3 per cent of inflow component of water budget and both are almost equal to the evaporation part of the water balance (0.65 km^3 per year). The total discharge of water from the lagoon to the Baltic Sea approximately equals to sum of marine and catchment water influxes (21.17 km^3 per year). Thus, the lagoon's hydrological regime is mainly defined by the water exchange over the Baltiysk Strait and rivers inflow.

Driving forces

The currents and fluctuations of water level in the lagoon are determined by river discharge, local wind action and water level variations in the Gulf of Gdansk, the last being caused mainly by wind and air pressure action over the Baltic. The astronomic tide in the Baltic Sea is negligible. Daily fluctuations are about of 1 cm and negligible in comparison with the maximum amplitude of wind setup (up to 1m). Water exchange with the Baltic causes the temporal variations in lagoon water volume. Local wind establishes temporal inclination of the water surface (wind setup), which causes down wind currents on the shallow parts and reverses compensative currents (up wind) in the deep areas of lagoon.

Salinity

The average salinity for the eastern part of the lagoon during spring – autumn period typically varies between 2.4 and 4.3 PSU (minimum is 0.8, maximum is 6.1 PSU). The central part of lagoon is characterized by salinity between 3.9 and 5.0 PSU (minimum - 1.9, maximum - 6.4 PSU). For the southern part the range of 1.0 to 3.4 PSU is typical (minimum is 0.1, maximum is 4.6 PSU). The annual course of rivers' discharge defines the annual variation of average salinity in the lagoon area: Minimum salinity in the spring and maximum in the autumn-winter season. The short-period variations of salinity are determined by the intensity of water exchange processes with the Baltic Sea, wind driven advection and horizontal mixing in the area.

The vertical stratification of salinity is observed mostly in the area close to the Baltiysk Strait and the Pregel river mouth, but salinity difference between upper and bottom layers mostly (except in spring) does not exceed 1 PSU. This is the reason of predominant using of 2-dimensional (2D) approach for modelling of the main hydrological characteristics of the lagoon area.

Temperature
The spatial and vertical variations of water temperature are small and usually in the range of 1.5 per cent (summer) and 30 per cent (spring) from their average value. With respect to temperature field structure the Vistula Lagoon can be considered as uniform. The annual variation varies between 0°C in winter up to +22-25°C in the beginning of August. The Vistula Lagoon is covered by ice usually during 3 month annually (from January till March).

Suspended sediments
The average concentrations of total suspended sediments are in the range of 25 - $66 \cdot 10^{-3}$ mgl^{-1} [Chubarenko, Kuleshov and Chechko, 1998]. The average (and minimum and maximum) values of organic component are about 18 $(7\text{-}35) \cdot 10^{-3}$ mgl^{-1} and 19 $(5\text{-}30) \cdot 10^{-3}$ mgl^{-1} for inorganic component. On the whole, the organic and inorganic components give the equal contributions to total content of suspended substances, though the dominant component depends on the season: organic in the spring-summer, inorganic in the windy autumn period.

Re-suspension process
The filtering effects of the molluscs are also an important ecosystem self-treatment element. Fresh water molluscs (*Dreissena Polymorpha Pallas*) that were brought from Northern America by vessels were abundant in earlier years. Now the population is reduced to the smaller sub-population due to salinity growth in the lagoon. They remain, however, in the less saline Polish part of the lagoon.

Re-suspension process is highly valuable for lagoon's self-treatment too. Huge masses of "secondary suspended matter" initiated by re-suspension increase its sorption capabilities to extract heavy metals and non-polar hydrocarbons. Re-suspension may however cause negative consequences for environment. Lagoon deposits do not utilise hazardous substances namely due to re-suspension. Permanent supply of nutrients into the water from bottom sediments while re-suspending results in nitric-phosphoric contamination of the lagoon. High concentrations of suspended particles influence the benthos negatively, e.g. it reduces bio-diversity and the number of organisms.

Organic matter
The Vistula Lagoon ecosystem is characterized by a very high rate of the organic matter production [Rasmussen, 1997]. Various species of phytoplankton determine the continuous high level of organic matter concentrations during the warm part of a year. There are usually two maximums in the primary production (in May and August). The summer maximum is higher than the spring one by 1.5 - 2 times. The Vistula Lagoon can be related to eutrophic lagoons on the basis of Vinberg classifications.

3.3.3 The Primorsk Bay

Primorsk Bay has a name in an honor of Town of Primorsk situated at the very north of the Vistula Lagoon coast. Former name of the city was Fischhausen and the bay had a name of Fischhausen Bucht.

The area of Primorsk Bay is c.a. of 55 km^2. The volume approximately could be estimated as 0.1 km^3. The maximum depth is 4.2 m, the average depth is 2.9 m. According to the results of a comparative study of 1994 the annual discharges of the rivers and artificial streams flowing into Primorsk Bay is estimated as in Table 3.1.

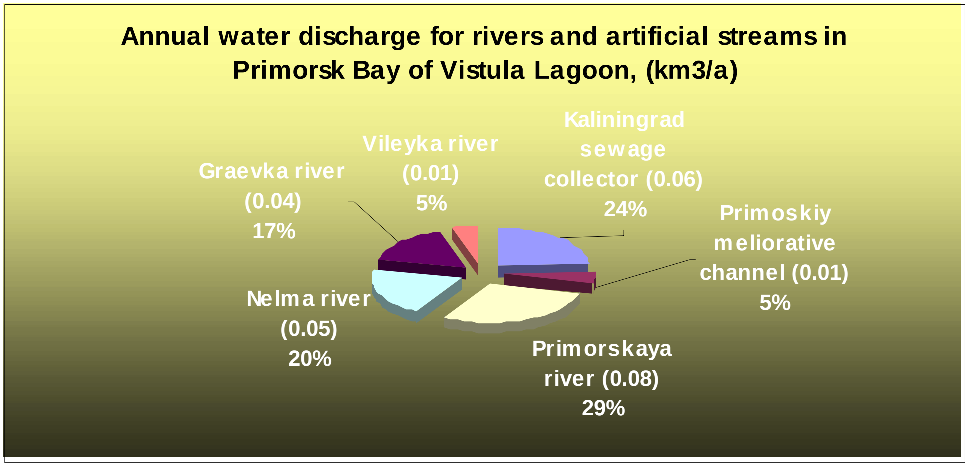


Figure 3.6 Annual discharge for rivers entering Primorsk Bay.

Table 3.1 Estimation of the annual discharge for rivers and artificial streams entering Primorsk Bay (by results of Project "Prioritizing Hot Spot Remediations in the Vistula Lagoon Catchment: Environment Assessment and Planning for the Polish and Kaliningrad Parts of the Lagoon". 1997. Danish Ministry of Environment, VKI Water Quality Institute (Denmark), Danish Hydrologic Institute (Denmark), GEOMOR Ltd. (Poland), P.P.Shirshov Institute of Oceanology, Atlantic Branch (Kaliningrad).

Stream name	Annual average water discharge (1994-1995)		
	m^3sec^{-1}	km^3a^{-1}	%
Primorskaya river	2.5	0.08	30
Kaliningrad sewage collector	2	0.06	24
Nelma river	1.7	0.05	20
Graevka river	1.4	0.04	17
Primoskiy meliorative Canal	0.4	0.01	5
Vileyka river	0.4	0.01	5

3.3.4 Bathymetry

Principal bathymetric structure of the Vistula Lagoon is presented in Figure 3.4. The deepest areas are in the central part of the lagoon. The maximum depth in equilibrium conditions is ca. 5.2 m. Due to inflow of big amounts of marine water in the lagoon pool the maximum depth of water volume is estimated to be 5.5 – 5.7 m.

Kaliningrad Canall passes along the northern lagoon coast. On Figure 3.5 its area is clearly marked by monitoring stations 11 ÷21. In the beginning, near Baltiysk, the Canal has a depth about 10-12 m (monitoring points 11, 12), further toward Kaliningrad the depth varies in a range of 8-9 m. The Canal is bounded by artificial dams, which now constitute islands, separated from each other by narrow passes. These islands partly have a very low land with a reed or dry land covered by a forest. At a part of its length the Canal is open (see monitoring point 13). This open part of the Canal together with two dams (the Second dam and the Northern dam) is separating Primorsk Bay from the eastern part of the lagoon.

Figure 3.7 Illustration of a narrow pass in the artificial dam bounding Kaliningrad Navigation Canal. Photo by B.Chubarenko.

Figure 3.8 Illustration of red belt along the navigational Canal Photo by B.Chubarenko.

Figure 3.9 Illustration of forest and stone structure along the Canal Photo by B.Chubarenko.

So, Primorsk Bay contacts with eastern part of the Vistula Lagoon by a pass of 7.6 km width, which is half closed by the dams bounding Kaliningrad Canall. Primorsk Bay area is ca. of 55 km^2 its volume is estimated as 0.1 km^3. The maximum depth is about 4 meters a half of the bay's area has a depth more than 3 m. Primorsk Bay has smooth cap-view bathymetric structure with maximum depths in its southern part. Morphologically Primorsk Bay is a segment of eastern part of the Vistula Lagoon because there is no natural border between Primorsk Bay and adjacent lagoon area.

The small pass between Vostochny peninsula and Northern dam has a width of 57 m and depth of 5-6 meters [OVOS]. This information is doubtful. The passes between dams if they are not artificially fastened usually have local depression of 20-30 percent deeper than adjacent area. It is caused by significant hydrodynamic influence of water exchange fluxes in these passes.

The existing information about water depth in the vicinity of the Ferry Terminal location is not sufficient to make comprehensive estimation of hydrology, hydrodynamics and sediment dynamics. The existed charts are rather rough and supplementary measurements are needed to make bathymetric measurements by modern technique in the pass between Northern dam and Vostochny peninsula, and in adjacent area of Primorsk Bay.

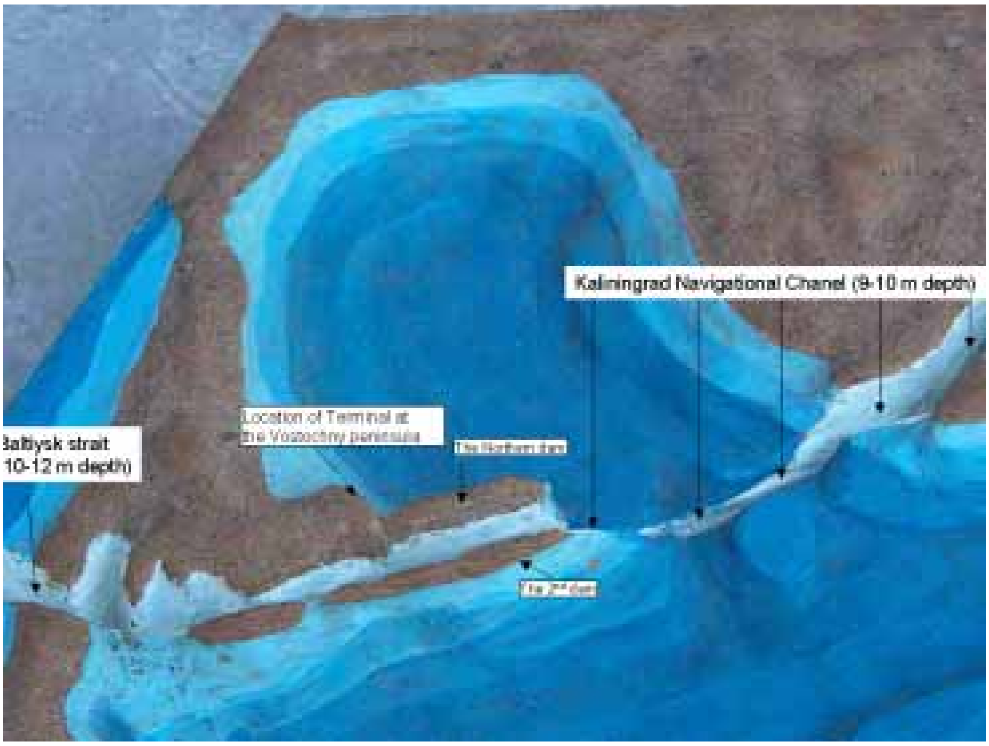


Figure 3.10 Three-dimensional view on the Primorsk Bay. By working materials of ABIORAS.

3.3.5 Water level variations

Water level variations in the Vistula Lagoon are determined by interaction between water level variations at the adjacent Baltic area, river inflow and local wind action. Due to the location of Vostochny port development is very closed to Baltiysk Strait, the water level variations there are mostly guided by the Baltic water level oscillations. Exceptions are the cases of winds of north-eastern direction which establish temporal local level rise at the windward coast of the Primorsk Bay.

According the analysis of data for measurements in Baltiysk during 1948-1975 the maximum level rise in comparison with mean reference level could achieve 100 – 110 cm. In the minimum of water the level may drop down till -115 to -125 cm. Maximal and minimal values of water levels are presented in Table 3.2. Usually the mean range of level variations during a month equals 60 – 80 cm.

Table 3.2 Maximal and minimal values of water level of different recurrence.

	The period of repetition, years				
	50	25	10	5	1
Maximal level, cm	106±5	97±4	85±3	76±2	39±2
Minimal level, cm	-121±4	-114±3	-104±3	-96±2	-65±1

The main factor guiding extreme level variations in the Vistula Lagoon is a wind surge. For example, in Kaliningrad it may produce rise of level up to 140 cm per 8-12 hours. The level starts to increase after 2-4 hours of wind, the main rate of increase is observed after 5-6 hours of permanent wind, the maximum of level rise is realized usually after 6-12 hours. The main wind induced level variations are observed during the winds lengthwise to the lagoon (SW and NE).

If the wind surge is a main forcing factor of level rise or drop at remote corners of the lagoon, the water inflow – outflow from the lagoon entrance is a main driving force for level variations near the Port Vostochny development. The rate of water level increase caused by marine water inflow in the Vistula Lagoon could run up to 40 - 55 cm per day.

There are other factors which permanently influence on water level variations and which ‘finger prints’ could be seen in analysis of medium and long-term level variations. The seasonal variations of water level caused by annual hydrological cycle for rivers drain, its amount is 15 cm in average during a year. Small tides oscillation due to penetration of semi-diurnal tide from Northern Sea to the Baltic may cause the changes in water level of 2-5 cm in the Vistula Lagoon entrance. The influence of seiche oscillation of the Baltic is much high. It leads to 10-20 cm range of level variations in the lagoon entrance. Global water volume variation of the total Baltic equals to 0.8-1.0 mm per year [Lazarenko & Maevski], land drift for South-Eastern Baltic is estimated of sinking rate of 0.1-0.2 mm per year.

3.3.6 Wind statistics

[OVOS, Lazarenko&Maevski, 1971]

The wind regime is determined by cyclonic activity over the Baltic Sea, which intensifies in winter and grows weak in summer. Kaliningrad region is situated on the way of atmospheric cyclones originated over the Atlantic Ocean. The trajectories of cyclones pass as usual north of the Baltic Sea. Because of this, the strong winds of western, south-western and southern directions have high probability during the year. The wind rose considering all wind speed gradation has small skewness, but the prevalence of western directions is obvious for the strong winds. Inter-annual distribution of wind directions are characterized by more high recurrence of southern winds in winter and eastern or north-eastern winds in summer.

Table 3.3 Probability of wind directions in winter and summer, (%)

	N	NE	E	SE	S	SW	W	NW
January	4	7	13	10	22	22	12	10
July	17	8	9	5	8	12	19	22
Year	11	8	12	11	14	!6	14	14

The mean annual wind speed is estimated as 6.1 ms^{-1}. The intensity of wind is high in cold seasons. The strong winds (9-13 ms^{-1}) are observed in 16.5 %, the stormy winds (higher than 14 ms^{-1}) are observed in 6.23 % [OVOS].

Table 3.4 Monthly average wind speed, ms^{-1}

Month	Ja	Fe	Ma	Ap	My	Jn	Jl	Au	Se	Oc	No	De	Year
Wind speed	7.5	6.5	5.9	5.0	4.7	4.9	5.1	5.7	6.2	6.8	6.8	7.6	6.1

Maximum wind speed of 35 ms^{-1} (with gusts over 40 ms^{-1}) was observed for western and south-western winds. The distribution of days with wind higher than 15 ms^{-1} during the year is presented in Table 3.5 [OVOS].

Table 3.5 Number of days with wind speed higher then 15 ms^{-1} during a year

Month	Ja	Fe	Ma	Ap	My	Jn	Jl	Au	Se	Oc	No	De	Ye
Mean	4.9	2.9	2.5	1.1	0.6	0.5	1.6	2.5	3.5	4.2	3.9	4.8	33
Max.	10	11	9	3	2	2	6	8	10	11	10	15	59

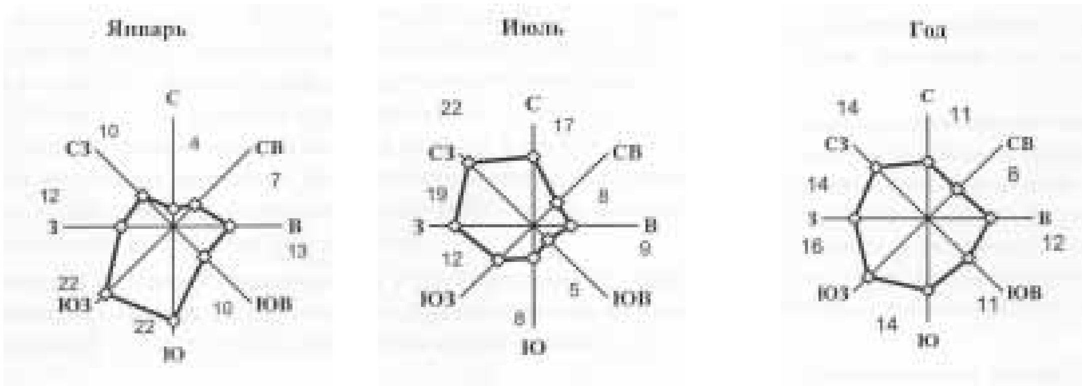


Figure 3.11 Wind averages for typical winter and summer months and for the year in average [OVOS].

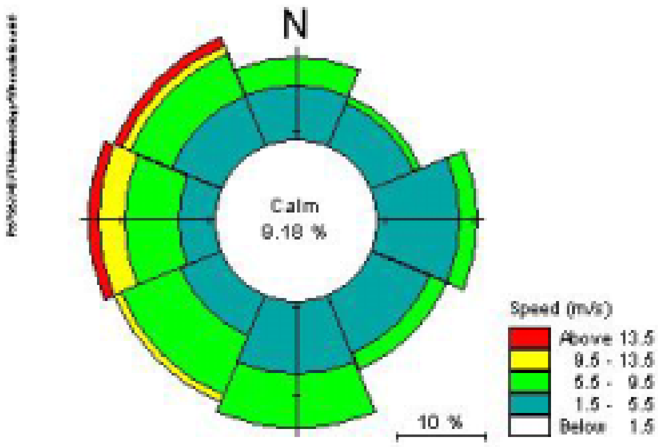


Figure 3.12 Wind rose based on wind observations in Baltiysk between 1949 and 1988.

3.3.7 Ice conditions

There are no exact data for ice coverage for Primorsk Bay due to the absence of observation point.

According to the description performed in [Lazarenko and Maevskiy, 1971] the ice cover in Vistula Lagoon originates every year, but the duration of ice period differs over the years. On average, ice usually comes up in December, and melts in March or April. In warm winters ice appears in the second half of December, and fast ice stays until the beginning of January. The natural melting and break up of ice starts in the very beginning of March, and in the second half of March the Vistula Lagoon is usually free of ice. In moderate winters ice appears in the middle of December, fast ice stays at the end of December, ice break up starts in the beginning of March and ends with the end of March. In cold winters first ice appears in beginning of December, and after 7-10 days the lagoon completely freezes, the steady ice holds until the beginning of April.

The duration of ice period by data of 1985 for warm, moderate, cold and very cold winters are 70-80 days, 100-110 days, 125-135 days, and 135-140 days respectively. Due to general warming of climate the average duration of the ice period for the Vistula Lagoon was estimated in as 67-75 days, maximum as 140 days. The mean thickness of ice is 35 cm, the maximum is 75 cm.

Usually, 15 – 20 days after temperature constantly drops below zero, steady ice covers total lagoon area. Only Kaliningrad Canall and Baltiysk Strait stay free of ice because of ship traffic. Rapid cooling of land hastens the ice formation near the south and eastern coast first. The area of the Vistula Lagoon near its inlet freezes later, because of intensive water dynamics and permanent intrusion of more saline marine water into the lagoon. Even the location of Ferry Terminal is very close to the lagoon inlet. The south-western corner of Primorsk Bay is covered by ice very soon and melts at latest, because of low wind wave activity at this time.

Figure 3.13 *Melted ice in the pass between 1st dam and Vistula barrier spit near the lagoon inlet (upper panel) and in the small harbor basins (lower panel). Photos by B. Chubarenko.*

3.3.8 Flow velocity regime in Canal and Primorsk Bay

[*Chubarenko & Chubarenko, 2002*]

Water velocity in Kaliningrad Canall at the segment from Baltiysk to the open part of Canal (Primorsk Bay) depends mostly on water level variations at the lagoon inlet. The wind driven component is small because a water surface in the Canal is shadowed by bounding dams. The typical currents could be estimated in a range of 4-8 cm s^{-1}.

The currents in Primorsk Bay are characterized by permanent existence of 2-cell circulation structure for different winds. Only the spatial scale of these cells and direction of water flow differ against the wind variations.

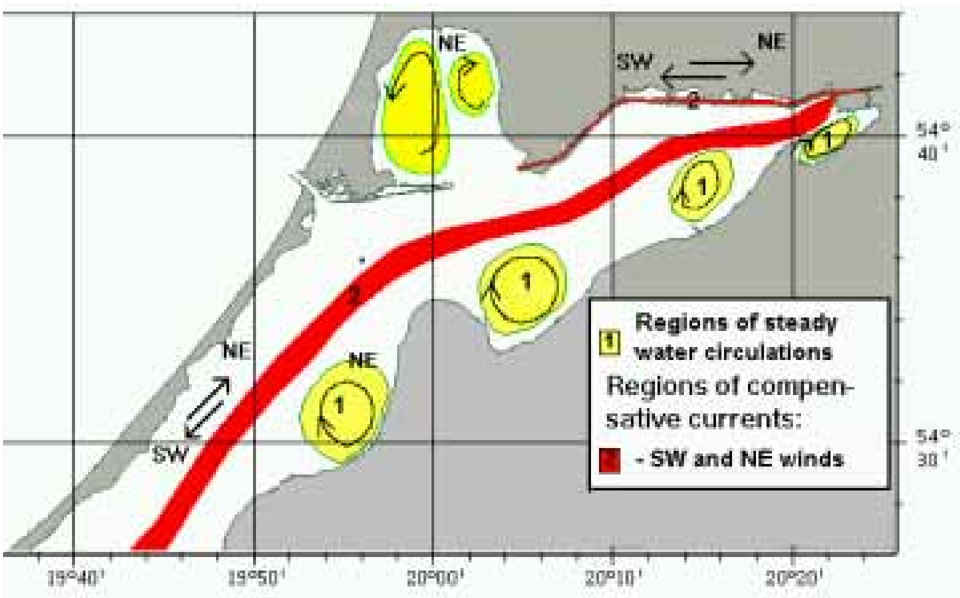


Figure 3.14 Current's structure during winds lengthways of Vistula Lagoon axis. Circulation directions are shown for NE wind. There directions for SW wind are opposite.

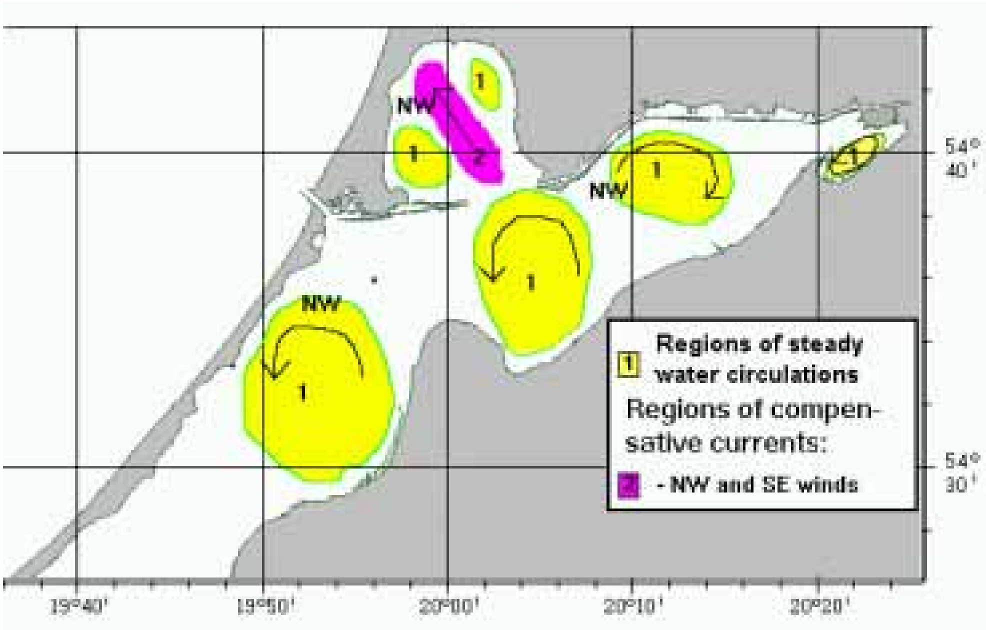


Figure 3.15 Current's structure during winds across the Vistula Lagoon axis. Circulation directions are shown for NW wind. The directions for SE wind are opposite.

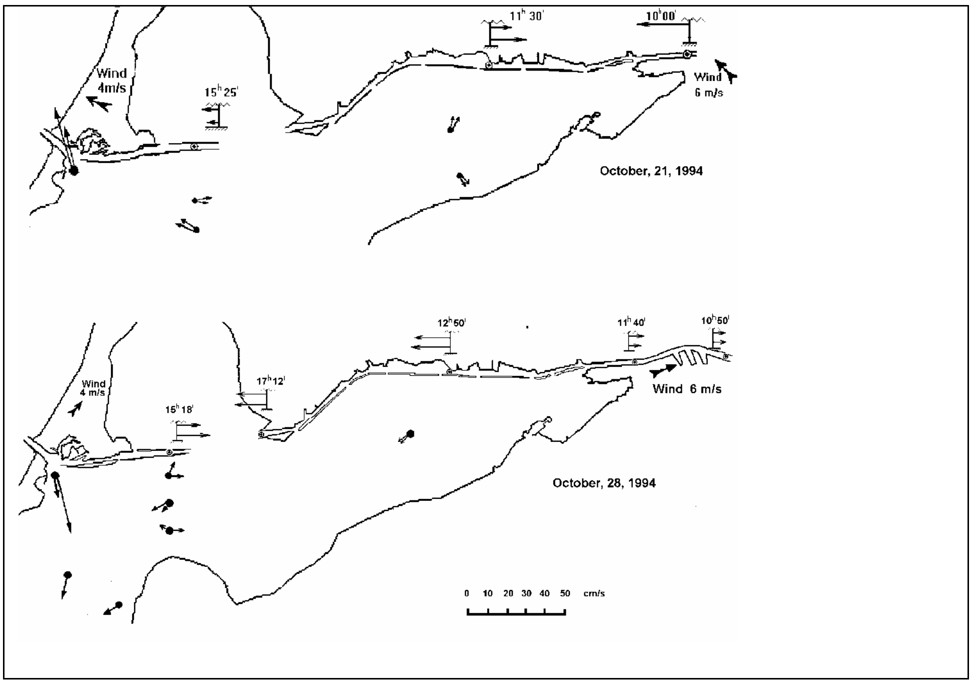


Figure 3.16 Currents in Kaliningrad Marine Canal and Gulf of Kaliningrad during wind of south-east and south-west directions.

3.3.9 Wind wave conditions

Due to the location of the ferry terminal at the south-western shore of Primorsk Bay the winds of north-eastern direction cause a maximum wave high in adjacent area of the bay. Considering the future deepening of the area around the terminal the significant wave height is expected to be 32, 50, 100 and 150 cm for wind speed of 5, 10, 20, 30 cm s^{-1}. The wind waves in the Vistula Lagoon are short, the ratio between wave height and length my achieve 1/7, [Lazarenko and Maevskiy, 1971].

An analysis of average re-suspension conditions in the Vistula Lagoon [Chubarenko et. al., 2002] showed that re-suspension is a frequent phenomenon at the location of the future ferry terminal, especially during wind from the north, north-east and east. The limiting factor for re-suspension at this location is the small water depth that limits the wave height and hence the wave energy that is needed for re-suspension.

3.3.10 Hydrological regime

The hydrological regime of the Primorsk Bay is to a large extent identical with conditions in the Vistula Lagoon, ref chapter 3.3.2.

Water temperature

The seasonal variation is mostly pronounced for temperature (Figure 3.17). The maximum temperature is usually observed at the beginning of August, which is about one week later than the maximum air temperature and about 2 weeks after the maximum solar radiation. The spatial temperature variations in the lagoon area are negligible.

Vertical gradients of temperature are observed only in the spring time during the intensive solar radiation in calm weather. Occasionally, these gradients persist until June (as in 1997). The vertical gradients are periodically observed near the lagoon inlet and in the central part of the lagoon (Stations 6,7,10, see Figure 3.5) as a consequence of dense marine water inflow with a different temperature. Difference of about 1°C are recorded in connection with these dense bottom inflow events. Intensive inflow of the Baltic water reaches usually station 6,7,10, see Figure 3.5. Inflow events occur during the rapid water level increases.

The Vistula Lagoon is practically uniform in thermal structure. The lateral and vertical temperature differences are insignificant in comparison with the temporal variations (daily and seasonal). The seasonal variation of the water temperature (from 0 up to 25 °C) depends on solar heating and atmospheric cooling and is closely correlated with air temperature.

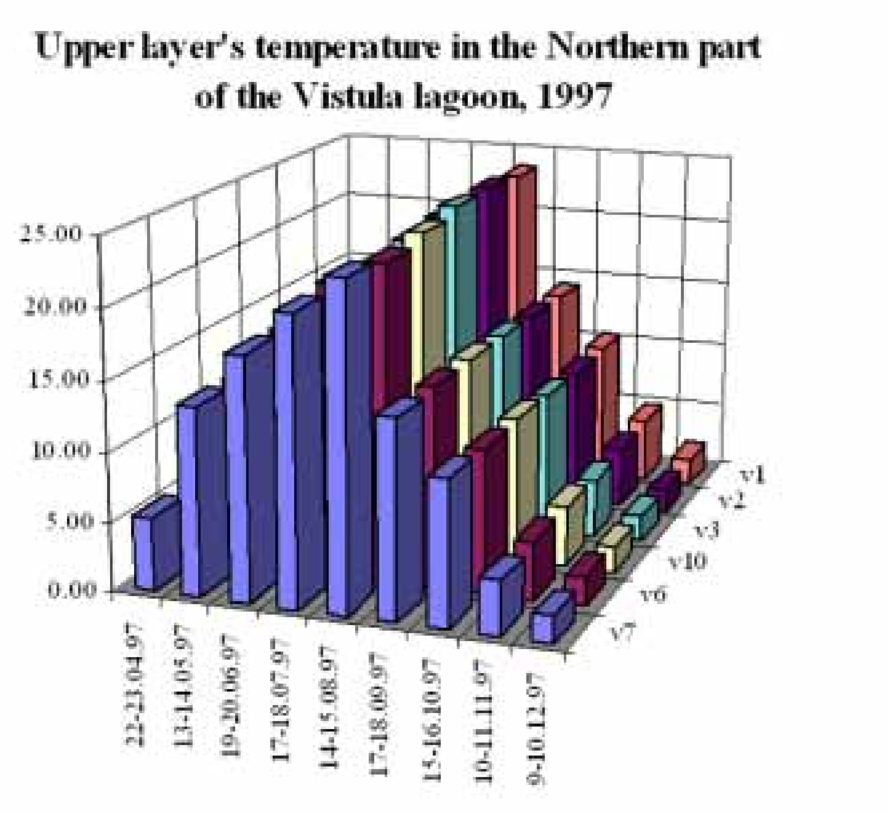


Figure 3.17 The 1997 annual course of water temperature on various stations in the northern part of the Vistula Lagoon.

Salinity

The seasonal variation of salinity in the Vistula Lagoon is illustrated in Figure 3.18. Salinity decreases due to river run-off in spring, March - April. In the spring time the salinity spatial distribution is characterized by decreasing from the central lagoon part eastward (to the river Pregel mouth) and southward (to the Polish part). The maximum in the spatial salinity differences is also observed in the spring.

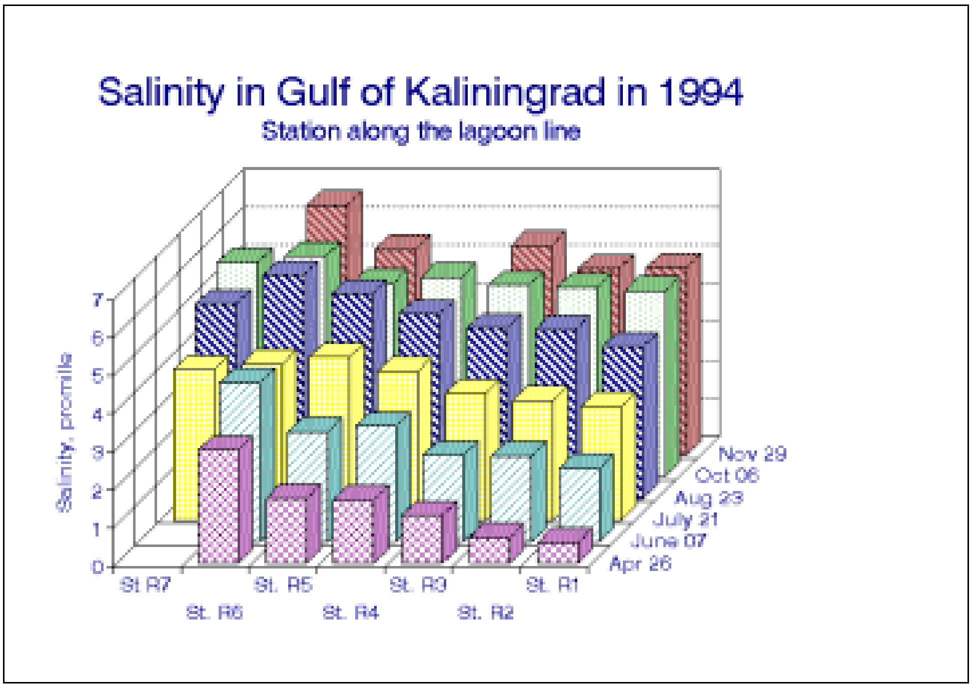


Figure 3.18 Spatial and temporal variability of upper layer salinity in Gulf of Kaliningrad (Russian part of the Vistula Lagoon).

Some differences which are observed year after year in the spring conditions are stipulated by single penetration of salty sea water into the lagoon, which occurs sometimes in the spring and changes the mean hydrological conditions in the lagoon.

The salinity increases during summer and autumn due to reduced fresh water run-off combined with periodic inflows of Baltic Sea waters, which take place during rapid increases of the Baltic Sea level under atmospheric influence.

The salinity field (in the average during year) has a maximum at the lagoon entrance, and minimum values in the eastern part of the lagoon due to the influence of the river Pregel (main source of fresh waters). The maximum amplitude of annual course was found at the Station 1 (0.5-5 PSU), the minimum one was observed at the Station 6 (4-6.5 PSU).

Although the Vistula Lagoon area is well vertically wind mixed, the stratification is observed, and mostly at the spring and late autumn periods. The most frequently stratification is near the lagoon entrance (Station 6) and river Pregel mouth (Station 1), where the intrusions of respectively salt and fresh water occur. At the beginning of winter and during the ice period the lagoon is vertically stratified.

During the other periods, it is possible to consider the water of the lagoon to be uniform in vertical direction, especially from the point of view of ecological monitoring.

Role of the Kaliningrad Canal
The seasonal salinity variation in the canal is illustrated in Figure 3.19. During spring time freshwater from river Pregel presses brackish water toward the lagoon inlet. In June, dense bottom currents develop and during autumn water with Baltic origin is found throughout the deep canal. The seasonal salinity variation near the point of the planned ferry terminal is estimated from Figure 3.19, point 12. It should be mentioned that this segment of the Canal is vertically stratified water during the entire year.

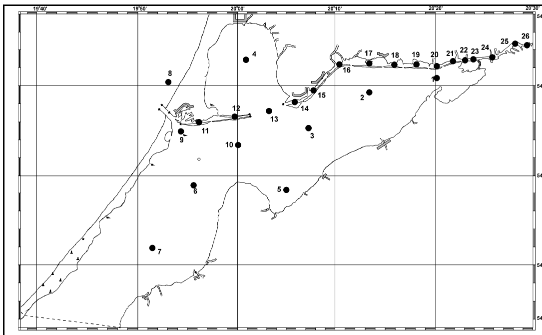
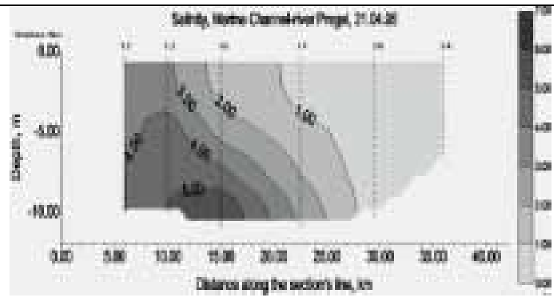
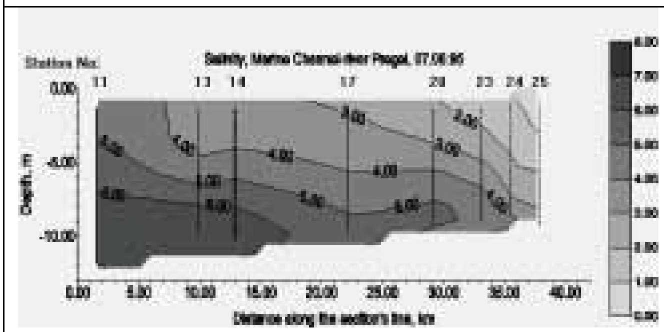
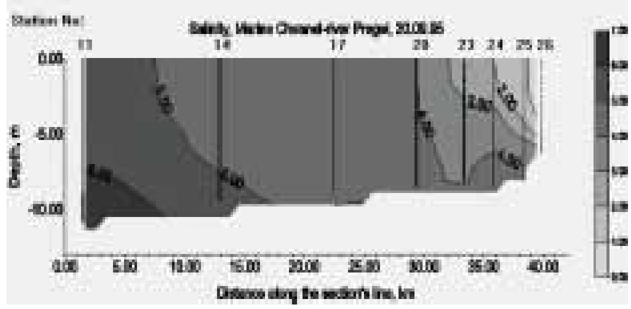
	
(a)	(b)
	
(c)	(d)

Figure 3.19 Salinity distributions along Kaliningrad Marine Canal in spring (b), summer (c) and autumn (d) periods, and basic chart of ABIOARS monitoring stations in Gulf of Kaliningrad and Kaliningrad Marine Canal.

3.3.11 Water chemistry

The Vistula Bay and in general and the Primorsk Bay in particular are recipients for substantial nutrient loads, primarily from domestic waste water. The Primorsk Bay is the recipient of a main sewage canal from the city of Kaliningrad, which is illustrated on Figure 3.20.

Figure 3.20 Arial picture of the waste water plume in Primorsk Bay at Svetly, looking north.

It is shown that the Primorsk Bay is visually affected by the discharge of sewage, which also is reflected in the eutrophic state of the Bay and the lagoon.

The sewage discharge from the city of Baltiysk is illustrated in Figure 3.21.

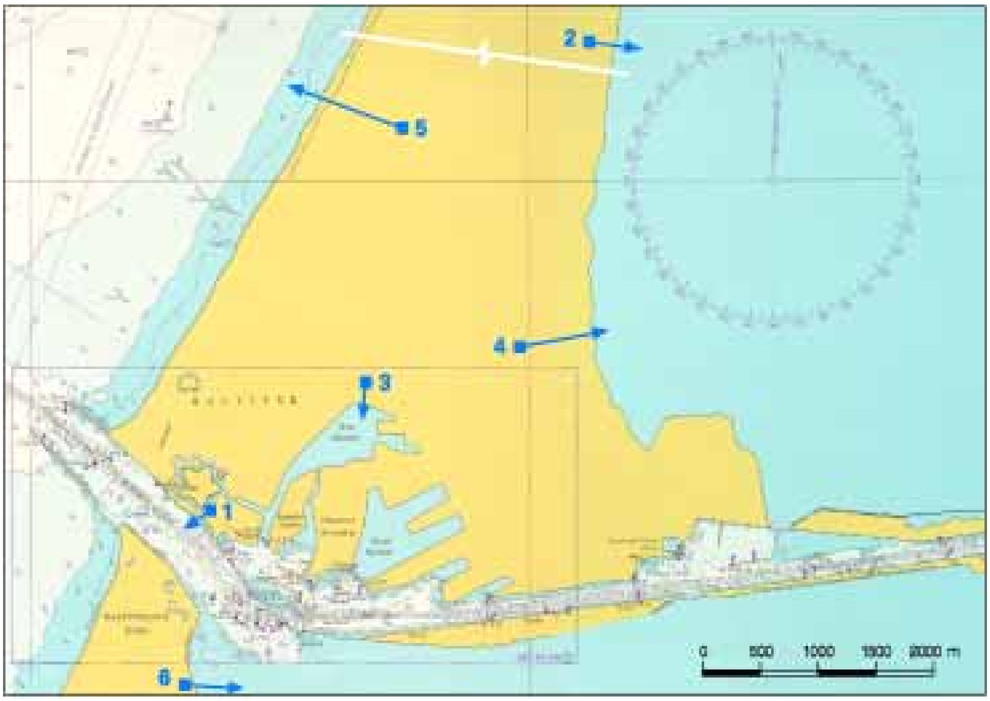


Figure 3.21 Illustration of the sewage discharges from Baltiysk to the marine environment. Discharge no.5 accounts for approximately half of the total discharge and the only discharge of treated sewage.

The discharges of waste water from the different outlets are given below (Maritime Inspectorate, pers. com.):

1 $1000 \cdot 10^3$ m^3/year

2 $120 \cdot 10^3$ m^3/year

3 $130 \cdot 10^3$ m^3/year

4 $220 \cdot 10^3$ m^3/year

5 $1500 \cdot 10^3$ m^3/year (treated)

6 $60 \cdot 10^3$ m^3/year

It is seen that about $340 \cdot 10^3$ m^3/year (2 and 4) are discharged untreated into the shallow Primorsk Bay in the near zone of the terminal. This corresponds to about $5 \cdot 10^3$ person equivalents of untreated sewage.

Suspended matter
According the study of 1994 [Chubarenko,B.V., Kuleshov,A.F., Chechko,V.A. 1998] the total suspended matter concentration changed within the limits of 15-183 mg/l and were characterised by large spatial and temporary variability. Av-

erage total value for Russian part of the lagoon was about 36 mg/l (Figure 3.22).

The suspended matter (SM) content in the southern part of the lagoon was in 1.8 times larger than in its eastern part (in average during the year). The minimum values of suspended substances were found in a central part of the lagoon (points 6 and 7, Figure 3.19a), near the lagoon inlet. This area is under permanent influence of the Baltic waters, which had concentration of suspended substances in the range of 1-5 mg/l.

The suspended matter in the lagoon contains organic and inorganic components. The average concentration (minimum and maximum) for organic component was about 18 mg/l (7-35 mg/l) and for inorganic component it was about 19 mg/l (5-30 mg/l). On average during the year, the organic and inorganic components gave equal contribution to total content of suspended substances, but only one of them dominated in a particular season (Figure 3.23).

Organic components are found in the form of phytoplankton or re-suspended organic matter. Due to the spring bloom of phytoplankton this component shows a pronounced spring peak.

Inorganic components are found in the form of clay, silt or sand. The concentrations are basically determined by wind and wave action resulting in re suspension. This process shows a minimum in the spring due to ice cover. It increased up to the beginning of autumn.

The resulting annual variation of the lagoon averaged concentrations of total suspended matter is characterised by a peak of 49 mg/l in the middle of summer and an autumn peak in mid November of about 41 mg/l. The spatial variations of SM concentration are comparable with their temporary variations in spring-summer period.

Specifically for the Primorsk Bay, the annual average concentration of organic suspended material is about 19 mg/l, the concentration for inorganic component is of 17 mg/l.

Figure 3.22 Spatial distribution of total value (fixed and volatile) of suspended matter concentration along central line of the Vistula Lagoon in 1994 (R1-R7 – are station in the Russian part of the lagoon, increasing towards south west)

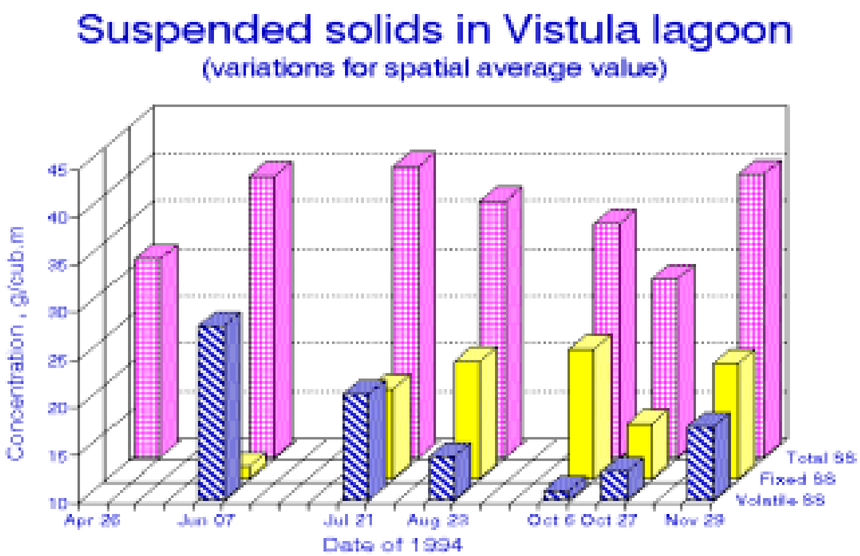


Figure 3.23 Measurements of volatile (organic), fixed (inorganic) and total suspended matter concentration spatially averaged for Russian part of the Vistula Lagoon.

3.3.12 Water transparency

The transparency of the Vistula Lagoon water in terms of Secchi depth varies between 0.3 and 0.8 m with the average value is about 0.55-0.60 m (Chubarenko et al., 1999). The annual average light attenuation coefficient, which limits the photosynthetic activity in the lagoon, varies from 1.7±1.2 m^{-1} at the lagoon inlet to 2.9 ± 1.2 m^{-1} at the eastern corner of the lagoon with an average value of 2.4 ±1.0 m^{-1}. Specifically for the Primorsk Bay the attenuation coefficient is similar and characterized by the value of 2.6 ± 1.0 m^{-1}.

The studies of 1994 and 1995 (Figure 3.24) showed that the summer peak of light attenuation in the entire lagoon is well correlated with total suspended matter concentration. An increase of this coefficient in the late autumn is caused by excess of inorganic component of suspended matter due to wind induced re-suspension.

The transparency in the Primorsk Gulf is slightly higher then in the adjacent lagoon area. It is expressed by the minimum in values of light attenuation coefficient for the Primorsk Bay (point 4 or R4) in comparison with points R3 and R5 (Figure 3.25). The reason is the limited wind fetch resulting in reduced wave action in the Primorsk Bay. Therefore, re-suspension is lower than in other areas of the lagoon. Together with the considerable load of organic matter from sewage into Primorsk Bay the reduced re-suspension is a reason for that the inorganic matter levels in the Primorsk Bay are lower then organic matter levels.

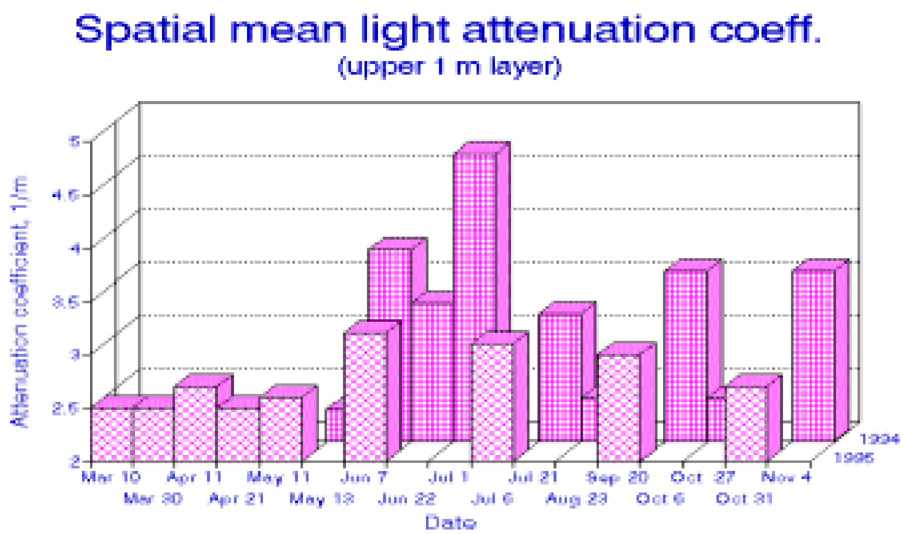


Figure 3.24 Seasonal variations of spatial mean value of the light attenuation coefficient for the Russian part of the Vistula Lagoon.

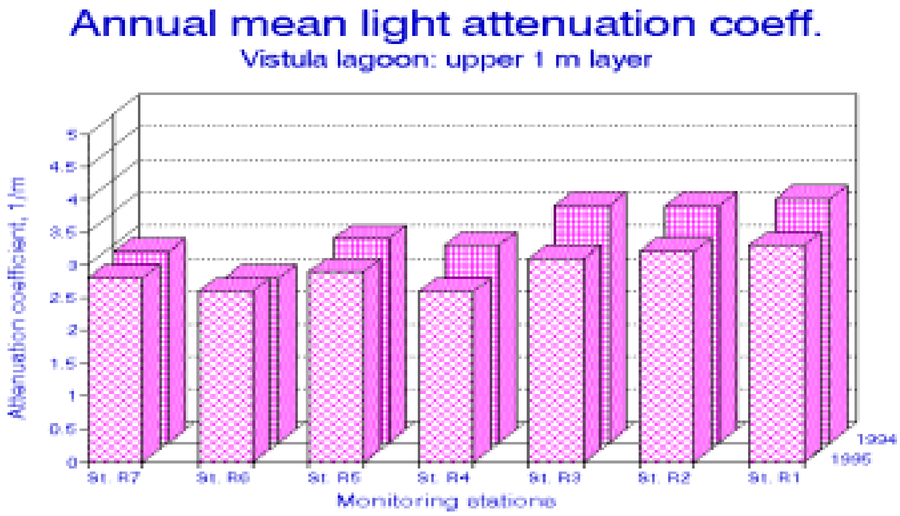


Figure 3.25 Spatial distribution of annual mean values of light attenuation coefficient along the main lengthwise axis of the Vistula Lagoon.

3.3.13 Oxygen

Oxygen concentrations in the Vistula Lagoon usually are high and varies in the range of 6 ÷ 16 mgl^{-1}. A main cause for oxygen consumption is discharge from the Kaliningrad sewage collector into the Primorsk Bay. Main reason for oxygen supply is ventilation of the Primorsk Bay by intensive wind and wave mixing, which provides intensive exchange with the atmosphere. Therefore, the saturation of water masses is always close to 100%.

The seasonal oxygen variations are characterised by a maximum observed during spring bloom [Kaliningrad oblast water bodies, 2002]. Saturation is higher during windy weather due to wind wave mixing. Daily variations in oxygen content are caused by the daily cycle where photosynthesis is dominant during day time and respiration during night time. The average values of absolute oxygen content in the Primorsk Bay are represented at the Figure 3.26, where results from different sources are compiled.

All minimum values are higher than 4 mgO_2/l, when fish show avoidance behaviour. Oxygen conditions are hence not considered as critical for the ecosystem.

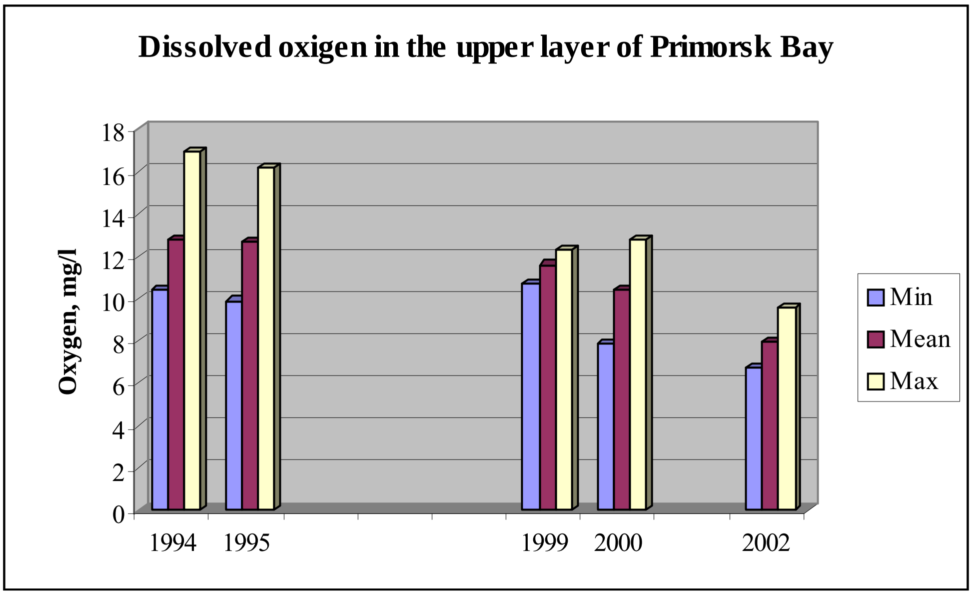


Figure 3.26 Average concentrations of dissolved oxygen in the upper layer of Primorsk Bay (monitoring point at the centre of the Bay). Data for 1994-1995 and for 1999, 2000, 2002 are from [Rasmussen, 1997] and working materials of ABIORAS.

3.3.14 Alkalinity

The alkalinity level varies within a fairly wide range from 6.4 to 9.2 [Kaliningrad oblast water bodies, 2002]. The values below 7.3 are typical for under-ice water in winter. The lowest values were observed during winter where photosynthesis is absent. During spring bloom, the maximum values occur. Alkalinity is not considered a environmental parameter that is critical with regards to the port development.

3.3.15 Inorganic nitrogen

It is known that the content of nitrites (NO_2) is usually lesser than 20-30 mcg/l. The recent results [Kaliningrad oblast water bodies, 2002] even tell about lower values namely 15 mcg/l. This has to be taken in account in the description of the sum of nitrogen compounds below. Here, the sum of nitrate (NO_3) and nitrite (NO_2) is studied in 1994 – 1995 [Rasmussen, 1997].

Nitrate concentrations in the Vistula Lagoon waters range between 0 to 1940 µg/l. The seasonal variation of N-NO_3 (nitrate-nitrogen) is characterised by a maximum (about 1900 µg/l) in late February – beginning of March. High consumption of nitrogen by phytoplankton during the spring bloom (March - April) rapidly leads to low nitrate and nitrites concentrations (10-20 µg/l). During the summer, autumn and until November the nitrate and nitrite concentrations are low, at the detection limit, not exceeding the level of 20 µg/l. During December the concentrations increases because of the reduced primary the concentrations increases because of the reduced primary production due to light limitation. The seasonal variation is illustrated in Figure 3.27

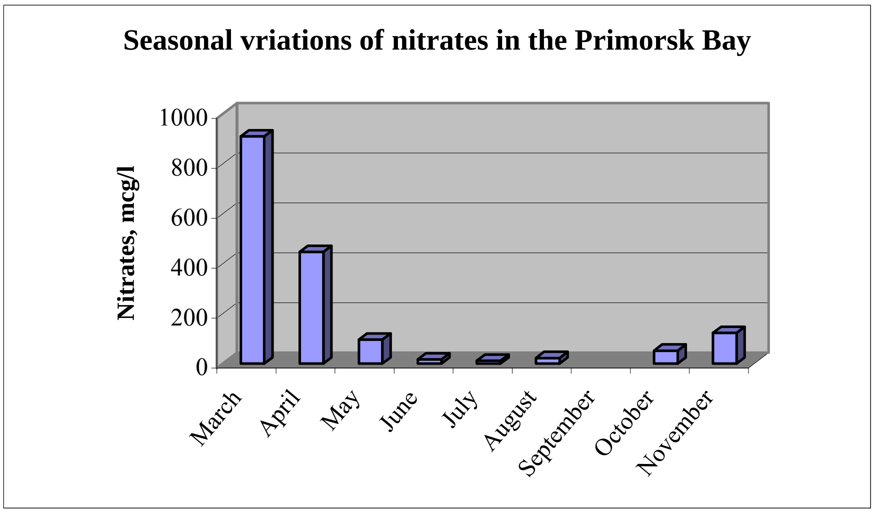


Figure 3.27 Variations of the nitrates concentration during a year by example of 1994-1995 measurements in the point 4 (see Figure 3.19).

3.3.16 Total nitrogen

Total nitrogen (TotN) includes all forms of nitrogen present in water, both inorganic and organic. The contents of total nitrogen characterises complete nitrogen stock in the water column. During photosynthetic process and other biochemical processes transform nitrogen between in inorganic and organic states, expressing a dynamic balance between the different processes involved and providing a circulation of nitrogen with the different states or compartments of the ecosystem.

By the data obtained in [Rasmussen, 1997] the total nitrogen in the Vistula Lagoon varies in a range of 350 - 3263 µg/l, and particularly for Primorsk Bay it was 90 – 1280 µg/l. The seasonal variability is presented in Figure 3.28. Interannual variation of maximum values of total nitrogen concentration could exceed 50%.

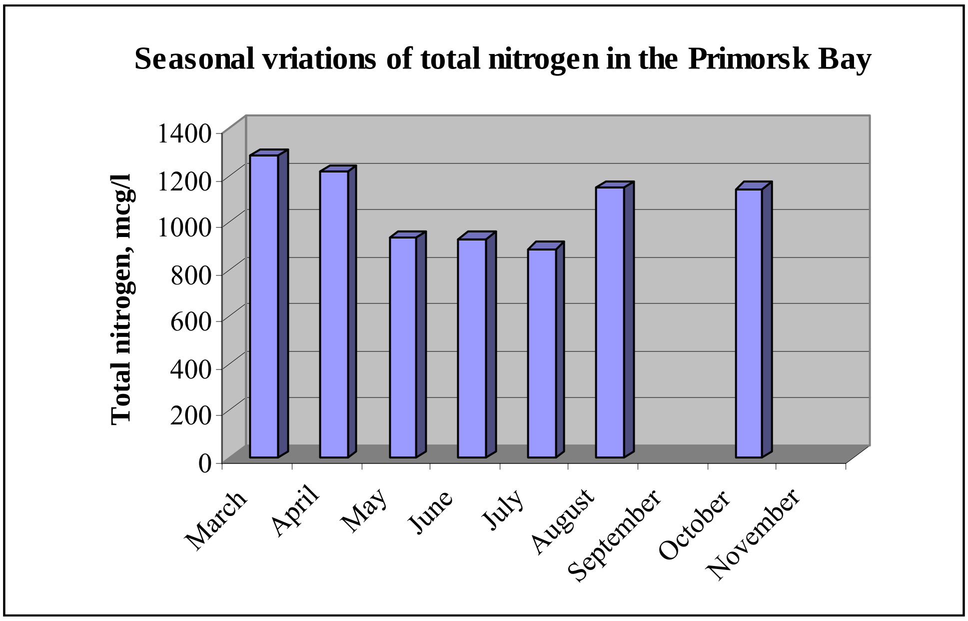


Figure 3.28 Variations of the total nitrogen concentration during a year by example of 1994-1995 measurements in the point 4 (see its position in Figure 3.19a)

3.3.17 Ammonium

The ammoniac nitrogen (N-NO_4) represents an intermediate compound of nitrogen, which is forming during the nitrification of organic substances. It undergoes further oxidisation to NO_2 and NO_3 in oxygenated waters, so it therefore only is found in insignificant concentrations. This nitrogen compound is rapidly consumed by phytoplankton.

In annual cycle of N-NO_4 shows minor seasonal variability. The minimum values are observed during spring phytoplankton bloom, a small increase of the average level is found during summer and autumn. According to [Rasmussen, 1997] the concentration of the ammonium nitrogen in oxygen-saturated waters of the Vistula Lagoon is low and seldom exceeded 15-20 µg/l. The maximum N-NO_4 concentration is observed in the beginning of June near the Pregel river mouth.

3.3.18 Phosphate

The concentration of phosphate (P-PO4) in the Vistula Lagoon varies in the range of 10 - 225 µg/l [Rasmussen, 1997]. Temporal variations are more pronounced than the spatial variations, which is characterized by a permanent minimum of phosphate near the lagoon inlet. The seasonal variations are illustrated in Figure 3.29 and controlled by phytoplankton. The variations between years in summer peak may achieve 2-3 times.

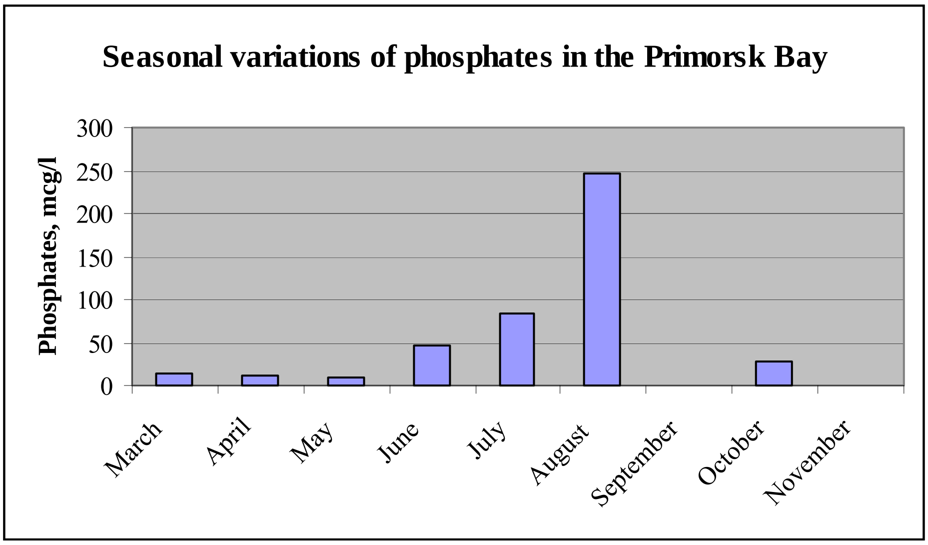


Figure 3.29 *Variations of the phosphates concentration during a year by example of 1994-1995 measurements in the point 4 (see its position in Figure 3.19a)*

3.3.19 Total phosphorus

The total phosphorus (TotP) includes the net content of mineral and organic phosphorus forms in the water. Therefore, this concentration is higher then phosphate concentration and independent from bio-production cycle e.g. of phytoplankton. High concentrations of phosphates in the summer months coincide with high concentration of total phosphorus (300-350 µg/l), but during the rest of the year total concentration of phosphorus in the Vistula Lagoon is 90 - 100 µg/l [Rasmussen, 1997]. The seasonal variations of the phosphorus concentrations are presented in Figure 3.30.

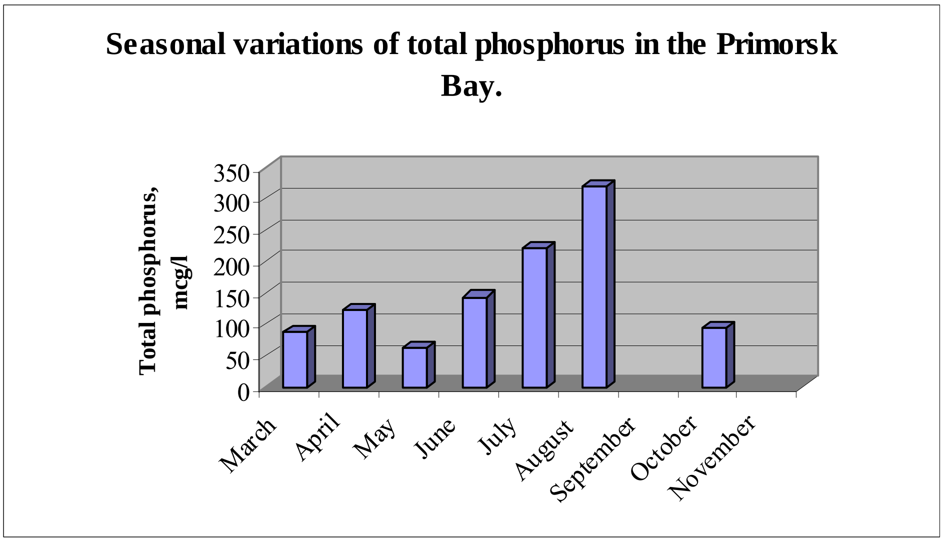


Figure 3.30 Variations of the total phosphorus concentration during a year by example of 1994-1995 measurements in the point 4 (see its position in Figure 3.19a)

3.3.20 Aquatic flora and fauna

The Vistula Lagoon is a highly productive fishery lagoon-type reservoir with changeable salinity of 0-8.6 ‰. It determines formation of transient biocenoses including freshwater, brackish-water and marine organisms in the reservoir.

Phytoplankton

The phytoplankton of Vistula Lagoon is characterised by a large variety of species. As of 1995 in the lagoon 382 kinds, types and forms related to 7 divisions and a combined group of dinoflagellates were found. The majority is represented by 134 green algae (mainly *Protococcophyceae*), then 103 diatoms (*dyatomea*) and 76 blue-green algae. Phytoplankton is mainly represented by brackish water species.

Within recent decades the lagoon's taxonomic structure of phytoplankton has changed significantly: The diversity of almost all the systematic groups of algae and especially green algae grew significantly. This indicates increased eutrophication due to anthropogenic pollution of waters by nutrients. Thus within recent years 29 of previously unregistered species have been observed, two of them are toxic.

A structure of phytoplankton communities at the Vistula Lagoon, seasonal successions of its species composition, main phytoplankton groups, number and biomass makes lagoon a hyper-eutrophic reservoir.

In the summer the blue-green algae (class cyanophyceae) are highly developed, salinity of about 3 ‰ and temperature of water of 15-16ºC create optimum conditions for their growth. The seasonal development of blue-green algae peaks in July - August. The blue-green algae belong to nitrogen-fixing bacteria, in order to grow they also need phosphorus. These algae use dissolved molecular nitrogen and also extra sources of nitrates, which results in summer blooming when the growth of a phytoplankton is usually limited by nitrogen. Included into a blue-green algae group the hepatotoxic algae - *Nodularia spumigena* is of special concern by ecologists. It is one of more than 20 kinds of toxic algae existing in Baltic.

Within recent years the structure of dominant complex of species defining a total number and biomass of phytoplankton has changed. Recently observed restructuring of phytoplankton structure in the Canal, i.e. a decrease of green algae (class Protococcophyceae) significance and essential increase of blue-green algae significance, which annually results in blooming, confirm a considerable anthropogenic eutrophication and high trophic status of the lagoon.

Zooplankton
Zooplankton in the Canal, as well as in the lagoon, is composed of three main groups: rotifers, cladocerans and copepods. In terms of species composition zooplankton of the Canal is represented by euryhaline species and corresponds to that of the Vistula Lagoon. The smaller number of species found in a Canal can be explained by absence of regular hydro biological survey in this area.

Peaks of quantity and biomass are not timely synchronised in terms of seasonal dynamics of zooplankton. The quantity peaks in summer, the biomass peaks in spring.

Zoobenthos
The distribution of bottom fauna in the area is determined both by substrate character and salinity. Chironomids and oligochaetes are mainly seen in mild muddy sediments rich in organic matters. These groups prefer less saline water their biomass decreases towards the strait. Bivalves (*Macoma baltica, Mya arenaria*) prefer more saline water and occupy the sand-muddy sediments in the area next to the strait. Specimen of polychaeta species - *Nereis diversicolor* are also seen here.

Since 1996 the zoobenthos' structure returned to "initial" quasi-stable condition. Biomass of brackish-water groups (polichaetes and bivalve molluscs) decreased and biomass of freshwater organisms (chironomids) consequently grew. *Chironomus f.l. semireductus Lenz* became dominant again. Ratio of groups in biomass is as follows: 58 % chironomids, 26 % polichaetes (including 25 % *Marenzeleria viridis*), 13% molluscs, 4 % oligochaetes.

Zoo benthos is represented by the same systematic groups in the lagoon and the canal, except for molluscs not found in the canal. The species composition of dominant groups of zoo benthos in the Canal is similar to that in the lagoon, but the total species diversity is lower. It may be explained through a smaller diversity of biotopes and irregular hydro biological research in the Canal as compared with the lagoon.

The restructuring of bottom biocenosis is observed in the canal as well as in lagoon due to change of salinity as it was in the Vistula Lagoon.

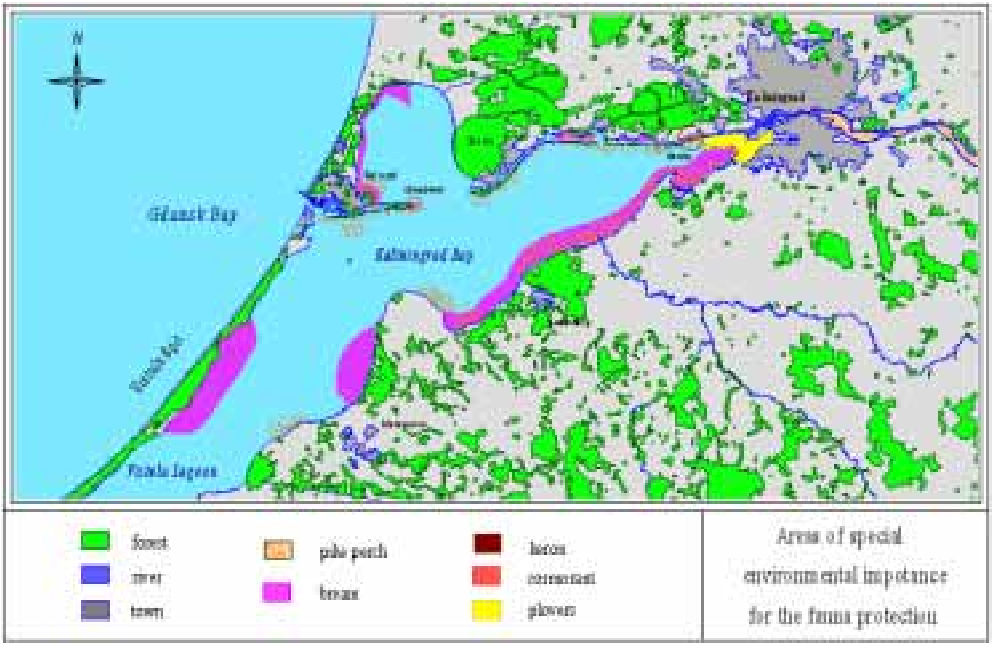


Figure 3.31 Map of areas with environmental importance for fish and birds (TACIS, 1999)

Fish

The Vistula Lagoon is a highly productive fish reservoir with regulated fishery, i.e. fishing business complies with the fishery regulations of two states: Russia and Poland.

Currently 44 species of fish including 1 species of Cyclostomata (fluvial lamprey) have been observed in the Russian part of the Vistula Lagoon. They can be divided into several ecological groups.

Sea fishes: the Baltic sprat, the Baltic cod, long snout sea-needle (pipefish), the Baltic chickweed (sand-eel), river-flatfish, turbot etc.

Freshwater fish: smelt, pike, roach, asp, bream, silver (white) bream, ablet, sabrefish, crucian carp, tench, pike-perch, perch, ruff (pope) etc. These species inhabit the lagoon, but they regularly pasture in inshore sea.

Migratory and semi-migratory fish: the Baltic herring, the European eel, the European smelt, Atlantic salmon, bull-trout, twaite shad, etc. The Baltic herring, the European smelt, the Atlantic salmon, bull-trout, twaite shad mature in the Baltic Sea and spawn in the lagoon or rivers of its basin. The European eel is a catadromous migrant. It grows up in the lagoon and spawns in the Sargasso Sea.

The most mass trade species of the Vistula Lagoon is the Baltic hearings. As noted before, it is a semi-migratory species and spends the majority of its life in the Baltic Sea. It spawns in the Vistula Lagoon. The lagoon is one of the largest spawning grounds of a coastal spring spawning herring of the south-east Baltic Sea. Spawning migration into the lagoon starts as soon as ice is melts and breaks up in February - March. The main spawning grounds in the lagoon are located near the Severniy cape, the Baltiyskaia spit and the Russian-Polish border. The main spawning peaks in the beginning of April and it continues until mid May - beginning of June. After the spawning the milters (sires) move to the sea. The roe is developed up to the end of April until fries hatch from the eggs. Fries migrate to the sea from June until August.

Bream and pike-perch are second and third in terms of catch volume. These species spend the most part of life cycle in the lagoon. Spawning grounds of these species are the shallow areas of the lagoon. Besides that, pike-perch spawns in the Kaliningrad Canal.

Eel is the 4th in term of fish catch in the Russian part of the lagoon. It is a migratory species. The eel reserve in the Vistula Lagoon is artificially enriched by whitebait.

The following ordinary fish are also caught in the lagoon: sabrefish, roach, perch. Roach and perch spawning grounds are located almost at inshore lagoon. Sabrefish spawns in the free water and in the entire lagoon.

The Kaliningrad Canal hosts a number of fish that are typical for lagoon. Species that prefer saline water are observed in smaller quantities. Different species of fish especially pike-perch spawn in the Canal. Whitebait of species similar to those in the lagoon mainly concentrates here.

3.3.21 Ground water conditions

Kaliningrad oblast is located within Pribaltyskiy artesian basin. There are up to 30 horizons of ground waters. The ground waters of the area in question are located in prequaternary and quarternary rocks.

Unconfined ground waters (closest to surface a gravity water aquifer and temporary perched ground water) are contained in delta, alluvial and marine sands, fluvioglacial sandy-gravel-pebble deposits and bog peat. Waters are carbonate-calcium, fresh, mineralised at 0,2-0,3 g/l. The aquifer is fed through filtrating of precipitation. Consequently unconfined ground waters next to the inhabited settlements are considerably contaminated. Dumps, untreated wastewater of industries and agriculture are the potential sources of unconfined ground water contamination. The unconfined ground water level in the Vostochny port area is 1.3-2.0 m deep.

The area in question is situated next to the Baltic coast. Physical-geographic conditions differ from the remaining more continental area of Kaliningrad oblast. Roughly 30% of total precipitation volume provides ground water.

Quarternary above-moraine aquifer complex comprises a transit layer, which feeds water into the confined quarternary and prequarternary aquifers. The climate defines duration of feeding of confined ground water. In a coastal area there is a narrow zone of a year-round alimentation. The rest part of a land is the zone of seasonal alimentation. The intensity of feeding through infiltration depends on lithologic structure and thickness of aeration zone. The amplitude of fluctuation of confined ground water level also depends on thickness of aeration zone. The amplitude in sandy deposits is 1.5-1.7 m, in loam and clay loamy-sand deposits is 1 m.

Standard feeding rates of confined waters are much less than those of unconfined ground waters and do usually not exceed 1 l/s per sq. km. Feeding intensity is reduced for increased depth.

Alimentation area of quarternary above-moraine aquifer complex coincides with its location area. Confined ground waters of this complex are partly alimented through vertical water exchange from underlying confined aquifers. During floods the surface water also aliment water complex. Water complex is discharged into local hydrological network, the Vistula Lagoon and the Baltic sea.

Alimentation of underlying confined aquifers of quarternary and prequarternary rocks is more complicated. Alimentation areas partly coincide with location areas, but they are mainly located to the eastern from the area in question.

Due to “patch” (intermittent) aquicludes and lithologic features, entire layer of the Meso-Cenozoic aquifer encompass an integral hydraulic network providing an intensive water exchange. Ground waters generally move towards the Baltic sea. Mainly gravity (unconfined) and partly confined aquifers from the top of quarternary intermorenic complex are discharged into local hydrological network. This happens due to the fact, that river valleys in the area in question have shallow incisions up to 4m deep.

The greatest depth of the Vistula Lagoon is about 5 m. Its coast encompasses an area of discharge through hydraulic "windows" for the upper confined aquifers including the Upper-Cretaceous.

Water level regime of upper aquifers is closely dependent on hydro-meteorological factors. Hydro-chemical zonality of ground waters within the area in question shows 2 general regional trends: the deeper and\or the more south west ground waters are located the more mineralised they are.

A zone of active water exchange corresponds to the Meso-Cenozoic aquifer, which is about 900-1100 m thick, including thickness of an underlying regional aquiclude. The continuity of aquifers, both quarternary and prequarternary, is disturbed by buried valleys in the upper part of this zone. The valleys are composed of glacial and fluvioglacial mainly well permeable deposits. It creates favourable conditions for vertical water exchange. The entire investigated area is a solid system of double-sided vertical water exchange, providing both alimentation and discharge of ground waters within a small area. The lower part of active water exchange zone is separated from buried valleys by badly-permeable aquicludes. Hence rate of vertical water exchange more than 150m deep is considerably decreased.

Fresh waters are conventionally bordered along a base of the Upper Cretaceous 100-120m deep in average. Fresh waters are hydro carbonaceous and mineralised up to 1 g/l. Waters contain chloride sodium and are mineralised up to 15-20 g/l in the lower part of the above the Meso-Cenozoic aquifer. Chemical contents of fresh waters are composed under excessive moisturising of deposits, which do not usually contain easily soluble salts. Leaching occurs of calcium carbonate form hydro carbonaceous calcium waters. The content of chlorides, nitrates, sulphates in ground waters may increase up to 2 g/l as a rule due to anthropogenic load. The near shore belt is influenced by the sea and Kaliningrad lagoon, which results in penetration of seawaters into aquifers.

The area in question is the minor part of Kaliningrad oblast, where the practical value for water facilities has paleogene-neogenic water-bearing complex. In order to supply water that is suitable for drinking water and that is economical feasible, the Oligocene-Pliocene and Pliocene-middle Eocene aquifers are explored.

The territory of the Baltic spit is characterised by poor water quality. The water-supply of this area is based on exploitation of underground waters of modern marine deposits. Because of closeness of the Baltic Sea and Kaliningrad lagoon to their salty waters, a danger of salt water intrusion is apparent. As a result of sea influencing the salinity is rises up to 0,8-1,7 g / dm3, and simultaneously the content of chlorine-ion in a water increases. Now the water-supply of the area is modernised.

The water-supply of Baltiysk is based on exploitation of Pliocene-middle Eocene the aquifer. Because of the relatively high water abundance this horizon is considered the main sources of centralized water-supply. On qualitative parameters the water of Pliocene-middle Eocene horizon completely corresponds to the existing requirements. The salinity changes within the limits of 0.2-0.7 g /dm^3. On value of hardness waters are mild, moderately hard and hard.

This aquifer has a great importance for water-supply of the area, because it is characterized by relatively small depth and high water abundance. The remaining underground waters can only serve as the source of local and agricultural water-supply.

3.4 Landscape

Contemporary relief of seabed and land is inherited, and in many respects is predetermined by relief of pre-quaternary rocks roof. Pre-quaternary surface fully buried under deposits of Pleistocene and Holocene constitutes a flat-waves plain.

Aeolian hilly - ridge plains dominate on the Vistula spit. Widely spread dunes may be 25-30 m high. The majority of them are fixed by pine plantations. Further natural intensive foresting is noted.

Lagoon plain totally occupies the Vistula Lagoon bottom bed and is nearly flat and sub-horizontal and is formed by intensive accumulation of fine terrestrial material the shallow basin.

Phytogenous plains occupy minor area of the territory in question. They are located on absolute height of about +10 m. Often they can be observed between hills and in valley-like lowland. The phytogenous plains are characterised by hummock or ridge-pool micro-relief.

Technogenic relief is represented by accumulative and denudation relief types. Denudation relief type includes quarries, Canals, ditches, hollows and the Canal. Accumulative type of technogenic relief is mainly appropriate to industrial and habitation zones, harbour facilities. This type includes various constructions, such as damps of household and industrial waste: embankment for harbour facilities mainly near Baltiysk and the Canal dam.

Terrestrial landscapes of western and northern coast of the Primorskaia Bay comprise periglacial-lake flat and gently-rolling plains badly drained, composed of non-boulder pelitic clays and peat. Soils are sod-podsolic with gleyic upper horizon, sod-gley and bog. Meadows (hayfield, pastures, plough-lands), spruce-broad-leaved, spruce, ash, birch forests and high moor are developed here.

Eastern coast of the Primorskaia bay is landscaped as ancient-alluvial rolling-hilly plain, variously drained composed of sand (sometimes pebble and gravel), peat, with low-podsolic, sod-podsolic and bog soils. Pine, birch and bogged spruce -pine forests vegetate here. There are also high moors.

The Vistula spit is landscaped as coastal-marine rolling-hill plain with dunes composed of aeolian sands, some peat, a thin layer of low podsol, sod-podsol and bog soils. Pine, birch and alder forests are planted.

3 types of lagoon facies (sub-landscape) in underwater landscapes of the Vistula Lagoon are set out below:

a) Accumulative – situated at mouths of small rivers and the Baltiysk Strait, which supplies sedimentary matter from the open sea. Process of underwater vegetation (approximately up to 1m depth) facilitates accumulating bottom deposits

b) Transit (variable sediment accumulation) – dependant on storm impact on easily eroded dune coast and inshore bottom. It is composed of mobile sandy load

c) Erosive – related to re-suspension of lagoon's mud and causing a wash up and outwash of clayed material out of sandy-silt sediments to the sea. High layer of sediments (10 cm) is always consequently coarser than the lower one.

The coastline types in the Vistula Lagoon are illustrated on Figure 3.32 below.

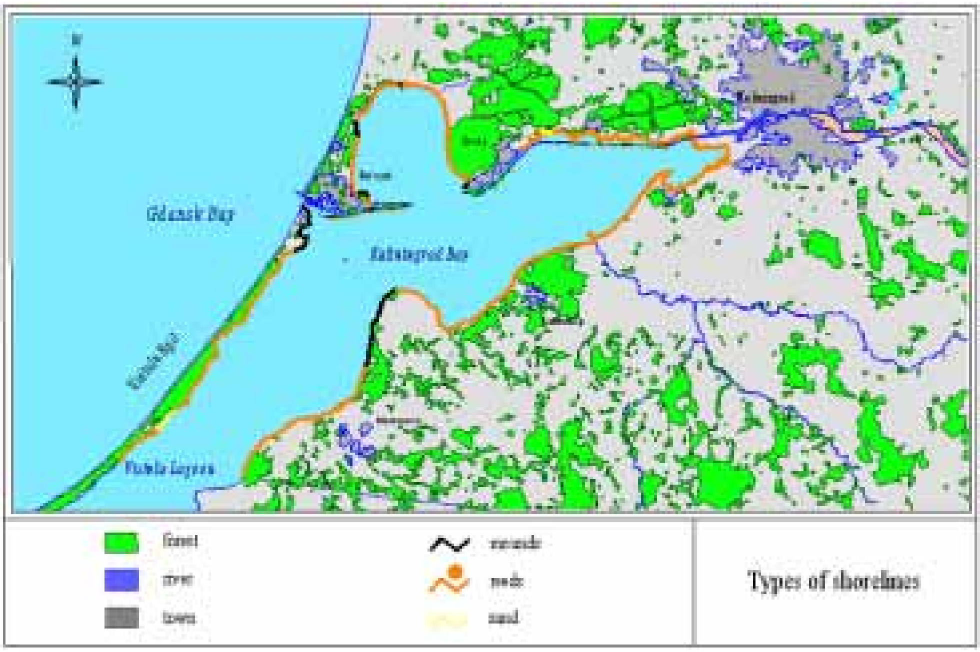


Figure 3.32 Types of coastlines in the Vistula Lagoon (Tacis, 1999)

3.5 Terrestrial ecology and biotic resources

3.5.1 Vegetation

Average forest cover of the Sambian peninsula and Kaliningrad oblast is about 10 and 17% respectively. Forests are mainly concentrated along the sea, in the northern and south-eastern part of the peninsula.

Over 600 kinds of vascular plants are observed in the lagoon area. 32 kinds of these are to some extent rare for Kaliningrad oblast and are subject to protection. The kinds enlisted in the Red Book of Russia are of special interest: *Armeria vulgaris* and *Dactylorhiza majalis* (observed in the Vistula Lagoon). Besides *Dactylorhiza majalis* other protected kinds of orchid are also observed: *Dactylorhiza incarnata*, *Dactylorhiza longifolia* and *Epipactis atrorubens*. The area is a unique place known in Kaliningrad oblast hosting *Blysmus compressus*, and is one out of two hosting *Ophioglossum vulgatum*. The area has a largest population of *Pulsatilla pratensis* and one of the largest populations of *Eryngium maritimum*. *Glaux maritime* is very abundant in the Vistula Lagoon.

During a brief visual inspection of the Vostochny peninsula it was observed that it mainly is occupied by spoil fields without any vegetation and by vegetated areas dominated by hawthorn (*Crataegus*) and willow (*Salix*). In (OVOS) it is reported that the central part is covered by mixed woodland, which, besides pine tree (*Pinus*), features rare tree species like European beech (*Fagus sylvatica*), and European hornbeam (*Caprinus betulus*). The underbush is well-developed, consisting of European hazel (*Corylus avellane*), woodbine (*Lonicera xylosteum*), gatten-tree (*Euonymus*), etc. The grass cover includes May lily (*Convallaria majalis, Majanthemum bifolium*), angel's eye (*Veronica chamaedrus*), weed (*Aegopodium podagraria*), lungwort (*Pulmonaria obscura*), etc.

Figure 3.33 Vegetation at the Vostochny peninsula. [OVOS]

Figure 3.34 Vegetation at the Vostochny peninsula.[OVOS]

No rare plants are observed on the territory of the port construction site.

3.5.2 Fauna

Fauna of the investigated area includes 8 species of amphibians, 5 species of reptiles, over 150 species of birds (including 100 nesting), about 35 species of mammals. Birds are of greatest interest, whereas amphibians, reptiles and mammals are of mostly regional interest. No rare animals are observed breeding on the territory of the port construction site.

Water- and shorebirds

Birds such as ducks, waders (sandpipers, godwits, plovers, snipes and others) and seagulls unite in large numbers along the sea coast, in the northern part of Primorsk Bay and in the Kaliningrad Canal during migration period. The specified area is in general the important element of the Baltic part of the White Sea-Baltic migratory way of birds. Arctic diver (*Gavia arctica*), White-tailed sea eagle (*Haliaeetus albicilla*), Peregrine falcon (*Falco peregrinus*), Golden plover (*Pluvialis apricaria*) which are enlisted in the Red Book of Russia are regularly registered visiting the area.

Birds rare for region such as Hoopoe (*Upupa epops*), Ringed plover (*Charadrius hiaticula*) and Tawny pipit (*Anthus campestris*) regularly create nests in the area. Little terns (*Sterna albifrons*) registered in the RF Red Book nest on islands of the Kaliningrad Canal.

During the winter period the lagoon adjacent to Baltiysk and the Kaliningrad Canal mouth regularly host large and rather steady flocks of wintering shore birds. The biggest amount is represented by Old squaw (*Clangula hyemalis*), Black scoter (*Melanitta fusca*) and Goosander (*Mergus merganser*).

The breeding season for shore birds is between 1 April and 15 July. In this period the birds are particularly vulnerable and shall not be disturbed. During the remainder of the year the birds have the opportunity to fly to another area within the lagoon.

3.5.3 Protected areas

Since 1963 the area functioned as “Vistula Lagoon” state natural reserve (refugium). In compliance with the Governor’s degree dated 18.05.1998 № 351 “Vistula Lagoon” has no longer a status of a specially protected area.

The "Vislinskaya Kosa" reserve includes the part of the sand bar between the canal at Baltiysk in the north and the Polish border in the south. A 1 km wide strip of the Vistula Lagoon and the Baltic Sea are included. The reserve was designated in 1973 for protection of animals.

The Vistula Spit is designated as a Baltic Sea Protected Area by Helcom recommendation 15/5. This guideline recommends a size of a minimum of 30 km^2 for marine and lagoon areas, and the criteria can be high biodiversity, habitats for endemic rare or threatened species or communities, habitats for migratory species, nursery and spawning grounds, and rare or unique geological or geomorphological structures or processes. All criteria are fulfilled in the Vistula Lagoon.

3.6 Air quality

Atmospheric air pollution above the investigated area is localised and sporadic and as a rule do not exceed Ambient Air Standard.

Background concentration according to the Kaliningrad centre for Hydrometeorology and Environmental Monitoring (letter № 506 dated 24.09.02) is set out below:

Table 3.6 Background concentrations (OVOS)

Code	Polluter	Background concentration
-	Suspended solids	0.20
0333	Sulphur dioxide SO2	0.01
0333	Carbon oxide CO	2.10
0330	Nitrogen dioxide NO2	0.008

3.7 Noise

The main noise sources in the investigated area are: vessels following along the channel, vehicles and railway transport. Noise level is mainly not critical.

3.8 Socio-economic an cultural issues

Population of Baltiysk is 31.6 thousand. Compared to the Kaliningrad oblast the population in the region around Baltiysk is relatively dense.

The area is economically settled at a decent level. A large share of population belongs to military units (Naval base). The population is also engaged in industry, agriculture and fishing. The industry is concentrated in the city of Baltiysk. Several industrial companies operate in Baltiysk. The largest are the shipyard and Baltiysk plant named after Gorkiy. Food-processing industry is represented by bakery. Building materials industry produces building blocks and other elements. A number of companies process precious metals and half precious stones. The unemployment rate is relatively high, particularly in Kosa village, which is located in the north of Vistula spit along the coast of the Baltic entrance channel is high. The highway network is well developed. The city of Baltiysk is connected to the regional centre through railway.

Baltiysk is the large Russian naval base on the Baltic and is of strategic importance. The city was restrictedly accessed by foreigners for a long. The port birth dates back to 1947 when the strait between the sea and fresh water lagoon was formed. In 1626 the Swedes built a fortress. The main sights of Baltiysk are 32m high lighthouse, the Peter-The-First monument, the Baltic Naval museum. The ruins of Lochschted ancient knight palace are situated to the north of Baltiysk.

The demographic situation in the Baltiysk district is much better than that in oblast as a whole. Reduction of the population number is however noted here. Monitoring with recent 10 years (1991-2000) showed that mainly mortality of the adult population is caused by circulatory disease (46 %). Than comes mortality due to malignant (cancerous) tumour (13 %). Mortality due to respiratory organs' illnesses amount to 4 %, digestive system - 3 %, infectious illnesses - 2 %. It is remarkable that mortality due to the above listed diseases tends to grow. Rather significant number of people dies because of accidents (19 %). This group includes many mortality causes: alcoholic poisoning, chemical poisoning, transport and other injuries, suicide and murder.

Recent years are characterised by an increased sickness rate in the city of Baltiysk: hepatitis, digestive system diseases, caries, eye-sight deterioration, oncological diseases. The reason is a high content of iron salt, free chlorine and fluorine and other compounds in tap water. The city lacks capacity and quality of existing treatment plant, more than a half of which is discharged into the sea (see Figure 3.21) without treatment.

3.9 Land use and settlement patterns

The planned ferry complex is located on the territory of a Maritime Engineering Service of the Baltic Navy. Land use of the investigated area is influenced by navy presence and borderline proximity. Agriculture is undeveloped. The population is engaged in subsistence gardening and fishing. The Vistula Spit as well as the Baltiysk suburbs have not been used as a tourist recreational zone for 50 years. Hence, the nature has not been landscaped as compared with other coastal zones of Kaliningrad oblast.

4 Description and assessment of the significant environmental impacts of the proposed operation at the local, regional and global levels

Impact at the local and regional level are identified and described below and comprise impacts with a scale of about 10 km. It is assessed that impacts on a larger scale will be negligible.

4.1 Impacts associated with construction

4.1.1 General construction activities

As the terminal is a conventional infrastructure facility the impacts during construction are in general at the typical level for constructions within that field. Some aspects of the impacts are relieved by the remote location of the area, relative to the neighbouring urban developments.

Air pollution from machinery and fumes from materials.
The amounts of dust caused by earth works are expected to be high compared with an average construction site, because much of the soils are fine sand and silts from old dredging works.

Noise during construction
On the basis of data from (OVOS, 2003) the noise impact from activities during territory formation is calculated. In general, the calculated noise levels are in good agreement with the levels given in (OVOS, 2003). The noise propagation is shown on Figure 4.1 and the noise values in for four specific points are shown in Table 4.1.

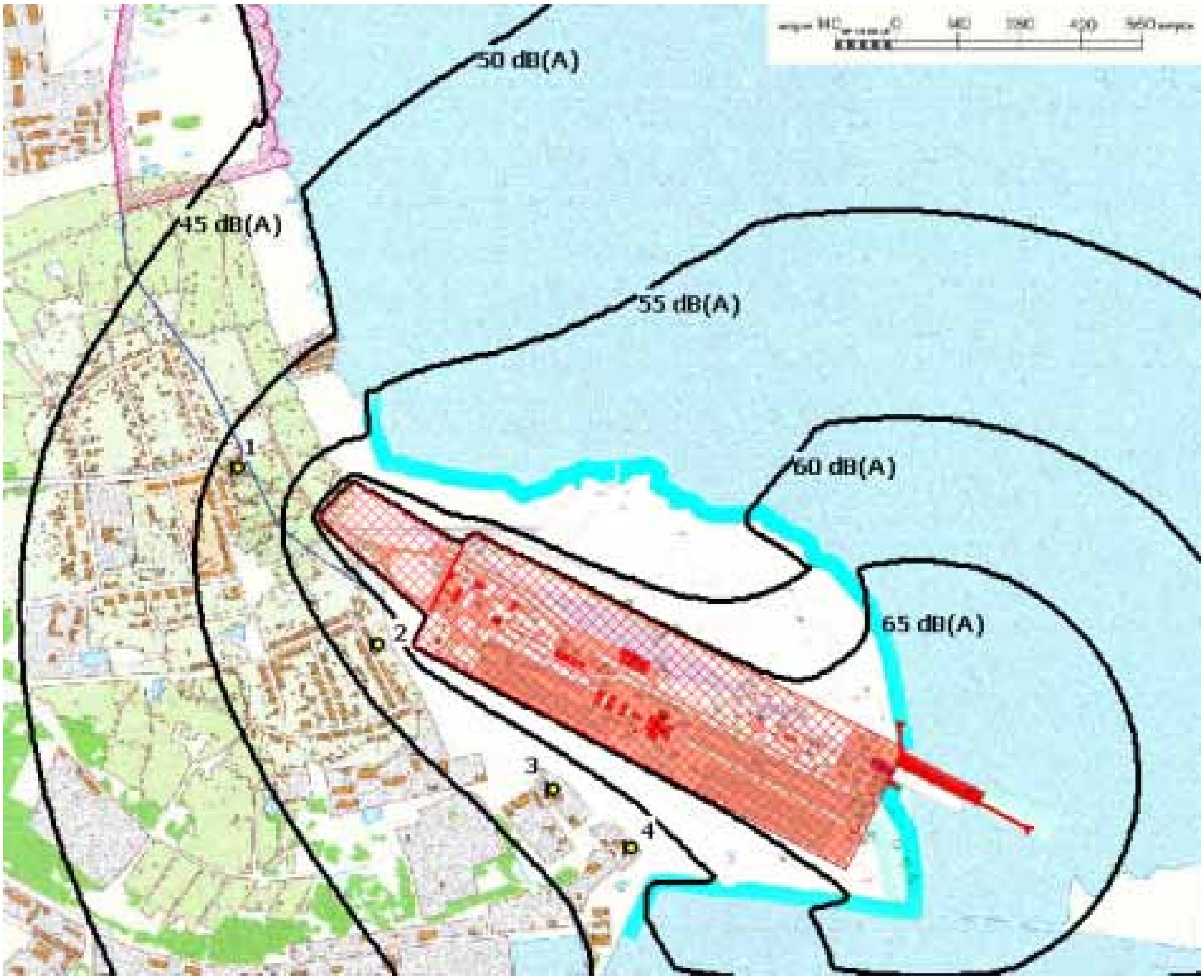


Figure 4.1 Noise impact from work stage territory formation, 3-shift working

Primary noise sources are sheet piling, dump-trucks, dozers, crawler cranes and a dredger and the work take place in 3 shifts. This is considered to be a conservative combination of noise sources and most probably not valid for the entire construction period. The noise levels during day, evening and night time are the same.

Table 4.1 Noise impact in 4 points from work stage territory formation. Positions of the points are indicated in Figure 4.1.

Immission point	Noise impact in dB(A) day and night time
1	51,7
2	57,8
3	58,2
4	58,6

Noise limits
The allowable levels of noise in residential and public premises should not exceed 55 dB(A) during day time and 45 dB(A) at night time.

It is seen from the calculations that the noise limit is exceeded up to approx. 5 dB for the closest residential buildings during daytime and 10-15 dB(A) during night time.

In the Nordic countries the allowable levels of noise form temporary work and from construction work are higher during daytime than those form permanent plants and industries working the whole year round. The allowable level during daytime is 60-70 dB(A) and 40-45 dB(A) during night time.

It would be possible to reduce the noise from the territory formation and construction work if the proposed screening (green belt) was established in the beginning of the project and if the screening includes a mound or dike of 4-5 m above existing territory.

Occupational health and safety
The working conditions of the project are within normal conditions for marine and terrestrial constructions, respectively. The standards applicable for construction will have to be applied.

Waste during construction
Before work can commence on the construction of the ferry complex, the existing structures must be removed. This includes any tanks left on site and the dry docks identified as part of the military facility (see Progress Report 1), not previously mentioned in the (OVOS).

The quantities of waste assumed to be generated during the construction phase are prepared after Russian standards and in agreement with western experience. The amounts are listed in Table 4.2

Table 4.2 Waste generation during construction (OVOS), rounded figures.

Waste type	Waste production (tons/year)
Construction waste	200
Reinforced concrete construction waste	1900
Steel scrap	170
Timber waste (breakage)	3
Polyethylene waste	1
Household waste	100
Food waste	25

The waste flows will be managed, including collection on site and transport to a place where the waste can be reused, recycled, treated or land-filled.

During construction and demolition (C&D) the following waste management issues shall be addressed:

1. Legislation
   Relevant national and regional/local legislation relating to waste management shall be followed. Special emphasis has to be put on
   - describing requirements for source separation of certain fractions for maximum recycling,
   - registration of waste types and amounts,
   - transportation of waste by registered companies,
   - delivery of waste to correct and authorised final reception facilities.

2. Site administration
   The internal system for handling waste has to be describe in terms of goals/objectives, waste minimisation, logistics, quality control, environmental management, documentation)
   Alternative layout of on-site container collection system for construction site are to be described

3. Waste management options
   The following waste management options are to be considered:
   - reuse/recycling
   - concrete, asphalt reprocessed at C&D recycling plant and reused (describe type of recycling plant required)
   - PE waste to recycling
   - household waste reuse/recycling of e.g. paper, cardboard, plastic,

metal etc.
- steel scrap to steel mill for recycling
- food waste composting
- WTE - timber waste;
- non-recyclable household waste
- landfill (licensed) for non-recyclable and non-combustible waste; concrete contaminated with HC

Resource consumption for construction
During construction a considerable amount of earth works will be required. It is assumed that the demands regarding volume and quality will be met by the amount that will be dredged and excavated during deepening of the new basin.

Specific attention has to be paid to storage and handling of hazardous material: The risk for accidental pollution through leakage and spillage (e.g. of oil) shall be encountered during planning and execution of the construction.

Requirements for building material for quay, road, railroad, asphalt, buildings, etc do not give rise to specific environmental concerns.

Disruption and damage to local infrastructure
The risk of typical construction-related damages, such as cable disruption, injured roads, etc. are somewhat reduced by the location on a peninsula.

The construction requires a substantial upgrading of the existing access roads. Further, the necessary technical facilities such as supply of power, water, sewage service and communication shall be created, since no or very limited facilities can be expected.

The introduction of service roads and supply lines will require co-operation with the local planning authorities in order to guarantee an optimised construction process and as little nuisance of the citizens of Baltiysk as possible.

Aesthetic impacts
The construction of a terminal and its connecting road and railway facilities are obviously designed entirely for practical purposes. A potential disturbing impact on the aesthetic quality of the surrounding urban environment during construction will have to be performed in order to avoid or to minimise such negative effects.

4.1.2 Capital dredging and deposition

The main part of earthworks in terms of dredging and dumping will be marine earthworks. It will be envisaged to reuse as much of the dredged material as possible in the earthworks where additional soil is needed to for the construction site. It is assumed that the soil demand for construction of the port area will be met by the volumes from the dredging. Therefore, no additional raw material sites have to be appointed. Surplus soil from the dredging will be dumped on existing dumpsites either at sea or along the channel. The key quantities for the earthworks are given below

- The expected volume for marine dredging: 2.1 million m^3.
- The expected volume needed for site construction: 1.6 million m^3.
- The expected volume to be dumped at sea: 0.8 million m^3.

Dredging spill
The dredging volume is 2.1 million tons which will be carried out with suitable machinery, preferably suction or cutter suction dredgers. The traditional usual material has a capacity between 8.000 and 15.000 m^3 per day. If an average of 10.000 m^3 per day is applied and it is assumed that two dredgers are active a minimum total dredging period of 105 day or 3.5 month is expected. Alternatively one large dredger will be applied. No significant difference is expected with regard to the environmental impact.

The amount of spilled material depends on the requirements regarding the maximum permitted spill percentage. The required limits shall be as low as possible with due respect to the technical options available (Best Available Technology). The experience form similar project is that spill percentage of 5% can be achieved for suction dredging combined with pumping into a settling pond. The spill from the overflow arrangement of the settling pond can be managed to be less than 2%. The settling ponds will preferably be established on Vostochny peninsula. This holds the two advantages. First, it is close to the dredging site (short transport distance) and second, the land fill provides raw material for the earth works on land.

The sediment volumes released to the aquatic environment will hence be approximately 24 kg/sec. If this mass release is evenly distributed over the channel cross-section of 1.400 m^2 (60m*10m+400m*2m) and if a typical flow velocity of 10 cm/s is assumed resulting in a typical discharge of 140 m^3/s, than the order of magnitude of the average concentration of suspended solids will be 170mg/l.

This surplus concentration due to the dredging works has to be compared with the natural background level of suspended matter concentration, which is either about 3 mg/l for Baltic Sea water in an inflow situation or about 30mg/l for an outflow situation where the water is from the Vistula Bay.

The dredged material will partly consist of relatively soft material from the upper layer in the channel as it is characterised by the analysis in (Lemnimor-proect, 2003) mainly of coarser material in below the surface layer. On average, the grain size distribution of the dredged material is hence assumed to be between the sediment from the approach channel and the channel bottom at Vostochny.

The spilled material is expected to be the fines (d<0.05mm) with a characteristic diameter of 0.03mm. The corresponding settling velocity is about 0.4mm/s. This implies that the average water depth of 2m will be cleared within 1.4hours. This again corresponds to a down stream length of 500 m. For the deep channel the corresponding time is about 7 hours and the down stream length of 2.5km.

The length scale is comparable to the channel length inward to the open part of the Vistula Lagoon and also outward to the Baltic Sea.

Dumping sites

It is recommended to use the Vostochny peninsula for dumping site. From an environmental point of view it is obvious to use this site and to prepare for future port development. The sediments will create a temporary habitat. From a geotechnical view this solution also has the advantage that the soil can consolidate. As for the other possible dumpsite, an approval is not obtained for this location.

In the (OVOS) it is anticipated that the volume that is not used for territory building (approximately 0.8 million m^3) will be distributed between the offshore dumping site in the Baltic Sea, see Figure 4.2, and the existing dumping sites along the sides of the Canal, see Figure 4.3.

The administrative state of the offshore dumpsite is that it presently is closed. However, the approval procedure is ongoing and a decision is expected during summer 2003.

Figure 4.2 Location and size of offshore dumpsite off Baltiysk (Lenmorniiproect, 2003)

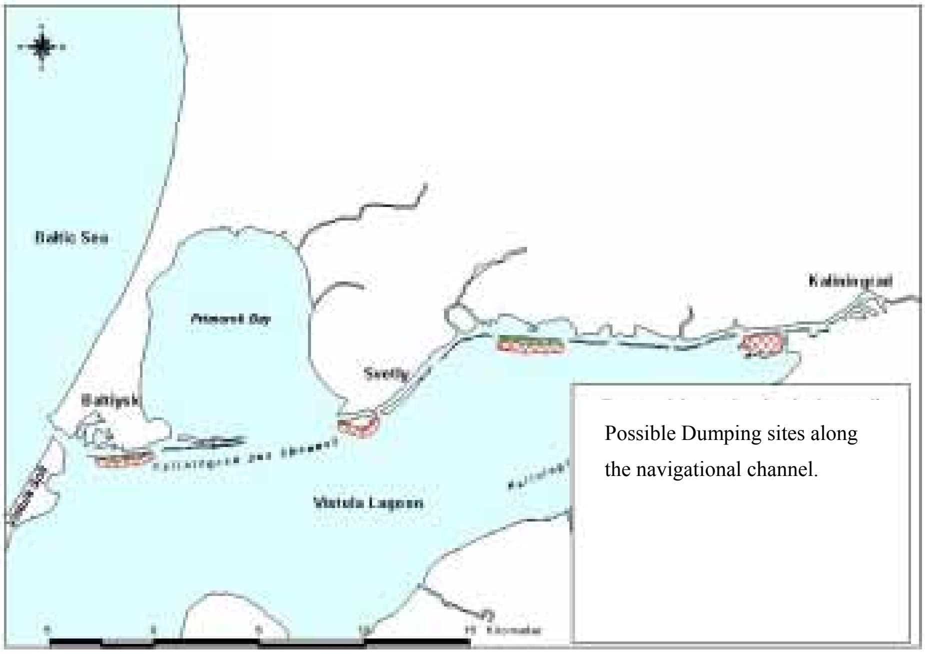


Figure 4.3 Dumping sites along the Canal that currently are in use. (TACIS, 2002)

Release of matter from the sediments

The pumping of soil under water gives potentially rise to release of nutrients, BOD and toxic substances that are contained in the sediments. The samples in (Lenmorniproject, 2003) show that the concentrations of heavy metals and oil products are within the allowed range. The content of nutrients and BOD is expected to be low. Therefore, no significant environmental impact is expected from release of substances during dredging.

Interference of dredgers with traffic

The potential environmental risk from interference of dredgers with the ship traffic will have to be addressed by the existing VTS (Vessel Traffic Service) of the Port of Baltiysk and of the Port of Kaliningrad. It is expected that the ship traffic in the Kaliningrad Canal temporary will be restricted because of the dredging works in the adjacent area.

Impacts due to changed bathymetry

During construction the bathymetry of the lagoon at Vostochny will be changed and deepened significantly. It is assumed that the friction in the canal will be reduced locally and that the pass towards Primorsk Bay to the north will be significantly widened. Hydraulic effects on plumes of suspended particles are expected during construction. Regarding the longitudinal flow in the canal they are assumed to be negligible because the total friction between the entrance and the open part of the lagoon not is changed significantly due to the new deep basin at Vostochny. Regarding the sediment spreading into the Primorsk Bay it is assumed that it will be of minor and temporary character because the water depth north of the new basin still will be rather shallow and hence restrict major water exchange

4.1.3 Pollution risks (polluted site)

Sufficient information to assess the pollution risk associated with the military facility has not been available up to date. An environmental site assessment including soil sample analysis will be carried out as soon as authorisation will have been obtained

4.1.4 Other impacts and risks

Impact risks on fish / fisheries

During construction impacts on fish and fisheries are considered a major potential threat due to the suspended matter in the water column that are expected during dredging works.

The level of suspended matter in the port location and in the adjacent canal is assessed in chapter 4.1.2. A surplus concentration of the order of 170 mg/l was found. The avoidance criteria for different fish species of relevance to the Kaliningrad Canal are listed below:

Table 4.3 Avoidance criteria for different fish species regarding suspended sediments.

Fish species	Avoidance criteria
Baltic herring[1)]	10 mg/l
Salmon[2)]	350 - 650 mg/l
Trout[2)]	50 mg/l
Soft bottom fauna (reduced growth)[3)]	300 g/m^2/day

[1)] Great Belt, 1994
[2)] Lloyd, 1987
[2)] Essing, 1996

Avoidance behaviour of fish due to high suspended material concentrations in the lagoon entrance can have significant impact on the fish stock if the lagoon if the spawning migration is disturbed or even interrupted. Hence, impact on fishing industry and the associated service industries are affected due to reduced fish catch.

Other impacts on marine life

Sediment spreading and spreading of contaminants (e.g. accidental oil spills) during construction are expected have impacts on benthic flora and fauna. Plants will suffer from shadow effects of the sediment plumes, fauna species in the near zone will either be extinct due to the dredging activity or they will be buried due to high sedimentation. Small or moderate sedimentation rates may, however, have a stimulating effect on growth of specific filtrators (Great Belt, 1994).

A reduced bottom fauna will have impact on higher level species like fish, and birds. The capacity of the area as a foraging location is hence reduced and the species will hence have to find better suited areas elsewhere.

The area where these impacts are likely to occur is estimated to be within a distance of 2-3 km.

Though the dredging operation is more intensive than regular maintenance dredging of the harbour, it does not differ qualitatively, Based upon experience from maintenance and consideration of the planned activities it is concluded that the temporary impacts are of a character, that they can be minimised and mitigated through requirements to the contractor so that the impacts on the environment will be negligible

4.2 Impacts associated with operation

During operation the following environmental impacts will be addressed.

- Water quality in the lagoon
- Air pollution and noise
- Water supply and discharge
- Waste management
- Maintenance dredging
- Oil spill risk
- Risk due to hazardous cargo

4.2.1 Water quality in the lagoon

The construction of the new terminal basin and the associated changing of the bathymetry give rise to locally changed currents and water exchange conditions. Changed flow regimes may give rise to local accumulation of debris (floating waste), high concentrations of released contamination, low concentrations of oxygen and hence adverse impact on marine flora and fauna. No discharges of untreated waste water will occur to the basin.

Terminal area
The deeper basin and the resulting increased opening between the Canal and the Primorsk Bay will result in an increase exchange of water and hence to more dilution with Baltic Sea water. The deep basin is expected to be subject to periodic occurrence of local oxygen depletion. The deep connection to the Canal will guarantee exchange of bottom water with the Canal and the Baltic Sea.

Compared to other basins in the existing Port of Baltiysk the environmental conditions are expected to be better at Vostochny.

Lagoon
The deeper basin and the resulting increased opening between the Canal and the Primorsk Bay will result in an increased exchange of water in the south-western part of the Primorsk Bay and hence to more dilution with Baltic Sea water. The remaining part of the lagoon is not expected to be affected to a measurable degree by the changed bathymetry.

4.2.2 Air pollution and noise

Air pollution
Local concentrations of SO2, NO2 and VOCs [hydrocarbons] are not expected to exceed limit values, but these pollutants contribute to regional pollution problems (acidification and ozone formation) which should always be minimised. It is recommended to require the use of low-sulphur fuel for landside and ship operations. It is also recommended to require the use of low-NOX and low-particulate diesel engines for ship motors and landside equipment, and to require particulate filters on stationary diesel motors installed near parking areas for waiting vehicles, passenger terminals and permanent work areas.

Noise from terminal operation activities
On the basis of data from (OVOS, 2003) the noise impact from terminal operation activities is calculated. In general, the calculated noise levels are in good agreement with the levels given in (OVOS, 2003).The noise propagation is shown on the Figure 4.4 and the noise values in 4 specific points are shown on Table 4.4.

Figure 4.4 *Noise impact from terminal operation activities including trains, vehicles and ferries, 3-shift working.*

Primary noise sources are idle noise from ship, shunting of railway cars, train formation, departing and arrival of trains, handling of trailers and trucks and traffic on the new road.

Table 4.4 *Noise impact in 4 points from terminal operation activities (positions of the points are indicated in Figure 4.4.*

Immision points	Noise impact in dB(A) day and night time
1	46.0
2	45.6
3	47.9
4	47.7

It is seen from the calculations that the noise limit is exceeded up to approx. 5 dB for the closest residential buildings during night time.

It is proposed to reduce the noise by establishing a screening (green belt) between the site and the residential areas. We consider a screening approx. 4-5 m high necessary to reduce the noise impact to values not exceeding the noise limit at night time.

It is not expected that the increase in the number and size of ships entering the lagoon will adversely affect the fishery.

4.2.3 Water supply and discharge

Water supply

The port facility will have different water supply systems, one for potable (drinking) water, one for industrial water and a system for fire prevention, which will be based on marine water.

The drinking water supply (Potable water) of Baltiysk is considered to be sufficient for local and agricultural use. The additional requirements from the port are about 30 m^3/day [OVOS] and are assumed not to give rise to supply problems. However, a detailed analysis is required to co-ordinate the water supply of Baltiysk city with the requirements of the new port.

For the supply for industrial water and fire prevention water salt water from the Primorsk Bay or the canal will be used. Therefore, no environmental constraints are connected to these water demands. A marine water treatment plant with the approximate capacity of 8.3m^3/h and 83m^3/day is planned.

Water discharge

Waste water from the port will comprise

- Household sewage
- Industrial sewage
- Surface run-off

Household sewage

The discharge of household sewage from the port facility will be 5.5.m^3/h and approximately 30m^3/day [OVOS]. This will cover the sewage production of the about 150 person that will be employed at the port, including administrative personnel, port and auxiliary personnel, state control and security personnel. Ship generated sewage water will not be received at the Vostochny terminal. Passenger ferries will be directed to Berth No 3 in the Baltiysk Port.

The sewage treatment capacity will hence be designed to about 30m^3/day. It is anticipated, that a new treatment facility will be constructed. The discharge criteria of the plant are to follow requirements by HELCOM and SanPid 4631-88, i.e. suspended matter <15 mg/l, BOD_5 <15mg/l, Ptot<4.5 mgP/l, Ntot<10mgN/l.

<u>Industrial sewage</u>
Industrial wastewater mainly consists of wastewater from waste water from the boilers, vehicle washing, mechanical workshops and fire depots. The required capacity is set to 8.2 m^3/h and 83 m^3/day [OVOS].

<u>Surface run-off:</u>
The flow rate of water that runs off the port area will be in the order of 110,000 m^3/year (295 m^3/day on average). This includes precipitation on sealed surface as well as contributions from washing of vehicles, mechanical workshops and fire stations.

The treatment capacity for industrial sewage and surface run-off will include sand and oil separation units before it is discharged into the sea. The discharge has to fulfil the requirements of HELCOM and SanPid 4631-88.

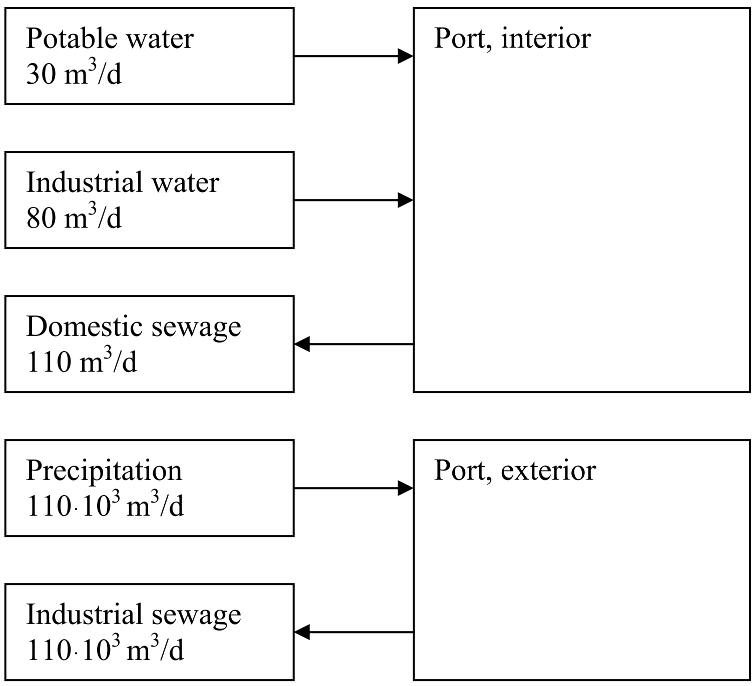


Figure 4.5 Illustration of the water circulation of the terminal

4.2.4 Waste management

Waste production during operation is described in (OVOS).

Table 4.5 Waste generation of the port during operation [OVOS}

Waste source	Approximate annual amount
Luminescent lamps	600 pcs.
Sewerage	$11 \cdot 10^3$ m^3
Waste swept from territory	100 t
Waste of abrasive metal dust	0.13 t
Abrasive waste	0.05 t
Ferrous metal scrap	1 t
Non-ferrous metal scrap	0.03 t
Ferrous metal shaving	14 t
Household waste	14 t 100 m^3
Food waste of the terminal	2.6 t

As for the construction phase, the types and quantities of waste listed seem correct compared with western standards. However, waste management is not mentioned. Procedures for on site collection have to be prescribed, transportation to a place where the waste can be reused, recycled, treated or landfilled will have to be required. Further, hazardous waste management, related laws, standard procedures have to be included and licensed or authorised handling companies and receivers are to be identified.

Measures to reduce the environmental impact of waste by active management are to be implemented.

The Environmental Protection Dept. of the ferry complex is responsible for internal waste management control, including waste collection, storage and removal. They also are responsible for the organisation for treatment and disposal of waste and how different waste fractions/types will be managed.

Ships generated waste

In [OVOS] the following quantities of ship generated waste are listed.

Table 4.6 Ship generated waste [OVOS}

Source	Approximate annual amount
Oily sewerage sludge	4 m^3
Oil waste after reservoir cleaning	1.3 t
Motor oil	2.2 t
Transmission oil	0.2 t
Oily rags	0.7 t
Food waste from ferries	60 t
Other waste from ferries	120 t

The oily wastes have to be handled and disposed without any loss or leakage. The final deposition will be at refineries or in licensed dumpsites / reception facilities.

Transport and disposal of other waste from the ships will have to be managed accordingly and the final disposal will at licensed dumpsites.

4.2.5 Maintenance dredging

Increased needs for maintenance dredging relate to

- deepening of the access channel
- establishment of the new harbour basin

Based on the existing maintenance dredging volumes in the vicinity of Vostochny is between 50 and $100 \cdot 10^3$ m^3/year. This number is to be compared with the total annual maintenance dredging demand of approximately $500 \cdot 10^3$ m^3. This confirms the intuitive understanding that the entrance canal is the area of highest sedimentation due to the long shore sand transport of the Baltic Sea. The new harbour basin will act as a sediment trap because it represents a sudden expansion in the main current direction (east - west) and also a sudden flow expansion in the new wider opening to the north towards the Primorsk Bay. The existing small (about 50-100m) opening to the north gives apparently rise to erosion in the opening. If this trend will continue if the opening is widened in the new port or if the new basin will silt up is difficult to assess. Both currents will give rise to significant transport of sediments and hence a maintenance dredging volume of the order of 10% of the basin volume or $2 \cdot 10^5$ m^3/year may be expected.

4.2.6 Oil spill risks

The new port at Vostochny will reduce the risk of oil spill in the exiting port of Kaliningrad and the navigational canal because most of the large vessels will call the new port and not sail through the canal to Kaliningrad. The total number of ships entering the Vistula Lagoon is expected to rise and the size of the ships is also expected to rise in the coming years.

The [OVOS] operates with a risk for emergencies (collision and subsequent oil spill of the above size) of 10^{-7} per year per call. For 330 calls per year this results in a risk of $3.3 \cdot 10^{-5}$. From (TACIS, 1998) the risk of collision and grounding with subsequent oil spill is fount to be $3.2 \cdot 10^{-5}$ per call for oil tankers in ports. For cargo vessels the risk is estimated to be 10 times smaller. For 330 calls per year the resulting risk for oil spill is hence found to be $1.1 \cdot 10^{-3}$. Although this risk is about 32 times larger the magnitude of the risk is not to be considered particularly high.

The ships calling Vostochny terminal are vessels, which only carry bunker oil. Oil tankers will pass by the terminal on their way to the Svetly terminal. Oil tankers will also approach the existing oil terminal on the south shore of Vostochny. For both oil tanker routes the new terminal at Vostochny represent a potential increased risk for accidents and hence a risk for oil pollution in the area. Requirements for low sailing speed in the canal and in the manoeuvring areas of the exiting oil terminal and the new ferry terminal limit the size of the accidental oil spills. A typical spill size from ferries is about 300 - 600 tons of bunker oil. Since the traffic is controlled by VTS, and since the VTS system will be renewed with the nearest future, the risk for collisions is minimised. The re-distribution of traffic from Kaliningrad port towards the new Vostochny terminal will reduced the ship traffic intensity in the canal and hence reduced the total risk for collision in the region. In all, it is the assessed that the risk for collision not is changed significantly due to the establishment of the Vostochny terminal.

Comments to the existing oil spill contingency plan are given in chapter 5.2

4.2.7 Risks due to increased land traffic

The existing road and rail road infrastructure in Baltiysk and on the northern Vistula spit are assessed not to have the capacity to serve the new terminal adequately. The port design includes new by-pass road and rail road at the eastern edge of the Baltiysk peninsula and hence it represents a substantial upgrading of the existing infrastructure. Despite the increase of heavy traffic due to the new terminal it is expected that the resulting risk for accidents, noise and emissions will not increase.

4.2.8 Risks due to hazardous cargo (on land as well as on sea)

As the ferry terminal will be a major link for general trade, a certain amount of the cargo will be hazardous and thus constitute a risk during unloading, during temporary storage in the terminal area and during transport in and out on land.

As the planned means of transport are by conventional technology and procedures, the risk is found acceptable, provided that appropriate safety procedures are applied.

Reference is made to MARPOL 73/78 and Helcom , where guidance for planning and operation of reception facilities are given.

4.3 Impacts associated with closure and decommissioning

As decommissioning is assumed to take place in the remote future, the specific conditions for mitigation are inherently uncertain. A decommissioning plan that takes environmental issues into consideration will need to be prepared prior to the decommissioning works. The following considerations apply to the project.

- The terminal consists of conventional structures for road, rail, harbour and service building constructions. Decommissioning of such structures is familiar and manageable with respect to environmental practices.

- Environmental risks during decommissioning depend on choice of materials and construction principles applied.

- Any pollution that has accumulated in the area has a risk of spreading in the environment during decommissioning.

4.4 Identification of key uncertainties and data gaps

The assessment is based on the project as described at pre-feasibility stage, where not all design parameters, quantities or details about the design and the location are determined and still may still changed to some extent.

4.4.1 Dredging works

There is no approval of using any dumping site

Particularly, the Vostochny peninsula is interesting as dumping site. It is strongly recommended to use this dumping site because the terminal territory will have to use some of the dredged material and because the future port development will use this area. Be or the islands north of the canal.

Approval process for marine dumpsite of approximately 1 million m^3 is not finalised yet. Mentioning of a suited dumpsite is a requirement of the EIA.

The quantities for earth works given in the table above will be needed to be reassessed based on a detailed survey of the topography (on land) and a survey of the bathymetry (at sea).

4.4.2 Military facility

The military facility within the area of the planed terminal has briefly been inspected. The facility has obviously been used as fuel storage facility. Since the facility has not yet been thoroughly investigated no statement can be made regarding the environmental consequences and financial implications during construction, operation and decommissioning of the port. The mitigating measures have not yet been developed. An environmental site assessment including soil sample analysis will be carried out as soon as authorisation will have been obtained.

4.5 Comparison of impacts associated with alternatives, including the do-nothing alternative

This chapter compares the environmental impacts associated with the different alternatives. The comparison is performed on environmental parameters that are found to be most important for this project.

4.5.1 Zero solution

The issue of Zero-solution, also called "do nothing" or "no construction" solution is not dealt with in the existing documents since the port construction is considered a necessary step to achieve the overall objectives of the governmental target programme.

The environmental consequences of this alternative are not studied to the same degree of detail as the other alternatives. Some general remarks based on th experience from similar alternative studies are given.

The environmental consequences of not establishing the new port with its spin-off on employment and local and regional development will result in a growing gap between the increasing traffic and demand for port facilities and the quantity and standard of the existing port facilities. This will cause in increasing breakdown frequencies, traffic congestions, accidents and environmental deterioration of the entire region. Further, the region would experience increased emission from inadequate facilities and machineries. Such consequences, in turn, will hamper the development of the entire region.

The zero solution is therefore assessed not to be a viable solution in this project.

Alternative port location

Alternative locations where investigated in TACIS (2002). Here, three alternatives were studied, see chapter 1.3.2.The main environmental concerns identified are the dredging activities during construction and operation.

PD01
Alternative PD01 regards the development of the existing port of Kaliningrad.

The material (1.8 mill. m³ in-situ wet material) should be brought to the dump-sites

For environmental reasons (sustainability) it would be worthwhile to take into consideration the construction of a separation field for dredge spoil, too. Such a facility may be needed to support further capital dredging for the reconstruction of the KSC, for the continuously required maintenance dredging and/or for construction work related to the creation of new ports within that area. It would be possible to use major parts of the former dredge material later for the construction or reconstruction of roads, for landfills and other purposes. The building of a separation field would create a promising future option for the environment.

PD02 - The proposed project alternative
Alternative PD02 regards the Vostochny peninsula.

The improvement measures are related to both, cargo handling facilities and related sea channel infrastructure and include principally:

- a rail ferry terminal at Baltiysk/Vostochny
- providing sea access and turning areas from the existing channel.
- land access links by road and rail
- bend smoothing at the entrance and VTS improvements

The capacity of the channel has been examined in PDO1. This concluded that the growth in liquid and dry bulk cargo would accompanied by an increase in numbers of larger vessels and this trend would be further promoted by deepening the sea channel. The numbers of ships calling would increase slightly and the channel capacity would be sufficient. The additional opportunities for vessels to enter and leave the new port will reduce the access time for these vessels.

For environmental reasons (sustainability) it would be worthwhile taking into consideration the construction of a separation field for dredge spoil, too. Such a facility may be needed to support further capital dredging for the reconstruction of the KSC, for the continuously required maintenance dredging and/or for construction work related to the creation of new ports within that area. It would be possible to use major parts of the former dredge material later for the construction or reconstruction of roads, for landfills and other purposes. It is necessary to find an agreement with the fishing industry for this measure

The main features where human health and environmental assets can be gained are:

- Increased living standard for the local population

- More healthy and safe working conditions due to new technology
- Enhanced sewage treatment
- Better harbour reception facilities (Oil, Bilge)
- Removal of fuel depot
- Enhanced waste treatment

PD03 Svetly
This alternative is located at Svetly. The improvement measures are related to both, cargo handling facilities and related sea channel infrastructure and include principally:

- a new port for Ro-Ro vessels
- a Rail ferry Terminal at Svetly/Komomloskiy
- providing sea access and turning areas from the existing channel
- land access links by road and rail
- bend smoothing at the entrance and VTS improvements.

The capacity of the channel has been examined in PDO1. This concluded that the growth in liquid and dry bulk cargo would accompanied by an increase in numbers of larger vessels and this trend would be further promoted by deepening the sea channel. The numbers of ships calling would increase slightly and the channel capacity would be sufficient. The additional opportunities for vessels to enter and leave the new port will reduce the access time for these vessels.

One major aspect is the environmentally proper handling of the dredged material. The material (4.5 mill. m^3 *in-situ* wet material) of this KSC reconstruction phase and the building of the new port should be brought to dump sites. It is necessary to find an agreement with the fishing industry for this measure.

For environmental reasons (sustainability) it would be worthwhile to take into consideration the construction of a separation field for dredge spoil, too. Such a facility may be needed to support further capital dredging for the reconstruction of the KSC, for the continuously required maintenance dredging and/or for construction work related to the creation of new ports within that area. It would be possible to use major parts of the former dredge material later for the construction or reconstruction of roads, for landfills and other purposes. The building of a separation field would create a promising future option for the environment.

Comparison
In the TACIS study extension of the existing port in Kaliningrad is described as the solution that solves the traffic growth and that can be extended with less cost than for the Baltiysk and the Svetly option.

- The Baltiysk option has the following advantages
- Short approach time.
- A new infrastructure can be established without interfering with major master plans / town planning.

Compared to the alternative locations the Baltiysk option has the following environmental advantages

- Increased living standard for the local population
- Less risk for accidental pollution at sea
- High dilution rates in the marine environment providing a high environmental stability
- Minimised reconstruction of existing infrastructure and settlements.
- Possibility for enhanced sewage treatment for residential areas
- Better harbour reception facilities (Oil, Bilge)
- Removal of a potentially hazardous military site
- Enhanced waste treatment.

5 Description of mitigation measures and/or measures to enhance environmental benefits

The scope of mitigation is understood as including all feasible, cost-effective measures to prevent or minimise environmental impacts to an acceptable level, to address other environmental issues, and to ensure compliance with national and international environmental standards.

5.1 Measures during construction

5.1.1 Design considerations

Apply good environmental practices in design. Good environmental practices in design include in particular the use of materials, which will not constitute an environmental hazard during operation or upon decommissioning. Other examples for such measure are:

- Maximal reduction of construction site area
- preservation of the upper vegetative layer of soil for its consequent remediation
- application of devices eliminating possibilities of leakage, for receiving of solutions and concrete mixtures
- measures on prevention of soil contamination with hydrocarbon products and waste
- remediation of temporarily used territory
- periodic re-cultivation of the infringed grass cover

Require good practices during construction. Good environmental practice during construction includes the strict enforcement of proper waste handling, avoidance of unnecessary pollution wherever possible, and respecting health and safety standards for the construction worker. Also, measures for protection and rational use of lands shall be taken, such as

- maximal reduction of cutting down of wood on the construction site, enclosure of tree, installation of caution signs in places of traffic of building engineering machinery and motor transport,
- duly improvement of the territory with remediation of the fertile layer of soil,

5.1.2 Environmental standards for contractors

Tender documents for contractors should include information on all relevant parts of the Environmental Action Plan. Further, the contractors should be requested to prepare their own EAP, reflecting the requirements of the project and indicating the organisational arrangements and responsibilities relating to specific requirements as well as to general environmental standards of relevance for the project. The contractor shall be requested to document the availability of environmentally qualified staff in his organisation. Where relevant, the contractor shall be requested to include environmental performance in his reporting.

5.1.3 Dredging management

I order to give operational guidelines for the dredger the general dredging management comprises requirements regarding the choice of methodology and performance of dredging equipment. A dredging programme will be developed in accordance with WB (IFC) guidelines for Port and Harbour Facilities (World Bank, 2003) prior to dredging works to minimise adverse environmental impacts.

Spill limit

The requirement for dredging spill is set based on large international marine earth works, (e.g. Great Belt 1994). An average spill percentage of 5% can be achieved by using suction dredgers that pump the spoil directly into spoil fields on land. The proximity to land and existing spoil field and the soil conditions at Vostochny indicate that such method and spill ratios can be obtained.

Dredging period

In order to protect the stock of Baltic herring it is advised to consider the migration period of a period of protection. The Baltic Herring is very sensitive to suspended matter in the water and dredging in the canal will therefore most likely lead to avoidance with the risk of blocking for migration into the Vistula Lagoon. In order not to loose an entire year of recruitment it is hence advised to stop dredging operation in the migration period. Spawning migration into the lagoon starts as soon as ice is melts and breaks up in February - March. The main spawning peaks in the beginning of April and it continues until 15.May. This means that dredging is forbidden for about 2½ month during spring.

5.1.4 Air quality

Mitigation measures for fugitive dust should be negotiated with the contractor and included in the contract to ensure that measures are taken to minimise dust generation from construction activities, especially during dry conditions when dust levels increase from other sources.

5.1.5 Soil Pollution

In case of soil pollution appropriate clean up action will have to be conducted according to the type and size of the contamination and a consequent soil monitoring programme will have to be initiated.

5.1.6 Land use and landscape

Considering the current status of the remaining areas on Vostochny Peninsula, it is not recommended to leave these neighbouring areas as they are, as they would constitute an unattractive state for the immediate surroundings of a public facility. Further, a future extension of the harbour is foreseen on the remaining part of the peninsula.

On this basis it is proposed to treat the area as follows

- clean up known pollution and demolish old military structures
- elaborate the highly filled spoil fields to improve their appearance. A landscape architect should be involved in the design
- keep existing vegetation where possible and improve the appearance of other parts by simple re-vegetation (grass or willow/blackthorn, like the current vegetation)

5.1.7 General precautions during construction

During construction, general precaution shall be demonstrated to reduce nuisance for the environment in general and for particular for human health and safety. Minimisation of dust production, emissions of smoke and fumes, noise and vibration, and infrastructure damage shall be integrated into all construction processes.

With regard to protection of nesting birds it is purposed to reduce the disturbance from major earth works during breeding period between 15 April and 15 June.

5.1.8 Vessel Traffic Service

During construction the dredger has to be in close contact with the VTS system of KPA in order to avoid accidents with vessels in the Kaliningrad Canal.

5.2 Measures during operation

5.2.1 Ship waste collection

The collection of ship-generated waste in the port is described in the International Convention for Prevention of Pollution from Ships 1973, modified by the Protocol of 1978 and called MARPOL 73/78. Further, the Helcom conventions describe the requirements for port reception facilities for ports in the Baltic Sea.

The planning of the port reception facilities requires a detailed design of the port and its key characteristics. At present, data are available at a general level, the detailed design of the port reception facilities will be performed in parallel will the detailed design of the port.

Companies that are potentially can receive and process wastes are to be identified. Such services are supplied for the Kaliningrad Port and will hence also be provided for the new terminal at Baltiysk. They comprise garbage collecting companies in Baltiysk, oil refineries (Lukoil in Svetly), ship yards in Kaliningrad, and tank cleaning companies.

The issue of space requirements for different activities is dealt with in the design. For further space requirements for e.g. port development, temporary storage of waste during emergencies, possible storage for potentially polluted soil, the remaining northern part of the Vostochny Peninsula is proposed.

The Ro-Ro ships that will be expected in the new port are described in chapter 2.

According to MARPOL 73/78 reception facilities are to be provided for the so-called Annex I, Annex II and Annex V wastes that comprise oil products for Annex I, noxious liquids in bulk for Annex II and garbage for Annex V. The other Annexes regard wastes that will not be expected for the planned terminal.

The detailed requirements with regard to type and size of reception facilities, operation and maintenance etc will have to be prepared according to the MARPOL 73/78 convention together with the detailed design of the port.

5.2.2 Oil Pollution contingency

The existing oil spill contingency plan (OSCP) for the Kaliningrad Port has been revised in the context of the planned port development at Vostochny.

An illustration of the different existing operational zones of within the responsibility of the KPA is given in Figure 5.1 below.

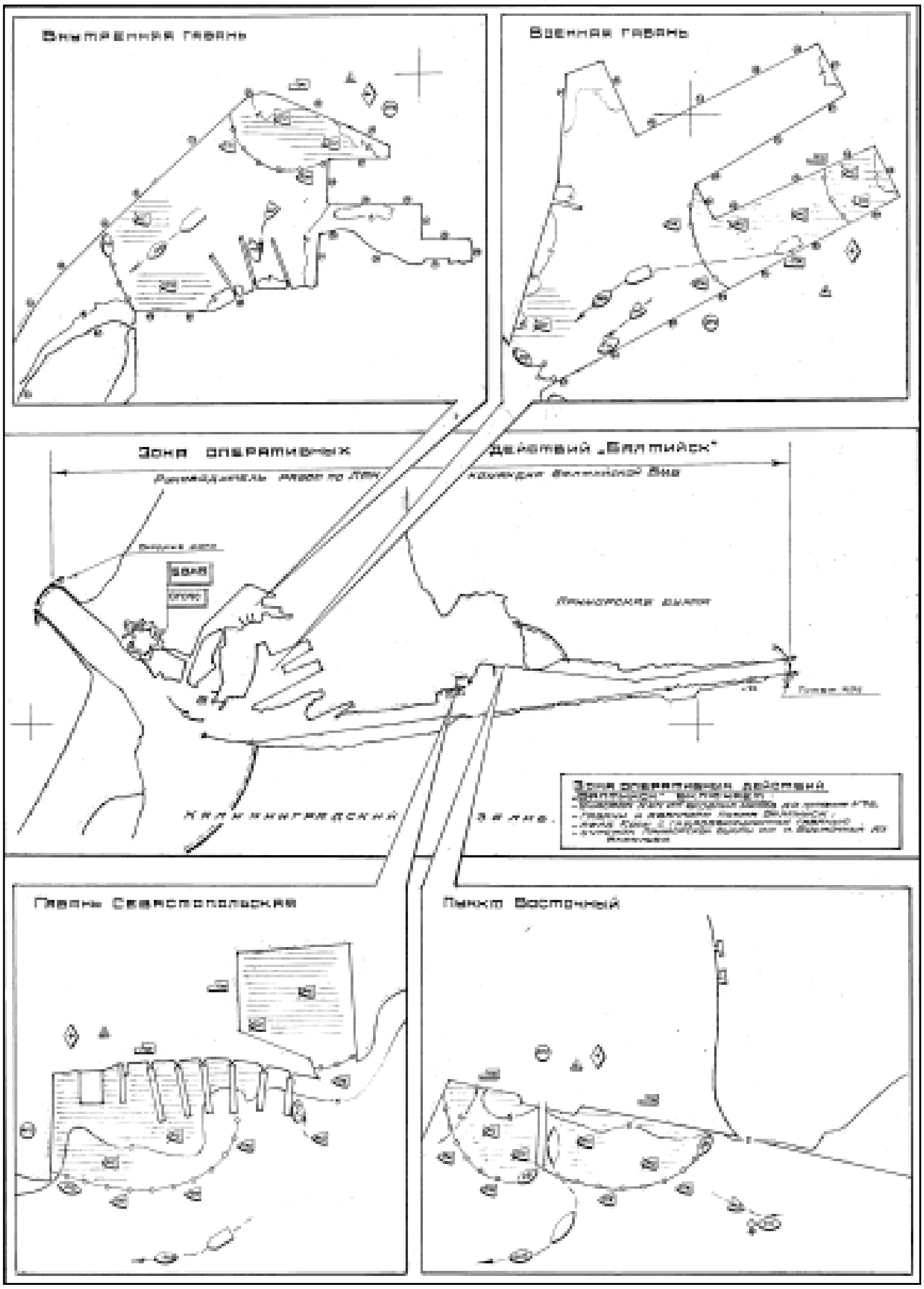


Figure 5.1 The existing oil spill response plan: Illustration of the Baltiysk operational zones (Tacis, 1999)

Responsible authorities for OSPC are

- The Commission for Emergency Situations of the Kaliningrad Region
- The Board for Emergency Situations & Civil Defence for the Kaliningrad Region

- The State Committee for Environmental Protection of the Kaliningrad Region

- The Port Authority of Kaliningrad

The plan is attached in the appendix. Below the main principles for reviewing the OSP are given as well as the results of the finding and the proposed specific additions.

Main guiding principles

1. National and international legislation shall be considered when developing the plan.
2. The main RF requirements to oil spill contingency plan (the RF Government Decree № 613 dated 21.08.00. and №240 dated 15.02.02.) shall comply with IMO requirements.
3. Environmental sensitivity mapping and potential trans-boundary dispersion of spilled oil shall be assessed
4. A new plan shall be an integral part of the current plan applicable for Kaliningrad port and lagoon considering available means and forces.
5. Dispersion of spilled oil options shall be modelled in order to develop the most efficient response strategy.
6. All scenarios of accidental oil spills shall be considered
7. All organisations able to assist in case of emergency and their means and forces shall be considered
8. Should oil spill may not be combated by MAP, external means and forces shall be applied
9. In order to secure a high level preparedness the staff shall be duly educated and regularly trained
10. Oil spill combating methods shall be available for public. A way and means of public awareness shall be specified.
11. Environmental monitoring shall be carried out during lagoon treatment process as well as upon its completion.
12. The plan shall be regularly updated.

The findings of the review

In general it is found that the plan is developed in compliance with the RF legislation and international agreements. This implies that the following issues are addressed:

- Climate conditions in the plan application area are briefly described.
- Potential oil spill volumes have been forecasted.
- Main potential sources of accidental oil spill have been revealed.
- Forces and means to oil spill combating as well as their contents and location have been indicated.

The following organisational matters have been proposed:

- Operating and interaction of forces and means
- Communication and awareness
- Information flow
- Alert readiness of forces and means for oil spill combating and staff training

The following technical and financial aspects have been elaborated in the plan:
- Oil spill combating
- Reimbursement of oil spill combating costs
- Environmental protection measures due to accidental oil spill

Further, the following issues are described:
- Methods of collected oil utilisation are suggested.
- Public safety and first aid measures are indicated.
- Representative graphs are shown in annexes.

Specific additions
After revision of the plan the following specific additions are proposed to adjust the existing plan to the new port development at Vostochny. The specific additions will be developed as part of the environmental action plan in close co-operation with the Kaliningrad Port Authority who is the responsible authority.

1. In order to thoroughly analyse potential scenarios of accidental oil spill, fire risk and fire fighting brigade availability shall be considered
2. A plan for an optimised combination of simultaneously applied skimmers and other equipment should be prepared to reduce the period of impact in the lagoon. At present the time for oil spill collection is given for each individual skimmer. The collection time is calculated based on their capacities and given in clause 5.1.1.
3. Environmental sensitivity map (Annex 19) shall be furnished with the data on recreational value of the beach zone and Baltiyskaia peninsula as an extra sensitive nature object.
4. A plan for public information about the oil spill combating actions, advise to the public and results of the actions shall be prepared

Risks due to hazardous cargo (on land as well as on sea)
The ferry terminal is not planned for dangerous or potentially dangerous cargo. It is assumed oil spills during bunkering and accidents in the port and the Kaliningrad Canal represent the highest environmental risks.

Risks due to hazardous cargo have to be managed according to the following Russian standards, laws and conventions

- Federal Law on Industrial Safety of Dangerous Production/Service Facilities, No 11-FZ from 27.07.97

- Regulations on Maritime Transport of Dangerous Cargoes (so-called MOPOG), No 5M, 1977 (developed in accordance with the International Maritime Dangerous Goods Code, IMO, 1992)

- SanPiN 2.2.1/2.1.1.1200-03 "Sanitary protection zone and sanitary classification of companies, facilities and other premises", approved by the Chief State Sanitary Doctor of the Russian Federation in April 2003 (superseded old standard, in force since June 15, 2003)

- Guidelines on Technological Design of Sea Ports, RD-31.3.01.01-93, Ministry of Transport, 1993

5.2.3 Vessel Traffic Service

During operation the vessels calling for Vostochny terminal have to be in close contact with the VTS system of KPA in order to avoid accidents with vessels in the Kaliningrad Canal.

5.2.4 Air quality

Local concentrations of SO2, NO2 and VOCs [hydrocarbons] are not expected to exceed limit values, but these pollutants contribute to regional pollution problems (acidification and ozone formation) which should always be minimised. It is recommended to require the use of low-sulphur fuel for landside and ship operations. It is also recommended to require the use of low-NOX and low-particulate diesel engines for ship motors and landside equipment, and to require particulate filters on stationary diesel motors installed near parking areas for waiting vehicles and permanent work areas.

5.3 Measures related to decommissioning

For conventional structures like the terminal, the application of good environmental practices is instrumental for avoiding pollution problems during decommissioning.

Environmental risks during decommissioning are minimised by the following measures during construction and operation:

- Specification of environmentally safe materials and supervision of the choice of materials during design and construction.

- Prevention of pollution during operation and early clean-up when pollution occurs.

5.4 Costs and financial provisions

5.4.1 Cost basis

Costs for mitigation of environmental impacts are estimated on the following basis:

- Actions to comply with Russian environmental standards are assumed to be part of basic project budget.
- Basic environmental precautions are assumed to be cost-neutral, provided they are accounted for at the design stage.
- Comprehensive environmental precautions are assumed to require a provision of up to 5% of the cost of the affected project component.
- Costs for specific actions are estimated individually.

6 Environmental Action Plan

The Environmental Action Plan (EAP) has been prepared in consideration of the Environmental Procedures of the EBRD and the ToR of the present project. The current version is a proposal for consideration during public hearings and loan negotiation.

As the MPAK has management of marine constructions as part of its normal operations, the EAP has been based on the existing procedures and responsibilities of the MPAK, with due consideration of the specific issues of the project. The EAP includes actions during design and construction as well as the operation phase until the loan is repaid.

The EAP is based on the assumption that all relevant Russian standards and regulations are complied with. The Russian requirements for EAP are mainly prescribed by the Federal Law on Environmental Protection, No 7-FZ from 10/01/2002.

6.1 Organisation and responsibilities

The responsible authority for the EPA is building owner, in this case the KPA and the MoT.

During construction the entrepreneurs will have to conduct monitoring of their own activities. The data are to be compared with the criteria required in the EAP and the activity has to be adjusted accordingly. The monitoring data are to be presented public regularly and subject to inspection and audit at any time by KPA or its subcontractors and the Bank. During operation the monitoring will be carried out by the KPA and reported to the Bank and the public in regular intervals.

The EAP has to encounter the Russian requirements given in the following: The organisation of environmental monitoring is described by the "Manual on environmental expertise of pre-design and design documentation"(Ministry of Ecology, Moscow - 1993), by CR 11-102-97 "Engineering and environmental studies for construction", and by the "regulation about introduction of the state monitoring for water bodies", order No 307 of 14.03.97. The environmental monitoring of dredging operations has to follow the "regulation about the order for receiving permits for dredging, silting and disposal of soil in water bodies"(Russian Ministry of Nature, St. Petersburg, 1995). Environmental monitoring of soil disposal in water bodies is described by "Temporary order of permit providing for disposal on the continental shelf of the Russian Federation and for disposal of waste and other material in the economy exclusive zone of the Russian Federation", introduced by Goscomecology No 110 of 18-03.99.

6.2 Actions during the construction phase

6.2.1 General actions

Environmental Design Review
The design review shall ensure that all environmental provisions relating to the loan as well as other relevant standards are complied with in the design and tender documents. Reviews shall be performed at key stages of the design process by KPA-Environmental Department.

Environmental Expertise (Russian Procedures)
Environmental Expertise procedures will proceed at federal level with KPA, which will be the future owner of the facility, as responsible project "promotor".

Follow-up on EIA for EBRD
The follow-up shall review the final design and report all changes that could affect the conclusions of the EIA. The impacts of such changes shall be analysed.

Environmental baseline description
In order to assess the environmental impacts on the water quality after the construction of the terminal a site specific study is needed. This study has to reveal “initial conditions”, which will be used as site specific reference conditions during assessment procedure. The spatial structure of zones of environmental impact is a crucial point for the development of the environmental monitoring programme at the stage of terminal design, construction and operation.

Environmental supervision
The implementation of environmental measures and the environmental performance of contractors shall be supervised during the construction phase. The KPA is the ultimate responsible for this supervision but will be able to engage subcontractors for this matter. Full publicity has to be guaranteed through regular publications as well as through inspection by the Bank.

6.2.2 Specific Actions

Contaminated soil from the military facility

(To be elaborated)

6.2.3 Monitoring of dredging activities

The monitoring activities are still in state where they are to be re-considered following further assessment.

The activity of main environmental impact is the capital dredging activity. Therefore, the following monitoring activities are to be implemented. For all measurements a full documentation for calibration and validation procedures shall be available (Quality Assurance procedure).

Bathymetric survey

A survey has to be performed prior to earth works and shall cover the area where dredging will take place (on the marine territory) and the depot area (on land).

After appropriate periods surveys will have to be performed within the area of present activities I order to verify the volumes removed, pumped in and hence to determine the spill ratio together with measurements in the surrounding water. After accomplishing the dredging works the same areas are to be surveyed again in order to assess the results of the activities.

Sampling of sediments

Sediment samples shall be taken prior to construction in order to give a rough description of the characteristics of the soil that will be dredged. At about 20 positions in the dredging area borings shall be performed down to the planned basin depth (maximum 11m). The positions shall be distributed on the border and cover the interior of the dredged area. Samples shall be taken from each meter depth.

Each sample has to be analysed for grain size distribution, organic matter content. Every second surface sample will be analysed for heavy metals and hydrocarbons.

Sampling of discharge

The discharge that is pumped into spoil fields will have to be monitored continuously in terms of discharge and. content of matter.

The outlet from the spoil fields will have to be monitored. It is proposed to install a continuously recording water level gauge in the spoil field and to calculate the discharge by means of the geometry of the overflow. The content of suspended matter will have to be determined through samples.

Sampling of surrounding waters

The aim of sampling in the surrounding water is to determine the spill during dredging. Sampling of suspended matter in the marine environment in the vicinity of the dredging works will be preformed in regular intervals as sediment cruises. The cruises can be conducted during special dredging operations or on a regular monitoring basis. At least 10 calculations of the sediment spill shall be performed during the dredging. Samples are taken upstream (undisturbed), and in the downstream sediment plume (approximately 10 samples). A very suitable instrument for this investigation is a handhold turbidity instrument. The advantage is that it provides vertical profiles. If no turbidity instrument is available, samples have to taken at various depths (½-1 m interval). Analysis is made on suspended matter. At the same time the flow velocity field has to be described, i.e. flow direction and speed at the same position, depth and time as the suspended matter sample. Compared with measurements of dredging intensity these analyses will provide the basis for calculation of the spill.

Spill criteria

The acceptance criteria for the spill ratio is set to 5%, based on experience from a long list of offshore dredging works (e.g. Great Belt 1994). In case of violation of the criteria the operation procedure must immediately be changed or stopped. It is proposed that suction dredgers with direct pumping into spoil field are used. In this case, the danger of major spill is expected to be limited.

If other dredging methods are applied a monitoring system shall be developed that can verify that the average spill is less than 5%. This requires an on-line system of vessel and acoustic instruments for assessing the density and size of the sediment plume during dredging. Since this method is very cost intensive, it is recommended to apply the dredging method outlined above.

For verification, sediment cruise will form the basis of the spill calculation. The analysis and calculations after a sediment cruise will take 1-2 days. Compared with the period of dredging and taking the expected homogeneity of the soil conditions into account this response time seems adequate. Faster response times will require more online measuring equipment on board the survey vessel.

The total spill rate is the sum of the spill rate determined from the sediment cruises and the spill rate from the spoil field. The spill percentage or spill ratio is the sum of these two spill rates divided by the rate of total dredged volume. The rate of total dredged volume is determined based on the measured discharge and suspended matter content of the flow pumped into the spoil field and it is also based on the bathymetrical survey of the sea floor.

Monitoring of contractor

The environmental performance of dredging contractors shall be monitored by KPA, Environmental Department, based on contractor's reporting and on site inspection. Summary of amounts, environmental characteristics of soils, dredging methodology, estimates of spill, and observed and reported impacts shall be included in annual report.

The environmental reporting of the contractor shall also include other incidents and observations of environmental relevance, in particular observation of oil spills.

Table 6.1 Overview of Environmental actions during the construction phase

Project Component	**Environmental Impact**	**Action**	**Timing**	**Responsibility**
Design review	General	Modification of design	immediate	KPA
Environmental exper-tise	General	Procedure promotion	immediate	KPA
EIA by EBRD	General	Consequence check	After submission of EIA	KPA
Environmental super-vision	Suspended matter, flora, fauna	Aquatic environment monitoring	During construction and operation	KPA or its consult-ant
Site specific Environ-mental baseline	Suspended matter, flora, fauna	Aquatic environment monitoring	immediate	KPA or its consult-ant
Monitoring of military facility	Soil contamination (oil)	Monitoring of selected borings	immediate	KPA or its consult-ant
Dredging monitoring	Spill of sediments	Field survey of dredged material, sedimentation in spoil fields, sediment plumes	During construction	Entrepreneur, KPA, KSMI

6.3 Actions during operation

6.3.1 Environmental monitoring

The data and information required within the existing environmental monitoring programmes shall be co-ordinated and integrated in the monitoring programme of the project.

The monitoring activities are still in state where they are to be re-considered following further assessment. At this stage, environmental monitoring during operation is specified at the conceptual level. A final monitoring schedule shall be prepared by the KPA when construction is complete. It shall account for modifications of the project during construction and for the level of traffic related activities on the site.

Annual reports shall consider potential needs for programme modification. Monitoring results are compared with the environmental objectives of geographical areas of ecological value. If discrepancies are found between objectives and monitoring results measures shall be proposed hoe the objectives are achieved.

Air monitoring

It is recommended to monitor particulate matter concentrations during construction and operation at a location near the edge of the site which is likely to have the highest particulate concentrations from construction and operation. The monitoring could be carried out as two 30-day periods of continuous 24-hour sampling each year (during active construction and during operational phase, summer and winter), and be discontinued when and if the levels of particulate matter from operations are confirmed to be well below the limit values. It is recommended to make wind speed and direction measurements together with the particulate sampling, to enable proper interpretation of the monitoring data.

Special monitoring campaigns shall be planned to describe emergency and other particularly uncomfortable meteorological situations.

During periods with snow cover deposition rates of heavy metals, arsenic, COC, hydrocarbons, polycyclic aromatic hydrocarbons, acidity, alkalinity and mineral dust can be determined if such substances are handled in the port.

Sea water and sediment monitoring

Sea water monitoring data are measured in the canal, the Primorsk Bay and the lagoon within a distance of approximately 5 km from the Vostochny terminal. The amount of stations shall be approximately 20. Samples are to be taken at the surface and bottom.

Water monitoring parameters comprise heavy metals, COC, VOC, hydrocarbons, PCB, PAH, detergents will be measured every 3 month. The parameters suspended matter, salinity, temperature, oxygen, BOD, COD, pH, Ntot, Ptot and Coliform bacteria will be measured monthly.

Special monitoring campaigns shall be planned to describe emergency and other particularly uncomfortable hydrological situations.

Sediment analysis will be made on 5 positions within a 1 km distance from the port. Analysis for grain size distribution and organic matter are conducted annually. Further, analysis of heavy metals, arsine, COC, total hydrocarbons, PCA, VOC, non-polar AH and phenols will be conducted in a 3 year interval.

Ground water monitoring
Ground water monitoring data are measured in control wells in approximately 3 locations on Vostochny peninsula.

Water monitoring parameters will have to be agreed upon with the sanitary and Epidemiological Inspectorate of Kaliningrad. The monitoring frequency will be once a year.

Special monitoring campaigns shall be planned to describe emergency and other particularly uncomfortable ground water situations.

Waste management
Waste will be monitored as it is collected and removed from the terminal.

The waste monitoring parameters follow the waste classification laid out be MARPO 73/78.

The reporting frequency is once a year.

Waste water management
Waste water (domestic and industrial sewage) will be monitored as it is collected and removed from the terminal.

The reporting frequency is once a year.

Soil monitoring
At contaminated areas the soil has to be monitored annually for the parameters of the specific contamination. Such monitoring is relevant for site acting as temporary or permanent storage of contaminated soil, oil framing area, etc.

For not contaminated soil the monitoring is foreseen for levels of MAC which ensure no significant bioaccumulation in flora and fauna. Soil sampling has to e performed during summer and once a year.

Monitoring of terrestrial flora
Monitoring stations for vegetation sampling shall be co-ordinated with soil monitoring stations. Sampling will be carried out once a year during late sum-

mer. Samples will be analysed for species composition, abundance, content of heavy metals, arsenic, COC and PCA.

Monitoring of marine flora and fauna
The monitoring area for marine flora and fauna is restricted to a distance of approximately 5 km from the Vostochny terminal.

Marine flora has to described in approximately 3 transects from shallow towards deeper water. The composition and abundance of underwater vegetation has to be described. Transects will be investigated every second year.

Benthic fauna is described by approximately 10 stations where grab samples are taken and analysed for species compositions and abundance. The stations shall cover different substrates, depth and current regimes.

Birds will be monitored by annual (synoptic) bird counts. Co-operation with NGOs can be established to provide for more resources. The gain of public participation can also be an asset to the monitoring programme.

Fish catch will be monitored continuously through the statistics of the Fishing authorities.

Observation of mammals on Vostochny or the in the lagoon will be registered by the personnel performing the monitoring but is not envisaged to make prepare a systematic monitoring programme.

6.3.2 Management of specific activities

Maintenance dredging
For maintenance dredging in the basins of the new Vostochny terminal the following requirements are pointed out:

- Suction or cutter suction dredgers are to be applied. Sediments are to be pumped into sedimentation basins.

- Dredging has to be performed outside the period of herring migration (from ice break to mid May)

If other dredging methods are applied a monitoring system shall be developed that can verify that the average spill is less than 5%. This requires a on line system of vessel and acoustic instruments for assessing the density and size of the sediment plume during dredging. Since this method is very cost intensive, it is recommended to apply the dredging method outlined above.

Oil spill
The oil spill contingency plan for the KPA will have to be modified and adjusted to the introduction of the new terminal, see chapter 4.2.6 and chapter 5.2.2.

Emergency response

The emergency response plan for the Baltiysk region addresses management of fire and explosion safety, pollution control, containment, and oil spill contingency. The organisations participating in the emergency response will have to adapt the changes to the risk pattern due to the establishment of the new Vostochny terminal.

The existing organisation of the emergency response in Kaliningrad is illustrated in below.

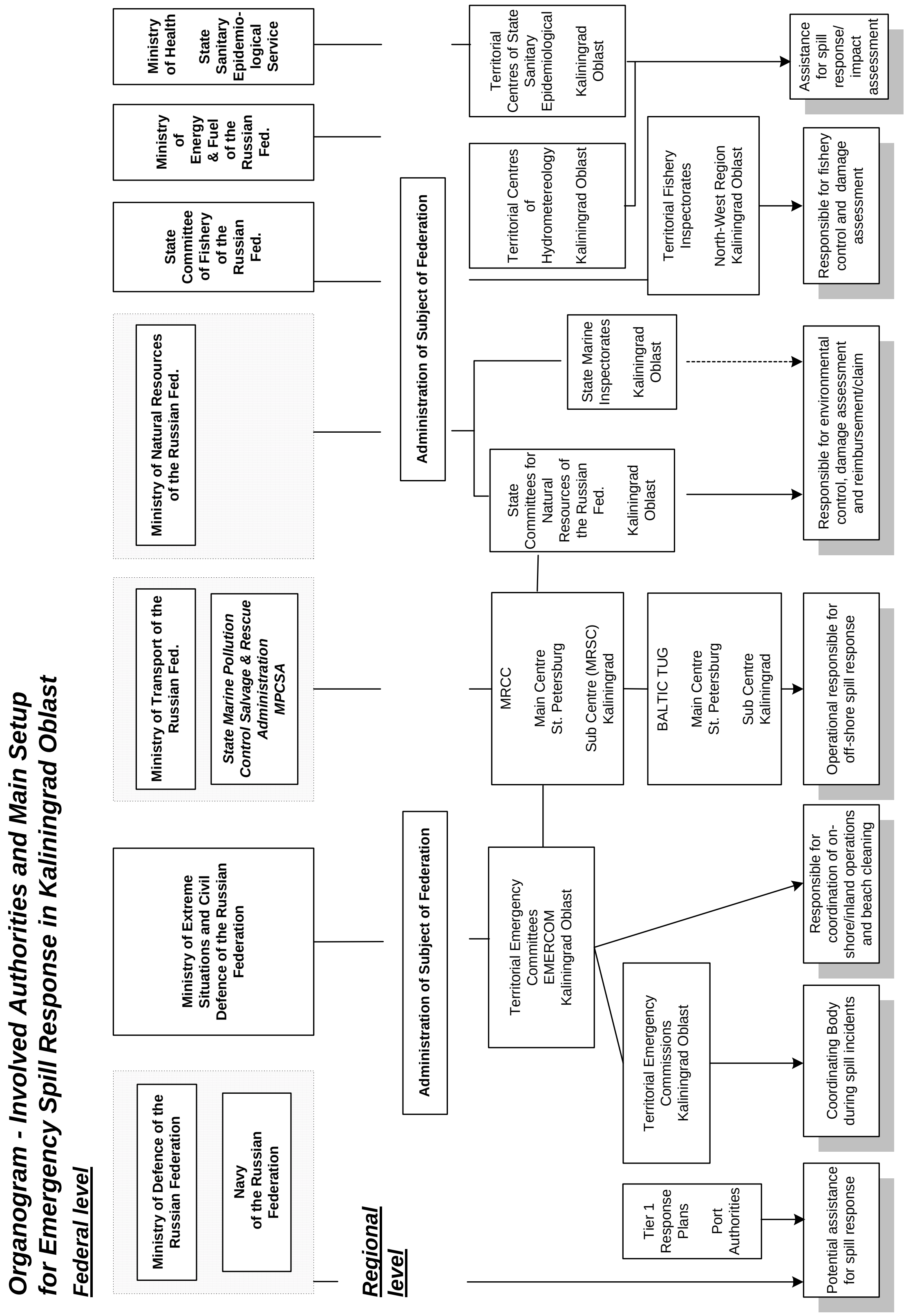


Figure 6.1 Organisation diagram for the emergency response in Kaliningrad (Tacis,x)

Ship waste collection

The organisation, establishment and operation of collection and removal of ship generated waste will be carried out according to the requirements in chapter 5.2.1

6.3.3 Planning issues

Environmental management of Terminal operator
The terminal operator(s) shall develop plans and procedures for environmental management, which shall include availability of qualified staff and reporting to the KPA.

Environmental inspection
The terminal operator shall conduct environmental inspection within the area of responsibility of the terminal. This includes monitoring and reporting of environmental issues during operation of the terminal and comprises solid waste, waste water, ground water, emissions, storage of hazardous cargo, and specific emergency situations.

Public information plan:
The Bank has developed requirements for informing the Bank and the public during construction of the terminal and until full remuneration of the loan.

The Bank requires the project sponsor (MoT/KPA) to commit to on-going public information and communication programmes. For examples, the Bank may require the results of ongoing environmental monitoring to be made available to the public. The Bank requires the project sponsor (MoT/KPA) to provide an annual environmental report and will encourage release of this information on the project sponsors (MoT/KPA) website.

For the period after remuneration of the loan, plans for information of the public are to be developed. The information shall comprise an annual environmental report as well as specific thematic publications that can be connected to specific activities of public interest.

The reports shall include environmental objectives, the monitoring results and the measured proposed to overcome possible discrepancies between objectives and measurements. The long term trend of the environmental state shall be included to guarantee the continuity of the monitoring effort.

Table 6.2 Overview of Environmental actions during the operation phase

Project Component	**Environmental Impact**	**Action**	**Timing**	**Responsibility**
Co-ordination with existing monitoring	Minimisation of general environmental impact	Co-ordination between authorities with monitoring obligations	Immediate	KPA
Air	Emission control Ambient concentration monitoring in the air	Monitoring, reporting, recommendations. Independent quality assurance (control)	During operation	KPA Kaliningrad Center for Hydrometeorology and Environmental Monitoring (KCHEM)
Surface water	Source control Ambient concentration monitoring in the lagoon	Monitoring, reporting, recommendations. Independent quality assurance (control)	During operation	KPA Board for Natural Resources and Environmental Protection (BNREP) and Territorial Fund for Geological Information under the Ministry of Natural Resources (TFGI)

Groundwater	Ambient concentration monitoring in borings	Monitoring, reporting, recom-mendations. Independent qual-ity assurance (control)	During operation	KPA BNREP/TFGI
Waste (solid)	Waste flow: source, tem-porary storage, transport and final deposition.	Monitoring, reporting, recom-mendations. Independent qual-ity assurance (control)	During operation	KPA BNREP
Waste water	Source control Ambient concentration monitoring in the lagoon	Monitoring, reporting, recom-mendations. Independent qual-ity assurance (control)	During operation	KPA BNREP/TFGI
Soil	Ambient concentration monitoring in selected lo-cations (military facility)	Monitoring, reporting, recom-mendations. Independent qual-ity assurance (control)	During operation	KPA BNREP/TFGI
Terrestrial flora	Species composition and abundance Sampling of vegetation for chemical analysis	Monitoring, reporting, recom-mendations. Independent qual-ity assurance (control)	During operation	KPA Kaliningrad State Uni-versity (KSU)
Marine flora and fauna	Species composition and abundance Sampling for chemical analysis	Monitoring, reporting, recom-mendations. Independent qual-ity assurance (control)	During operation	KPA Atlantic Scientific Re-search Institute (At-lantNIRO)
Maintenance dredg-	Sediment spill	Monitoring, reporting, recom-mendations. Independent qual-	During construction	KPA

ing		ity assurance (control)		KSMI
Oil spill contingency plan (OSCP)	Oil concentration in the environment	Optimisation and co-ordination of existing OSCP	Immediate	KPA
Emergency response plan (ERP)	Concentration of hazardous substances in the environment	Optimisation and co-ordination of existing ERP	Immediate	KPA
Ship waste collection	Waste flow: source, temporary storage, transport and final processing and deposition.	Monitoring, reporting, recommendations. Independent quality assurance (control)	During operation	KPA Porte waste collection company
Environmental management	Minimisation of general environmental impact	Optimisation and co-ordination of existing management plan	Immediate	KPA
Environmental inspection	Minimisation of environmental impacts	Control and quality assurance. Reporting and recommendations	During operation	KPA KSMI
Public information	Transparency regarding env. issues, public participation	Publicity of monitoring reports (summaries),e.g. on a website	During construction and operation	KPA

6.4 Reporting

Periodic reporting to the Bank typically comprises an annual environmental report. The annual environmental report shall include updates on the progress of implementing any agreed environmental action plan, any environmental, health and safety issues that have arisen within the reporting period and how they have been dealt with, plus any change in implementation scheduled agreed with the Bank. Depending on the nature of the project or on reporting schedules agreed for other aspects of the Banks reporting, the project sponsor may be required to report on a more frequent basis.

Besides periodic reporting, the project sponsor (MoT) will also be required to provide reports on any incidents or accidents. Such reports must be provided to the Bank as soon as possible after the accident or incident.

As part of the annual environmental reporting requirements to the Bank, the project sponsor (MoT) will be asked to provide a summary on the environmental status and implementation of project environmental requirements for publication on the Banks website, to be attached to the project summary document for the project.

Cases of non-compliance with national environmental standards and regulations, non-compliance with environmental requirements related to the loan, with specification of remedial action.

An annual environmental report to the affected public shall be issued locally.

Annex 1: Names of those responsible for preparing the EIA

Annex 2: Scoping Report

Annex 3: Written material references used in preparing the EIA

Annex 4: Records of public meetings and consultations in preparing the EIA

Annex 5: Legal and institutional background